

# Human dimensions methods

## Individual factors influencing agricultural management practice adoption

Reef Water Quality Report Card 2023–2025

Reef 2050 Water Quality Improvement Plan



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### **Citation**

Australian and Queensland governments. 2026. Human dimensions methods — Individual factors influencing agricultural management practice adoption, Reef Water Quality Report Card 2023–2025, State of Queensland, Brisbane.

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# Human dimensions: Individual factors influencing agricultural management practice adoption

This report summarises the method to collect, assess and report the individual factors that influence agricultural management practice adoption against the 2025 Human Dimensions target in the Reef 2050 Water Quality Improvement Plan; Australian and Queensland governments 2018). The results of the 2022–2023, 2023–2024 and 2024–2025 social monitoring data are outlined, and recommendations are made for the presentation format for these data.

## Background

### Why monitor human dimensions?

The Reef 2050 Water Quality Improvement Plan recognises that a range of human dimensions (i.e., social, cultural, institutional, and economic factors) play a role in shaping outcomes associated with water quality and the Great Barrier Reef (Australian and Queensland governments 2018a pg. 20). Further, achievement of the water quality targets will only be achieved by supporting industries and communities to build a culture of innovation and environmental stewardship towards agricultural land management adoption (Australian and Queensland government 2018a, p. 7). Accordingly, the Reef 2050 Water Quality Improvement Plan set the human dimension target as follows:

- Active engagement of communities and land managers in programs to improve water quality outcomes is increased.

### How do we monitor human dimensions?

The effectiveness of the Reef 2050 Water Quality Improvement Plan, including the human dimension target, is monitored and reported through the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program (Paddock to Reef program). The Paddock to Reef social monitoring survey was introduced in 2019 to track producers' responses regarding agricultural management practice adoption and to identify any trends evident over time that can both give context to and help inform and improve progress towards the land management and water quality targets of the Reef 2050 Water Quality Improvement Plan.

Data collected from a suite of cane and grazing projects has been presented previously in both the Reef Water Quality Report Card 2020 and the Reef Water Quality Report Card 2021 and 2022. For the Reef Water Quality Report Card 2023–2025, reporting for the human dimension target draws from the complete 2019 to 2025 social monitoring survey dataset. This allows for representation of insights from cane, banana and grazing industry projects as well as regional and practice level insights that offer a more nuanced and complete picture of why producers are engaging in practice change and what their specific experiences are following practice adoption. The finer data scale enables development of appropriate policy and project level responses.

The data presented in the Reef Water Quality Report Card includes links to the most recent Social and Economic Long-Term Monitoring Program (SELTMP) survey (Hobman, et al., 2024) and Social Monitoring Benchmarking surveys (MCR, 2023 and 2025). This provides an expanded picture of the agricultural industry by including the perceptions of residents in the Great Barrier Reef catchment and producers who have not participated in funded projects.

### The individual factors that influence agricultural management practice adoption

As the lead agency for developing a human dimension baseline, the Queensland Department of the Environment, Tourism, Science and Innovation, funded a project to identify the human dimension indicators of agricultural innovation and stewardship behaviours (Hobman and Taylor, 2018). The project identified key

‘themes’ and social monitoring questions to include in the existing Paddock to Reef agricultural management practice adoption questionnaire for the cane, grazing, grains, horticulture and banana industries. These thematic variables (refer Table 1) demonstrated both strong conceptual validity and supporting empirical evidence.

Except for cultural norms and artefacts, the identified themes are classified as ‘individual factors’ that measure the human dimensions that directly influence land management practice adoption.

*Table 1. Identified themes that influence agricultural management practice adoption (Hobman and Taylor, 2018)*

| Theme                                | Description                                                                                                                                                                                                        |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Attitudes (towards the practice)     | How attractive, beneficial/advantageous (relative to the current practice), and/or risky the practice is.                                                                                                          |
| Perceived behavioural control        | How easy or difficult it is to perform the practice (self-efficacy/capability), and whether it is within one’s control (perceived control).                                                                        |
| Perceived barriers (control beliefs) | The extent to which one perceives that certain barriers are impeding performance of the practice.                                                                                                                  |
| Motivation                           | How motivated one is to perform the practice, and whether this is for intrinsic or extrinsic reasons.                                                                                                              |
| Behaviours (past and future)         | Whether the practice (or precursor practices) has been used in the past, and whether there is a stated intention to trial or use certain practices in the future, in a particular situation, at a particular time. |
| Group norms                          | Whether other land managers/ farmers in the community (with whom one has strong ties) approve of and perform the practice themselves.                                                                              |
| Trust                                | Level of trust in information sources and advice networks related to improved practices.                                                                                                                           |
| Cultural norms and artefacts         | Community- and industry-level norms that encourage/facilitate innovation and stewardship practices.                                                                                                                |

