Social Practices and Diffusion of Environmental Stewardship (SPADES)

An exploration of the communication of social norms in agricultural communications in reef catchments

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Acknowledgement of Country

We acknowledge, respect, and recognise all the Traditional Owners/Custodians of the Great Barrier Reef and its catchments. We also gratefully acknowledge the Traditional Owners and their custodianship of the lands on which this project originated, this Country known as Australia, where Aboriginal people have lived and practiced their culture for many thousands of years. We pay our respects to their Ancestors and their descendants, who continue cultural and spiritual connections to Country. We recognise their valuable contributions to Australian and global society.

Executive Summary

Purpose and Scope

Norms influence how people view practices as 'typical', normative, or socially approved. They play a crucial role in guiding behaviour. In 2019, norms, and the artefacts that communicate them, were identified as core indicators of agricultural stewardship in Reef catchments. Yet there is currently little understanding of norms and artefacts in Reef catchments and how they impact on growers and producers in their stewardship practice change journey.

Understanding the presence and attributes of stewardship norms and artefacts will allow for a better understanding and ability to monitor the role of an industry's culture (evident through norms and artefacts) in farming practice change. Additionally, exploring these variations provides an opportunity to improve the design and delivery of stewardship interventions, as well as the development and use of communication artefacts. Therefore, the scope of this project was to:

- Review and synthesise current communication artefacts within the agricultural industry, including newsletters, podcasts, social media (LinkedIn, Facebook and YouTube), and other platforms, to compare and contrast how these artefacts reflect industry norms.
- Explore patterns of artefactual evidence of stewardship norms
- Examining whether evidence of stewardship norms varies across and/or within industries (e.g., Industry sector types such as cane, grazing, bananas, and horticulture).
- Investigating whether evidence of stewardship norms varies spatially (e.g., across Reef catchments and NRM regions).
- Describe and explore the attributes of norms evidenced in the artefacts

Methodology

Data collection and analysis was through a four-stage process designed to identify stewardship norms and provide data that could describe the attributes of those norms. Stage one, artefacts that potentially communicated stewardship norms were systematically identified and categorised, ensuring comprehensive coverage of relevant sources. An initial scoping exercise to identify potential sources or artefacts was carried out by the project team in consultation with OGBRWH. The possible sources were tested and evaluated through a feedback loop between the project team, interviews with key Reef water quality informants and supplemented with online media searches.

Stage two was a combination of AI-assisted searches and manual double-coding by the project team was employed to extract explicit agricultural and Industry sector specific stewardship-related norms within the artefacts. This dual approach ensured both efficiency and accuracy in the identification process.

Stage three, the identified norms were further analysed to describe their attributes. This stage also utilised AI, complemented by double-coding, to provide a detailed description of the norms' characteristics. Lastly, the norms and their attributes were summarised and tabulated. This step facilitated the identification of patterns and insights in alignment with the project objectives.

This summary report is part of the Stage four deliverables. In addition to the report, additional factsheets will be produced to communicate and share the project findings with key stakeholders. Two journal outputs will also be produced – a paper focused on the findings plus a methods-focused paper.

Findings

Stewardship-related norms are predominantly communicated through media and industry sources, with newspapers, eNewspapers, and eMagazines contributing the highest volume of normative statements. Government sources, by contrast, produce far fewer norms. Given that frequent exposure to norms can strengthen their influence, and messages from trusted sources have a greater impact, industry communications are likely to shape stewardship perceptions and practices more effectively than government messaging.

These norms communicate a range of benefits, though they are often framed around farming-centred outcomes, such as economic benefits and improved production. Industry and private-sector communications predominantly focus on these priorities, whereas environmental outcomes, including water quality and the Great Barrier Reef, are less frequently emphasised and are mostly associated with government sources. This reflects a broader shift in agricultural communication, where industry has taken on the role of promoting farm productivity, while government messaging has pivoted toward public goods, particularly environmental conservation. Because environmental messages often come from perceived ‘out-group’ sources, they may require stronger persuasion or incentives to effectively promote stewardship. The balance between descriptive and injunctive norms also plays a critical role in shaping stewardship communication. While both influence behaviour, descriptive norms—highlighting what people commonly do—tend to have a stronger impact than injunctive norms, which prescribe what people ought to do, particularly when the two are misaligned. Trust in the communicator further determines norm adoption, with industry and peer messaging aligning more closely with farmers’ internal motivations (e.g., productivity and profit). This alignment

allows industry to effectively use injunctive norms, whereas government communications about environmental practices may face resistance if they rely too heavily on prescriptive messaging. Instead, descriptive norms may be a more effective and acceptable approach for promoting stewardship.

Our findings also highlight that the communicator of a norm is often the same as the producer of the material, with government artefacts featuring government voices and industry materials highlighting industry associations. However, some sources, such as NGOs, NRMs, and media, incorporate a broader range of voices, including farmers and experts. Given that the credibility of the messenger influences norm adoption, government stewardship communications could benefit from integrating a wider range of trusted voices and champions. Additionally, government messaging is heavily concentrated on websites, which may limit its reach within the agricultural community, underscoring the need for more diverse communication channels. Norms also varied across industry sectors, reflecting differences in management practices and priorities. The most common norms focused on innovation, support, and land management, with sector-specific emphases: bananas highlighted biosecurity, grazing focused on land management and climate actions, and crop-growing industries prioritized chemical management. Water quality and Reef-related norms were less prevalent and primarily communicated by government sources through low-visibility channels, further reducing their impact. Moreover, many norms were framed in broad terms as "management practices," which may limit their effectiveness in driving specific behavioural change.

Regional and industry differences also influenced how norms were communicated. Bananas emphasized biosecurity due to recent disease outbreaks, while grazing highlighted climate mitigation through public channels like newspapers, reflecting broader public interest in these issues. Most norms were directed at "all farms" rather than specific regions or industries, potentially reducing their relevance for individual farmers. A more targeted approach that focuses on regional or industry-specific messaging could enhance the effectiveness of stewardship communication.

Finally, the evaluative tone of stewardship messaging was overwhelmingly positive. Negative tones were more common in industry and media, particularly in relation to biosecurity risks and advocacy efforts. Notably, non-benefit statements rarely addressed environmental harms, instead focusing on collective industry threats such as biosecurity risks and regulatory impacts. This suggests that while stewardship communication remains largely constructive, industry messaging may use negative framing to increase salience, particularly when advocating against policies or highlighting immediate risks.

Taken together, these findings reinforce the importance of tailoring stewardship communications to their intended audience. Industry messaging benefits from alignment with

farmers' core motivations, while government communications may need to adapt their approach by continuing to leverage descriptive norms, but diversifying communication channels, and integrating trusted “in-group” voices to improve effectiveness.

Recommendations

The below recommendations are presented as opportunities to strengthen impact of norm-based communication and promoting stewardship.

Expand Communication Beyond Websites
Government messages are primarily shared on government websites, limiting reach and impact. Increase exposure across diverse media, including regional media, agricultural programming, and industry-focused outlets.

Broaden Voices to Celebrate Farmers and Local Champions
Use farmer and land manager voices to enhance credibility and resonance.
Integrate government perspectives with industry perspectives. Share farmers' stories and amplify their voices to connect practices with locally relevant outcomes.

Be Specific About Practices and Audiences
Avoid vague terminology—use precise practice descriptions (e.g., "fencing riparian areas" instead of "improved water quality management”). Tailor messaging to specific industries or regions rather than broad, state-wide approaches.

Use Language That Resonates with the Target Audience
Align communication language with familiar industry terms (e.g., using "Six Easy Steps" for fertiliser management). Where new practices lack familiar terms, frame messages around goals and benefits that matter to the audience.

Develop a Shared Language to Communicate Benefits
Integrate farm and environmental benefits in communication to reduce polarisation.
Use messaging that connects both domains (e.g., "Supporting the farm and supporting nature").

Increase Visibility of Policy Instruments That Promote Positive Norms
When new government led funding initiatives are made available (such as grant programs) ensure that outputs include communication of positive norms for funding recipients.

Strengthen Collaboration Across Agencies
Encourage multi-agency collaboration to improve communication strategies.
Share resources and best practices to build a unified approach to stewardship messaging.

Further maximise collaboration through communities of practice or cross-sector governance participation to promote the use of best practice communication principles when communicating norms.

Further Research Opportunities

This study provides a baseline assessment of stewardship norms at a fixed point in time, but norms are dynamic and evolve in response to external factors. Repeated monitoring over time, potentially in 2–5 year intervals, could help track how these norms shift in response to changing conditions. The study also highlights the trade-offs in using AI-assisted methods for large-scale text analysis, where balancing speed and accuracy is crucial. Future work could refine these approaches, further integrating human expertise to enhance coding precision.

Expanding beyond text-based artefacts to include images and face-to-face communication would provide richer insights into how norms are conveyed and adopted. More granular analyses at the industry, regional, or attribute level would allow for more targeted and effective stewardship communications, ultimately strengthening efforts to promote sustainable practices.

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Introduction

The Reef 2050 Long-Term Sustainability Plan represents the combined Australian and Queensland government approach to protect and improve the health of the Great Barrier Reef (Reef). It outlines a comprehensive framework of strategies and actions aimed at enhancing the Reef's resilience and sustainability through 2050, including goals and objectives to achieve the plans vision of a "healthy Reef and healthy People."

The current Reef 2050 Water Quality Improvement Plan (RWQIP) represents an essential component of the broader Reef 2050 Long-Term Sustainability Plan, emphasising the need to address water quality challenges through targeted agricultural management practices (often referred to as 'stewardship'). Recognising that achieving water quality improvements requires more than technical solutions, the RWQIP emphasizes the role of human dimensions—social, economic, and cultural factors that influence agricultural stewardship. Building on this foundation, a CSIRO project conducted in 2018 (RP190) sought to deepen understanding of these human dimensions, developing indicators to monitor and guide efforts to support landholder stewardship and drive meaningful, lasting change (Hobman and Taylor, 2018).

Additionally, social monitoring of water quality-focused practice change projects has been in place since mid-2019. Social monitoring engages with growers and producers across Queensland and Australian government practice change programs improving the quality of water running to the Reef. Questions focusing on social components from the Paddock to Reef program, are used to assess key factors that influence agricultural industries to adopt particular management practices. These factors include attitudes, group norms, stewardship norms, perceived behavioural control, motivations, and perceived barriers.

Here, we define **Stewardship norms** as the shared perceptions, values, and social expectations within communities and industries that encourage or facilitate environmentally responsible practices. However, despite stewardship norms and artefacts being identified as core indicators of agricultural stewardship, there is currently little understanding of norms and artefacts that might be present at an industry or regional level and how they impact on growers and producers in their practice change journey.

Understanding the presence and attributes of stewardship norms and artefacts will allow for a better understanding and ability to monitor the role of an industry's culture (evident through norms and artefacts) in farming practice change. The findings and insights gained from this work can be used by the Human Dimensions team of the Office of the Great Barrier Reef and World Heritage (OGBRWH), Queensland Department of Environment, Tourism, Science and Innovation

to help inform and improve on-ground practice change project design and implementation across the Queensland Reef Water Quality Program (QRWQP), and the insights will also be valuable for informing communications products developed internally or externally by project providers (Dessart, 2019).

Why are stewardship norms and artefacts important?

Norms, whether general or specific, influence how people view these practices as 'typical', normative, or socially approved[1]. They play a crucial role in guiding behaviour, shaping the adoption of sustainable practices, and fostering a sense of collective responsibility.

There are two main types of norms commonly described and applied in research:

- **Descriptive social norms** refer to perceptions of what others typically do.
- **Injunctive social norms** refer to perceptions of what others approve of or consider desirable.

In the context of agricultural stewardship, descriptive norms might reflect perceptions of how widely certain land management practices are adopted, while injunctive norms could relate to perceptions of social approval of these practices. Both types of norms can drive stewardship activities, either through the adoption of new practices or the sustained commitment to existing ones. For example, they may relate to specific actions like reducing fertiliser use or support broader goals like improving water quality and overall Reef health, with evidence that norms significantly influence policy effectiveness in water quality management and the uptake of targeted practices (Dean et al., 2023).

The Role of Visibility and Artefacts

Artefacts, on the other hand, are the tangible indicators of the presence of norms. These may be visible symbols, standards, codes, rewards, stories, rituals, or communications that reflect and reinforce community or industry-level norms. Norms can be inferred by looking at 'artefacts'. That is, artefacts serve as both evidence of existing norms and mechanisms for encouraging and perpetuating those norms.

The Diffusion of Innovations Theory (Rogers, 2003) underscores the importance of visibility (or observability) in the adoption of new practices. Practices that are highly visible—either in the act of performing them or in the communication of them —are more likely to elicit positive perceptions and encourage broader adoption (Coggan, 2021; Murray-Prior et al., 2024). That is, artefacts highlight visible aspects of stewardship norms, making them more salient and accessible to a wider audience. They reflect community or industry norms while actively

reinforcing and amplifying them, serving as powerful tools to shape perceptions and promote the diffusion of stewardship practices.

For example, organisations may intentionally communicate the positive practices of landholders in news outlets with a rural focus (e.g., North Qld Register; Rural Weekly; ABC Radio Rural report), via Industry newsletters, webinars and podcasts (e.g., NRM podcasts) or other forms of media to promote positive views of the industry or with the aim of strengthening norms. Formal programs or partnership may be established inviting farmers to participate, or report on water quality improvement program outcomes. The existence of such communications and programs provides manifest evidence of commonly performed or socially expected and desirable landholder practices within the industry (i.e., norms).

Additionally, research examining communication narratives on Reef water quality (RP227) suggests that external factors (e.g. political ideology, ownership of media companies) influence norms, and may result in artefacts that diverge from traditional media narratives (Newlands et al, 2021). This divergence emphasizes the importance of monitoring artefacts to understand how norms are constructed, communicated, and reinforced over time.

Monitoring Norms Through Artefacts

Traditionally, social research assesses norms directly via mixed-method approaches, often including surveys or interviews with the target population. While these methods are valuable, they may not always be feasible or inclusive, particularly for hard-to-reach populations. Importantly, norms can also be assessed indirectly by examining communication-focused **artefacts**, which are visible and/or digital representations of norms communicated via various formats. These artefacts may include:

- Portrayals of landholder practices in rural news outlets (e.g., *North QLD Register*, *ABC TV Landline*).
- Industry newsletters, webinars, and podcasts that celebrate stewardship successes.
- Program reports showcasing stewardship.
- Visual or narrative depictions of environmentally friendly practices on social media or websites.

Why focus on "communication" artefacts?

This analysis focuses on "communication" focused artefacts—such as news articles, websites, television programs, podcasts, and social media posts—because they provide a practical and scalable avenue for monitoring the presence and attributes of stewardship norms. Interpersonal or face-to-face artefacts may be more difficult are harder to capture systematically due to logistical, cost, and scalability constraints. In contrast, communication focused artefacts are:

1. **Accessible**: Digital platforms provide a wealth of publicly available data.
2. **Quantifiable**: Content can be systematically analysed for trends and patterns.
3. **Modifiable**: Governments and industry bodies can shape how norms are communicated in artefacts accessed by landholders through strategic recommendations and guidance.

Scope

Despite the significant potential of reviewing communication artefacts to gauge stewardship norms and their patterns with Reef-relevant industry sectors, little research has actively examined these to date. Little research has specifically examined artefacts (i.e. norms manifest) within farming communities in Reef Catchments, or how they might vary across regions or between and within different industries. Therefore, exploring these variations provides an opportunity to understand how stewardship norms are communicated, and to use this information to improve the design and delivery of communication materials and other interventions to promote.

Therefore, the scope of this project was to:

- Review and synthesise current communication artefacts within the agricultural industry, including newsletters, podcasts, social media (LinkedIn, Facebook and YouTube), and other platforms, to compare and contrast how these artefacts reflect industry norms.
- Explore patterns of artefactual evidence of stewardship norms (e.g., presence, extent, strength, and/or frequency), specifically:
    - Examining whether evidence of stewardship norms varies across and/or within industries (e.g., Industry sector types such as cane, grazing, bananas, and horticulture).
    - Investigating whether evidence of stewardship norms varies spatially (e.g., across Reef catchments and NRM regions).
- Describe and explore the attributes of norms evidenced in the artefacts, including:
    - The communicator of the norm (e.g., government, industry body).
    - The actor performing or promoting the norm (e.g., individual farmers or collective groups).
    - The scale of the norm (e.g., individual farms, regional, or industry-wide).
    - The type of management practice being promoted (e.g., Carbon farming and sequestration projects or Sediment and erosion management practices).
    - The perceived benefits (e.g., environmental, economic, or social outcomes).

While the Great Barrier Reef catchment area is the focus of this project, we recognise that stewardship behaviours often overlap across environmental domains. Given this, we adopt a

broader lens to examine environmental stewardship beyond stewardship that focused on improving water quality for Reef outcomes. By considering stewardship norms reflected in practices not exclusively tied to water quality (e.g., carbon farming, the use of drone technology), this approach allows for a comparative analysis of the communication of norms across a diverse set of practices. This broader focus enables the identification of patterns and attributes of how stewardship norms are communicated, across different domains of environmental focus.

It is important to note that while interpersonal mechanisms and artefacts are undoubtedly important for shaping norms, they fall outside the scope of this study due to the challenges of systematic monitoring.

Similarly, images were also excluded from the analysis. This decision was made because the focus of the project was on the textual articulation of stewardship norms as reflected in communication artefacts. Images, while often impactful, typically require subjective interpretation and can convey meaning that is more implicit or context-dependent, making them less suited to the systematic analysis required for this study. By focusing on text and spoken content (as transcribed into a written format), the project aimed to ensure a consistent and repeatable approach to identifying and analysing evidence of stewardship norms.

However, the role of both interpersonal mechanisms and visual images should not be overlooked, as they often complement and reinforce the narratives conveyed through written or verbal communication-focused artefacts.

Objectives

This project aimed to explore stewardship norms and artefacts to better understand their role in supporting agricultural communities' progress towards improved water quality and Reef health. The specific objectives were to:

- Understand the existing industry and community-level stewardship norms and artefacts related to each agricultural sector.
- Identify variations in stewardship norms across Reef regions and Industry sector types.
- Describe the attributes of norms as evidenced in artefacts, including the communicator, actor, scale, type of management practice, and associated benefits.
- Develop a method for easily and continually monitoring stewardship norms and artefacts.
- Provide actionable recommendations on how the insights from this study can inform and influence the ongoing progress towards the Reef 2050 Water Quality Improvement Plan human dimension targets, particularly in shaping communications produced by government, project providers, and industry bodies.

Method

Data collection and analysis was through a four-stage process designed to identify stewardship norms and provide data that could describe the attributes of those norms (see Figure 1).

Stage one, artefacts that potentially communicated stewardship norms were systematically identified and categorised, ensuring comprehensive coverage of relevant sources. An initial scoping exercise to identify potential sources or artefacts was carried out by the project team in consultation with OGBRWH. The possible sources were tested and evaluated through a feedback loop between the project team, interviews with key Reef water quality informants and supplemented with online media searches.

Stage two was a combination of AI-assisted searches and manual double-coding by the project team was employed to extract explicit agricultural and Industry sector specific stewardship-related norms within the artefacts. This dual approach ensured both efficiency and accuracy in the identification process.

Stage three, the identified norms were further analysed to describe their attributes. This stage also utilised AI, complemented by double-coding, to provide a detailed description of the norms' characteristics. Lastly, the norms and their attributes were summarised and tabulated. This step facilitated the identification of patterns and insights in alignment with the project objectives.

The following sections offer a high-level overview of the method developed and implemented, with a detailed description to be presented in a forthcoming peer-reviewed article.

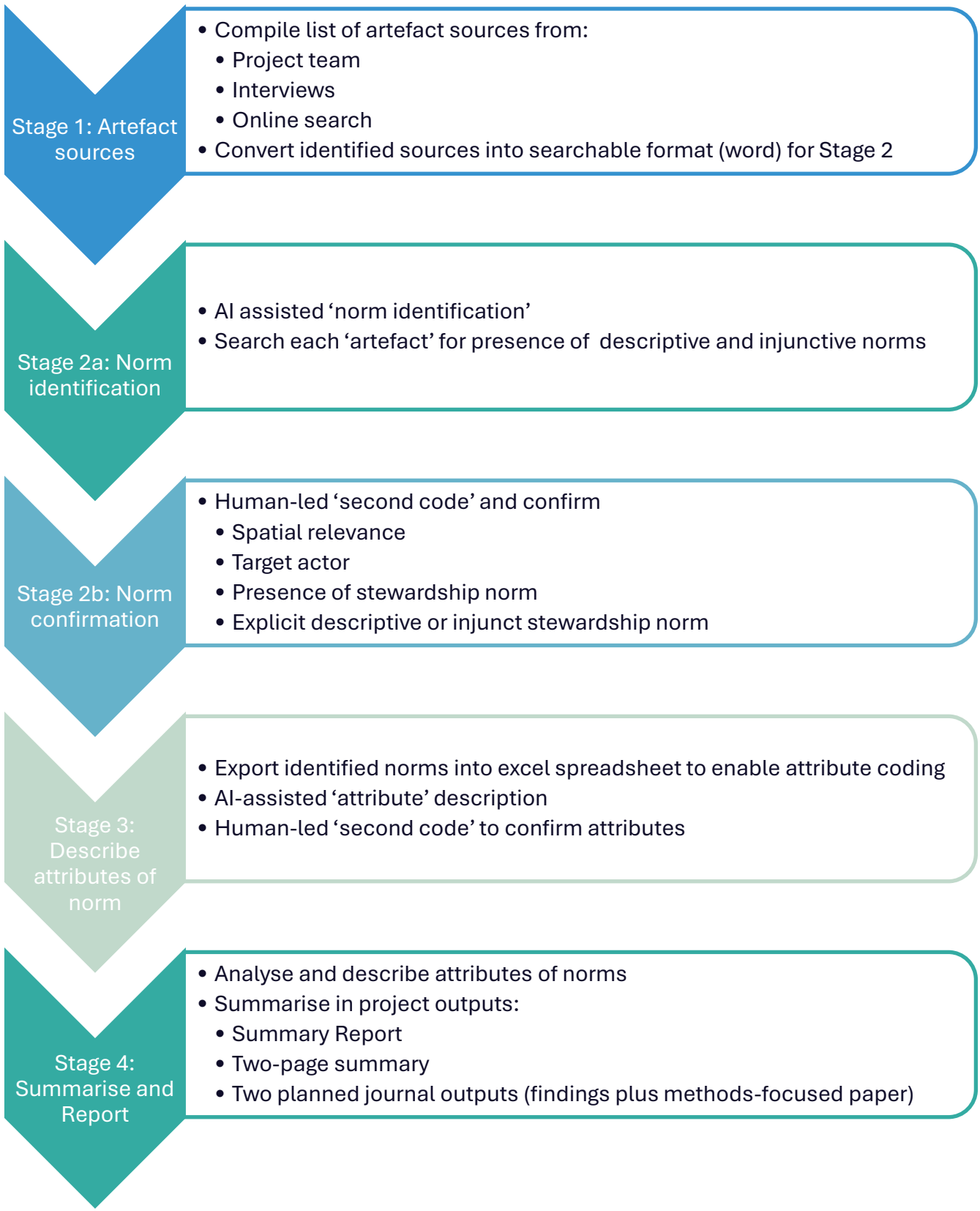


Figure 1 Methodology Overview

Stage 1. Identify and source artefacts

The first step in this stage involved identifying a list of publicly accessible communication 'artefacts' that were likely to contain information on agricultural stewardship relevant to landholders in Reef catchments. The project team initially compiled a list in consultation with OGBRWH (Stage 1a), which was then expanded through interviews with key informants (Stage 1b) and supplemented with online searches, including Google and media searches (using the Factiva database) based on a targeted keyword search (Stage 1c).

Stage 1a. Project team

In collaboration with the OGBRWH, the project team developed a comprehensive list of potential sources of communication artefacts. The goal was to identify a diverse range of groups and organisations that engage with agricultural landholders in the Reef regions about stewardship practices. This included groups from private industry, industry organisations, and government bodies, spanning various Industry sectors and operating within or across the Reef regions. For each organisation identified, the relevant communication channels were documented such as websites, social media platforms (e.g., Facebook and LinkedIn), blogs, eMagazines, eNewsletters, YouTube channels, podcasts, and media releases.

Stage 1a. Interviews

A series of key informant interviews (N=21) were conducted to: (a) confirm the types of industry-level 'artefacts' that communicate on-farm stewardship to farmers, and (b) gain an industry perspective on which artefacts are perceived as most effective in communicating stewardship norms, as well as the consistency of these norms across different domains.

Interview targets were identified through discussions with OGBRWH and included representatives from key Industry sectors relevant to agriculture in Reef catchments, general industry bodies, extension program delivery providers, regional bodies (e.g., NRM groups), and government. A summary of the types of interviewees is provided below.

