Australian Government

Queensland Government

Human dimensions methods

Individual factors influencing agricultural management practice adoption

Reef Water Quality Report Card 2021 and 2022

Reef 2050 Water Quality Improvement Plan

Disclaimer

This document has been prepared with all due diligence and care, based on the best available information at the time of publication. The government holds no responsibility for any errors or omissions within this document. Any decisions made by other parties based on this document are solely the responsibility of those parties. Information contained in this document is from a number of sources and, as such, does not necessarily represent government or departmental policy.

If you need to access this document in a language other than English, please call the Translating and Interpreting Service (TIS National) on 131 450 and ask them to telephone Library Services on +61 7 3170 5470.

This publication can be made available in an alternative format (e.g. large print or audiotape) on request for people with vision impairment; phone +61 7 3170 5470 or email.

Citation

Australian and Queensland governments, 2024, Human dimensions methods - Individual factors influencing agricultural management practice adoption. Reef Water Quality Report Card 2021 and 2022, State of Queensland, Brisbane.

CONTENTS

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 (Reef 2050 WQIP; Australian and Queensland governments 2018). The results of the 2020-2021 and 2021-2022 social monitoring data are outlined, and recommendations are made for the presentation format for these data.

Out of scope of this statement is the supporting communication regarding the release of this data which will be handled as part of the Reef Water Quality Report Card 2021 and 2022 communication strategy.

Background

Why monitor human dimensions?

The Reef 2050 WQIP 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). The Scientific Consensus Statement 2017 also recognised that 'further consideration of economic and social dimensions is needed in the development and implementation of programs to improve water quality' (Waterhouse et al., 2017, p. 8). Further, achievement of the land management targets to improve the quality of water flowing to the Great Barrier Reef will only be delivered 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 WQIP 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 WQIP, 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, and the first year of data, collected from a suite of cane and grazing projects, is presented in the Reef Water Quality Report Card 2020.

The social monitoring data tracks responses regarding agricultural management practice adoption and identifies 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 WQIP targets. Two subsequent years of data have been collected and results for cane and grazing projects will be presented in the Reef Water Quality Report Card 2021 and 2022. Additionally, there will be data presented from the social and economic long-term monitoring project (Hobman, et al., 2022) and regional report cards (Curnock, et al., 2022) expanding the picture of the agricultural industry and for the first time including the perceptions of residents of the Great Barrier Reef catchment.

The individual factors that influence agricultural management practice adoption

As the lead agency for developing a human dimension baseline, the Office of the Great Barrier Reef and World Heritage (OGBRWH), Department of Environment, 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

4

cane, grazing, grains, horticulture and banana industries. These thematic variables (refer Table 1) demonstrated both strong conceptual validity and supporting empirical evidence.

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.

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.

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 the social monitoring 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 and it remains consistent with the method as presented for the 2020 report card.

Questions 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 commodity

Commodity	Management practice
Cane	• changing my fertiliser management • changing my soil management • changing my pesticide management • changing my irrigation management • becoming BMP accredited
Grazing	• changing my pasture management • changing the way I manage streambanks • changing the way I manage gullies
Grains	• changing my soil management • changing my fertiliser management • changing my pesticide management • becoming BMP accredited
Horticulture	• changing my soil management • changing my fertiliser management • changing my pesticide management • becoming BMP accredited
Bananas	• changing my soil management • changing my fertiliser management • changing my pesticide management • changing my irrigation management • having 60% covered ground, living or dead, • becoming BMP accredited

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 OGBRWH 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 the end of 2022 was collected and recorded using Survey123 for ArcGIS[1], an online platform for creating and collecting survey data. Data was downloaded from Survey123 and stored in secure server folders on password protected computers. The OGBRWH reviews the raw data, including:

---

[1] Hard copies of surveys are provided to delivery agents at their request to aid in the collection of data with landholders, all collected data is to be recorded and transferred to Survey123 for ArcGIS and sent electronically to the OGBRWH for analysis and reporting purposes.

- 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.

Program specific raw data is provided to delivery agents to cross-check quality. The ISP review the aggregated results for each program area prior to public release.

Social and economic long-term monitoring program and regional report cards

The Social and Economic Long-Term Monitoring Program (SELTMP) collects primary data on a subset of Great Barrier Reef (GBR) human dimension indicators relating to social, economic, cultural, and governance aspects of the GBR (Hobman, et al., 2022), as described within the Reef 2050 Long Term Sustainability Plan (Reef 2050 Plan, Australian & Queensland governments, 2021).