## Methods

### Practice change project social monitoring

The Paddock to Reef Integrated Monitoring, Modelling and Reporting Program: Program Design 2018–2022 (Australian and Queensland governments 2018b, p. 47–49) outlined a phased approach for the addition of questions that assess individual factors. The approach included development, testing and consultation in the 2022 Paddock to Reef program design review. The following section sets out the method for developing, testing and consulting on the social monitoring survey conducted within practice change projects and it remains consistent with the method as presented for the Reef Water Quality Report Card 2020 and the Reef Water Quality Report Card 2021 and 2022.

### *Question format and design*

The themes identified by Hobman and Taylor (2018) were tested in a pilot project, with extensive stakeholder consultation to guide the format and design of Paddock to Reef social monitoring questions. The questions are

intended to be asked of the same individual at two time points — prior to the practice change and after. In addition to the social monitoring questions, a project extension officer records:

- whether the survey is being completed before or after a practice change
- project ID — a unique identifier
- project description — ascribes the survey to a program/ delivery agent
- specific Great Barrier Reef catchment
- specific agricultural commodity
- management practice — nominated practice (Table 2) the landholder is considering changing (at the commencement of the project) or has changed (at the end of the project).

*Table 2. Agricultural management practice options for each industry*

| Industry     | Management practice                                                                                                                                                                                                                                                                                                                 |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cane         | <ul style="list-style-type: none"> <li>• changing my fertiliser management</li> <li>• changing my soil management</li> <li>• changing my pesticide management</li> <li>• changing my irrigation management</li> <li>• becoming Best Management Practice accredited</li> </ul>                                                       |
| Grazing      | <ul style="list-style-type: none"> <li>• changing my pasture management</li> <li>• changing the way I manage streambanks</li> <li>• changing the way I manage gullies</li> </ul>                                                                                                                                                    |
| Grains       | <ul style="list-style-type: none"> <li>• changing my soil management</li> <li>• changing my fertiliser management</li> <li>• changing my pesticide management</li> <li>• becoming Best Management Practice accredited</li> </ul>                                                                                                    |
| Horticulture | <ul style="list-style-type: none"> <li>• changing my soil management</li> <li>• changing my fertiliser management</li> <li>• changing my pesticide management</li> <li>• becoming BMP accredited</li> </ul>                                                                                                                         |
| Bananas      | <ul style="list-style-type: none"> <li>• changing my soil management</li> <li>• changing my fertiliser management</li> <li>• changing my pesticide management</li> <li>• changing my irrigation management</li> <li>• having 60% covered ground, living or dead,</li> <li>• becoming Best Management Practice accredited</li> </ul> |

The nominated management practice is the focus for the remaining social monitoring questions. The management practice options for each commodity are based on the water quality risk frameworks. It is important to note that there can be a large variation in the individual practices that may fall under each management practice option. Landholders are asked to respond as follows:

*Attitude.* On a five-point scale (1 = strongly agree to 5 = strongly disagree, 'don't know' or 'decline to answer') to the statement *"I think this farming practice is a positive thing to do on my farm"*.

*Self-efficacy.* On a five-point scale (1 = strongly agree to 5 = strongly disagree, 'don't know' or 'decline to answer') to the statement *"I feel that this farming practice is easy to do on my farm"*.

*Group norm.* On a five-point scale (1 = strongly agree to 5 = strongly disagree, 'don't know' or 'decline to answer') to the statement "Most farmers in my local area and industry have adopted this farming practice".

*Motivation.* Select up to three (3) "main reason/s for implementing this farming practice". The options are:

- I received government funding (e.g., a grant or incentive)
- It will increase profitability
- It will increase production
- To save time
- To save money
- To comply with regulations
- It will benefit local water quality
- It will benefit the environment
- For my family
- There are no reasons to change
- Other landholders in my area have adopted this practice
- I don't know/ I need more information to answer this question
- I'd prefer not to answer
- Other (free response)

*Barriers.* Select up to three (3) "main challenge/s in relation to implementing this farming practice". The options are:

- I am worried about a reduction in production
- I am worried about a reduction in profitability
- I do not have the time
- I need more information before I can make a change
- It costs too much
- I don't think it will make a positive water quality impact
- It is not the way I have managed my farm in the past
- Weather and seasonal issues
- I tried it before and I was not happy with the outcome
- Lack of family support
- I am constrained by the availability of contractors and/ or contractors equipment
- There are no challenges/difficulties
- I'd prefer not to answer
- I don't know/ I need more information to answer this question
- Other (free response)

*Attribution.* A free-response question, landholders are asked to list "all people, projects, grants or events that have helped with or contributed to you adopting this farming practice".