Region	Industry	Stakeholder Type	No.
All	All	Program Delivery partner	3
		Government	2
		NRM	1
	Grazing	Government Extension	2
	Grains	Government Extension	1
	Banana/Hort	Government Extension	1
	Cane/Grazing	Government	1
	Bananas	Industry Group	1
Fitzroy	Grazing	Program Delivery Partner	1
	Cane	Program Delivery Partner	1

Mackay-Whit		Industry Group	1
	All	NRM	1
Burdekin	All	NRM	1
	Cane	Industry Group	1
Wet Tropics	Cane	Industry Group	2
TOTAL			21

A summary of the insights from the interviews have been provided in Appendix A. A snowballing sample from the interviewees added new sources to the initial list of sources established by the project team.

Stage 1b. Desktop search

A two phase desktop review was able to identify additional potential communication materials. The first phase involved conducting Google.au searches using a series of targeted search strings, which are detailed in Appendix B. These search strings were designed to identify online resources that met specific criteria:

- Referenced a target management practice, either explicitly (e.g., revegetation, erosion control, pesticide reduction, or nutrient management) or more broadly (e.g., terms like 'protect' or 'conserve').
- Focused on key regions relevant to the Great Barrier Reef, such as the Wet Tropics, Cape York, or Fitzroy Reef Regions, or used broader terms like "North Queensland" or "Wide Bay." Additionally, the search included references to any of the 35 river catchments.
- Mentioned target actors, including farmers, graziers, and producers.

In the second phase, a similar approach was applied to the Factiva database to locate relevant newspaper articles published within the previous 12 months in the Reef regions. Articles were included if they mentioned a target Industry sector (e.g., "Grazing," "Beef," "Horticulture," or "Avocado") or a key focus area (e.g., "water quality" or "Reef") in conjunction with agriculture-related terms. A manual review was conducted to exclude articles that were not relevant (e.g. artefacts focusing on business, technology or lifestyle issues that did not relate to stewardship or the environment more broadly)

Stage 1c. Document extraction

The table below outlines the parameters or 'rules' used to guide the document extraction process. When possible (which was often challenging for websites), the search was restricted to communication artefacts published within the last 12 months (i.e., from August 2023 to August 2024). From the initial scoping exercise and interview data, the advice was to restrict the sample to the previous 12 months due to the volume of potential artefacts. This approach provides a focused 'baseline assessment', while minimising the influence of longer-term temporal

variations or external factors that may have shaped activities or outcomes beyond the specified timeframe. Any exceptions to this approach are noted in the table. Extracted documents were saved as .doc files to support the next stage of norm identification. In all, over 2500 documents were extracted at this stage, with some documents depicting a single Facebook post and others, such as website extracts containing 100's of pages.

Artefact	Source	What was extracted from each identified source or communicator?
Social Media	LinkedIn	Up to 20 posts from the past 12 months were extracted
	Facebook	Up to 20 posts from the past 12 months were extracted
	YouTube	Transcripts (were available) of videos posted in last 12 months
Podcasts	All podcasts	Transcripts (where available) of podcasts posted in last 12 months
Websites/pages	Website	The home page and their linked pages up to three layers deep
	Specific URLs	Specific webpage
Case studies/Grower stories	Case Studies/Grower stories	Every story/study from last 12 months
eNews & eMagazine	eNewletters or eBulletins	Most recent release from last 12 months
	eMagazine	Most recent release from last 12 months
	Website "news" pages or Blog posts	Every post from last 12 months
	Media releases	Every post from last 12 months
Television	ABC Landline	Transcripts of relevant segments from last 12 months
Radio	ABC Landline and Country Hour	Transcripts were unable to be sourced for ABC Landline and Country Hour radio segments
Newspapers (via Factiva database)	All newspapers available in the Reef Regions.	Entire article that satisfied search criteria from the last 12 months

A diverse range of communication artefacts was identified, relevant both across and within various industry sectors and Reef regions, and produced by a variety of groups, including media, industry, government, and NRMs (see table below).

Table 1 Types of artefacts identified at Stage 1, showing artefact types across publisher, industry and region

		Case study or Grower Story	eMagazine	Media releases	eNews or Bulletin	Podcast	Social media	Website	Website news	You Tube	Landline TV Show	Radio	Newspaper
Publisher	Government	X	X		X		X	X	X	X			
	Industry	X	X	X	X	X	X	X	X	X			
	Media						X	X					X
	NGO/NRM	X	X		X		X	X	X				
	Private Business				X		X	X	X	X			
	Research					X	X	X	X	X			
Industry	Cross-Industry	X	X		X		X	X	X	X	X		X
	Bananas						X	X	X	X			X
	Cane	X	X	X	X		X	X	X	X	X		X
	Grains				X	X	X	X	X	X	X		X
	Grazing	X			X		X	X	X	X	X		X
	Hort			X	X	X	X	X	X	X	X		X
Region	Cross-region	X	X		X	X	X	X	X	X	X		X
	Burnett Mary		X		X		X	X	X	X	X		X
	Fitzroy	X			X		X	X	X	X			X
	Mackay-Whitsundays				X		X	X	X	X			X
	Burdekin						X	X	X	X	X		X
	Wet Tropics		X	X			X	X	X	X	X		X
	Cape York						X	X	X	X			X

Stage 2. Norm identification and attribute description

A two-stage process was applied to identify norms within the communication artefacts. The first stage, employing a deductive-driven approach, focused on searching the extracted documents for evidence of either descriptive or injunctive norms based on a predefined set of 'attributes'. The second stage involved analysing and describing the attributes of the identified norms. Both stages incorporated an AI-driven component, followed by secondary coding by a human researcher (independent to the researcher that drove the AI component) to verify and validate the AI outputs. This method, closely aligned with the principles of qualitative content analysis, emphasised the explicit representation of norms within the text. By focusing on explicit mentions, it avoided interpretative ambiguity and provided a rigorous, transparent basis for understanding how norms were communicated and described within the artefacts.
A more detailed guide of the process to first identify relevant norms and then describe the attributes of each norm according to predefined typologies has been provided in Appendix C.

Stage 2a. Norm identification

Artificial Intelligence (AI) was employed to conduct the initial coding round, and asked to extract any normative statements present in the text. This initial search was performed by an AI assistant (Claude.ai) through a Python API script to automate the process. The AI scripts have been provided in Appendix D.

The artefacts had to explicitly convey norms related to on-farm stewardship for the target industries in the Reef regions. Specifically, the instructions were given to the AI to find norms with the following criteria:

- **Explicit**: Clearly expressed or openly stated, not implicit or unspoken/unwritten.
- **Normative**: Highlighting a behaviour or action that has been or can be implemented or is currently being practiced. Specifically, the norm must be either:
    - **Descriptive**: Depicting what a landholder has done or is currently doing on their farm or related to their farm OR
    - **Injunctive**: Indicating what they should/must/ought to do on their farm or related to their farm.
- **Stewardship focused**: Reflecting a behaviour or action that contributes directly or indirectly to a positive environmental outcome or impact.

Example A

Animal production scientist from DAF, Jarud Muller said the technology is a big step forward for the industry. "The potential benefit I find most exciting is the ability to shift cattle into a defined area of a paddock by simply drawing a shape within the app on your computer," he said. "The ability to manage grazing in such an adaptive way is a game changer for industry. "We can match stocking rate to feed supply and optimise grazing utilisation on a finer spatial scale within each 'shape' to improve land condition and best meet cattle nutritional needs."

This text, extracted from a newspaper article, represents an **injunctive norm** by explicitly describing what landholders can or should do with technology, rather than detailing actions already undertaken. It emphasises the *prescribed* use of the technology to improve land and cattle management and highlights potential environmental benefits by discussing improved land condition.

Example B

The Burdekin Nutrient Management Project, known as RP161, is funded by the Queensland Government's Queensland Reef Water Quality Program and Australian Government's Reef Trust and delivered by a local agronomy firm Farmacist. The project has been working alongside local sugarcane farmers since 2016 to fine-tune their nitrogen rates in line with the industry standard, SIX EASY STEPS, while maintaining their productivity and profitability. Since 2016, 237 farms have received one-on-one agronomic support to create spatially mapped whole-farm nutrient plans. As a result, the project has achieved significant practice change outcomes, including over 25,000 hectares of improved sugarcane nutrient management with 353 tonnes less nitrogen applied across this area. As reported in social monitoring through this project in 2021, almost all landholders felt that changing their nutrient management was a positive and easy thing to do on their property. These are positive indicators for long-term behaviour change.

The text, extracted from a DESTI website, primarily reflects a **descriptive norm**, as it highlights explicit actions (i.e., *237 farms have received one-on-one agronomic support to create spatially mapped whole-farm nutrient plans*) already taken by sugarcane farmers through the Burdekin Nutrient Management Project. The text describes what farmers have done rather than prescribing future actions. The text also notes "*353 tonnes less nitrogen applied,"* which contributes to environmental sustainability.

NVivo Upload

The documents, with the AI-identified norms highlighted, were then uploaded into an NVivo database. This facilitated a secondary review and coding by an independent human researcher to verify the AI outputs and further highlight the normative text. The verified text was subsequently exported to an Excel spreadsheet for Stage 3, which involved describing the attributes of the norms.

Integrating AI into the analysis of stewardship norms offers significant advantages in efficiency and accuracy, especially when analysing large volumes of data. AI systems can swiftly process extensive volumes of text or data, and extract relevant information based on a clearly defined set of guidelines or criteria. This capability is particularly beneficial in monitoring research, where timely and precise data analysis is crucial. While no previous studies where identified that have used AI for the explicit purpose of identifying stewardship norms, studies have demonstrated the effectiveness of AI in automating systematic literature reviews. [1][2] Both systematic literature reviews and this project share a common goal: identifying and categorising specific information within large volumes of text. In both cases, AI facilitates the extraction of targeted information or data, ensuring consistent and streamlined application of a predefined criteria.

Stage 3. Attributes and typology of norms

Source attributes

The attributes of the norms were described at two levels, starting with the 'source' level. Each document extracted in Stage 1 was categorized by the type of artefact, its producer, and whether it was specific to a region and/or sector/Industry sector group.

Sources were only considered if they were relevant to at least one of the five core Industry sector groups (i.e., cane, grazing, bananas, horticulture and grains) and if they were relevant to at least one Reef region (i.e., Burnett Mary, Fitzroy, Mackay Whitsunday, Fitzroy, Burdekin, Wet Tropics or Cape York). The typology for remaining source attributes are outlined below.

[1] de la Torre-López, J., Ramírez, A. & Romero, J.R. Artificial intelligence to automate the systematic review of scientific literature. *Computing* **105**, 2171–2194 (2023). https://doi.org/10.1007/s00607-023-01181-x

[2] Spillias, Scott et al. Human-AI collaboration to identify literature for evidence synthesis. Cell Reports Sustainability, Volume 1, Issue 7, 100132. https://www.cell.com/cell-reports-sustainability/fulltext/S2949-7906(24)00207-6

Source Attribute	Typology or categories	Example
Artefact types	Case studies	https://www.daf.qld.gov.au/news-media/campaigns/farming-reef/case-studies/johnstones
	eNewsletters	https://www.desi.qld.gov.au/__data/assets/pdf_file/0024/352365/enews-2024-07jul-protecting-great-barrier-reef.pdf
	Magazines	https://www.canegrowers.com.au/news-media/magazine/australian-canegrower-dec-2023
	Social Media	https://www.youtube.com/watch?v=h5TxQ2eS9rc https://www.linkedin.com/company/chrrupemerald/?originalSubdomain=au NQ Dry Tropics NRM | Townsville QLD | Facebook
	Podcasts	https://australianmacadamias.org/industry/news/the-interrelationship-between-nutrient-management-and-irrigation-management-version1
	Websites/pages	https://smartcane.com.au/ https://reefcatchments.com.au/ https://www.panamatr4protect.com.au/
	Landline Television Program	https://iview.abc.net.au/video/RF2314Q001S00
	Newspapers	The Courier Mail Country Life
Who published the 'artefact'?	Government	QDESITI QDPI
	Industry	ABGC Canegrowers Agforce National Farmers Federation Australian Macadamia Society
	Media	The Courier Mail Country Life
	NRM	Terrain BMRG MCCC
	NGO	GBRF
	Private Business	Farmacist Elders
	Research	Sugar Research Australia https://www.pannelldiscussions.net/2024/07/422-social-process/

Norm attributes

The next stage involved a combined process of AI-supported analysis and secondary human coding. Each identified norm was examined in greater detail and categorized based on a predefined set of attributes. These attributes included:

- Actor: Who is performing the practice? How are they characterized?
- Communicator: Who is responsible for conveying the norm[3]?
- Practice: What type of practice is the norm focused on?
- Recognition: Is the norm presented through a formal recognition process?
- Evaluative Tone: Does the language convey a positive or negative perspective?
- Outcome: What, if any, benefits or outcomes are described in relation to the practice?
- Geographic Focus (Outcome): What is the scale of the impact attributed to the practice?
- Topic Salience: Does the communication explicitly reference the Reef or stewardship?

These attributes were chosen because they provide a comprehensive framework for understanding how stewardship norms are articulated and communicated. For example, by analysing the actor and communicator, we can explore who is involved in both promoting and performing the norm. The type of practice and recognition provide insight into the specific behaviours being encouraged and whether they are supported or formalised through acknowledgment, awards, or certifications. This level of analysis also enables the identification of patterns in how norms are articulated.

The following sections describe the typology developed for each of the norm attributes.

Actor and Communicator

When describing a norm, it is important to distinguish between the actor and the communicator. The actor refers to the person or group whose behaviour or practices the norm is about—essentially, the subject of the norm. The communicator, on the other hand, is the person or entity that conveys the norm to others. While in some cases the actor and the communicator are the same (e.g., when a farmer communicates a norm about their own farming practices), in other cases, they are distinct (e.g., when an extension officer communicates a norm about what farmers should do). Understanding this distinction is essential for accurately analysing and interpreting the norm's context and influence.

[3] The "Communicator" may or may not align with the "Actor". For example, in some cases, the Actor and Communicator were the same, such as a farmer describing their own practices. In other cases, they were distinct, such as when a government website described typical practices within a sector.

Attribute	Category name	Description	Examples…
Actor	Advisor	This category includes individuals involved in supporting or advising on farm management practices, distinct from the farmers themselves. It encompasses private industry representatives, researchers, extension officers, and NRM agents.	"CHRRUP's Agriculture Workforce Officer" "[company name]" DAF beef extension officer
	Farms – individual	This category includes when an individual farm or farmer is described.	"[name withheld] and her husband [name withheld]" "Client from Blue Water" "Ben (a farmer)"
	Farms – all	This category includes an instances were a 'farmer' or related synonym is used but with no reference to a region or sector.	"Farmers" "Growers" "Landholders"
	Farms in specific region/s	This category refers to when a group of farmers are nominated in relation to a specific region.	"a group of Innisfail growers" "Western Queensland farmers" "Primary producers in Great Barrier Reef catchments"
	Farms in specific sector/s	This category refers to when a group of farmers are nominated in relation to a specific sector.	"Macadamia growers" "Graziers" "Sugarcane grower"
	Non-specific or multiple groups are references.	This is when broad terms are used to describe stewardship related norms.	"Our industry" "The agricultural industry" "Rural communities"
Communicator*	Farmer/s	This category includes when an individual farm or farmer is attributed to the communicator of the norm.	"[Name withheld]" "tropical fruit farmer" "Stud owners [name withheld]"
	Government	This category included all levels of government as well elected officials.	"Western Downs Regional Council" "Queensland Government" "Department of Agriculture and Fisheries (DAF)"
	Industry Association	This category includes all Industry bodies and representatives.	"AgForce president Georgie Somerset" "National Farmers Federation"
	Private Business	This category includes private industries that provide services to landholders.	"DIT Ag Tech" "Comm bank" "Resource Consulting Services (RCS)"
	NRM	This category included any of the NRM groups, including catchment care groups, located in Reef regions and including their representatives.	Cape York NRM "Mary River Catchment Coordinating Committee (MRCCC)"
	Media	This category was used when no other group was attributed as the source of the norm description in the newspaper article.	Country Life The Courier Mail
	NGO	This category included any NGO groups or their representatives.	The Great Barrier Reef Foundation Greenpeace
	Expert/Research	This category anyone recognised as an expert (outside of private industry) or involved in research.	"Professor Babacan" GRDC SRA
	Indigenous/First Nations	This category included anyone that was identified as an Indigenous or First Nations person or group.	"name withheld" "Butchulla fire practitioner"

** If the communicator was not explicitly identified, the artefact publisher was used instead. For instance, if a newspaper article did not specify the communicator of a norm, it was coded as 'media'.*

Management practices

The typology below outlines the categorisation of management practices. Understanding these categories provides insight into whether different types of management practices are being described across other dimensions, such as who is communicating the norm, type and publisher of the artefact, or the scale of the benefit. The typology is further divided into categories based on their relative relevance to improving water quality for the Reef.

In this analysis, each agricultural practice has been classified into a single category to facilitate ease of analysis, even though some practices could logically fit into multiple categories. For instance, cultural burning could be categorised under both fire management and the use of Traditional Owner knowledge, while the use of drones for pesticide application could be classified under both pesticide use and technology. To support the analysis, the primary focus or overarching theme of the text was used to determine the most appropriate classification. Additionally, in cases where multiple practices were mentioned within a single text excerpt, they have been classified under the category 'multiple' to reflect the broad scope of practices discussed. For future research, it is recommended to develop a more complex classification framework that supports the identification and grouping of overlapping practices, enabling a finer analysis.

Group	Category Name	Description	Examples...
Chemical management	Pesticide and herbicide management	Practices associated with pesticide and herbicide management	"applying a chemical (likely a plant growth regulator or fungicide) to trees"
	Fertiliser management	Practices to optimize fertiliser use and reduce nutrient runoff.	"Acquiring a new Hodge 3-row stool-splitter fertiliser box" "whole-of-farm nutrient management plan"
Biosecurity	Biosecurity measures	Practices (non-chemical) to protect farms from pests and diseases.	"A suspect plant or plants should be immediately reported to Biosecurity Queensland" "Aerial shooting of feral pigs" "Complete a Biosecurity Matter Hygiene Declaration with the seller/supplier" "the control of noxious weeds" "the war on fire ants"
Land management	Fire management practices	Fire management practices, including planning fire operations, discussing fire management issues, burning, and obtaining permits for planned burning. NOTE: Practices related to cultural burning have been included 'Using Traditional Knowledge'.	"a technique called 'storm burning' to help maintain our grasslands" "early-season strategic burning in the dry season" "Implementing or touching up your fire breaks, checking up on your firefighting equipment, ensuring you have adequate access to water and cleaning up any unnecessary vegetation on your property"
	Pasture and forage management	Practices associated with pasture and forage management	"Adopting or refining the practice of forage budgeting" "Designating certain poor-performing paddocks to permanent pasture, capitalising on

Group	Category Name	Description	Examples...
			opportunistic summer rains to establish stock feed during the summer months, and sowing fast growing forage cereals during the winter months." "keeping an eye out for pasture dieback" "sustainable pasture management"
	Livestock and grazing management	Practices associated with livestock and grazing management	"using a stock book to determine herd demand" "Managing cattle grazing and preventing overgrazing of land" "Brahman cattle breeding" "Stock mustering" "grazing cattle" "rotational grazing" "Destocking during drought conditions"
	Gully and erosion	Measures to reduce soil erosion and sediment runoff, including gullies and contour banks	"multiple conservation banks" "fencing off gullies and limiting gully grazing" "Rehabilitating gullies" "implementing areas to capture silt and mitigate erosion/run-off entering waterways"
	Land clearing	Any actions related to clearing trees or land for the purposes of farming.	"land clearing" "Ending deforestation for livestock pasture"
Landscape resilience	Natural capital/land restoration	Actions related to restoring or maintaining natural capital or restoring land, without specific references to practices	"natural capital" "Establishing more tree coverage in the paddock" "Planting trees on farm land'' "restoring rural land"
	Riparian revegetation and streambank repair	Practices associated with the revegetation of riparian areas, and streambanks.	"riparian fencing" "Revegetating riverbanks" "riparian management" "fencing and providing off-stream watering points"
	Habitat restoration	Efforts to restore or enhance natural habitats.	"Building a high-quality fishway at a weir on their property" "Planting flowering plants and shrubs to provide habitat for beneficial insects and birds" "Undertaking tree planting and restoring back to wetlands."
Soil management	Soil health	Practices associated with soil health	"Applying ash to the soil" "Balancing soil pH" "reduce chemical use and build soil organic matter" "soil amelioration practices"
	Ground cover	Managing ground cover, including growing cover crops and inter-row management	"Higher rates of ground cover" "Growing crops which leave higher stubbles after harvest is one of the best ways to increase and maintain ground cover"
Water management	Irrigation management	Practices associated with irrigation management	"Adopting automated furrow irrigation across a whole farm" "Calibration of irrigation system" "pump that runs efficiently 24 hours a day" "Irrigation management practices for macadamia orchards"

Group	Category Name	Description	Examples...
			"purchase a new hard hose boom irrigator"
	Water conservation and drought management practices	Techniques aimed at efficient water use and preservation.	"Drought management practices for cattle" "Taking stock of water resources with a view of making every drop count." "Improving water distribution infrastructure on their property"
Advocacy	Advocacy and Awareness	Engagement in activities that promote societal or environmental awareness, or try to influence policies or decisions related to farming.	"I'm urging farmers and consumers to show support by signing an open letter" "the time for landholders to speak up was now, with objections" "there needs to be proper community consultation for all of these measures." "It is a day we must celebrate our wonderful beef cattle and salute the economic boost they provide to Queenslanders – as well as the juicy steaks sizzling on the barbecue."
Broad categories	Multiple practices described	Normative statements with multiple practices described	"focus has been on reducing sediment, dissolved inorganic nitrogen (DIN) from excess fertilisers and pesticide runoff" "Better grazing management practices, native forest regrowth, implementing changes to improve biodiversity results" "The project collectively worked on improving management practices, conducting system repairs, constructing treatment solutions, and evaluating and monitoring water quality improvements within the catchment area."
Broad categories	Regulation and compliance	Non-practice specific mentions of compliance with a regulation or a law. NOTE: Any specific mentions of practices (i.e., fertilizer or pesticide management) have been categorised with the relevant theme.	"complying with regulations" "compliance" "reef regulations" "Applying for an environmental authority (permit) for developing new or expanded commercial cropping or horticulture"
	Program-specific references	Mentions of specific programs or projects.	"Reef Trust 1 Saving our soils" "Attending Grazing for Profit" "Smartcane BMP" "Hort360 Certification"
	Non-specific stewardship practices	Broad references to sustainable or stewardship related practices without specific details	"adhering to sustainable practices" "aligning incentives to deliver a thriving natural ecosystem that is productive and feeds people" "Holistic management" "Sustainable farming practice"
	Generic best management practice statements	Practices associated with generic best management practice statements	"Adopting voluntary standards" "adoption of best management practice" "support growers implement improved practices"
	Farm-decision plans	Any mentions related to the development of farm-specific plans.	"action plan for land management" "Whole Farm Management Plans" "Succession planning" "Farm Business Resilience Plan"

Group	Category Name	Description	Examples...
Climate	Climate mitigation actions	Activities focused on emissions reductions, as well as capturing and storing carbon.	"carbon neutrality certification for beef production" "added methane-reducing compounds to water supply"
Innovation and support	Using Traditional Owner Knowledge	Practices associated with using traditional owner knowledge	"Blend traditional knowledge with innovative techniques in irrigation, productivity, weather monitoring, and nutrient management to advance sustainable farming practices" "Burning country properly"
	Accessing education, assistance, and support	Activities to increase knowledge and understanding, and /or accessing support including financial support.	"[use the] AgcarE platform ... " "Always consult with local experts and seek professional advice tailored to your specific circumstances" "Attending a conference" "work one-on-one with industry experts" "The LHWQP is giving growers the tools, knowledge, and innovation"
	Using innovative technologies	Adopting advanced tools and technologies to improve farming practices.	"Adopting and adapting technology to find a productivity edge for vegetable farming" "Adopting new farming technology such as a solar-powered FarmDroid robot for seeding and weeding" "using drone technology to spray weeds" "the machine uses artificial intelligence (AI) to detect and spray weeds,"
	Operational actions	Actions aimed at planning and organising farming operations, including record keeping, providing information to a third-party or making business decisions related to the farm.	"Accurately reporting cattle numbers" "Annual membership renewals for state farming organisations"
	Monitoring and trials	Practices associated with monitoring and trials	"Being actively involved in research projects and trials" "Changing pasture species mix based on trial results" "exploring and experimenting with sunn hemp." "electricity cost pass-through trial"
Uncategorised	Uncategorised practices	Practices associated with a mix of practices that did not meet the criteria for other categories	"Applying ethylene/Ethrel to induce maturity in macadamia nuts" "Building a supply chain for sustainable energy and resources from sugarcane fibre" "Changing approach to sweet potato production"
	Waste management	Practices related to waste and recycling	"waste management" "recycling"

Formal recognition

In some instances, the practices conveyed within the norm are linked to formal recognition, such as an award, guideline, or certificate. These formal recognition mechanisms function as artefacts that both magnify and reinforce the norms being described. That is, the norms are

made more salient, serving to validate and legitimise the practices they represent. These more 'formal' artefacts can also signal to others the desirability of specific behaviours, Below, instances of formal recognition are outlined and categorised:

Category Name	Description	Examples...
Funding scheme/program	Initiatives or programs that provide financial support or incentives to encourage specific actions or outcomes.	"Energy Efficiency Grants for Small and Medium Enterprises (National Program)" "Australian Government's Reef Programme" "Emissions Reduction Fund (ERF)"
Certification/accreditation	Formal recognition of adherence to specific practices or standards.	"Smartcane BMP" "AgCarE assessment" "BMP accreditation"
Standards OR guidelines	Documents outlining recommended practices to ensure consistent implementation of best practices or compliance.	"Australian Animal Welfare Standards and Guidelines" "soil testing guidelines" "Australian Agricultural Sustainability Framework (AASF)"
Regulations/legislation/reviews	Legal requirements or formal reviews that establish rules for practices or behaviour.	"Record keeping is required by all commercial beef-cattle graziers" "The Forestry Act" "Nature Repair Bill"
Report Cards/Targets/Indicators	Tools or benchmarks used to measure and communicate progress toward specific goals or outcomes.	"Target to be carbon neutral by 2030" "Government targets and international targets by the Paris Agreement" "Reef water quality report cards"
Awards	Any mentions related to awards.	"Prince of Wales Environmental Leadership – 2019 Reef Sustainability Award" "awards honoured the best in farming during 2023"
Campaigns and Strikes	Any mentions related to campaigns or strikes.	"AgForce has thrown its support behind an unprecedented national campaign against anti-farming policies - Keep Farmers Farming." "With strike action at eight Wilmar Sugar and Renewables mills"
Events	This category was for more broad references to events.	"Attending Beef Australia 2024" "Growers came from as far away as Plane Creek, Herbert River, Ingham and Mossman to attend the meeting."