The construct that was selected to support Human Dimensions reporting from the SELTMP survey was 'Importance of GBR interventions' which presented a range of options and a ten-point scale from 1= not important at all to 10 = extremely important, with the option of 'I don't know/I am unsure'. The options included 'Improved land management to improve GBR water quality (i.e., efforts to reduce sediments, nutrients and pollution flowing into the sea)'.

The 2021 survey included for the first time, a subset of demographic questions that enabled identification of GBR residents who selected (from a list of options) their main work as being in the agricultural sector. Those who selected this option were then directed to two further questions; the first to select the agricultural commodity/ies farmed, and the second to identify which, if any, support programs they have participated in, or if they have improved practices without being in a program or have done nothing to reduce run-off from their farm.

The supporting SELTMP module for the Regional Report Cards of the Great Barrier Reef which focuses on human dimension indicators of waterway health (Curnock, et al., 2022), includes a construct 'Relative importance of recreation and industry uses of regional waterways' gauging the extent to which respondents valued direct uses of waterways in their region, including uses by different industry sectors, were elicited using a series of items and the same 10-point rating scale (1 = 'I don't value this at all', 10 = 'I value this extremely highly'). Options included supporting agriculture ('the waterways support local agriculture').

These data sets and methods are publicly available via the Commonwealth Scientific and Industrial Research Organisation (CSIRO) Data Access Portal.

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 WQIP 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 opportunities to align the data with the regional report cards with regards to how the stewardship behaviours are reported and monitored across industries

- Informing and creating a data flow to the Reef Integrated Monitoring and Reporting Program human dimensions reporting process

- Providing internal reports to the Queensland and Australian governments on the social impacts of their respective investment.

Presenting the Reef Water Quality Report Card 2021/2022

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

Reporting scale

The Reef Water Quality Report Card for 2021 and 2022 will present the results of the 2020/21 and 2021/22 survey data set. The pathway for reporting social monitoring data in the Reef water quality report card will remain the same as for the 2020 report card. The current content management system (CMS) capability does not sufficiently allow for the intricacies of social monitoring reporting including interactivity, so a visually simple approach will once again be employed.

Data have been collected from projects with grazing, cane, banana and horticulture industries. The minimum reporting threshold is set at 50 records per region and commodity, which was considered a reasonable level to ensure a greater level of confidence in the data and farmer cohort anonymity. Banana and horticulture industry data did not meet the threshold, so it remains the case that only the grazing and cane industries have sufficient data for inclusion. Mackay Whitsundays region did not meet the threshold, and there is considerable variation in data from other regions so a regional breakdown will not be presented.

Depending on data availability and granularity, emerging trends and the content management system (CMS) capability, future report cards will be able to include banana and horticulture industry data and representation of all regions.

Most cane data relate to the landholders' perceptions of the selected practice change 'changing my fertiliser management' and for grazing it is for 'changing my pasture management'. Therefore, presenting specific fertiliser and pasture management data in the infographic enables a less generic representation of the data for each commodity.

The key social findings from the Human Dimensions program will be presented in the Reef Water Quality Report Card 2021 and 2022 as an infographic showcasing the following highlights from:

- cane fertiliser management and grazing pasture management practice change project social monitoring:

  - motivations (before engagement in the project), barriers, attitudes and self-efficacy (after engagement in the project) related to specific practice types, and

- Social and Economic Long Term Monitoring Project (SELTMP) core module:

- importance of Great Barrier Reef interventions as ranked by all respondents

- agricultural respondents' efforts to improve land management to reduce farm run-off.

- SELTMP Regional Report Cards of the Great Barrier Reef supporting module:

    - importance of recreation and industry uses of regional waterways as ranked by all respondents.

Further data (graphs) supporting the infographic will be linked from the infographic and will show:

- representation of results by industry

- SELTMP and Regional Report Cards dashboard.

Group norm and attribution data are not presented as part of the report card 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 "don't know" responses (26%) 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 (33%) to this question than other questions. These issues have been addressed for both items for future monitoring and reporting (see Table 3 below).

Future Reef water quality report card considerations

Future Reef water quality report cards will seek to include:

- Aggregated paired data at the deidentified landholder level 'before' and 'after' engagement

- A five-year trend of cumulative data reporting, aligning with the Paddock to Reef program design which also allows for program design reviews at those points in time

- Data at a commodity level and by Reef region

- Infographics to communicate social monitoring data at the higher level

- Updated grading scales

- Further testing with stakeholders and users of report cards.

Reviewing the human dimensions action

The Reef 2050 WQIP 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 from the Reef 2050 WQIP:

- 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 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).