## *Data privacy and informed consent*

The program complies with the *Information Privacy Act 2009* and the privacy of the landholders completing the Paddock to Reef Management Practice Adoption questionnaire is protected. Social monitoring data is linked to de-identified management practice adoption data through a unique identifier (Project ID) created by the delivery agent. At no stage does the department have access to, or receive, the 'spatial layer' data or any other identifying information.

Answering the social monitoring questions is voluntary for landholders and participation is initiated through an informed consent process. The delivery agent advises landholders of the data use and data management which ensures landholder privacy. An example of the statement provided to delivery agents for use in this process is provided in Appendix 1.

## *Data management*

Social monitoring data from 2019 to 2025 was collected and recorded using Survey123 for ArcGIS<sup>1</sup>, an online platform for creating and collecting survey data. Data was downloaded from Survey123 and stored in secure server folders on password protected computers. Additionally, data was also submitted from the Great Barrier Reef Foundation (GBRF) under the Reef Trust Partnership (RTP) which was collected through their own platform. The department reviews the raw data, including:

- assessing and addressing data quality issues, including missing data and/or data handling errors
- assessing that assumptions for data analysis have been met, including minimum sample sizes.

The Independent Science Panel review the aggregated results for each program area prior to public release.

## **Applications of the data**

The primary purpose of the social monitoring data is to track responses regarding agricultural management practice adoption and identify any trends evident over time that can both give context to and help inform and improve progress towards the Reef 2050 Water Quality Improvement Plan targets in the Reef Water Quality Report Card. While reporting against the other targets in the Reef Water Quality Report Card identifies if, and how much, change has occurred, the social monitoring data can provide insights into why (or why not) landholders are making particular land management decisions and the differentiating factors.

The data also has several other important applications including:

- inform the design of future water quality investment programs by using the knowledge of the drivers and barriers of management practice adoption by landholders and providing an assessment to identify areas for improvement
- by tracking progress over time, the data will provide an indication of likely trajectory of practice change
- comparing and understanding the effectiveness of different interventions across region, commodity, and program scales
- providing feedback to delivery organisations on the drivers and barriers of change which can be used to adaptively manage the program design and delivery to meet the needs of involved landholders and achieve greater outcomes
- providing internal reports to the Queensland and Australian governments on the impacts of their respective investment.

## **Presenting data for the Reef Water Quality Report Card 2023–2025**

The planned reporting scale, assumptions and issues associated with the data were workshopped with the Human Dimensions Working Group and an expert was engaged to independently review the data and assist with reporting (Dr Tracy Schultz).

### **Reporting scale**

The Reef Water Quality Report Card 2023–2025 presents results from the full 2019–2025 survey data set. This allows the social monitoring data to be reported in the same way as previous report cards with commodity highlights represented. Data have been collected during this reporting period from sugarcane, banana, grazing

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<sup>1</sup> Hard copies of surveys are provided to delivery agents at their request to aid in the collection of data with landholders, all collected data was recorded and transferred to Survey123 for ArcGIS and sent electronically to the department for analysis and reporting purposes.

and horticulture projects. The minimum reporting threshold is 50 records each for the before and after timepoints, which is considered a reasonable level to ensure a greater level of confidence in the data and farmer cohort anonymity. Utilising the 2019–2025 data set permits the inclusion of banana and grazing data. If the 2023–2025 dataset was used, neither would have met the threshold. Aggregating industry data from this three-year period was initially considered, however, meaningful and useful insights are obscured.