Scale of the outcome or impact

We also recorded the scale of focus for artefacts. For example, some artefacts referred to a single farm or region, whereas others focus on Queensland more broadly. These are described below:

Category name	Description	Examples
Individual – farm	An individual farm or a small group of farms (but not specific to an industry or region)	"the [insert name of farm]" "Mrs [insert name]"
Farms – all	Outcomes or impacts were described in terms of impacting all farms or all agriculture.	"all agriculture" "farms" "producers and industry across Queensland"
Farms in a specific sector/s	Outcomes or impacts were described in terms of impacting only farms in a particular sector.	"best in our [beef] industry" "The sugarcane industry" "banana growers"
Farms in a specific region/s	Outcomes or impacts were described in terms of impacting only farms in a particular region.	"Growers came from as far away as Plane Creek, Herbert River, Ingham and Mossman" ""local irrigators in the Fitzroy Food Bowl" "growers in the region"
Non-specific	This category was used to capture when the scale of the benefit was not clear or was not specific.	"Everyone" "all Australians" "Queenslanders"
Multiple	Benefits were mentioned at multiple scales (e.g., all cane farms and the natural environment).	"Producers.....the Reef" "neighbouring landowners and the broader community" "their land and onto the Great Barrier Reef." "strong regional communities...supporting farms"
Indigenous/First Nations	This category was used to capture instances when Indigenous or First Nations were mentioned as the beneficiary without reference to the environment or a farm.	"support Indigenous landholders" "important for First Nations like myself"
Environment or species	Any reference to benefits for either the natural environment (including habitats, water, land or biodiversity) or specific references to a species	"the Great Barrier Reef" "crucial for the environment" "restore the wetland" "restore and protect the Reef" "health of coastal ecosystems like mangroves and seagrass meadows"
Not-described	The scale of the outcome or impact has been described in relation to the practice, or no outcome or benefit was mentioned.	

Intended outcomes and impacts

In some cases, the description of an action or practice is accompanied by details of its outcomes or impacts, whether beneficial or harmful. These have been categorised in the table below.

	Category Name	Description	Examples...
Environmental outcomes	Ecological Outcomes	Outcomes that enhance biodiversity, ecosystem health, or habitat conservation unrelated to agriculture.	"Restoration of native vegetation to improve biodiversity." "Protecting wildlife habitats from agricultural runoff."
	Biosecurity	Outcomes that reduce biosecurity risks, prevent the spread of pests or diseases, or enhance farm protection.	“Reduce biosecurity risks, prevent entry of new weeds” “protect our farms from Panama TR4”
	Climate Mitigation or Carbon outcomes	Outcomes related to reducing greenhouse gas emissions, enhancing climate resilience, or improving carbon sequestration.	“satisfy our emissions reduction targets” “increased carbon sequestration”
	Land Condition or Soil Health	Outcomes focused on improving agricultural land quality, soil health, or sustainable farming practices.	"Improving water infiltration rates and soil moisture retention." "A sustainable farming system to ensure long-term soil health."
	Fire risk	Outcomes related to reducing the risk of bushfires or managing fire intensity and regimes.	“protect property from bushfires” “address issues like woody thickening, introduced grasses, and fire intensity and regimes”
	Water Quality	Outcomes aimed at improving water quality by reducing pollutants, enhancing water purity, or supporting clean water initiatives, without mention of the Great Barrier Reef.	“improve water quality in local waterways." “We get a lot less runoff”
	Water Conservation	Outcomes related to saving water or using it more efficiently to reduce overall consumption.	“Sustainable water use practices to reduce wastage." "A system designed to conserve water resources on farms."
	Great Barrier Reef	Outcomes that specifically reference the Great Barrier Reef and its protection.	“preventing thousands of tonnes of sediment from reaching the Reef” “meet water quality targets for the Great Barrier Reef”
Non-environmental outcomes/impacts	Vague Sustainability Mentions	Entries that use the term 'sustainability' or	"Clean water initiatives for sustainable agricultural use."

	Category Name	Description	Examples...
		'sustainable' in a broad or non-specific manner.	"Better outcomes for the environment and community." "A sustainable sugarcane farming system." "...leaving the land in the best possible condition"
	Economic outcomes	Outcomes that provide financial advantages, cost savings, profitability, or economic growth opportunities.	"4% lower crop yields and $1.8 billion lower GDP." "A platform for farmers to reap financial rewards."
	Production and productivity benefits	Outcomes that improve productivity, efficiency, in farming systems.	"Increasing fruit yields per hectare ...improve efficiency and profitability per hectare" "Enhanced productivity across farming systems."
	Social or Community Outcomes	Outcomes that foster community engagement, social well-being, or collaborative efforts among groups.	"Highlighting the role of farmers in sustainable development." "A platform for farmers to share their success stories." "Engagement in the conversation about the future of farming"
	Decision-making	Outcomes related to improved management or record-keeping.	"Improved farm management" "Improved record-keeping, farm management"
Other	Multiple Outcomes	Entries that describe a mix of outcomes spanning multiple categories without emphasising one clearly.	"produce the same yield ideally without a huge cost to the farmer .... improving water quality run-off from their farms ....brought nature back to the farm" "A holistic approach to sustainability benefiting water, soil, and ecosystems."
	No outcome or impact	No outcome or impact has been described in relation to the practice.	
	Non-Benefit Statement	Statements that describe challenges, barriers, or problems rather than positive outcomes or benefits.	"Defoliation or lack of effectiveness of Ethrel, depending on the rate used" "Potential loss of market access" "...upsetting many farmers with wind and solar energy"

Sentiment

In addition to describing the attributes of the norm, the overall sentiment or evaluative tone of each normative statement was assessed. Norms were classified as positive, neutral, or negative.

A positive example would be: *"On a positive note, Mr Menkens said 40% of Queensland's cane-growing area is now accredited in the industry-led, and government-funded, best management practice program, Smartcane BMP"* and *"The project supported landholders to collect their own water samples to increase understanding of what was driving the losses and to identify solutions which would not impact productivity."*

The following statement was classified as negative: *"Land management activities and impacts, including vegetation degradation, erosion, increased sediment, nutrient and pesticide runoff, and urban and coastal developments have been found to damage the reef's water quality."* Similarly, this statement related to the adoption of renewable energy projects on farms was also classified as negative due to the inclusion of this text: *"Let's not upset farmers with bird-killing wind generators and massive solar panel stretches."*

In contrast, the following statement was classified as neutral: *"Bringing fodder onto your property is a key pathway of entry for new weeds, pests, and other unwanted contaminants. Even in emergency situations, it is critical to complete a Biosecurity Matter Hygiene Declaration with the seller/supplier."* This was coded as neutral because, while it emphasizes the importance of completing a declaration to prevent biosecurity risks, it does not convey any emotional tone or subjective evaluation. Another neutral example is: *"Source stockfeed from a reputable supplier operating under a quality assurance program."*

Stage 4. Analysis and Synthesis

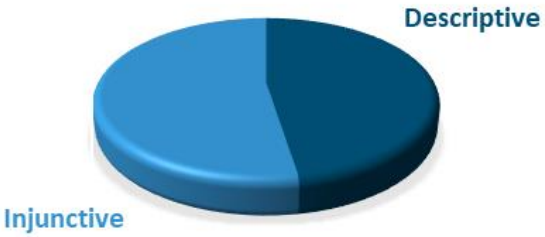
The final stage of the method was focused on analysis and synthesis. This involved using the compiled spreadsheet of identified norms and their attributes, categorised according to the typologies described above. The analysis included creating pivot tables and visualisations, such as graphs, to explore patterns within the data. Specifically, this stage examined the prevalence and distribution of norms across various artefact attributes, including Industry sector type, regions, publisher type, and communication artefact types. Additionally, the analysis sought to identify patterns, and/or variations in the specific norm attributes, including management practice types, benefits, actors and communicators. This approach provided a structured way to better understand the articulation of stewardship norms, offering insights into their relevance and potential impact across different contexts.

It is important to note that this analysis focuses solely on describing and measuring the communication of stewardship norms as conveyed through online and visual communication focused artefacts. Given that norms are generally understood as *unwritten* rules that guide behaviour, the presence of a communicated norm in an artefact described in this report does not necessarily indicate that it has been seen or acknowledged by landholders. Rather, this study examines how such norms are articulated and disseminated by various stakeholders and groups across different industry sectors and regions, providing insights into the *potential* influence of these communications and cannot make any judgements with regards to how influential or impactful those norms are.

Results

How many norms were identified?

Across the extracted documents, close to 3800 norms were identified and coded. Overall, the norms were almost equally split between descriptive (48%) and injunctive (52%) norms.



Overall Trends for Artefact Source Attributes

At the artefact "source" level, we categorised several attributes: the type of artefact (e.g., social media, website), the entity responsible for producing it (e.g., government, research body), its geographical focus (e.g., NRM websites were classified at the Reef region level, while state- or national-level industry bodies were categorised as 'non-specific'), and its Industry sector specificity (e.g., artefacts from private industries exclusively serving the grazing sector were classified as industry-specific, whereas government websites like the Queensland Department of Primary Industries (previously Department of Agriculture and Fisheries), which are not tied to a single Industry sector, were coded as non-specific).

Unsurprisingly, the results found that the distribution of sources artefacts has a correlation to industries across regions and Industry sector sectors (see figure below). The Mackay Whitsunday and Burdekin regions are predominantly focused on sugarcane production. In contrast, the Burnett Mary and Fitzroy regions are primarily dedicated to livestock grazing, which represents the major land use in these areas. The Wet Tropics region exhibits a significant presence of banana cultivation, reflecting the region's suitability for tropical crops, alongside much smaller proportion of cane farming. Additionally, the sources for the artefacts tagged as from the Cape York region is entirely categorized as "Non-specific," suggesting either a lack of predominant agricultural activity or insufficient data to classify the region.

Within each artefact type, norms were identified that were specific to both regional and industry sector scale that are distinct from the attribute classification provided below. For example, while websites and YouTube videos sourced from DETSI were tagged at the artefact level as non-specific, many of the specific norms identified were specific to a particular region or industry sector. This was captured at the norm specific level as either 'specific to region/s' or 'specific to sector/s.

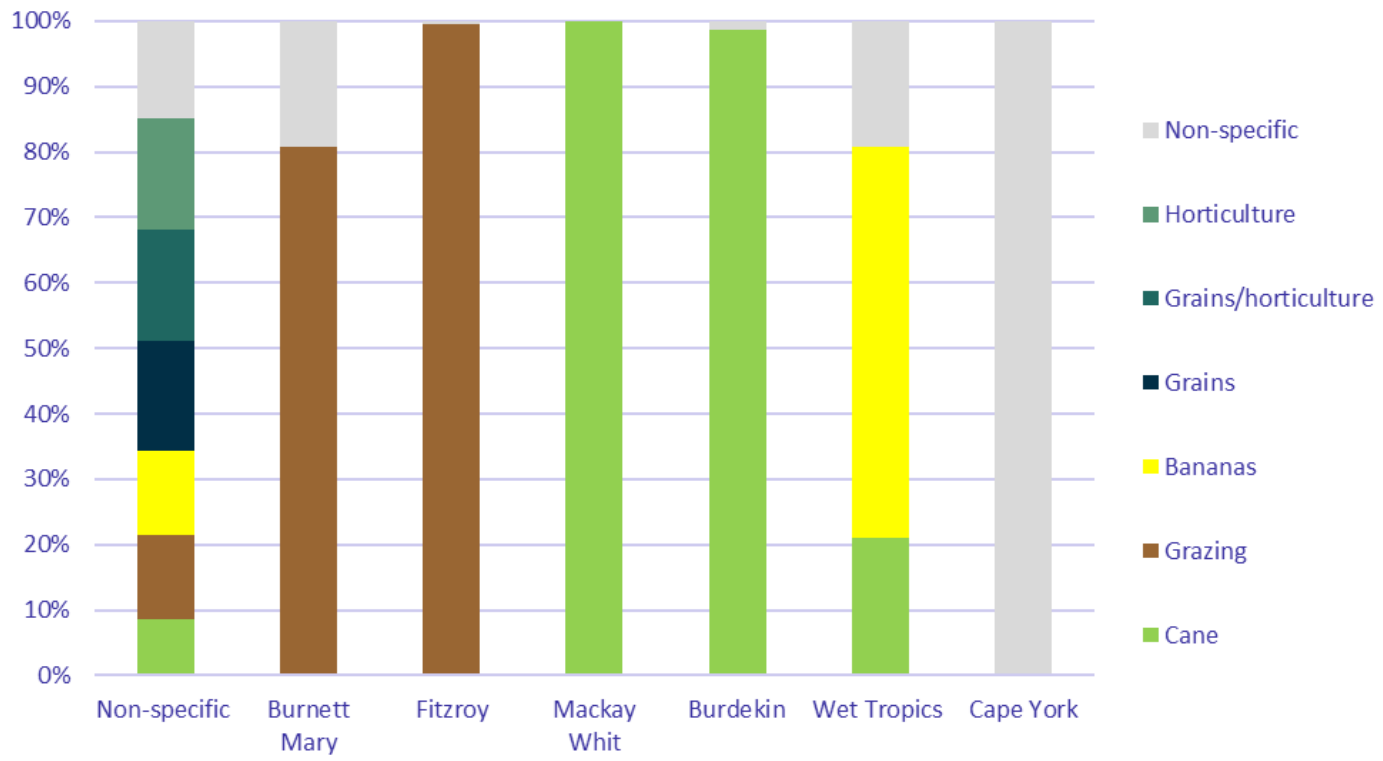
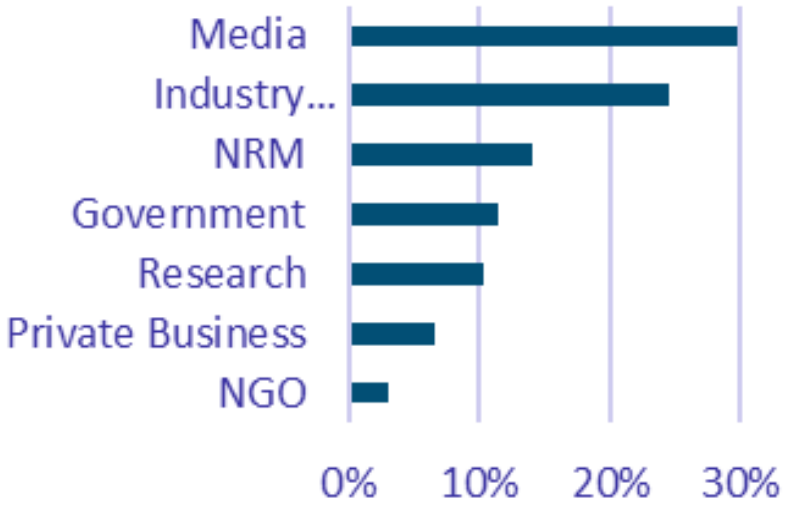


Figure 2 Presence of Artefacts across Region and Industry sector[4]

When examining where the largest number of norms were identified (refer figure below), media and industry associations emerged as the most prominent contributors, followed by NRM and government. NGO's produced the smallest number of norms.



[4] The Grains/Horticulture category includes artifacts that are relevant to both industries and cannot be distinctly classified into one or the other.

Interestingly, in terms of the use of different norm types, while most sources for the identified artefacts followed the overall trend of being reasonably balanced between injunctive and descriptive norms, industry associations and researchers exhibited a stronger use of injunctive norms, whereas NGO's leaned towards descriptive norms.

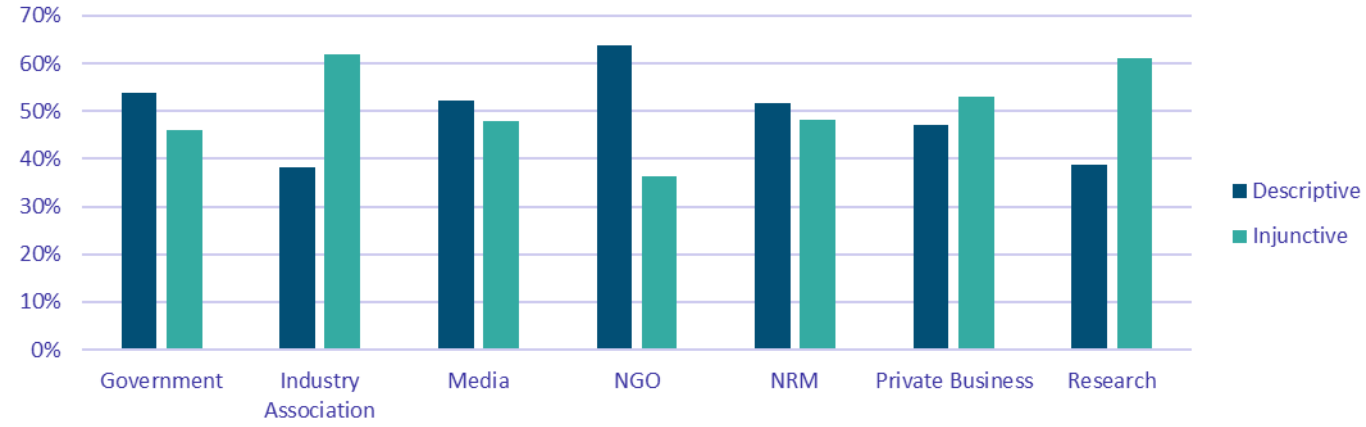


Figure 3 Artefact source by Norm type

The use of different types of norms also varied across specific Industry sectors. As the below figure indicates, the banana and grains? industry exhibited a higher proportion of injunctive norms whereas most other Industry sectors reflected the overall trend.

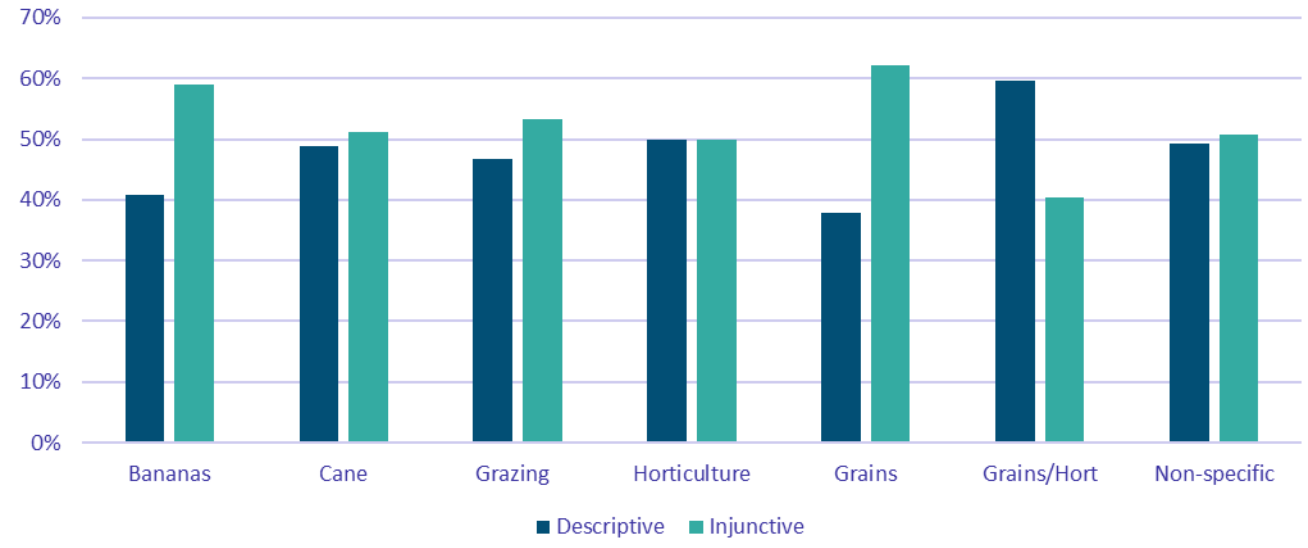


Figure 4 Industry sectors by Norm Type

When examining how the use of norms varied across different regions (refer Figure 5), we found that the outcomes largely reflected each region's dominant industry. For instance, in grazing-focused areas—such as the Fitzroy—injunctive norms were more prevalent. A notable exception emerged when comparing the Burdekin and Mackay regions. Although both are dominated by

sugarcane, descriptive norms were more common in the Burdekin, whereas injunctive norms predominated in Mackay. Overall, however, the results were generally consistent between region and industry. Therefore, in the sections that follow, we chose to analyse the data primarily by industry rather than by region (or both).

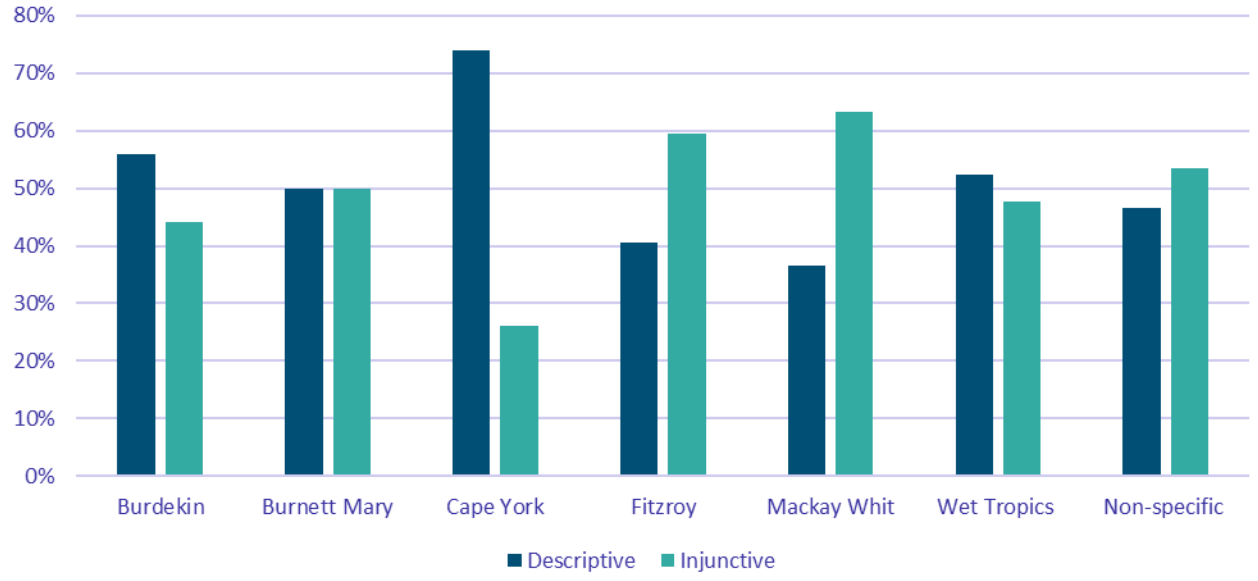


Figure 5 Regions by Norm Type

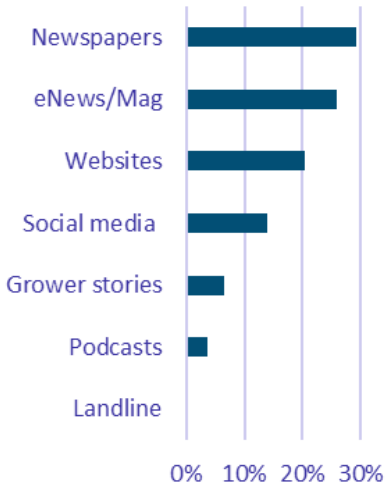


Figure 6 Artefact type

When examining the volume of norms identified across different source types, traditional newspapers (e.g., the Courier Mail) contributed the highest number of norms, followed by eNewspapers and magazines. However, caution should be exercised in interpreting these results. Rather than indicating how inherently 'normative' these sources are, the findings reflect the sheer volume of communication outputs they generate. For example, within the 12-month period covered by our search strategy, we accessed multiple newspapers that publish daily. Similarly, eNewsletters are produced on a frequent basis. In contrast, other source types, such as podcasts and grower stories or case studies, are published much less frequently. That is, the results are indicative of typical volume of output rather than how 'normative' those outputs are.