However, due to the small number of datasets available across commodities 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 is currently being reviewed as part of the Reef 2050 WQIP review and in addition, as of March 2023, a new and expanded social monitoring survey has been introduced following extensive consultation, review and refinement. Further, the OGBRWH has recently completed a social monitoring benchmark survey project (at June 2023) which provides data from agricultural landholders who are not engaged in projects. As such, while trends can be observed from the three years of survey data now available for cane and grazing, it is expected that future reporting against the human dimensions target in the report card will be derived from a more complete data set, and that 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 WQIP 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:
Relies on delivery organisations appropriately collecting social monitoring data	- Training. - Cross validation with qualitative survey data. - Established quality assurance and quality control processes (see section below). - Expert review with Human Dimensions Working Group and delivery agents.
Potential for response bias due to existing relationships between the landholders and those delivery agents administering the questionnaire	- Training on the role of response bias and strategies to minimise. - Landholder consent processes to establish the purpose of the study and reassurances regarding data confidentially.
Data of *participating* landholders is captured with no mechanism to report non-participating landholders. This limits the generalisability of the results; however, the current reporting still yields valuable behavioural insights.	- Acknowledgement and appropriate use of the data. - Collecting similar data from other lines of evidence (e.g., a benchmarking project on broader industry perceptions of practices). - Seek other opportunities to collect and collate data from a range of stakeholders in the practice change value chain (i.e., SELTMP, regional report cards, etc.).

Limitations of this approach:	How will this be addressed:
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.	• Data will not be included where no or limited data (below 50 records) exists for a commodity. • Data collection under contracted arrangements should see thresholds met for all commodities and regions for future report cards
Minimum standards for data quality and assumptions for analysis, including minimum sample sizes, may not be met.	• Data will not be published if data quality standards and assumptions for analysis are not met.
Data collection mechanism issues including difficulty in data pairing at the landholder level.	• From 2023, the survey will be collected and accessed through the P2R Projector which will allow for improved data pairing at the landholder level.
Survey questions limitations.	• The survey questions and scales have been reviewed and updated 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. • Demographic data is included in the updated survey.
Database limitations involving download and transfer processes posing risks to integrity.	• From 2023, the survey will be accessible through P2R Projector which will allow for improved data integrity.

References

Australian and Queensland governments (2018) Reef 2050 Water Quality Improvement Plan 2017-2022. Published by the Reef Water Quality Protection Plan Secretariat. Accessed at: https://www.reefplan.qld.gov.au/water-quality-and-the-reef/the-plan

Australian and Queensland governments (2021) Reef 2050 Long-Term Sustainability Plan 2021-2025. Published by the Commonwealth of Australia. Accessed at: https://www.dcceew.gov.au/parks-heritage/great-barrier-reef/publications/reef-2050-long-term-sustainability-plan-2021-25

Curnock, M.I., Pert, P.L., Maharjan, D., Gordon, B. and Kaniewska, P, (2022). Design and implementation of social surveys for Regional Report Cards in the Great Barrier Reef catchment. CSIRO Land and Water, Townsville. ISBN: 978-1-4863-1748-6. Accessed at: https://research.csiro.au/seltmp/publications/

Hobman, E. V., Mankad, A., Pert, P. L., van Putten, I., Fleming-Muñoz, D. & Curnock, M. (2022). Monitoring social and economic indicators among residents of the Great Barrier Reef region in 2021: A report from the Social and Economic Long-term Monitoring Program (SELTMP) for the Great Barrier Reef. CSIRO Land and Water, Australia. ISBN 978-1-4863-1719-6. Accessed at: https://research.csiro.au/seltmp/publications/

Hobman, E., & Taylor, B. (2018). Understanding the human dimensions of landholder innovation and stewardship: Identifying indicators of a culture of innovation and stewardship, and land management practice change. CSIRO, Australia. Accessed at: https://www.qld.gov.au/__data/assets/pdf_file/0027/92961/rp190-social-indicators-report-csiro.pdf

Jarvis, D., Taylor, B., & Hobman, E. (2018). Towards a human dimension baseline: A synthesis of social research data on farming practice adoption and environmental stewardship in reef catchments. Accessed at: https://www.qld.gov.au/__data/assets/pdf_file/0026/92960/rp190-baseline-report-csiro.pdf

Waterhouse, J., Schaffelke, B., Bartley, R., Eberhard, R., Brodie, J., Star, M., et al. (2017) 2017 Scientific Consensus Statement: land use impacts on the Great Barrier Reef water quality and ecosystem condition. State of Queensland, Australia. Accessed at: https://www.reefplan.qld.gov.au/__data/assets/pdf_file/0029/45992/2017-scientific-consensus-statement-summary.pdf

Appendix 1

Privacy statement

(Example organisation), on behalf of the Department of 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, 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 or email privacy@des.qld.gov.au.