Data have been excluded where it has not met the minimum reporting threshold at the industry and regional level. The following is included:

|                                                                                                                                                                                                                                                                                                                                                    | Mackay<br>Whitsunday | Burdekin | Fitzroy | Burnett<br>Mary | Wet<br>Tropics |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------|---------|-----------------|----------------|
| Cane all practices combined<br><i>Changing my:</i> <ul style="list-style-type: none"> <li><i>fertiliser management</i></li> <li><i>soil management</i></li> <li><i>pesticide management</i></li> <li><i>irrigation management</i></li> <li><i>Becoming BMP accredited</i></li> </ul>                                                               | X                    | X        |         | X               | X              |
| Cane <ul style="list-style-type: none"> <li><i>Changing my fertiliser management</i></li> </ul>                                                                                                                                                                                                                                                    | X                    | X        |         | X               | X              |
| Cane <ul style="list-style-type: none"> <li><i>Changing my pesticide management</i></li> </ul>                                                                                                                                                                                                                                                     | X                    | X        |         |                 |                |
| Grazing all practices combined:<br><i>Changing my:</i> <ul style="list-style-type: none"> <li><i>pasture management</i></li> </ul> <i>Changing the way I manage:</i> <ul style="list-style-type: none"> <li><i>streambanks</i></li> <li><i>gullies</i></li> </ul>                                                                                  |                      | X        | X       |                 |                |
| Grazing <ul style="list-style-type: none"> <li><i>Changing my pasture management</i></li> </ul>                                                                                                                                                                                                                                                    |                      | X        | X       |                 |                |
| Bananas all practices combined:<br><i>Changing my:</i> <ul style="list-style-type: none"> <li><i>fertiliser management</i></li> <li><i>soil management</i></li> <li><i>pesticide management</i></li> <li><i>irrigation management</i></li> <li><i>having 60% covered ground, living or dead</i></li> <li><i>becoming BMP accredited</i></li> </ul> |                      |          |         |                 | X              |

The key findings from the Human Dimensions program are presented in the Reef Water Quality Report Card 2023–2025 as widgets showcasing the following constructs from the 2019 to 2025 social monitoring survey dataset:

- motivations (before engagement in the project)
- attitudes and self-efficacy related to practice change and where applicable, specific practice types (nutrient and pesticide management) and
- barriers characterised as opportunities for strengthening success (after engagement in the project).

Group norm and attribution data have not been presented as part of previous report cards due to the high level of potential error, specifically non-response bias, present in these items. Non-response bias occurs when there is potential that those who have not answered a question could have provided responses different from those who have answered, making the results non-representative. The potential for non-response bias to be present with the group norms data is evidenced through higher missing responses (28%) than other questions, indicating the scale was not appropriate. For attribution data, the potential for non-response bias is evidenced through a higher non-response rate (47%) to this question than other questions. These issues have been addressed for future monitoring and reporting (see Table 3 below).

The 2019–2025 social monitoring data set is presented in a Power BI dashboard, allowing filtering of data by commodity and region (where minimum threshold is met) and by year and practice. Attribution data are not presented in the dashboard, however group norms data have been included. The inclusion of group norm data in the dashboard allows for the data to be used in conjunction with other available and aligned datasets including SELTMP and the Social Monitoring Benchmarking 2023 and 2025 surveys.

## **Future Reef Water Quality Report Card considerations**

From a data perspective, future Reef Water Quality Report Cards will seek to include aggregated paired data at the deidentified landholder level 'before' and 'after' engagement.

From a broader perspective the Human Dimensions monitoring and reporting program seeks to better respond to the needs of stakeholders and report card users by increasing the focus on highlighting community and landholder stewardship efforts to encourage continued engagement and further change. Reporting will be designed to promote positive descriptive norms and encourage producer/stakeholder centric reporting. This report card is a step in this direction.

The Human Dimensions Program will continue to make the behavioural insights data more accessible and useable to help inform on-ground practice change programs and the design of future projects and programs.

This approach responds and aligns to the findings and recommendations of the independent Paddock to Reef Human Dimensions Program review undertaken in 2024.

## **Reviewing the human dimensions action**

The Reef 2050 Water Quality Improvement Plan highlighted that the human dimension target was to be further refined as indicators or measures relevant to Reef water quality were identified and a baseline developed (Australian and Queensland governments 2018a, p. 20). The following action was set:

- develop a baseline for a variety of practice, behavioural and attitudinal drivers that influence Reef water quality. The baseline will be consistent with related Reef 2050 Water Quality Improvement Plan Targets (Action 7.3, p. 50–51).

In addition, the Paddock to Reef Integrated Monitoring, Modelling and Reporting Program: Program Design 2018-2022 indicated that the phased approach to the addition of social factors to the Paddock to Reef Management Practice Adoption questionnaire would be fully operational by March 2019 and that a baseline would be developed using existing monitoring and evaluation datasets (p. 48–49).