When looking at which publishers or sources of artefacts are more or less likely to produce different types of artefacts, a significant proportion of the government-tagged norms were sourced from websites. However, most of the normative statements from industry, NGOs, and

NRMs were predominantly found in eNewsletters and eMagazines. Grower stories were primarily published by government and industry associations, while podcasts were most commonly attributed to researchers. Private businesses, with their strong presence on social media, contributed most norms from that medium.

Table 2 Artefact type by Publisher

	eNews/ Mag	Grower stories	Landline	News	Podcasts	Social media	Websites	Grand Total
Government	3%	11%				10%	**76%**	**100%**
Industry Association	**46%**	21%			4%	14%	16%	**100%**
Media			1%	**98%**				**100%**
NGO	**88%**					4%	9%	**100%**
NRM	**58%**	1%	0%			25%	16%	**100%**
Private Business	11%					**58%**	31%	**100%**
Research	25%				26%	20%	29%	**100%**
Grand Total	**26%**	**7%**	**0%**	**29%**	**4%**	**14%**	**20%**	**100%**

When looking at which different artefact types tend to use more injunctive norms or descriptive norms, we can see in the figure below that grower stories tend to use more descriptive norms whereas social media, websites and podcasts tend to include more injunctive norms.

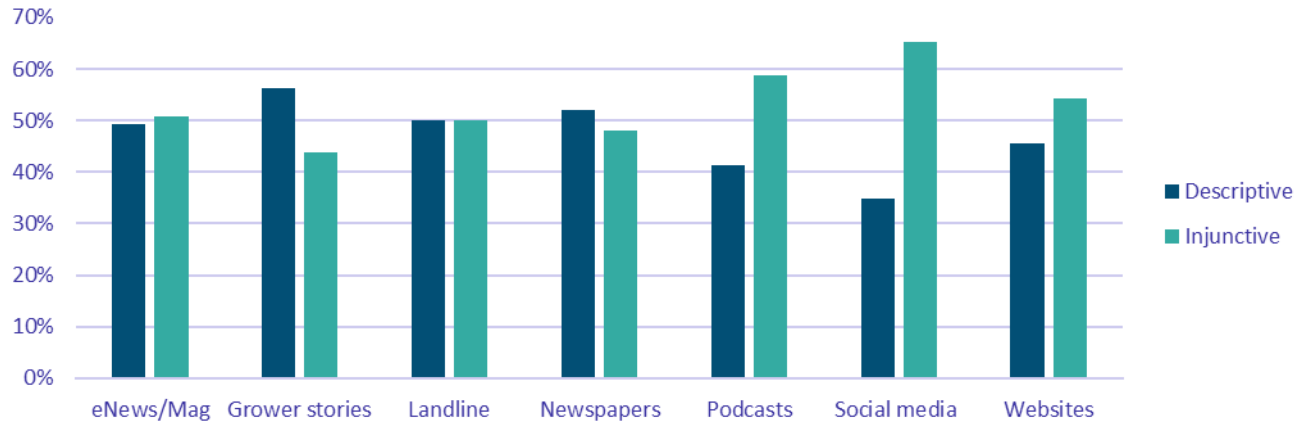


Figure 7 Artefact type by Norm Type

Overall Trends for Norm Attributes

In addition to describing the source attributes, we also detailed attributes at the norm statement level. This was deemed necessary because a single source (for example, a podcast transcript or a page on a website) could contain multiple normative statements. As outlined in the methods section, these attributes included the actor or group being described, the communicator of the

norm, the practice, any reference to formal recognition, the overall sentiment or tone of the statement, and the presence and type of outcome described, including the geographic scale. Additionally, normative statements that mentioned the words 'Reef' or 'Stewardship' or ‘Water quality’ were specifically noted.

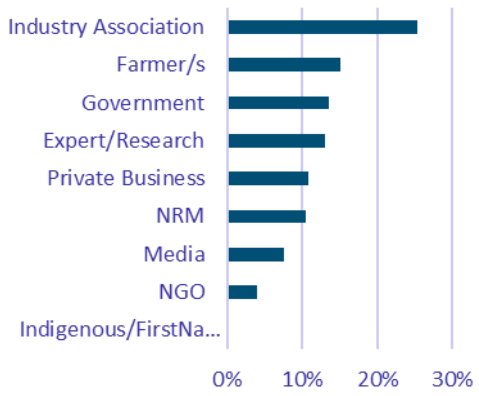


Figure 8 Communicator

Who is communicating the norms?

When looking at the who is describing the norm (the communicator identified in the text), most norms were being communicated by an industry group (this also reflects the overall attribute source trend), this was followed by government departments and farmers.

Figure 9 shows that most communicators tended to describe descriptive norms, with two notable exceptions: communicators identified as First Nations people or groups (although this group represented a very small proportion of all communicators), those identified as industry representatives and experts/researchers. The media (when the norm was not ascribed to anyone in the article) strongly favoured descriptive norms. For others, the split was more evenly balanced.

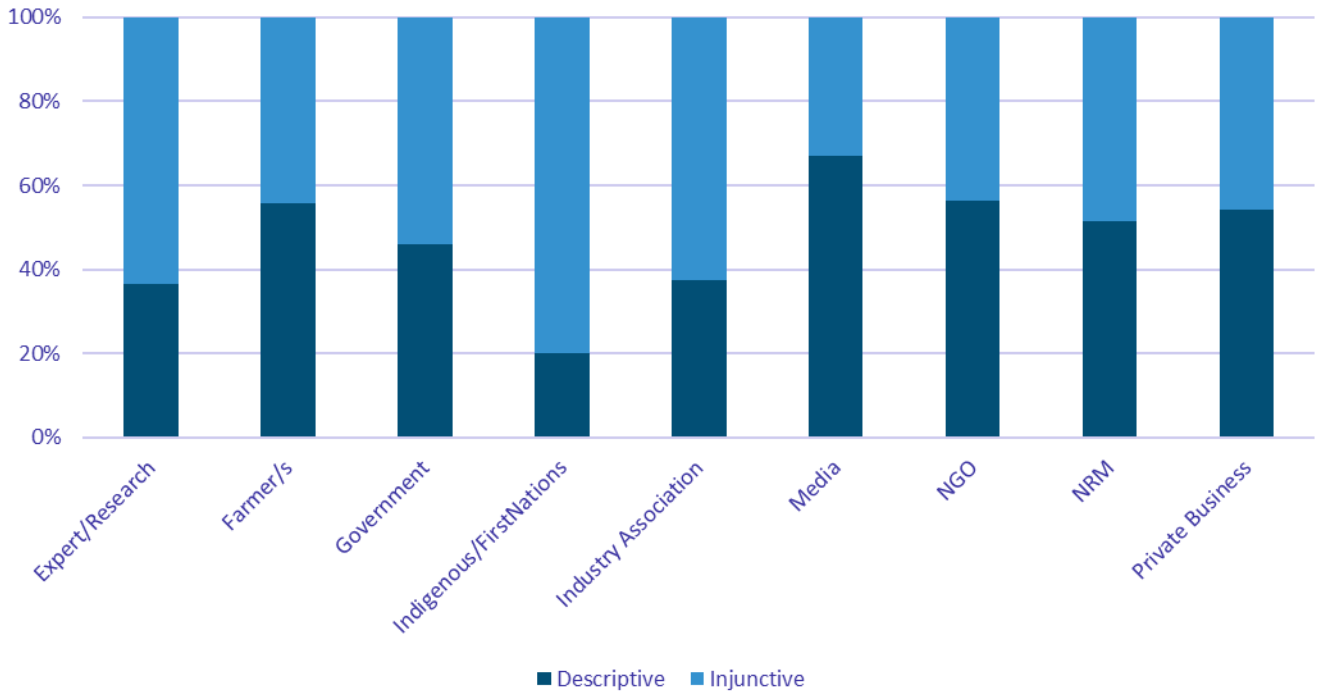


Figure 9 Use of Norms by Communicator

As can be seen below, the communicator often followed the source producer (i.e. government was identified most often in government produced artefacts and industry association was the most common communicator in industry produced artefacts). There were some notable variations however when comparing use across different source types. NGOs and NRMs, compared to other source types, used farmers as the communicator. Similarly, while the media was only attributed as the communicator in less than a quarter of the norms, it had a comparatively higher proportion of experts/research as the communicator.

Table 3 Communicator by Source type

	Govern't	Industry Assoc.	Media	NGO	NRM	Private Business	Research	Grand Total
Expert/Research	2%	5%	10%	3%	1%		**81%**	**13%**
Farmer/s	14%	11%	16%	36%	20%	14%	13%	**15%**
Government	**65%**	2%	17%	3%	1%		1%	**14%**
Indigenous/ FirstNations								**< 1%**
Industry Association		**77%**	20%	2%			2%	**25%**
Media			**25%**					**8%**
NGO	14%		2%	**52%**	2%			**4%**
NRM	2%				**69%**			**10%**
Private Business	2%	5%	9%	4%	4%	**85%**	2%	**11%**
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Interestingly, the data shows wide diversity in "where" different voices are heard. Experts or researchers and farms were prominent across many channels. In contrast, industry voices were concentrated in newspapers and eNews. Natural resource management groups were predominantly found in eNews, but absent from newspapers. Government communicators were mainly featured in newspapers and on websites.

Table 4 Communicator by Artefact Type

	eNews/ Mag	Grower stories	Landline	News	Podcasts	Social media	Websites	Grand Total
Expert/ Research	23%			22%	**24%**	14%	17%	**100%**
Farmer/s	28%	10%	1%	**30%**	3%	11%	17%	**100%**
Government	6%	7%		38%		8%	**41%**	**100%**
Indigenous/ First Nations	**40%**	20%		**40%**				**100%**
Industry Association	**38%**	15%		23%		12%	12%	**100%**
Media			2%	**97%**	1%			**100%**
NGO	29%	1%		14%		7%	**49%**	**100%**
NRM	**52%**			3%		25%	21%	**100%**
Private Business	16%	1%		26%		**31%**	26%	**100%**
Grand Total	**26%**	**7%**	**0%**	**29%**	**4%**	**14%**	**20%**	**100%**

Additionally, different Industry sectors seemed to preference the use of different communicators. In the horticulture sector, industry associations were the dominant communicators, followed by experts/researchers. The grains sector also had a comparatively higher proportion of expert/researcher voices. In the bananas sector, industry associations and media were the most prominent communicators. While still moderate, industry assocation tended to be more commonly used in the cane and grazing sectors as the communicator of the norm.

Table 5 Communicator by Industry sector

	Bananas	Cane	Grazing	Grains	Grains/ Hort	Hort	Non-specific	Grand Total
Expert/ Research	5%	10%	6%	64%	2%	15%	2%	**13%**
Farmer/s	13%	18%	15%	10%	35%	10%	14%	**15%**
Government	18%	6%	11%	5%	0%	11%	28%	**14%**
Indigenous/ First Nations	1%							**0%**
Industry Association	35%	28%	27%	10%	61%	44%	18%	**25%**
Media	23%	6%	13%	8%		12%	3%	**8%**
NGO		1%	2%				13%	**4%**
NRM		15%	16%				10%	**10%**
Private Business	6%	15%	11%	3%	2%	7%	11%	**11%**
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Who is the norm about?

This chart on the right shows that norms most commonly reference either all farms or are referencing an individual farm, highlighting a focus on both broad and individual-level farming behaviours. "Non-specific" norms (i.e., those norms where the actor was not clearly defined or where multiple groups were mentioned) were the next most identified.

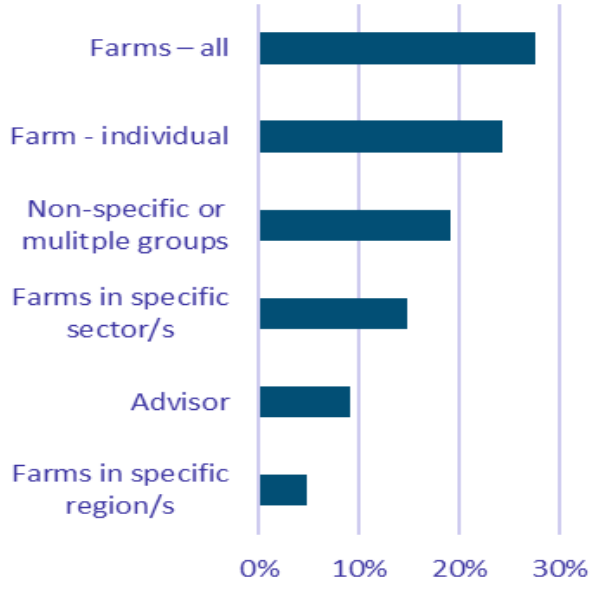
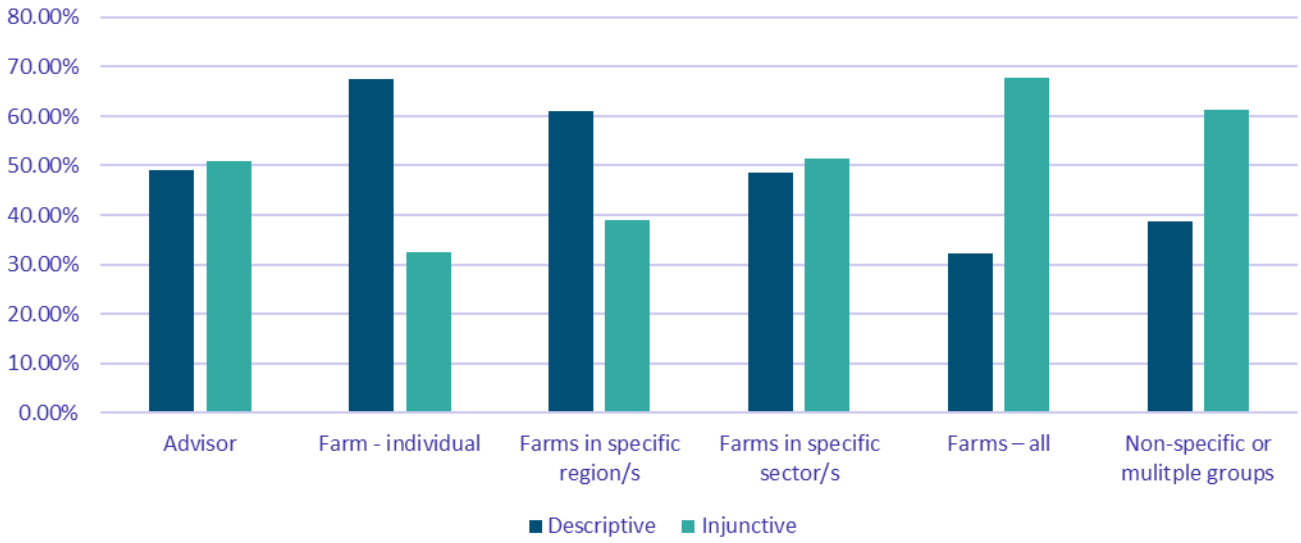


Figure 10 Actor

Figure 11 shows a clear trend where norms shift from being more descriptive to more injunctive as the reference point moves from an individual (e.g., "Farm - individual") to broader groups (e.g., "Farms - all" or “Non-specific”) or when the norm is non-specific.

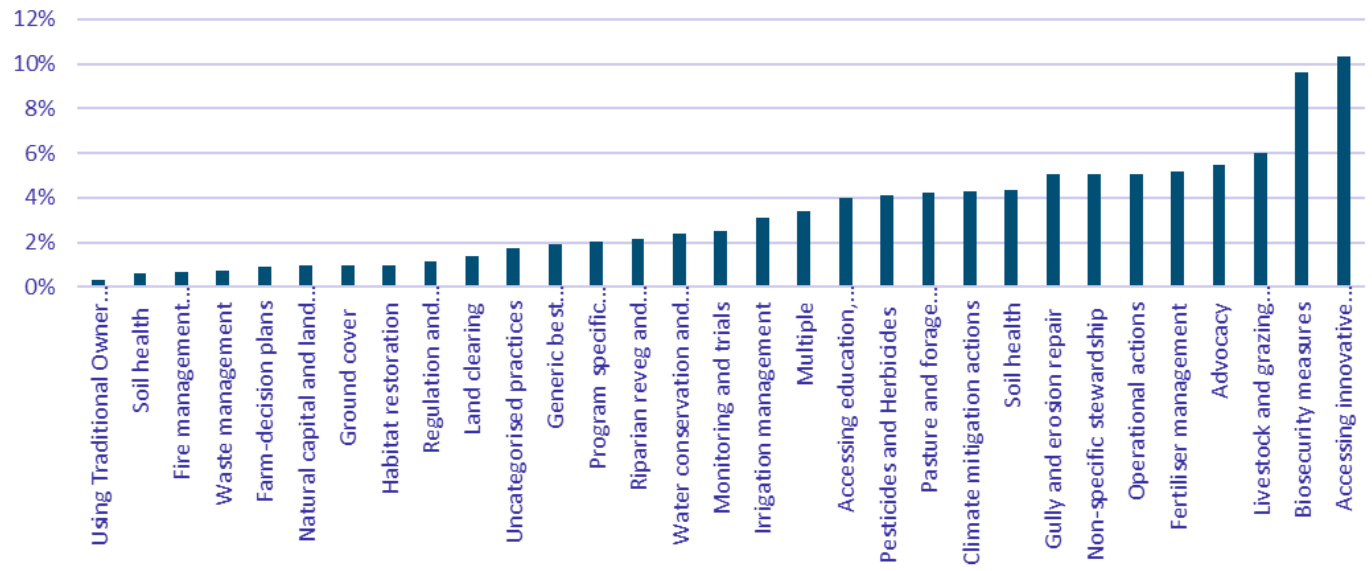
Figure 11 Actor by Norm type



There were no clear trends when looking at whether different types of communicators were more or less likely to be referencing different types of actors, other than some expected alignment between scales. For example, industry groups are more likely to be describing farms in a specific sector and NRMs are more likely to be describing farms in a specific region, and individual farmers tended to be describing an individual farm. Again, regional differences reflected the dominant industry for that area (figures not displayed).

What management practice is being described?

As can be seen in the below graph, a wide array of management practices were described. The practices most frequently mentioned were related to biosecurity, accessing innovation, and livestock management. Less commonly mentioned practices were related to soil health and fire management.



Because of the wide diversity of practices being described, these have been further grouped into high-order categories (refer to Section 3, Management Practices) as per below. These categories have been used in the rest of the report.

Category	Total %
Innovation and support	22%
Land management	17%
Broad categories	13%
Biosecurity	10%
Chemical management	9%
Soil management	5%
Advocacy	5%
Water management	5%
Landscape resilience	4%
Climate	4%
Uncategorised practices	2%
Regulation and compliance	1%

Is there a relationship between management practices and types of norms?

As can be seen in the Figure 12, when talking about practices or actions related to advocacy, regulation or biosecurity measures, communicators are much more likely to be describing what farms should or ought to be doing. Whereas it's slightly more likely that communicators are

describing something that farmers are already doing when talking about practices related to farming land or chemical management.

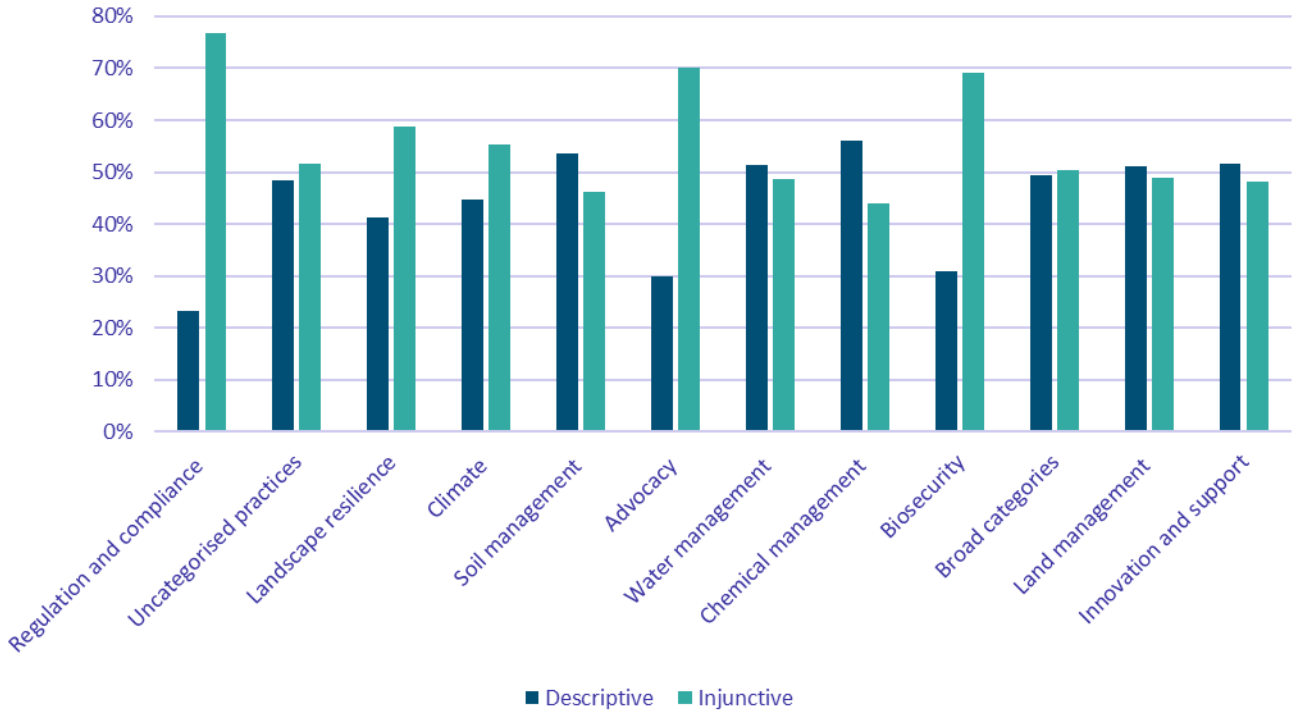


Figure 12 Norms by Management Practices

How do communicators differ in the management practice norms they describe?

Generally, there was a wide distribution of communicators for each of the main practice themes. Variations in the management practices described by communicators are described in the table below. Of note:

- Norms related to advocacy are mostly communicated by Industry Associations.
- Norms related to broad categories are more commonly described by government and industry associations.
- Chemical management (both fertiliser and pesticides) norms often were attributed to experts or private business.
- Climate norms are communicated by industry and the media.
- Land management and land resilience related norms are more often communicated by NRM groups.
- When the farmer was identified as the communicator the norm was generally related to land management, including soil management and landscape resilience.
- One third of the norms related to regulation and compliance were from government.
- A notable proportion of the norms that were not categorised were attributed to the media.

Table 6 Management practice by Communicator

	Expert/ Research	Farmer/s	Government	Indigenous/ First Nations	Industry Association	Media	NGO	NRM	Private Business	Grand Total
Regulation & compliance	14%	5%	**33%**		16%	19%	5%		9%	**100%**
Broad categories	3%	18%	23%		**26%**	5%	7%	10%	9%	**100%**
Water management	17%	16%	16%		**35%**	4%	2%	4%	6%	**100%**
Biosecurity	23%	6%	16%		**35%**	9%	2%	4%	4%	**100%**
Land management	8%	19%	14%		19%	8%	3%	**22%**	8%	**100%**
Chemical management	**26%**	11%	11%		16%	2%	7%	5%	**22%**	**100%**
Innovation & support	16%	13%	11%		**26%**	8%	4%	9%	13%	**100%**
Soil management	22%	**23%**	11%		15%	1%	2%	13%	12%	**100%**
Uncategorised practices	17%	18%	10%		13%	**19%**		3%	**19%**	**100%**
Climate	8%	11%	9%		**25%**	18%	2%	2%	**25%**	**100%**
Landscape resilience	3%	21%	8%		15%	5%	8%	**31%**	8%	**100%**
Advocacy	2%	17%	7%		**57%**	11%	1%	1%	3%	**100%**
Grand Total	**13%**	**15%**	**14%**	**< 1%**	**25%**	**8%**	**4%**	**10%**	**11%**	**100%**

Are different sectors communicating about different management practice norms?

As can be seen in the table below, there are notable variations in the management practices described by different Industry sector groups:

- Bananas: Strong focus on biosecurity and uncategorized practices
- Horticulture: Emphasis on water management, unlike other Industry sectors
- Cane: Chemical management and soil management norms predominant
- Grains: Soil management norms more common
- Grazing: Climate and land management norms more prevalent, especially compared to other Industry sectors.

The data highlights how different sectors prioritise communicating about various agricultural management practices.

Bananas	Cane	Grazing	Grains	Grains/Hort	Hort	Non-specific
Uncategorised Biosecurity	Chemical management Soil management Landscape resilience	Land management Climate Advocacy	Chemical management Soil management Innovation and support	Soil management Uncategorised	Water management Uncategorised	Broad categories Landscape resilience Regulation and compliance

Are there variations in the types of management practice norms described across types of artefacts?

The below figure highlights just how broad the communication of different types of norms is across the different artefact types. There are some notable exceptions:

- More so than other artefact types, many of the norms tagged as climate, advocacy and uncategorised were found in newspapers
- Water management was a strong focus on grower stories
- Podcasts were often about chemical and soil management
- The proportion of norms related to broad categories and regulation was notably higher for websites

Table 7 Management Practices by Artefact Type

	eNews/ Mag	Grower stories	Landline	News	Podcasts	Social media	Websites	Grand Total
Advocacy	17%			**64%**		9%	10%	**100%**
Broad categories	28%	9%		18%		9%	**36%**	**100%**
Chemical management	24%	7%		8%	11%	17%	**34%**	**100%**
Climate	15%	0%		**52%**	1%	9%	23%	**100%**
Innovation and support	**31%**	5%		**31%**	3%	15%	15%	**100%**
Land management	**35%**	5%	1%	26%	3%	18%	14%	**100%**
Landscape resilience	**25%**	12%	1%	19%		19%	**25%**	**100%**
Soil management	**25%**	16%		9%	12%	13%	**25%**	**100%**
Uncategorised practices	5%	5%	3%	**59%**	8%	10%	10%	**100%**
Water management	8%	23%		34%	2%	13%	21%	**100%**
Biosecurity	25%		1%	**43%**	5%	16%	11%	**100%**
Regulation and compliance	14%	2%		35%	9%	2%	**37%**	**100%**
Grand Total	**26%**	**7%**	**< 1 %**	**29%**	**4%**	**14%**	**20%**	**100%**

Are any type of formal recognition referenced in relation to the norm?

Generally, forms of recognition were only mentioned in around half of the norms identified. Accessing funding or a program specific reference was the most commonly referred to type of recognition.

The below graph shows that, as might be expected, norms that mention awards or accessing funding schemes or a program tended to be descriptive, where norms related to campaigns or regulations tended to be more injunctive.

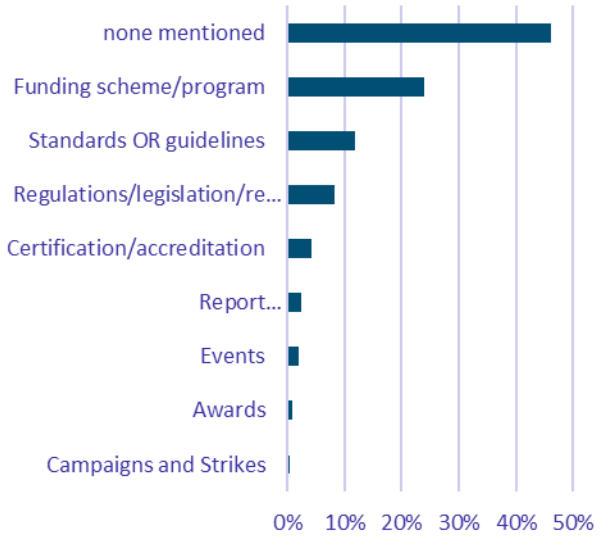


Figure 13 Recognition

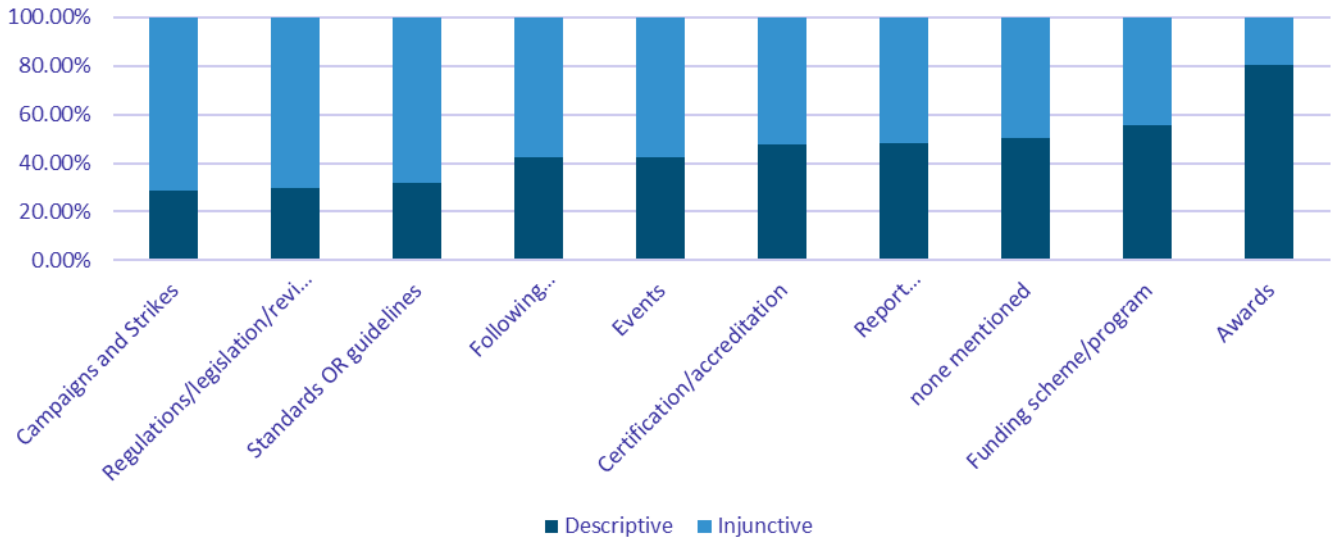


Figure 14 Recognition by Norm type

Figure 15 shows that funding schemes and programs are mentioned in a wide range of source types, though more commonly in sources from NGOs, NRMs and Private businesses. Standards and guidelines are also communicated in a wide range of sources, but more often in sources tagged as 'research'. While there were very few mentions of campaigns and strikes, they were mentioned exclusively by the media and industry associations. Interestingly, regulations and compliance was more commonly found in newspapers than government-sourced materials.

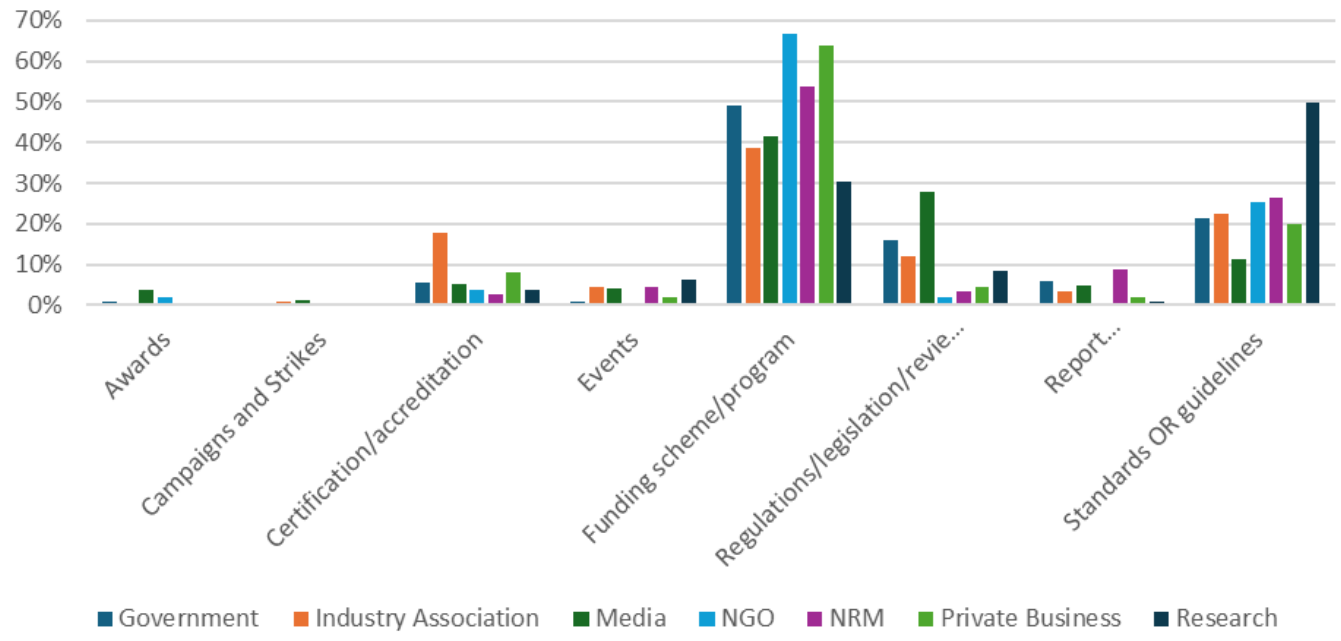


Figure 15 Forms of Recognition by Source Type

Figure 16 shows variations between sectors or Industry sector types. Notable variations are:

- Grains: More likely to mention standard or guides compared to other Industry sectors.
- Bananas and grazing: More likely to mention regulations and compliance.
- Horticulture: More likely to mention certifications or accreditation.
- Grains and Grazing: Less likely to mention accessing funding schemes or programs compared to other Industry sectors.

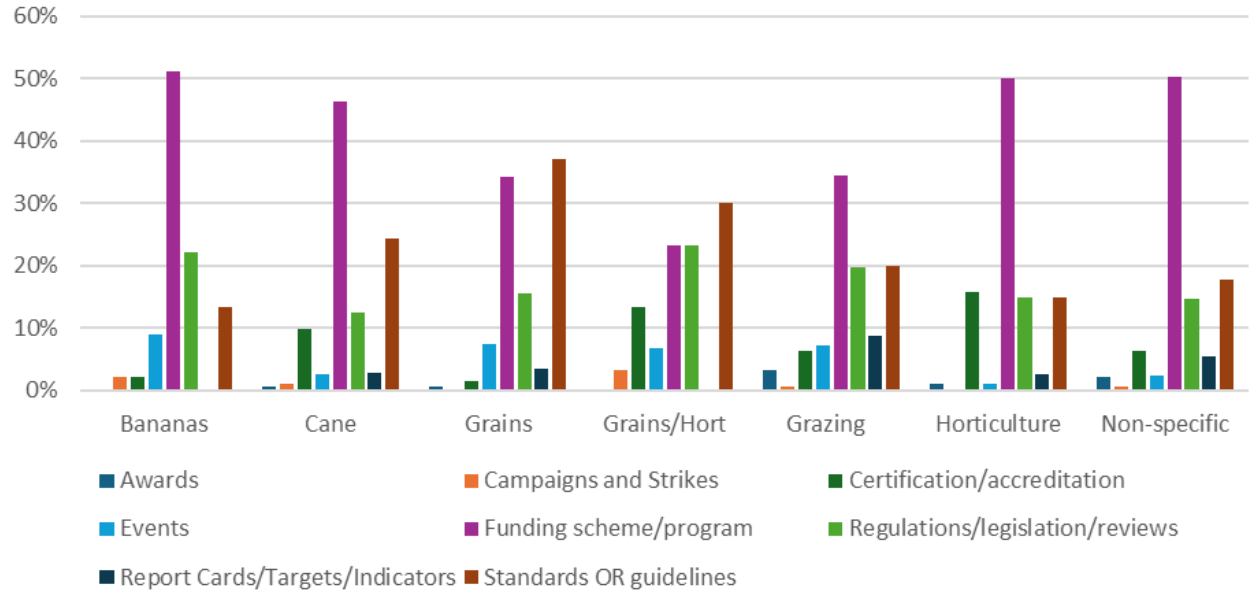


Figure 16 Forms of Recognition by Sector

Appendix E lists the types of recognition by both source type and management practice categories.

What outcomes or benefits are being described in relation to the norms?

Figure 17 highlights the wide range of outcomes linked to the norms. Around 1 in 3 of the normative statements mentioned multiple benefits or outcomes, this was followed by economic benefits and production or productivity benefits. This strongly reflects the co-benefits of many stewardship practices. This was followed by improvements to land condition and soil health, followed by benefits to the Great Barrier Reef and Water Quality. For around 5% of the norms, no benefit or impact could be ascertained.

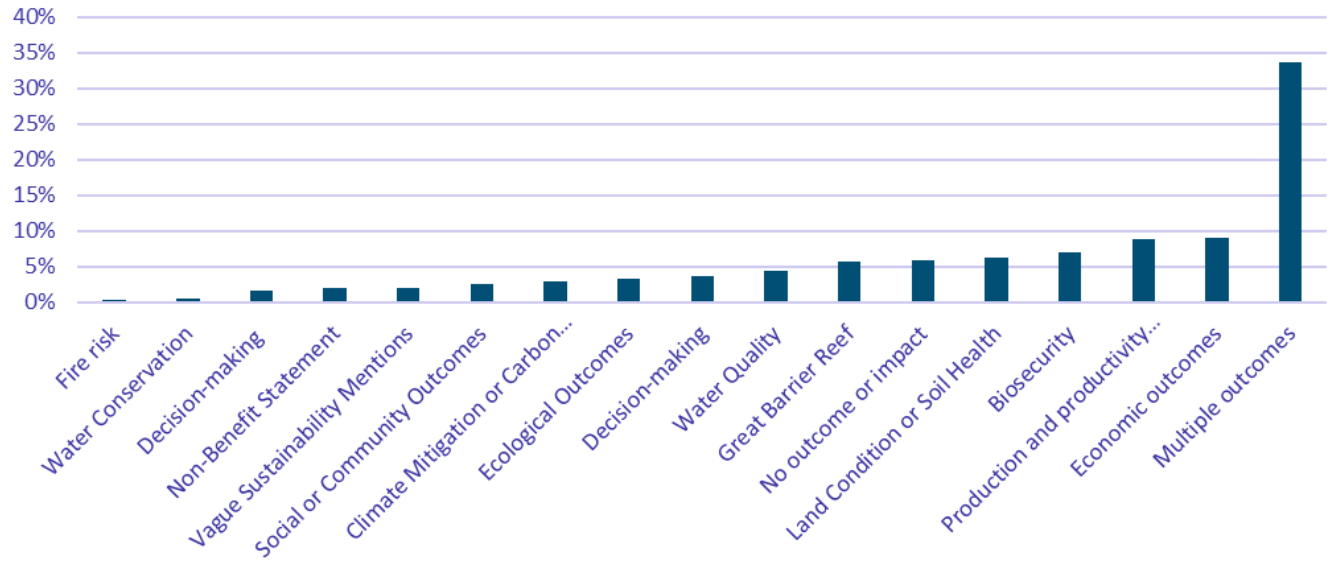


Figure 17 Types of outcomes described

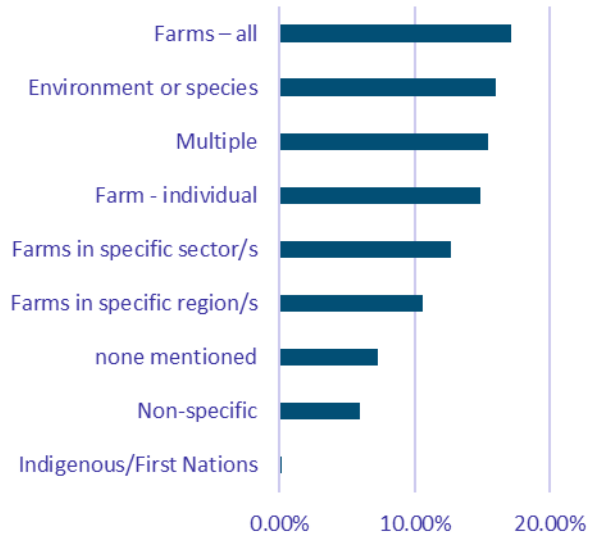
As expected, when the source was attributed to the government, the proportion of norms coded as benefiting the Great Barrier Reef and water quality was much higher compared to other sources or producers of artefacts (see below table). In contrast, the proportions for benefits such as production and profit were higher for industry, private business, and research. Social outcomes, when mentioned, were more commonly found in sources from Industry Associations. Norms mentioning climate benefits were predominantly found in newspapers. Broader ecological outcomes were more frequently highlighted by NGOs and NRMs. Nearly all of the non-benefit norms and those describing economic outcomes were identified in newspapers.

Appendix F shows the outcomes as associated with different artefact types, management practice and Industry sector.

Table 8 Outcomes by Source Type

	Govern't	Industry Assoc.	Media	NGO	NRM	Private Business	Research	Grand Total
Multiple outcomes	**32%**	**30%**	**33%**	**31%**	**35%**	**40%**	**43%**	**34%**
Production & productivity benefits	4%	10%	9%	5%	4%	16%	15%	**9%**
Economic outcomes	4%	8%	17%	2%	2%	6%	8%	**9%**
Biosecurity	3%	10%	10%		2%	4%	8%	**7%**
Great Barrier Reef	**17%**	5%	3%	12%	7%	3%	2%	**6%**
No outcome or impact	6%	6%	6%	3%	4%	7%	8%	**6%**
Land Condition / Soil Health	8%	4%	1%	12%	18%	8%	4%	**6%**
Water Quality	11%	4%	1%	17%	9%	3%	1%	**5%**
Decision-making	3%	6%	2%	3%	3%	2%	8%	**4%**
Social or Community Outcomes	1%	5%	3%	1%	2%		1%	**3%**
Climate Mitigation or Carbon outcomes	2%	4%	4%	1%	2%	2%	1%	**3%**
Ecological Outcomes	2%	1%	4%	5%	7%	3%	0%	**3%**
Decision-making	3%	3%		4%	1%	3%		**2%**
Non-Benefit Statement		1%	6%				1%	**2%**
Non-specific Sustainability Mentions	3%	3%	1%	5%	2%	2%	1%	**2%**
Water Conservation		1%	1%	1%	1%	1%	1%	**1%**
Fire risk			1%		1%		1%	**0%**
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Figure 18 Scale of outcomes



When considering the scale of the outcome, most often the outcomes were described in terms benefiting all farms. This was followed by the environment rather than a farm, or benefiting multiple of the options (e.g., the environment and all farms). Moreover, Figure 19 illustrates a clear trend in the way the benefits associated with norms are described, where the scale of the benefit influences whether the norms are framed descriptively or injunctively. When describing the outcomes for smaller groups such as "Farm - individual" or "Farms in a specific group" the norms are largely descriptive, reflecting an emphasis on existing practices and observed outcomes. In contrast, as the focus shifts to

broader scales, from "Environment and/or species" through to "Farms - all," there is an increasing reliance on injunctive framing of practices. This suggests that benefits for larger groups or scales are more often framed in terms of what should or could be achieved, potentially reflecting aspirations or goals that extend beyond individual actions.

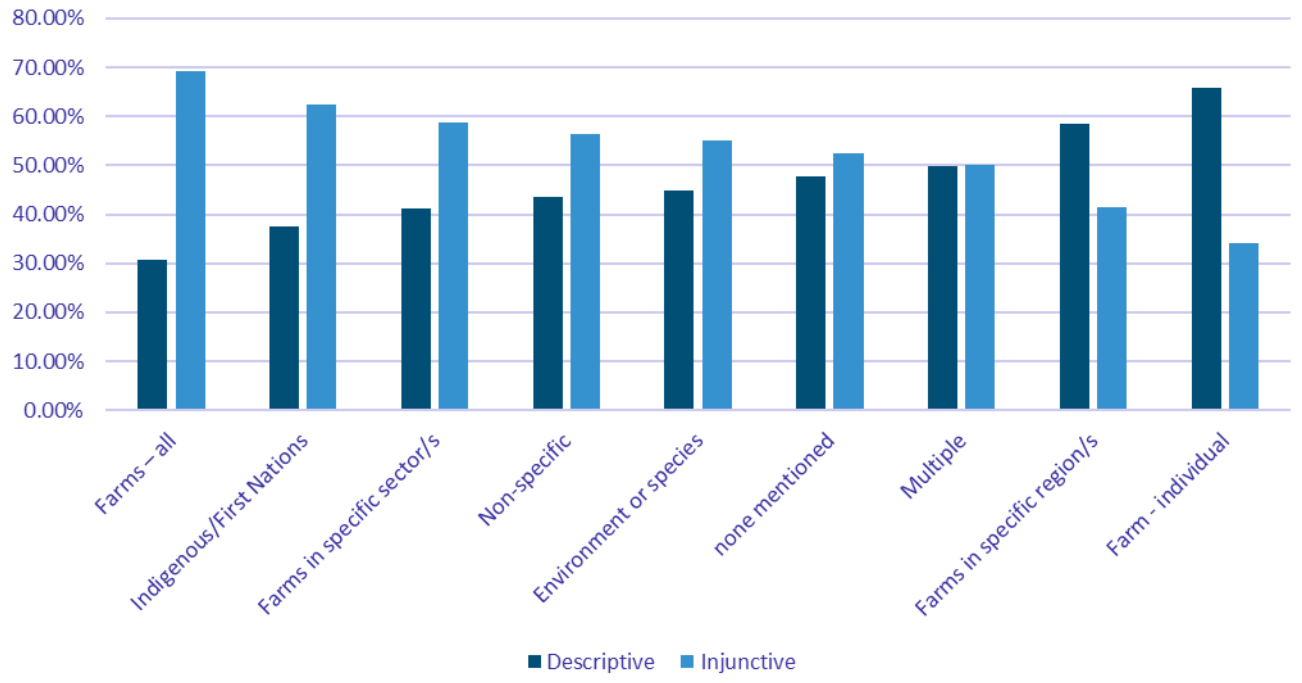


Figure 19 Use of norms by Scale of Outcomes

Lastly, the below illustrates how different types of outcomes are associated with varying spatial or thematic scales. As could be expected, environmental outcomes, such as ecological health, water quality, and Great Barrier Reef protection, are primarily tied to environmental contexts and the benefits are generally not tied to farms either individually or as part of any farm group. In contrast, farm-related outcomes like economic benefits, decision-making, and production outcomes are more often associated with individual farms or groups of farms. Fire Risk shows an emphasis on both "Environment and/or species" and “all farms” reflecting its dual impact on ecosystems and farming. Social and community outcomes, as well as climate mitigation outcomes, are more evenly distributed across different scales. Non-benefit statements were nearly always made in relation to harms to all farms or farms in a particular sector/region, and rarely in terms of harms to the environment.

Table 9 Outcomes by Scale of Outcome

	Environment	Farm - individual	Farms – all	Farms in specific region/s	Farms in specific sector/s	Indigenous/ First Nations	Multiple	None mentioned	Non-specific	Grand Total
Multiple outcomes	25%	41%	29%	37%	25%	25%	63%	4%	27%	**34%**
Economic outcomes		11%	14%	20%	11%	13%	5%	1%	9%	**9%**
Production and productivity benefits		14%	14%	13%	17%		3%	1%	6%	**9%**
Biosecurity	3%	5%	12%	7%	14%		4%	2%	10%	**7%**
Great Barrier Reef	21%	1%		1%	1%		8%		12%	**6%**
Land Condition or Soil Health	7%	13%	7%	4%	5%		2%	4%	6%	**6%**
No outcome or impact								81%		**6%**
Water Quality	17%	2%		2%	2%		4%	1%	4%	**5%**
Decision-making		8%	10%	5%	10%	23%	2%	4%	1%	**4%**
Climate Mitigation or Carbon outcomes	3%	1%	3%	1%	4%	13%	1%	1%	12%	**3%**
Ecological Outcomes	16%					13%	3%			**3%**
Social or Community Outcomes	1%	1%	4%	3%	4%		1%		9%	**3%**
Non-Benefit Statement	1%	1%	4%	3%	3%		1%		1%	**2%**
Non-specific Sustainability Mentions	3%	2%	2%	1%	3%		2%		2%	**2%**
Water Conservation		1%	1%		1%			1%	1%	**1%**
Fire risk	1%					13%				
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

To what extent are the words ‘Reef’, ‘Stewardship’ or ‘Water Quality’ mentioned in conjunction with norms?

Across all the norms analysed, the Reef (referred to as "the Reef" or the "Great Barrier Reef") was mentioned in just over 15% of cases. As might be expected, the Reef was most frequently mentioned by government and NGOs. In contrast, it was rarely mentioned by industry, media, and farmers. With regards to the term “Water Quality” (found in 1 in 10 of the identified norms), this was used most often by government and NGOs. Interestingly, the media and research used the term the least. When considering all the different Industry sector groups, cane and horticulture used the term more frequently. In sum, it was much more common to see these terms used in source types that were not attributed to a specific Industry sector.

The term “stewardship” was used in less than 2% of the identified norms. While it was not widely adopted, it appeared equally in communications from government and industry, with occasional

use by farmers and NRMs. Notably, the media, NGOs, private industry, and experts/researchers use this term extremely rarely. Words like “sustainability” and “protect” where more common, but only slightly.