Due to the small number of datasets available across industries and poor alignment between the available datasets and the identified social factor themes, a baseline was unable to be established (Jarvis, Taylor and Hobman, 2018) prior to survey implementation in 2019.

The human dimensions target was reviewed as part of the Reef 2050 Water Quality Improvement Plan review and in addition, as of March 2023, a new and expanded social monitoring survey was introduced following extensive consultation, review and refinement. As such, while trends can be observed from the six years of social monitoring survey data, it is expected that future reporting against the human dimensions indicators in the Reef Water Quality Report Card will be derived from a more complete data set, and consideration will then be given to creating a baseline.

## Data limitations

Agricultural practice change project social monitoring to support the 2025 Human Dimensions target in the Reef 2050 Water Quality Improvement Plan has been in place since mid-2019 and is continuously developing and both data collection and reporting is improving. Table 3 below outlines current limitations and how they are being minimised for presentation in the current report card and future report cards.

*Table 3. Limitations of data collection approach*

| Limitations of this approach:                                                                                                                                                                                  | How will this be addressed:                                                                                                                                                                                                                                                                                                                                                                                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The practice change project social monitoring relies on delivery organisations appropriately collecting social monitoring data.                                                                                | <ul style="list-style-type: none"> <li>• Training.</li> <li>• Established quality assurance and quality control processes (see section below).</li> <li>• Expert review with Human Dimensions Working Group and delivery agents.</li> </ul>                                                                                                                                                                                                       |
| Potential for response bias within the practice change project social monitoring data due to existing relationships between the landholders and those delivery agents administering the questionnaire.         | <ul style="list-style-type: none"> <li>• Training on the role of response bias and strategies to minimise.</li> <li>• Landholder consent processes to establish the purpose of the study and reassurances regarding data confidentiality.</li> </ul>                                                                                                                                                                                              |
| Data is collected from landholders in Queensland or Australian Government funded programs: some regions and commodities will not have any social monitoring data reported against the Human Dimensions target. | <ul style="list-style-type: none"> <li>• Data will not be included where limited data (below 50 records) exists for a commodity.</li> <li>• Data collection under contracted arrangements should see thresholds met for all commodities and regions for future report cards.</li> </ul>                                                                                                                                                           |
| Minimum standards for data quality and assumptions for analysis, including minimum sample sizes, may not be met.                                                                                               | <ul style="list-style-type: none"> <li>• Data will not be published if data quality standards and assumptions for analysis are not met.</li> </ul>                                                                                                                                                                                                                                                                                                |
| Data collection mechanism issues including difficulty in data pairing at the landholder level.                                                                                                                 | <ul style="list-style-type: none"> <li>• From 2023, the P2R Perceptions of Practices survey has been collected and accessed through the P2R Projector which allows for improved data pairing at the landholder level.</li> </ul>                                                                                                                                                                                                                  |
| Survey questions limitations.                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• The survey questions and scales have been reviewed and updated. From 2023, the P2R Perceptions of Practices survey has been in use and future report cards will reflect the updated survey. Specifically, some of the questions and scales have changed (including group norms) and the attribution question has been removed.</li> <li>• Demographic data is included in the updated survey.</li> </ul> |
| Database limitations involving download and transfer processes posing risks to integrity.                                                                                                                      | <ul style="list-style-type: none"> <li>• From 2023, the survey has been accessible through P2R Projector which allows for improved data integrity.</li> </ul>                                                                                                                                                                                                                                                                                     |

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# Appendix 1

## *Privacy statement*

*(Example organisation), on behalf of the Department of the Environment, Science and Innovation, is collecting the information in this survey assessing land management practices to evaluate and report how effective the actions taken through the (Example project) have been in improving water quality in the rivers and creeks that flow to the Reef, as part of the Reef 2050 Water Quality Improvement Plan 2017–2022.*

*Some of the information is provided to the Office of the Great Barrier Reef and World Heritage, the Department of Agriculture and Fisheries and/or the Department of Resources to support annual reporting of progress towards land management and water quality targets. Your personal information, including address, geographical location or any information that can make your identity apparent, will not be disclosed to any other parties unless clearly and expressly authorised or required by law. Individual property data is not published or made public in any way. If you would like further privacy information visit [www.des.qld.gov.au/legal/privacy](http://www.des.qld.gov.au/legal/privacy) or email [privacy@des.qld.gov.au](mailto:privacy@des.qld.gov.au).*