What is overall sentiment when norms are being communicated?

The evaluative tone or sentiment when communicating the norms was overwhelmingly positive, with less than 10% categorized as negative and just over 12% categorised as neutral. However, it is important to note that our sample was specifically focused on artefacts related to stewardship norms, which are inherently related to benefits and positive outcomes. This focus likely introduced a bias in our findings. If we were to broaden the scope to include a wider range of agricultural norms, the distribution of sentiment might differ significantly, even when describing the same practices.

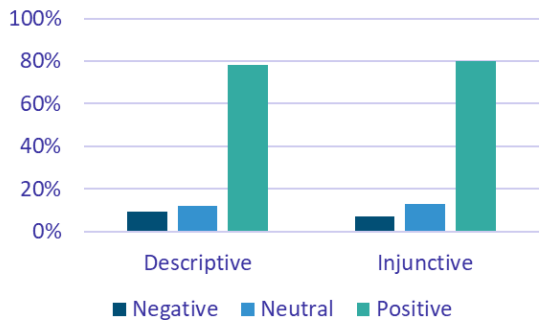


Figure 20 Use of Norms by Sentiment

In terms of how sentiment varied according to some of the attributes of the norms, there was a slight tendency for any negatively framed norms to be descriptive, whereas the inverse was true for positive and neutral norms.

Figure 21 shows some variations between communicators and the sentiment of the norm. When the norm was categorised as negative, it was more likely be communicated by industry or the farmers. When the norm was categorised as neutral, the communicator was also significantly more likely to be from an industry group, followed by an expert/researcher. Most negative and neutral norms were related to advocacy, climate, biosecurity and regulation and compliance.

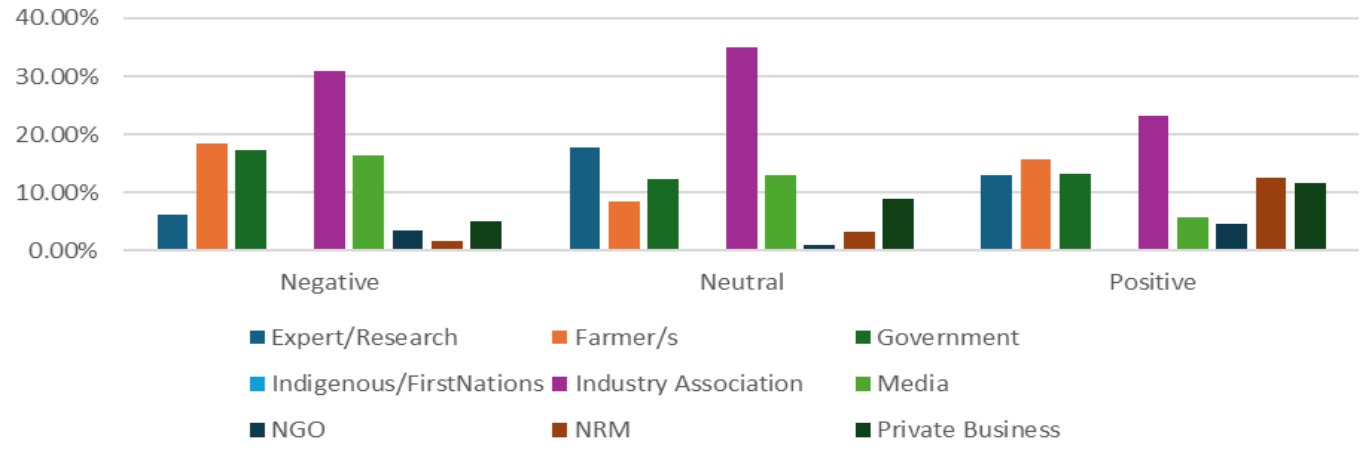


Figure 21 Sentiment by Communicator

Additionally, the grazing industry (likely related to the high proportion of climate-related norms) and bananas plus horticulture (related to the high proportion of biosecurity norms) had comparatively higher proportions of “negative” and “neutral” salience norms.

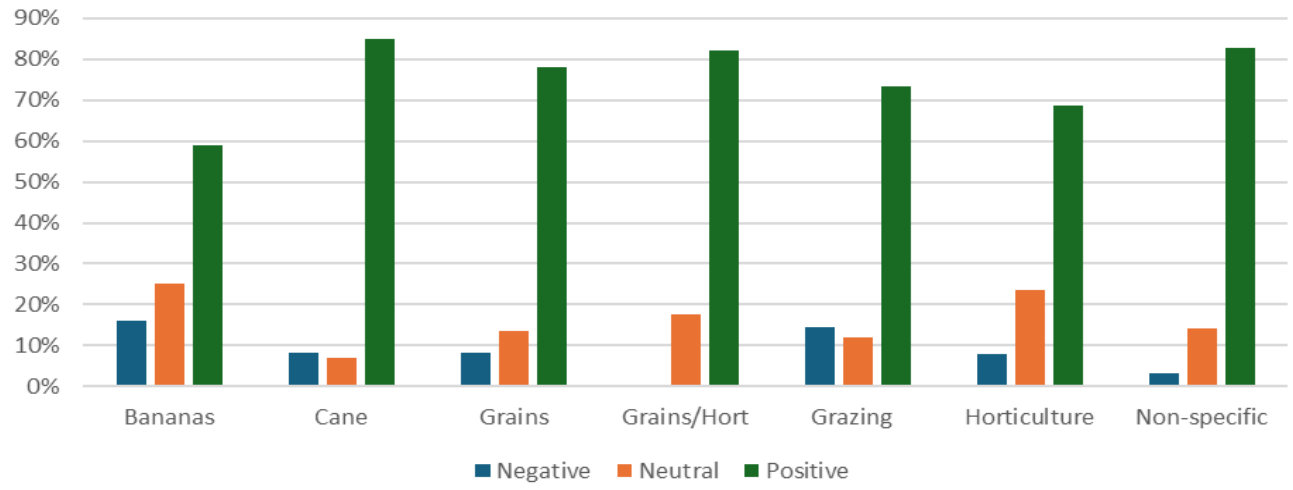


Figure 22 Sentiment by Sector

Figure 23 shows that when looking at where those negative norms are communicated, negative norms are predominantly found in newspapers. This may reflect the tendency of newspapers to focus on controversy, prioritising readership and attention. Podcasts and Landline tended to have a comparatively higher number of norms coded as “neutral.” In contrast, other platforms may focus more on encouraging adoption and therefore avoid negative framing. As might be expected, none of the grower stories were coded as negative.

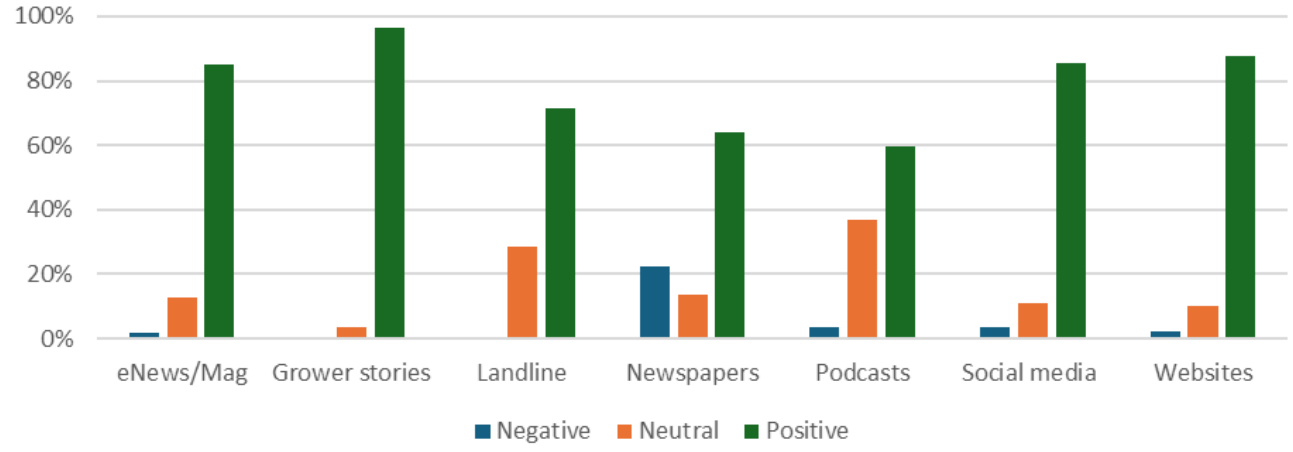


Figure 23 Sentiment by Artefact Type

Discussion

The Role of Norms in Influencing Stewardship Behaviours

Norms are powerful drivers of human behaviour, shaping how people act based on their perceptions of what is typical or expected in a situation. In the context of stewardship — norms can play a critical role in encouraging people to care for and protect the environment. Norms influence behaviour through a range of explicit (conscious) and implicit (sub-conscious) processes (Morris et al. 2015; Farrow et al. 2017). These include:

1. Social Expectation and Belonging: Norms operate through our need to belong and be accepted by others. People are often motivated to align their actions with the behaviours or expectations of a group to maintain social connections and to avoid disapproval.
2. Shortcut for Decision-Making: Norms provide a mental shortcut, simplifying complex decisions by signalling what is commonly done or valued in a specific context.

Role of governments in communicating stewardship norms

As shown in our findings, there are many groups and agencies that seek to influence norms, and each of these groups and agencies will have diverse motivations for communicating norms. While not the focus of this project, we note that this research may raise questions about the role of governments in influencing norms. We highlight the comment from Kinzig and colleagues, who state that government communication for norms "can be carried out in a way that abides by the principles of representative democracy, including transparency, fairness, and accountability" (Kinzig et al. 2013).

Within the complex ways that norms emerge and evolve, governments have a role in promoting public goods and practices that relate to these. In some circumstances, governments may focus on promoting a 'minimum standard' of practice across a broad population; in other circumstances, governments may seek to promote innovative practices in targeted groups. There are many policy instruments available to governments which can shape stewardship practices in agricultural settings, including financial incentives, regulations, and persuasive communication (Dean et al. 2023), each of which provides opportunities to communicate or demonstrate positive stewardship norms (Kinzig et al. 2013). Persuasive communication may aim to strengthen norms directly by communicating examples of specific descriptive or injunctive norms. However, other policy instruments may shape norms both directly and indirectly via behaviour. For example, provision of financial incentives (such as grants or

subsidies) may signal the importance of certain practices. These incentives can generate practice change which in turn, result in shifting norms (indirect pathway). At the same time, communicating about availability of financial incentives may signal what behaviours are approved of and thereby strengthen perceived injunctive norms (direct pathway). Regulations may also influence norms via these direct and indirect pathways (Kinzig et al. 2013).

When are communicated norms most powerful?

The social context influences the degree to which norms can influence perceptions and practices. **Norms are more impactful when they come from an "ingroup"**—a group that people identify with or feel a sense of belonging to. For example, farmers may be more influenced by stewardship practices shared by other local farmers in the same industry or the same region, than by those promoted by government agencies. This is because messages from ingroups feel more trustworthy and relevant.

Norms are more influential when they feel psychologically "close" to the individual, for example:

a. **Spatial proximity**: Norms from nearby communities or neighbouring farms resonate more than those from distant regions or when described as relevant to 'all farms' or the entire 'agricultural industry'.
b. **Social proximity**: People are more influenced by peers with whom they know and/or trust. Farmers are more likely to adopt sustainable grazing practices when their neighbours demonstrate the benefits on nearby properties.
c. **Temporal proximity**: Recent behaviours are more salient; for example, highlighting stewardship actions taken in the past year rather than a decade ago is more effective.
d. **Experiential proximity**: Norms feel stronger when they are directly relevant to someone's experiences. For example, messages about conserving water resonate more with farmers facing drought conditions than those in water-rich areas.

Norms are most influential when clearly linked to specific behaviours. Ambiguous, vague or generalised norms can confuse people or lead to inaction. For example, a message like "Many farmers test soil health annually to optimize fertilizer use" is clear and actionable. Whereas a norm related to "improved fertiliser management" is less clear and actionable.

Norms are more influential when they are consistent from different communicators and across different channels of communication. Inconsistent messaging can dilute the power of the norm, leading to confusion or mixed messages about what is expected. For example, a campaign promoting pasture management should consistently highlight the same set of best practices across social media, community meetings, and farmer education programs.

Using a single real person to communicate norms offers emotional relatability, credibility, and a tangible example that can motivate behaviour change. However, it may also feel anecdotal or unrepresentative of broader trends. In contrast, using a generalized group (e.g., "a farmer") provides neutrality, broader applicability, and avoids reliance on one specific case, making it feel more inclusive. Yet, it may lack the emotional engagement or relatability of a real person. The choice depends on the goal: a single person works well for creating a personal connection, while a generalized group is better for demonstrating typical behaviour without over-personalising the message.

Highlighting benefits alongside norms makes the behaviour more compelling, but **proximal benefits—those that are immediate and close to the target audience—are generally more influential.** Proximal benefits, like cost savings or improved crop yields within a season, feel tangible and achievable, making them highly motivating. While distal benefits, such as long-term environmental sustainability, can inspire action, they often feel abstract or less urgent. The most effective messaging focuses on proximal benefits relevant to the audience while subtly connecting them to broader, long-term impacts for sustained motivation.

Positive framing is more effective than negative framing. Norms work best when they highlight the desired behaviour rather than the undesired one. For instance, saying, “85% of farmers in your region use cover crops to improve soil health” is more effective than “Many farmers don’t use cover crops, leading to soil degradation.” Positive framing avoids inadvertently normalising undesirable behaviours.

Reflecting on findings

Media and industry sources generate the most artefacts

The study identified a wide range of stewardship norms in various communication-focused artefacts across various sources (including industry, regions and ‘producer’ of the artefact). Most of the identified norms originated from media, industry, and NRMs—likely reflecting the sheer volume of communication artefacts produced by these groups. Normative statements from government were much less frequent. When examining the volume of norms across different artefact types, newspapers contributed the highest number of norms, followed by eNewspapers and eMagazines, again highlighting the substantial communication outputs generated by these artefact types.

There are many mechanisms by which norms and artefacts may shape perceptions and practices. Some research indicates that *frequency* of exposure to a norm may generate stronger support for the norm, support stronger cultural transmission of the norm, and stronger emotions

related to trust (Kwan et al. 2015). Within the context of our findings, where media and industry generate the highest volume of norm-related content, this suggests that norms communicated by media and industry may generate a stronger influence than norms generated by government sources.

When also considering that communications from trusted sources are more powerful, this suggests that industry communications are likely to have the strongest influence on perceptions and practices relating to stewardship.

Goals of communicating norms – farming centred versus public good

These findings highlight the diverse range of outcomes associated with communication of stewardship-related norms, emphasising the multi-faceted benefits of these practices:

- Around one-third of the normative statements implied multiple benefits. Norms classified in this way typically mentioned both environmental benefits and outcomes for the farm or farmer.
- Farming-centred outcomes were commonly emphasised. Norms focused on outcomes that are central to farming businesses and likely to appeal to a wide range of farmers, such as immediate economic outcomes or improved production. Norms that focused on farm-centred outcomes such as production and profit were typically communicated by industry, private business, and research agencies.

Norms focusing on water quality or the Great Barrier Reef were low in frequency (6% of total number), and typically associated with government sources.

Another distinction between government and industry related to descriptive norms (what people do) and injunctive norms (what people ought to do):

- Descriptive norms were more commonly used by government and NGOs
- Injunctive norms were most commonly used by industry associations.

To put these findings in context, we focus on the potential types of goals that are considered within stewardship communication. A key challenge for promoting stewardship requires consideration of how different goal types are communicated, and how this is situated within the broader history of agricultural extension and communicating for practice change. Historically, most communication about agricultural practices centred on providing information and support for practices centred on core goals for farming businesses (e.g. enhancing productivity, yield, profit). Broader shifts in both agricultural and communication practices mean that this role is now largely provided by industry and industry-related bodies; the role of governments now focuses on outcomes related to public goods, including outcomes related to environmental

conservation (Leeuwis & Van den Ban 2004). Similarly, there is divergence in the 'problem' that new practices may be aiming to solve and how this 'problem' is identified. For example, problems centred on farming businesses (e.g. related to productivity, yield, or profit) are typically identified and addressed by the farmer or industry. In contrast, problems related to the environment are typically identified and addressed by an external party, such as a government or NGO (Leeuwis & Van den Ban 2004).

These distinctions appear to mirror the gradient observed in our findings about norm types. That is, when problems are central to farms and farming (as communicated by industry), injunctive norms are common; in contrast, when the problem relates to the broader environment (as communicated by government), descriptive norms are more common. Given that communication about environmental outcomes is typically led by external parties (such as government), it has been argued that this needs to be more persuasive than communication on issues central to farming (Leeuwis & Van den Ban 2004) or provide other forms of incentivisation (Kinzig et al. 2013).

How does balance of descriptive and injunctive norms shape the effectiveness of communication?

The findings discussed above raise the question of whether government or environmental agencies should consider using more injunctive norms within their communications that promote stewardship.

Research shows that both descriptive and injunctive norms can be important influences on perspectives and practices, and are likely to be most effective when they are in alignment (Farrow et al. 2017). However, these norms are not always in alignment. For example, an individual may perceive that Practice A is commonly performed (descriptive norm), but also perceive that Practice B is encouraged or 'approved of' (injunctive norm). In these circumstances, experimental research suggests that the descriptive norm will influence practices more than the injunctive norm (Farrow et al. 2017).

Importantly, there is a broader range of literature on norms and practices that should influence communication choices. Experimental research suggests that relative influence of these types of norms may also depend on the social and environmental context. For example, it has been suggested that descriptive norms may be more effective when audiences have limited 'mental bandwidth', and provide a heuristic guide of 'immediate' or 'short term actions. In contrast, injunctive norms may be more influential for longer-term planning (Morris et al. 2015). As discussed above, the communicator of the norm also shapes its influence – norms (whether descriptive or injunctive) communicated by a trusted 'in group' member (e.g. other farmers or industry bodies) are likely to be more influential than norms communicated by an external party

where trust may be low (e.g. the government) (Morris et al. 2015; Farrow et al. 2017; Simmons et al. 2020). Another body of research suggests that the influence of norms also depends on the degree to which the practice is connected to internalised motivations (Farrow et al. 2017). For example, communicating norms about a practice that is viewed as central to farming and aligned with existing farmer goals (e.g. maximising productivity) are going to be more influential than norms related to goals that are external to farmer motivations (Farrow et al. 2017).

Pulling these findings together, it is likely that industry sources are able to effectively communicate injunctive norms because they are a trusted source for 'what farmers do' and are focusing on practices that are centred on farming success (e.g. productivity, yield, profit). Because there is strong alignment between the target practice, internal motivations of the farmer, and trusted source, injunctive norms can be suitable and effective. In contrast, government communications about environmental practices will not generate the same alignment for broad farming audiences – which means that strong injunctive norms may generate negative responses, and descriptive norms are likely to be more acceptable (Farrow et al. 2017). Considering these findings within the broader context of communication for practice change, it is likely that government communication that focuses on descriptive stewardship norms may be viewed as more appropriate and acceptable than focusing on injunctive stewardship norms.

Widening the types of norms available

Celebrating champions and individual stories of success is an important and effective way to communicate practices. Norms about individual actors, such as farmers sharing personal success stories, provide relatability and emotional engagement, and a sense of connection. However, individual stories may risk feeling anecdotal and not representative of what broader groups of farmers are engaged in. Much norms-based communication focuses on communicating specific rates of behavioural adoption (e.g. using descriptive norm statements such as "80% of Australians do…"). Such approaches are only effective when the communicated norm is authentic – that is, it aligns with people's sense of what practices are actually common. For some stewardship practices, especially new practices, it is likely that a minority of farmers within an industry have adopted the practice (Cialdini et al. 2006). In these scenarios, communicating strong descriptive norms for the group is not possible. One solution is to communicate how practices are changing, which is referred to as a dynamic norm (Fielding & Louis 2020). Experimental studies highlight the effectiveness of dynamic norms messages such as "Over the past 5 years, 40% of Queenslanders have started to make an effort to …" (Fielding & Louis 2020).

Another option for communicating when actual descriptive norms are low, is to consider incorporating injunctive norms within communication (Cialdini et al. 2006; Fielding & Louis

2020). As discussed above, government use of strong injunctive norms (using language such as "farmers should…") may be less acceptable to many audiences. However, it may be worth considering softer methods to communicate injunctive norms. For example, a statement such as "People in this industry say they want to make sure Practice X is available, to help their land and our waterways" conveys social approval of a practice, while avoiding a forceful or didactic approach.

Communicators, actors and artefact types

Our findings show that the communicator of a norm was generally the same as the producer or source of material. For example, government artefacts tended to feature government as the communicator, and industry-produced artefacts usually featured industry associations as the communicator. However, there were times where the communicator of a norm was distinct from the producer or source of the material conveying it. For example, an industry-led source may incorporate voices of individual farmers that convey a norm. NGOs and NRMs more frequently relied on farmers themselves as communicators, while the media often featured farmers and experts.

Given that the communicator of a norm can shape the influence of a norm, this highlights the opportunity for government communications to incorporate a wider range of voices and champions within stewardship-focused communications.

There was also a distinction in the types of artefacts used by different communicators. In particular, government communications typically focused on websites, including government-based websites. This level of concentration suggest that government-based communication content may have limited reach across broader agricultural communities.

Management practices

A large number of practices were identified in the analysed artefacts. The most common practices were tied to areas such as accessing innovation or support and land management. There were notable variations across industry sectors. Bananas showed a strong focus on biosecurity, while grazing emphasised land management and was the only group with a significant share of norms related to climate actions. As expected, chemical management was dominant in crop-growing sectors like cane and grains, and water management was dominant for horticulture.

Practices related specifically to water quality and the Reef were overshadowed by others. Moreover, norms for these practices were typically conveyed by government sources, rather than typical "in-groups." This becomes particularly evident when considering where norms were communicated: norms related to water quality (e.g., chemical management, landscape

resilience) appeared more frequently in “low visibility” sources, such as websites. By contrast, in high-visibility channels (e.g., newspapers and newsletters), norms related to advocacy, biosecurity, and uncategorized practices (i.e., those that did not fit any other category) tended to dominate.

Many of the norms being communicated fell under very broad categories of “management practices,” which was especially pronounced in government-tagged norms. This can create challenges for a number of reasons. Behavioural science emphasises the importance of having clear specific behaviours as a first step in behaviour change programs (Schultz 2014). While we acknowledge that not all communication of norms is directly tied to behaviour change programs, it does indicate that non-specific norms may have limited influence on shaping perceptions about specific practices.

The use of forms of recognition

Most normative statements did not reference any formal system of recognition; however, when recognition is mentioned, funding schemes were the most common forms, often linked to more generic “management practices”. Regulations or legislation are the third most cited forms, frequently in negative or neutral contexts such as advocacy against policies. As might be expected, governments and NRMs are the primary publishers of materials referencing recognition, mainly funding schemes, while industry focuses more on using standards and guidelines (the second most common form of recognition). Recognition varies by sector, with funding schemes common across all, while certifications appear in cane and grazing, and regulations are prominent in bananas (related to biosecurity) and grazing (in relation to land clearing and management).

Geographic scale of practices

As mentioned above, the development of industries across specific regions of Queensland mean that there were strong relationships between patterns or norms across regions and across industry. There were some distinctions between industries:

- The banana industry stood out for its strong emphasis on biosecurity norms, which reflects both the industry's priorities and the influence of temporal factors, such as recent disease outbreaks. This demonstrates how shifting contexts can amplify specific norms.
- The grazing industry, on the other hand, had norms more strongly linked to climate mitigation, often communicated through broader public channels such as newspapers perhaps reflecting greater public interest and awareness.

- Bananas and horticulture focus on injunctive norms, primarily related to biosecurity management. Grains, grazing, and cane industries tend to use more descriptive norms compared to the other industries, which are known to be more impactful.

We also examined the geographic focus of norms, which reveal a divergence between single farm and 'all farms'. Norms focused on individual farms were the second most common target, but were overshadowed by norms directed at "all farms" or norms that were non-specific. There were relatively fewer norms that focused on 'middle ground' options such as specific regions or industries. This presents a challenge as research indicates that norms are more effective when they are specific and relevant, which includes geographic scale. On one hand, farmers may struggle to identify with broad-scale messages; on the other hand, communications focused on single farms may not have a sufficiently broad appeal to influence a wider range of farmers. One opportunity for finding the middle ground may be to focus communication on regions or industries.

Evaluative Tone and Non-Benefit Statements

Positive tones dominated stewardship communications. Negative tones, more common in industry and media communications, were often tied to biosecurity risks or advocacy efforts, potentially increasing the salience of norms by highlighting immediate threats or concerns related to the impacts of regulation/policy on the industry. Harms (i.e., non-benefit statements) were rarely linked to environmental outcomes, with non-benefit statements focusing more on collective sectoral harms (e.g., biosecurity risks).

Opportunities and recommendations

We note that the points raised in this section are not intended to be proscriptive. We recognise that there are many factors that shape design and implementation of communications, and choices about design and implementation will need to respond to the dynamics of specific situations. The below recommendations are presented as opportunities to strengthen impact of norm-based communication and promoting stewardship.

Beyond websites - increasing exposure across diverse media

Government messages currently appear most often on government websites. Information sources influence accessibility of information, and perceptions about relevance for the target audience. As such, this reliance on websites is likely to limit both reach and impact. This finding underscores the importance of strengthening not only the volume of communication outputs but ensuring that these outputs are available across media channels that are used and valued by target audiences. While this research did not examine what the 'most effective' media channels may be, it is likely that sources with greater accessibility and trust include regional media outlets, agricultural programming within national media outcomes, and industry-focused media (Department of Agriculture and Fisheries, 2024).

Broaden voices to celebrate farmers and local champions

Many groups, including NGOs and NRM organisations share voices of farmers and land managers. This approach can help content resonate with audiences. Similarly, norms that are communicated by the farmers themselves are likely to be more effective. In situations where governments have established partnerships and relationships with industry groups, regional bodies or individual farmers, it may be appropriate to consider:

- Integrating government perspectives with other industry perspectives
- Share the stories and voices of farmers
- Amplify farmer perspectives and 'join the dots' between practices and locally-relevant outcomes.

Be specific about practices and audiences

Many government communications about stewardship norms did not focus on specific practices or audiences, which can limit their perceived relevance and ability to shape change. Where appropriate, describe specific practices. For example, 'fencing riparian areas' rather than 'water quality management', or 'no till farming' instead of 'land management'. Similarly, communications that focus on specific industries or regions will be perceived as more relevant by farmers in that industry or region (for example, https://www.canerise.com.au/). Rather than

trying to catch all farmers across the state (a general practice for farmers), specify a practice and core target audience (a grazing-relevant practice for graziers).

Use language that resonates with the target audience

Communication products are more likely to be noticed, considered and trusted if the language used aligns with language that is familiar to the target audience. While the need to avoid unfamiliar jargon is well recognised, there are additional opportunities to shape the language used to describe stewardship practices that better aligns with the audience.

For example, in areas related to minimum standards of practice, there are many areas where government-encouraged stewardship practices (e.g. 'fertiliser management') align with industry-recommended practices (e.g. 'Six easy steps'). Where possible, use the language that is used by farmers.

When communications may be promoting a new practice, there will be limited opportunity to describe this practice in familiar terms. In these circumstances, one option may be to focus on goals and benefits that resonate with the target audience. For example, rather than leading communications with a distal environmental impact, focus on on-farm or local benefits.

Develop a shared language to communicate benefits

Many stewardship norms were framed in terms of delivering multiple benefits—both environmental and farm-related. However, a general trend emerged where farm-centred benefits were portrayed at local scales with more immediate and direct benefits, while environmental benefits were often framed at more distant geographic scales. To reduce polarisation between on-farm benefits and distal environmental benefits, develop a shared approach to communication where both domains are integrated and valued. For example, phrases such as "Supporting the farm and supporting nature", or "Looking after land, on farm and across the state" can communicate integrated benefits (we note that these examples are just suggestions and do not reflect audience-tested messages).

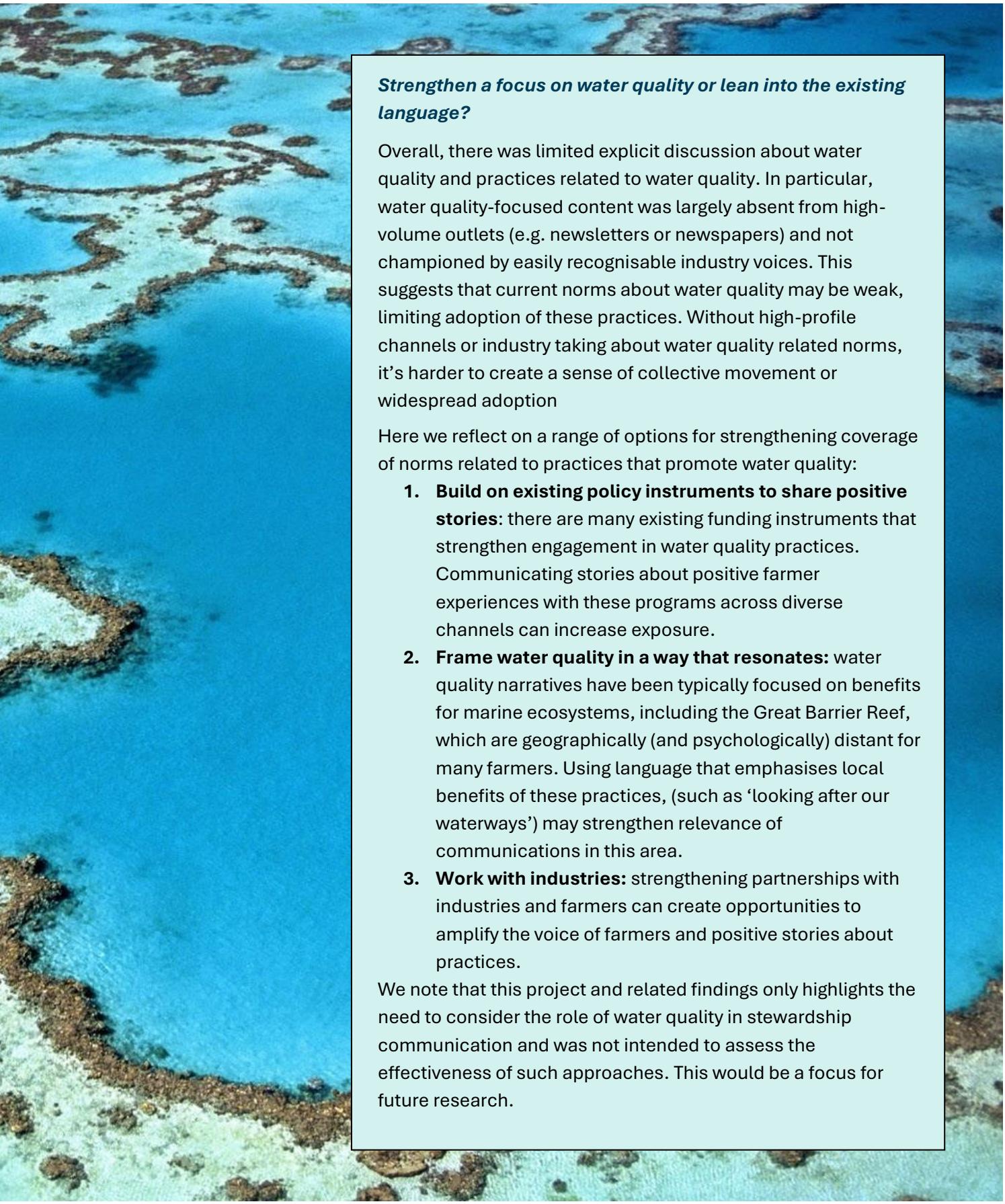
Increase visibility of policy instruments that promote positive norms

Policy instruments, such as funding schemes, have the capacity to influence norms directly, through communication, and indirectly, by shifting practices. Investment in financial instruments can be leveraged to provide a foundation for norm-based communication. Funding schemes are typically viewed positively by farming audiences, and embedding formal structures can have a strong influence on practices and cultural change (Morris et al. 2015), Funding

schemes were the most commonly cited formal system of recognition, but were associated with non-specific ‘management practices’. When a funding scheme (or other policy instrument) is established that promotes particular practices, make sure that examples of these practices being adopted are communicated to broader audiences . If possible, consider communicating both short term and longer term examples of practice adoption and associated benefits.

Strengthen collaboration across agencies

There is increasing recognition that multi-agency collaborations can develop stronger responses to environmental challenges (Lane & Robinson 2009; Allen et al. 2011; Hill et al. 2015; Gooch et al. 2017). While not the scope of this research, such collaboration can also foster effective approaches to communication. Sharing resources, information and best-practices can facilitate collaborations and mutual understanding across agencies. More formal collaborative approaches—such as communities of practice or involving non-government agencies in efforts to promote best practices in communicating normative messages—can help develop a shared understanding and language that facilitates effective communication.



Strengthen a focus on water quality or lean into the existing language?

Overall, there was limited explicit discussion about water quality and practices related to water quality. In particular, water quality-focused content was largely absent from high-volume outlets (e.g. newsletters or newspapers) and not championed by easily recognisable industry voices. This suggests that current norms about water quality may be weak, limiting adoption of these practices. Without high-profile channels or industry taking about water quality related norms, it's harder to create a sense of collective movement or widespread adoption

Here we reflect on a range of options for strengthening coverage of norms related to practices that promote water quality:

1. **Build on existing policy instruments to share positive stories**: there are many existing funding instruments that strengthen engagement in water quality practices. Communicating stories about positive farmer experiences with these programs across diverse channels can increase exposure.
2. **Frame water quality in a way that resonates:** water quality narratives have been typically focused on benefits for marine ecosystems, including the Great Barrier Reef, which are geographically (and psychologically) distant for many farmers. Using language that emphasises local benefits of these practices, (such as 'looking after our waterways') may strengthen relevance of communications in this area.
3. **Work with industries:** strengthening partnerships with industries and farmers can create opportunities to amplify the voice of farmers and positive stories about practices.

We note that this project and related findings only highlights the need to consider the role of water quality in stewardship communication and was not intended to assess the effectiveness of such approaches. This would be a focus for future research.

Putting it all together – an example

Opportunities to strengthen impact of funding-related communication include applying the principles discussed across this section:

- **Join the dots between practices and outcomes:** communicate outcomes and successes (including on-farm benefits) in addition to funding availability. Where possible, communicate norms and benefits throughout the cycle of the project and over longer time frames that capture the range of potential benefits.
- **Be specific:** Provide information about specific practices, and focus on specific industry or region
- **Farmer-led and farmer-read:** partner with industry to share stories of success and choose media channels that are used by the target audience. Use the language of the audience to describe the practice (e.g. Six easy steps) rather than government language (water quality management).
- **Extend the norm beyond an individual farmer:** Where appropriate, include information that extends the norm beyond an individual farmer. Examples include:
    - Include multiple farms or farmers within a story
    - Communicate dynamic norms (e.g. "An increasing number of farmers…")
    - Amplify farming voices that share injunctive norms about these practices.

General considerations when for communicating for change

Understand the communication context to support consistent messaging

Research shows that consistent messaging can be important for shaping effectiveness of communicating for change (Schultz et al. 2007; Farrow et al. 2017; Ruxton et al. 2023). However, when there are numerous agencies and voices contributing to the broader media landscape about agricultural practices, this can be challenging to deliver.

As a first step, when designing new communication initiatives, examining the broader media landscape can provide clues as to potential alignment or points of divergence. This can also reveal particular frames or language that can be used to deliver messages that resonate with audiences. When there is potential alignment between new communication initiatives and existing media landscape (and the values and needs of target audiences), identify points to ensure consistency in behavioural advice or recommendations.

When there is strong divergence between new communication initiatives and the media landscape (and values and needs of target audience), this may signal that additional support may be required to achieve communication goals. Points of divergence may be explicit or implicit. An example of an explicit divergence would relate to communicating about regulations in a setting where the target audience has strongly opposed regulations. An example of implicit divergence may relate to how the word 'stewardship' is conceptualised – a government agency may conceptualise stewardship as caring for the Reef, whereas a farmer may conceptualise stewardship as ensuring soil quality best supports long term productivity on their land.

Consider equity and communicate shared effort

It has been suggested that people have a 'finite pool of worry' (Weber 2006), and that stressors associated with farm management or daily life may constrain engagement with new information (Dean et al. 2018). In these circumstances, communications to promote stewardship may generate reactance or other negative impacts. When asking farmers to consider new practices with minimal on-farm benefits, also consider opportunities to share information about how other groups and agencies are also contributing to broader goals. It may also be suitable to consider including information about *how* practice recommendations were developed to minimise burden and include rewards or incentives to offset costs.

Have realistic goals

While there is increased enthusiasm for applying insights from behavioural psychology within agricultural contexts, insights from psychological research focusing on household practices may not translate simply to farming contexts. For example, as discussed by Dean and colleagues, within behavioural terms, agricultural practices are complex behaviours (Dean et al. 2023). Rather than comprising a single action (e.g. turning off a tap), a practice such as changing amounts of fertilizer application comprises a complex series of *multiple* actions over long periods of time (Montes de Oca Munguia et al. 2021; Dean et al. 2023). Complex practices typically require greater support for change than simple practices. Agricultural practices may also contribute to a farmers' cultural identity, allowing someone to express values and traditions (Burton et al. 2020). Practices that contribute to cultural or personal identity may be harder to change (Fielding & Hornsey 2016; Fritsche et al. 2018).

Don't rely on top-down messaging to tackle conflict about diverging norms

While their presence within our overall results was small, there were still a number of artefacts related to regulations that were coded as having an overall negative sentiment, many of which were encouraging farmers to oppose or challenge them. The divergence between desired practices and audience preferences creates a challenge for communication. While general recommendations about communication still apply (e.g. understand and focus on the values of

the audience), it is important to note that top-down communication approaches are typically not sufficient to solve these challenges (Williams et al. 2021; Romero-de-Diego et al. 2025). Rather, building relationships across agencies to support mutual understanding and co-design of solutions can help to build a shared commitment for emerging practices.

Limitations and future monitoring

This study captured stewardship norms at a set period of time. Norms are fluid, changing over time and in response to diverse experiences and stimuli. Repeated monitoring (or conducting analyses for previous windows of time) would enable research to examine how stewardship norms are shaped by temporal factors. While there is no set 'best practice' to identify optimal frequency of this type of monitoring method, it is possible that periods of 2-5 years may be necessary to reveal distinct patterns.

The methods applied in this project reflect emerging approaches to identify and code large numbers of text based sources that integrate human and AI-based techniques. We note that the application of these methods to thousands of documents involves inevitable trade-offs between rapid screening and accuracy of coding. This raises the question of what rates of accuracy are considered acceptable; we expect that this is likely to be in the range of 80 to 90% (rather than 100%). While available methods in this area will evolve rapidly (in parallel with rapid evolution of AI technology), we found that integrating human coding methods and applying content-relevant expertise to support coding was essential for study accuracy and are likely to be essential for future iterations of such work.

This work represents an example of an emerging field that focuses on 'unobtrusive indicators of culture' (Reader et al. 2020; Reader & Gillespie 2023). We focused on online text-based artefacts, but there are diverse other ways that norms and culture may be assessed. For example, images provide a rich source of communication context that could be examined. Another important area relates to face-to-face communication (both formal and informal), which may be more influential than passive communication via media (Farrow et al. 2017).

This work also focused on describing patterns of norms and artefacts, as a 'baseline assessment'. While our discussion integrates other research insights to consider how these patterns might influence effectiveness, our findings do not specifically assess patterns of norm communication with effectiveness at promoting short-term or long-term changes in practices and other outcomes. Importantly, our recommendations draw on a diverse body of research that explores cultural transmission of norms, and the impacts of information provision that focuses on communicating norms. This research also indicates that transmission of norms and effectiveness of communicating norms may vary across different social groups (Kwan et al.

2015; Morris et al. 2015; Savani et al. 2015; Farrow et al. 2017). Most of this research has focused on large population studies, or experimental samples of urban residents, rather than farming or rural communities. Most research on cultural transmission of norms focuses on national-level communities (Gelfand et al. 2011; Roos et al. 2015). It would be fascinating to develop methods to examine how practice norms are transmitted through agricultural communities over time. This could focus on specific practices within specific industries, and more broadly about practice changes within and between generations, industries and regions.

Lastly, the findings presented in this report provide a high-level overview, often summarising norms and artefacts into broad categories or classifications. While this approach establishes a valuable baseline, there are further opportunities to delve deeper into the data. Future analyses could explore finer-grained patterns at each attribute or norm level, examining specific communication dynamics or variations. Additionally, narrowing the focus to particular regions, industries, or subgroups within the agricultural community could provide more tailored insights. Understanding how different factors shape the adoption and impact of norms across these contexts would enhance the ability to design more targeted and effective stewardship communications.

Conclusion

Stewardship-related norms are primarily communicated through media and industry sources, with newspapers, eNewspapers, and eMagazines contributing the highest volume of normative statements. Government sources, in contrast, produce fewer norms. Since frequent exposure to norms strengthens their influence and messages from trusted sources are more impactful, industry communications are likely to shape stewardship perceptions and practices more than government messaging.

The findings demonstrated that framing of these norms varies, with industry and private-sector communications emphasising farming-centred benefits like economic gains and productivity, while government messaging focuses more on environmental outcomes such as water quality and the Great Barrier Reef. This distinction aligns with a general distinction in agricultural focused communication, where industry promotes farm productivity, and government highlights public goods like conservation. However, because environmental-framed government messages often come from perceived ‘out-group’ sources, they may require stronger persuasion or incentives to promote or enhance stewardship.

The balance between descriptive and injunctive norms also influences stewardship communication. It is generally accepted that descriptive norms, which highlight common practices, tend to have a stronger impact than injunctive norms, which prescribe what should be done—especially when the two are misaligned. Trust in the communicator further determines

norm adoption, with industry and peer messaging aligning more closely with farmers' internal motivations. As a result, it is likely that government communication that focuses on descriptive stewardship norms may be viewed as more appropriate and acceptable than focusing on injunctive stewardship norms. It may be worth considering softer methods to communicate injunctive norms. For example, a statement such as “People in this industry say they want to make sure Practice X is available, to help their land and our waterways” conveys social approval of a practice, while avoiding a forceful or didactic approach.

Norms also vary across industry sectors and regions, reflecting different management priorities. For example, banana farming emphasises biosecurity, while grazing highlights climate mitigation. Many government messages are distributed through websites, which may limit their reach, and are often framed in broad terms as "management practices," reducing their specificity and impact. A more targeted approach that integrates trusted industry voices, uses diverse communication channels, and tailors messages to specific sectors and regions could improve the effectiveness of stewardship communications.

In light of the findings, the following recommendations were made to strengthen impact of norm-based communication and promoting stewardship.

1. Expand government communication beyond websites
2. Use farmer and land manager voices to enhance credibility and resonance
3. Avoid vague terminology—use precise practice descriptions
4. Align communication language with familiar industry terms
5. Integrate farm and environmental benefits in communication to reduce polarisation
6. Increase Visibility of Policy Instruments That Promote Positive Norms
7. Encourage multi-agency collaboration to improve communication strategies.

While this study provides a baseline assessment of stewardship norms at a fixed point in time, but norms are dynamic and evolve in response to external factors. Repeated monitoring over time, potentially in 2–5 year intervals, could help track how these norms shift in response to changing conditions. The study also highlights the trade-offs in using AI-assisted methods for large-scale text analysis, where balancing speed and accuracy is crucial. Future work could refine these approaches, further integrating human expertise to enhance coding precision.

Expanding beyond text-based artefacts to include images and face-to-face communication would provide richer insights into how norms are conveyed and adopted. More granular analyses at the industry, regional, or attribute level would allow for more targeted and effective stewardship communications, ultimately strengthening efforts to promote sustainable practices.

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Appendix A. Summary of findings from key informant interviews

Can you think of an example of a practice that has environmental benefits that is well supported by the industry that you work with?

A wide variety of practices were reported with no clear trend emerging.

What about an example of a practice that has environmental benefits that is not supported by the broader industry?

In discussing environmental benefits of practices not widely adopted within the industry, the feedback has not been specific to identified practices but has focused more on the barriers to wider adoption or has focused on providing reasons why practices are not being supported by the industry. Many participants cited financial constraints as a primary barrier, pointing to the high costs associated with implementing these practices and the significant debt burdens already faced by farmers. Another major deterrent was the absence of mandatory regulations for many stewardship-focused practices, which often resulted in low uptake unless enforced. Additionally, there was a notable lack of understanding among farmers about the specific benefits and methodologies of these practices. Cultural factors also played a significant role, with adherence to family traditions and established norms within farming communities sometimes conflicting with the adoption of newer, environmentally beneficial practices. Moreover, a pervasive culture of risk aversion and fear, exacerbated by negative messaging from industry peers, further hindered widespread adoption. For instance, some farmers were discouraged by exaggerated warnings that compliance with new regulations would lead farmers to “go broke”.

Do you feel that there are points of difference between what the industry groups you have mentioned promote, versus what farmers commonly do on their land? If yes, can you explain?

Every single participant has said that there are many points of difference. This has been collectively attributed to the following:

- The fact that industry is promoting industry standard, which not everyone will/can meet.
- Farmers' financial situation, farm topography, location, who they can get to work with them.

Do you feel that there are points of difference between what the state and federal government promote and what farmers commonly do on their land? If yes, can you explain?

Again, every single participant has said that there are many points of difference. This has been collectively attributed to the following:

- Lack of trust in the government (this was consistently mentioned).
- Government is meant to push the forefront, therefore naturally people will not be at that level for the most part.
- Difficulties actually implementing the solutions that the government promotes.
- Low appetite for risk, with very real consequences.
- Social challenges involved with rolling out the reef water quality legislation, rather than technical challenges.
- Not enough funding for certain suggested changes.
- Some don't want to do what the government suggests due to historical reasoning that has caused them to lose trust / just not want to follow government's lead.
- The government is perceived in a very different way to what we (industry) are. Of all the groups, landholders will be more resistant to info from government due to deep distrust in what the government wants.

However, a small number of people pointed out that there is some consistency due to government funding that targets specific practices – so where there is funding there is alignment.

We have asked about industry and government, are there any other groups or bodies that regularly promote stewardship practices to farmers that we haven't spoken about yet?

The most common response was "farmers" themselves, or "peer-to-peer". Some NGOs were mentioned, and two participants mentioned Traditional Owner groups.

Is there much commonality between what farmers consider good stewardship?

The most common response was that yes, there is a consistent "base" that most and if not all farmers care for the land in the sense that (a) stewardship equals profit and productivity (b) (for certain farming sectors particularly) they care about passing it on to the next generation. A small number disagreed, however, and felt more strongly that there were segments of farmers that do not care about stewardship and are purely profit-driven or related it to disagreements related to the specific practices that can be considered good 'stewardship' (for example, "one farmer had a water method that was really good but then neighbours said it was a disaster.")

Is there much variation or difference among the farmers in their stewardship? Please explain how it varies in and between which groups?

The stewardship practices among farmers exhibit significant variation across multiple dimensions. Firstly, there is diversity in risk tolerance, with some farmers opting to maintain more “stable” production levels and profit margins, while others pursue more “innovative” methods. Motivations for adopting new agricultural techniques also vary, with certain farmers preferring straightforward approaches for success, contrasting with proactive early adopters. There are variations among industries, for example, cane farmers' reluctance towards soil testing compared to other agricultural sectors where such practices are routine. Age demographics further delineate disparities in stewardship attitudes: younger farmers are generally more receptive to scientific innovations and are acutely aware of environmental impacts, particularly on ecosystems like the Reef. Conversely, older farmers may resist changes perceived as requiring long-term investment or lacking immediate returns, often due to concerns over generational continuity on the farm. Financial considerations also play a pivotal role, dividing farmers into groups ranging from environmentally conscious investors to those constrained by financial obligations or those that have ideological opposition to government funding and intervention. The level of trust in government initiatives varies significantly among farmers, affecting their willingness to engage in collaborative efforts or even accept financial incentives. While monetary incentives can sway some, others prioritise personal values or autonomy over financial gain when deciding whether to participate in environmental initiatives. Co-contribution models emerged as a practical gauge of farmer commitment, reflecting individual perceptions of project value and alignment with personal or business objectives.

In your opinion, where do farmers get information about how to [insert item here]?

Improve water quality: The most common answer was that they don’t talk about water quality; they don’t look for this information. They’re not proactive in trying to improve water quality. If they do, it’s a by-product of other factors e.g. nitrogen. Other answers included:

- Extension officers in their peak industry body (regional meetings).
- State gov. agronomists and researchers, resellers (business interests).
- Growers themselves talking to each other.
- The organisations that are funded to improve water quality and industry groups.
- Traditional media when promoting reef regulations.

Land restoration: A wide range of responses were received including:

- Peer to peer, community, friends, other growers.
- QLD country life, social media.
- NRMs, Greening Australia.

- Productivity boards / ag-chemical reseller: influential because they're considered the trusted and most experienced source.
- NRM bodies / local community organisations.
- Community: family, friends, neighbours.

Access to carbon markets: The most common answer was that they don't look for information about this, most don't know about it, and most are confused about it. Some are willing to try it out, but most are confused and their respective NRM bodies lack information to provide them. Information they get stems from the carbon companies who are directly contacting them or traditional media like Landline.
Access to reef credits: The most common answer was that most farmers don't know what this is, likely have only vaguely heard of it and most aren't involved at all. Would have been contacted directly by companies if they had heard of it.
Improved profit and productivity: The answers were highly variable, but the most common response was generally peer-to-peer, community, informal communications. Essentially anyone they trust and respect. Other answers:

- Resellers / agronomists (as they have the most frequent contact = high trust).
- Peak industry body
- SRA / productivity boards
- Farmacist
- Government extension officers
- NRMs
- Landline.

Overall findings for this question:

Very few people mention media. They don't get info from media (except Landline).

Now I want to ask about your organisation, what are the main ways that you communicate with farmers?

When discussing how their organisation communicates with farmers, interviewees highlighted several. The most frequently mentioned approach involved direct, face-to-face interactions. This method was perceived as vital for as the most "effective" communication. Government representatives noted more formal channels such as official websites, whereas others emphasised the need to customize communication methods to suit farmers' preferences for effectiveness.

Are there any other ways that farmers get information about stewardship we haven't talked about yet?

The most common response here was Landline, followed by Facebook. A number of people mentioned the news, but more in terms of it having a negative effect. One interview noted the role of consumers. That is, that consumers want to know that farmers are not doing the wrong thing.

Are you aware of any sources of information that are having a negative effect on stewardship? Why?

The most common answer was the media. Another challenge noted was the constant changing of support staff within organisations and variable opinions within organisations. While not mentioned as often, some mentioned extreme conservation groups. Others noted that anything that mentions water quality on the reef can cause farmers to "close up a lot" and that many groups have chosen to become quite cautious to not reference the Reef at all in communications.

Can you provide any examples of where farmers, that are demonstrating the highest levels of stewardship, are being celebrated and rewarded? If so, how and where?

The most common responses were: Reef awards, Landcare awards, NRM awards. Some participants talked about the value of the quiet achievers who aren't celebrated publicly but are respected by their community. Other examples included peak industry bodies sharing stories via industry magazines.

Appendix B. Google Search Strings

No.	Action/Target Management Practice	Location	Actor
Search 1	(protect* OR steward* OR preserv* OR conserv* OR revegetation OR regenerat* OR restor*)	("Wet Tropics" OR "Cape York" OR Burdekin OR Fitzroy OR "Burnett Mary" OR "Mackay Whitsunday*")	(Agriculture* OR Farm* OR Landholder* OR Grower* OR Producer* OR Grazier*)
Search 2	(reef OR nature OR environment OR habitat OR wildlife OR "land condition" OR "water quality")	AS ABOVE	AS ABOVE
Search 3	(adopt* OR "practice change*" OR "management practice*")	AS ABOVE	AS ABOVE
Search 4	("vegetation cover" OR erosion OR gully OR hillslope OR riparian OR "shelter belt" OR "pasture management" OR "ground cover" OR "vegetation management" OR "conservation covenant" OR "stock exclusion" OR "streambank management")	AS ABOVE	AS ABOVE
Search 5	((pesticide* NEAR (decrease* OR reduce* OR address*)) OR (herbicide* NEAR (decrease* OR reduce* OR address*)) OR (chemical* NEAR (decrease* OR reduce* OR address*)) OR (weed* NEAR (decrease* OR reduce* OR address*)) OR (pest* NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Seach 6	((fertiliser NEAR (decrease* OR reduce* OR address*)) OR (nitrogen NEAR (decrease* OR reduce* OR address*)) OR (phosph* NEAR (decrease* OR reduce* OR address*)) OR (nutrient NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 7	((soil NEAR (decrease* OR reduce* OR address*)) OR (sediment NEAR (decrease* OR reduce* OR address*)) OR (runoff NEAR (decrease* OR reduce* OR address*)) OR (run-off NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 8	(wetland* OR carbon OR credits)	AS ABOVE	AS ABOVE
Search 9	(irrigation)	AS ABOVE	AS ABOVE
Search 10	(protect* OR steward* OR preserv* OR conserv* OR revegetation OR regenerat* OR restor*)	("North Queensland" OR "Far North Queensland" OR "Central Queensland" OR "Mackay*" OR "Wide Bay" OR "Fraser Coast")	AS ABOVE
Search 11	(reef OR nature OR environment OR habitat OR wildlife OR "land condition" OR "water quality")	AS ABOVE	AS ABOVE
Search 12	(adopt* OR "practice change*" OR "management practice*")	AS ABOVE	AS ABOVE
Search 13	("vegetation cover" OR erosion OR gully OR hillslope OR riparian OR "shelter belt" OR "pasture management" OR "ground cover" OR "vegetation management" OR "conservation covenant" OR "stock exclusion" OR "streambank management")	AS ABOVE	AS ABOVE
Search 14	((pesticide* NEAR (decrease* OR reduce* OR address*)) OR (herbicide* NEAR (decrease* OR reduce* OR address*)) OR (chemical* NEAR (decrease* OR reduce* OR address*)) OR (weed*	AS ABOVE	AS ABOVE

	NEAR (decrease* OR reduce* OR address*)) OR (pest* NEAR (decrease* OR reduce* OR address*)))		
Search 15	((fertiliser NEAR (decrease* OR reduce* OR address*)) OR (nitrogen NEAR (decrease* OR reduce* OR address*)) OR (phosph* NEAR (decrease* OR reduce* OR address*)) OR (nutrient NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 16	((soil NEAR (decrease* OR reduce* OR address*)) OR (sediment NEAR (decrease* OR reduce* OR address*)) OR (runoff NEAR (decrease* OR reduce* OR address*)) OR (run-off NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 17	(wetland* OR carbon OR credits)	AS ABOVE	AS ABOVE
Search 18	(irrigation)	AS ABOVE	AS ABOVE
Search 19	(protect* OR steward* OR preserv* OR conserv* OR revegetation OR regenerat* OR restor*)	("Jacky Jacky" OR "Olive Pascoe" OR Lockhart OR Stewart OR Normanby OR Jeannie OR Endeavour OR Daintree OR Mossman OR Barron OR "Mulgrave-Russell" OR Johnstone OR Tully OR Murray OR Herbert)	AS ABOVE
Search 20	(reef OR nature OR environment OR habitat OR wildlife OR "land condition" OR "water quality")	AS ABOVE	AS ABOVE
Search 21	(adopt* OR "practice change*" OR "management practice*")	AS ABOVE	AS ABOVE
Search 22	("vegetation cover" OR erosion OR gully OR hillslope OR riparian OR "shelter belt")	AS ABOVE	AS ABOVE
Search 23	("pasture management" OR "ground cover" OR "vegetation management" OR "conservation covenant" OR "stock exclusion" OR "streambank management")	AS ABOVE	AS ABOVE
Search 24	((pesticide* NEAR (decrease* OR reduce* OR address*)) OR (herbicide* NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 25	((chemical* NEAR (decrease* OR reduce* OR address*)) OR (weed* NEAR (decrease* OR reduce* OR address*)) OR (pest* NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 26	((fertiliser NEAR (decrease* OR reduce* OR address*)) OR (nitrogen NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 27	((phosph* NEAR (decrease* OR reduce* OR address*)) OR (nutrient NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 28	((soil NEAR (decrease* OR reduce* OR address*)) OR (sediment NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 29	((runoff NEAR (decrease* OR reduce* OR address*)) OR (run-off NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 30	(wetland* OR carbon OR credits)	AS ABOVE	AS ABOVE
Search 31	(irrigation)	AS ABOVE	AS ABOVE

Search 32	(protect* OR steward* OR preserv* OR conserv* OR revegetation OR regenerat* OR restor*)	(Black OR Ross OR Haughton OR Don OR Proserpine OR "O'Connell" OR Pioneer OR Plane OR Styx OR Shoalwater OR Waterpark OR Calliope OR Boyne OR Baffle OR Kolan OR Burnett OR Burrum OR Mary)	AS ABOVE
Search 33	(reef OR nature OR environment OR habitat OR wildlife OR "land condition" OR "water quality")	AS ABOVE	AS ABOVE
Search 34	(adopt* OR "practice change*" OR "management practice*")	AS ABOVE	AS ABOVE
Search 35	("vegetation cover" OR erosion OR gully OR hillslope OR riparian OR "shelter belt")	AS ABOVE	AS ABOVE
Search 36	("pasture management" OR "ground cover" OR "vegetation management" OR "conservation covenant" OR "stock exclusion" OR "streambank management")	AS ABOVE	AS ABOVE
Search 37	((pesticide* NEAR (decrease* OR reduce* OR address*)) OR (herbicide* NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 38	((chemical* NEAR (decrease* OR reduce* OR address*)) OR (weed* NEAR (decrease* OR reduce* OR address*)) OR (pest* NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 39	((fertiliser NEAR (decrease* OR reduce* OR address*)) OR (nitrogen NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 40	((phosph* NEAR (decrease* OR reduce* OR address*)) OR (nutrient NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 41	((soil NEAR (decrease* OR reduce* OR address*)) OR (sediment NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 42	((runoff NEAR (decrease* OR reduce* OR address*)) OR (run-off NEAR (decrease* OR reduce* OR address*)))	AS ABOVE	AS ABOVE
Search 43	(wetland* OR carbon OR credits)	AS ABOVE	AS ABOVE
Search 44	(irrigation)	AS ABOVE	AS ABOVE

Appendix C. Norm identification and attribute coding guide

Norm identification in NVivo

Coding category	Description	Then
1. Exclusion	Is the content 1. spatially relevant to landholders in Reef regions? 2. About something a landholder can do on their land as a farming management practice? 3. Does it describe a norm? 4. Is the norm stewardship related?	If yes, move to step 2. If no, copy first few lines into excluded code.
2. Descriptive norms	Does the content describe a landholder / farmer or ag industry person engaging in a practice? NB (could also include an industry doing a practice, not just farmers) Past and present tense only (not future)	Code all relevant text into the category 'Descriptive norm' References to common practices: Phrases like "most farmers," "many growers," or "the typical approach" can indicate descriptive norms. For example, "Most farmers in the area now use precision fertilizer application."
3. Injunctive norms	Are any injunctive norms are conveyed in text? Use the following eight examples as a broad guide:	Modal verbs: Words like "should," "must," "ought," "shall," or "may" often indicate normative expectations or obligations. For example, "Farmers should maintain vegetation buffers along waterways."
		Prescriptive phrases: Phrases like "it is necessary that," "it is required that," "it is important to," or "there is a need for" can signal normative statements. For example, "It is important to minimize fertilizer runoff."
		Evaluative adjectives and adverbs: Words that express value judgments, like "good," "bad," "appropriate," "inappropriate," "right," "wrong," "properly," or "incorrectly" often accompany normative claims. For example, "Applying fertilizer correctly is essential."
		Figures of speech and metaphors: Vivid language like "a ticking time bomb" or "a disaster waiting to happen" can frame practices in a normatively loaded way. For example, "Excessive fertilizer use is poisoning our reefs."
		Mention of consequences: References to the positive or negative outcomes of practices can imply their normative status. For example, "Clearing gullies helps prevent erosion and protect the reef."

		Comparisons and analogies: Comparing a practice to other normatively charged actions can transfer that normative status. For example, "Using too much fertilizer is like dumping toxins right onto the reef."
		Imperative statements: Direct commands or instructions like "do this" or "avoid that" explicitly convey norms. For example, "Restore vegetation along all waterways."

Norm attribute categorisation (in spreadsheet exported from Nvivo)

Categorisation attribute	Description	Options
1. Artefact descriptions	What industry is it relevant to?	Bananas Grain Grazing Horticultural Sugarcane Non-specific/All
	What Reef region is it relevant to?	Burdekin Burnett Mary Cape York Fitzroy Mackay Whitsundays Wet Tropics Non-specific/All
	Who produced the 'artefact'	Government Industry Media NRM NGO Private Industry Research
	What type of 'artefact' is it?	Case Studies and Grower Stories eNewsletters and eBulletins

		Newpapers Magazine Websites Website News Landline TV Social Media Podcasts
2. Actor	Who is the actor doing the practice?	Individual farm/farmer Advisor Group of farms Farm – location specific Farms – industry specific All agriculture Non-specific/Other
3. Communicator	Who is communicating the norm?	Expert/Research Farmer/s Government Industry Media NGO NRM Private Industry
4. The type of practice	What is the practice that is the focus of the norm?	Note practice or action
5. Recognition	Are the norms conveying a sense of recognition in some way (e.g., award, guideline, certificate)	Award Funding scheme/program Certification/accreditation Following standards OR guidelines Regulations Other No recognition mentioned
6. Evaluative tone	Language of approval / disapproval – are they praising the norm practice or disapproving of it?	Positive Negative Neutral Can't tell/Don't know

7. Geographic focus – scale of outcome or benefit	At what scale is the outcome or benefit being described?	Farm – individual Group of farms Farms in a specific region Farms in a specific sector All farms Non-specific Environment or species Indigenous/First Nations people Multiple Not specified
8. Type of outcome or impact	What outcome or impact is being described?	Note outcome or impact
9. Key word search	Does it mention the words….	Reef Stewardship No relevant word

Appendix D. Generative AI search scripts

Generative AI was used in two stages through the use of an Application Programming Interface (API) connecting to Claude.ai via Python programming language. The Python-based automation system streamlines document analysis by systematically processing files using Claude.ai generative AI interface. This digital interface examines each document's contents and returns the answers to specific questions (italicised below). This process allows automatic analysis of very large datasets, significantly reducing time and resource requirements for large-scale document analysis.

Stage 1: Reviewing all text files to identify potential norms.

Stage one involved scanning each file in the dataset to identify and flag potential norm text for a human coder to review and verify. The script below instructs Claude.ai to read each separate .docx file, and then answer the questions in italics:

```
# Read the .docx file
try:
    doc = Document(file_path)
    full_text = "\n".join([paragraph.text for paragraph in doc.paragraphs])
    print(f"Successfully read file. Text length: {len(full_text)} characters")
except Exception as e:
    print(f"Error reading file: {e}")
    return

# Prepare the messages for descriptive and injunctive norms
descriptive_message = textwrap.dedent(f"""
Human: Please search the attached text to identify the presence of any explicit descriptive norms relevant
to agricultural landholders. The norms must meet the following criteria:
a) Explicit: Openly expressed or clearly stated, not implicit or unspoken.
b) Descriptive: Describing what people have actually done or are doing, not what they should do or could do.
c) Normative: Describing a behavior or action that has been implemented or is being practiced.

Important: If multiple instances of the same norm exist, report all occurrences. Do not infer or extrapolate
```

any information not explicitly stated in the text. Only include information that is directly quoted from the
document other than for the rationale.

Exclude any statements that describe what people should do, could do, or might do in the future - focus only
on behaviours that are explicitly described as having occurred or are currently occurring.

For each identified norm, please highlight the exact text conveying the norm by enclosing it in [NORM] tags.
Include in the highlighted text who the norm is about and the behavior described.

Here's the text to analyze:
{full_text}

Assistant: I will analyze the provided text for explicit descriptive norms relevant to agricultural landholders,
following the criteria you've specified. I'll enclose each identified norm in [NORM] tags.
""").strip()

injunctive_message = textwrap.dedent(f"""
Human: Please analyze the following text for explicit injunctive norms relevant to agricultural landholders. The norms must meet the following criteria:
a) Explicit: Openly expressed or clearly stated, not implicit or unspoken.
b) Injunctive: Describing what people should do, ought to do, or are expected to do, rather than what they actually do.
c) Normative: Prescribing a behavior, action, or practice that is considered appropriate or desirable.
For each identified injunctive norm, enclose the exact text in [INJ_NORM] tags.
Important: If multiple instances of the same norm exist, report all occurrences. Do not infer or extrapolate any information not explicitly stated in the text. Only include information that is directly quoted from the document other than for the rationale.
Here's the text to analyze:
{full_text}
Assistant: I will analyze the provided text for explicit injunctive norms relevant to agricultural landholders, following the criteria you've specified. I'll enclose each identified injunctive norm in [INJ_NORM] tags.
""").strip()

Stage 2: Reviewing each norm excerpt to identify norm features

Stage two took place after a human coder had selected each relevant norm text, guided by the Claude.ai suggestions identified through the Python API above. This second stage involved scanning each individual norm excerpt in the dataset to deliver an answer for each of the categorisations of interest. The script below instructs Claude.ai to read each separate norm text in a specific spreadsheet cell, answer each of the questions in italics, and deliver its answer for each question into a new cell in the same row on the spreadsheet:

```
# Function to process each norm text
def process_norm(norm_text):
  prompt = client.messages.create(
    model="claude-3-sonnet-20240229",
    max_tokens=1000,
    messages=[
      {
        "role": "user",
        "content": f"""Given the following text, please answer these questions:
1. Look in the first column labelled 'File' to see who is the entity with the file name. Then read the text in the coded text column. Now state who is communicating the norm, that is the entity or person or thing that is writing the text telling us the information which includes the norm
2. Who the actor in the norm is, that is, who the person or entity is that is doing the actual norm activity
3. What the 'management practice' is that the norm conveys, that is, the actual practice or activity being promoted or described in the norm
4. Whether the norm includes some form of recognition, which includes reference to a funding scheme or program or framework, certification/accreditation scheme, any standards/guidelines, regulations such as plans and strategies rituals, or other form of recognition
5. The scale of the practice, that is, who, or what is actually doing the norm management practice
6. The scale of the benefit or harm of the practice, that is, who or what will benefit or experience harm when the management practice is undertaken
7. The type of benefit or harm that the norm will produce, that is, the specific outcome that will occur when the norm management practice is undertaken or completed
8. Whether the norm is positive, negative or neutral
9.Explain why you categorized the norm as positive, negative, or neutral in the previous answer
10. Whether it mentions the word 'Reef' or 'reef'
11. Whether it mentions the word 'stewardship' or 'steward'

12. Quote the exact text that conveys the norm
13. Please write whether the norm being conveyed is injunctive or descriptive
```

14. Evaluate if the norm relates to farmers or farming, such as about red meat producers, or managing farm practices, or growing things for example. State yes or no as an answer, followed by your reason

For each of those, provide only the specific answer without repeating the question. Do not introduce your answer with text such as 'the norm states'...or 'the actor is ...' just copy over the exact text that answers the question. 'If there is no specific answer, or the answer can't be found, please just put the nubmer of the question followed by the text 'none mentioned'.

For questions 10 and 11 only respond with a yes or no.

Text: {norm_text}"""
        }
    ]
)

Return the content of the last message
return parse_response(prompt.content)

Appendix E. Forms of Recognition

Table 10 Recognition by Source type

	Govern't	Industry Assoc	Media	NGO	NRM	Private Business	Research	Grand Total
Campaigns and Strikes	0%	36%	64%	0%	0%	0%	0%	100%
Awards	6%	3%	81%	3%	3%	0%	3%	100%
Events	3%	29%	33%	0%	17%	3%	15%	100%
Report Cards/ Targets…	16%	19%	33%	0%	27%	2%	2%	100%
Certification/accreditation	9%	55%	20%	1%	4%	6%	4%	100%
Regulations…	13%	19%	57%	0%	3%	2%	5%	100%
Standards OR guidelines	12%	25%	17%	3%	17%	5%	22%	100%
Funding scheme/ program	14%	22%	30%	4%	17%	8%	6%	100%
None mentioned	10%	23%	28%	4%	15%	8%	12%	100%
Grand Total	**11%**	**24%**	**30%**	**3%**	**14%**	**7%**	**11%**	**100%**

Table 11 Recognition by Management Practice Category

	Advocacy	Broad categories	Chemical mngmt	Climate	Innovation & support	Land mngmt	Landscape resilience	Soil mngmt	Uncat. practices	Water mngmt	Biosecurity	Regulation …	Grand Total
Campaigns and Strikes	50%	7%	0%	0%	29%	0%	0%	0%	7%	0%	7%	0%	100%
Awards	19%	29%	3%	3%	29%	3%	3%	0%	3%	0%	6%	0%	100%
Events	14%	6%	4%	1%	53%	9%	1%	1%	1%	6%	3%	0%	100%
Report Cards/ Targets…	4%	20%	4%	16%	25%	15%	2%	5%	0%	2%	2%	2%	100%
Certification/accreditation	3%	43%	4%	2%	17%	13%	3%	8%	3%	1%	4%	0%	100%
Regulations…	19%	5%	6%	5%	11%	13%	3%	1%	2%	5%	18%	13%	100%
Standards OR guidelines	1%	11%	15%	3%	17%	23%	4%	7%	1%	4%	14%	0%	100%
Funding scheme/ program	2%	20%	11%	7%	25%	12%	4%	3%	2%	8%	5%	0%	100%
None mentioned	5%	8%	9%	3%	23%	21%	5%	7%	3%	6%	11%	0%	100%
Grand Total	**5%**	**13%**	**9%**	**4%**	**22%**	**18%**	**4%**	**5%**	**2%**	**6%**	**10%**	**1%**	**100%**

Appendix F. Outcomes

Table 12 Outcomes by Sectors

	Bananas	Cane	Grains	Grains/ Hort	Grazing	Hort	Non-specific	Grand Total
Fire risk			1%				1%	0%
Water Conservation		1%		2%	1%	2%	0%	1%
Decision-making	1%	1%			2%	3%	2%	2%
Non-Benefit Statement	5%	1%	3%		4%	3%	1%	2%
Vague Sustainability Mentions		2%		3%	2%	1%	3%	2%
Social or Community Outcomes	3%	2%	1%	3%	3%	2%	4%	3%
Climate Mitigation or Carbon outcomes	1%	1%	2%		6%		3%	3%
Ecological Outcomes		2%			6%	1%	6%	3%
Decision-making	1%	3%	8%	5%	3%	5%	3%	4%
Water Quality		5%			2%	4%	8%	5%
Great Barrier Reef	3%	5%			2%	5%	11%	6%
No outcome or impact	13%	5%	9%	13%	6%	4%	6%	6%
Land Condition or Soil Health		9%	3%	3%	6%	4%	6%	6%
Biosecurity	27%	5%	12%	5%	8%	9%	4%	7%
Production and productivity benefits	8%	7%	18%	13%	11%	8%	5%	9%
Economic outcomes	10%	11%	9%	11%	10%	11%	5%	9%
Multiple outcomes	27%	40%	35%	42%	26%	36%	31%	34%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 13 Outcomes by Artefact Type

Row Labels	eNews/Mag	Grower stories	Landline	Newspapers	Podcasts	Social media	Websites	Grand Total
Fire risk	1%		14%	1%	1%			
Water Conservation	1%	1%		1%				1%
Decision-making	2%	4%			2%	2%	2%	2%
Non-Benefit Statement	1%		7%	6%	3%			2%
Vague Sustainability Mentions	2%	5%		1%	1%	1%	3%	2%
Social or Community Outcomes	3%	1%		3%	1%	2%	2%	3%
Climate Mitigation or Carbon outcomes	3%		7%	4%		3%	2%	3%
Ecological Outcomes	3%	2%	7%	4%	1%	4%	3%	3%
Decision-making	7%	4%		2%	4%	4%	3%	4%
Water Quality	6%	6%		1%	4%	4%	8%	5%
Great Barrier Reef	6%	9%		2%		4%	12%	6%
No outcome or impact	4%	5%	21%	6%	9%	9%	5%	6%
Land Condition or Soil Health	9%	10%		1%	7%	7%	7%	6%
Biosecurity	8%		7%	10%	5%	9%	4%	7%
Production and productivity benefits	9%	8%	14%	9%	25%	11%	5%	9%
Economic outcomes	6%	6%		17%	9%	5%	5%	9%
Multiple outcomes	31%	38%	21%	33%	27%	35%	38%	34%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

Table 14 Outcomes by Management Practice Category

	Advocacy	Biosecurity	Broad categories	Chemical mngmt	Climate	Innovation and support	Land mngmt	Landscape resilience	Regulation compliance	Soil mngmt	Uncategorised practices	Water mngmt	Grand Total
Fire risk		1%					2%						
Water Conservation												6%	1%
Decision-making			1%	1%	1%	4%	1%		5%	1%	1%		2%
Non-Benefit Statement	12%	2%	1%	1%	3%	1%	1%	1%	14%		4%	1%	2%
Vague Sustainability Mentions	3%	1%	5%	2%	1%	2%	1%	1%	2%	2%	5%	2%	2%
Social or Community Outcomes	19%		2%		2%	4%		1%			5%		3%
Climate Mitigation or Carbon outcomes	2%		4%	1%	34%	2%	1%	3%		1%	1%		3%
Ecological Outcomes	2%	2%	3%		1%	1%	4%	30%	2%	1%	1%		3%
Decision-making	2%	2%	4%	3%	2%	7%	2%	1%	9%	3%	1%	4%	4%
Water Quality	1%	1%	8%	10%		3%	4%	6%	9%	7%	2%	3%	5%
Great Barrier Reef	1%		16%	8%	1%	3%	7%	6%	16%	1%	2%	2%	6%
No outcome or impact	8%	5%	3%	4%	2%	7%	9%	3%	16%	4%	10%	5%	6%
Land Condition or Soil Health	2%		3%	5%	2%	3%	13%	14%	2%	22%	4%	1%	6%
Biosecurity	0%	55%	1%	6%		3%	2%			1%	1%		7%
Production and productivity benefits	5%	10%	3%	15%	2%	11%	14%	3%		6%	5%	7%	9%
Economic outcomes	15%	4%	4%	7%	17%	14%	6%	3%	9%	3%	23%	12%	9%
Multiple outcomes	25%	16%	42%	36%	31%	34%	33%	30%	14%	43%	33%	54%	34%
Grand Total	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**