Tropical Water Quality Hub

National Environmental Science Programme

Synthesis Report

Photo: Aaron Davis

Principles for establishing greater trust between scientists and farmers:

A Synthesis of NESP Tropical Water Quality Hub research

The Tropical Water Quality Hub is funded by the Australian Government's National Environmental Science Program

Principles for establishing greater trust between scientists and farmers: A synthesis of NESP Tropical Water Quality Hub research

Compiled by Dr John James

Enablers of Change

Supported by the Australian Government's
National Environmental Science Program
Project 6.6 Influencing agriculture practice behaviour change and trust frameworks

National Library of Australia Cataloguing-in-Publication entry:
978-1-922640-00-0

This report should be cited as:
Reef and Rainforest Research Centre (2021) James, J. (2021) Principles for establishing greater trust between scientists and farmers: A synthesis of NESP Tropical Water Quality Hub research. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (63 pp.).

Published by the Reef and Rainforest Research Centre on behalf of the Australian Government's National Environmental Science Program (NESP) Tropical Water Quality (TWQ) Hub.

The Tropical Water Quality Hub is part of the Australian Government's National Environmental Science Program and is administered by the Reef and Rainforest Research Centre Limited (RRRC). The NESP TWQ Hub addresses water quality and coastal management in the World Heritage listed Great Barrier Reef, its catchments and other tropical waters, through the generation and transfer of world-class research and shared knowledge.

Cover photographs: (front) Behana water sampling. Image: CANEGROWERS. (back) Rows of sugarcane growing in Giru mill area. Image: Lynne Eagle.

This report is available for download from the NESP Tropical Water Quality Hub website:
http://www.nesptropical.edu.au

www.synthesis.nesptropical.edu.au

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ACRONYMS

AIS ..... Agricultural Innovation System
BMP..... Best Management Practices
DES..... Department of Environment and Science
FNQ ..... Far North Queensland
GBR..... Great Barrier Reef
GBRMPA ..... Great Barrier Reef Marine Park Authority
LDC..... Landholders Driving Change
MERI ..... Monitoring, Evaluation, Reporting and Improvement
NESP ..... National Environmental Science Program
NGO..... Non-Government Organisation
NRM..... Natural Resource Management
RRRC..... Reef and Rainforest Research Centre Limited
TWQ..... Tropical Water Quality

ACKNOWLEDGEMENTS

This project was supported through funding from the Australian Government's National Environmental Science Program (NESP) Tropical Water Quality (TWQ) Hub. It would not have been possible without the foresight of the oversight committee organised by the Reef and Rainforest Research Centre (RRRC) to identify trust frameworks as a critical issue and lobby for change. The kind support of those contributing data through the survey and other means is gratefully acknowledged. The feedback from the reviewers was particularly constructive and greatly appreciated.

EXECUTIVE SUMMARY

There is a perception of a lack of trust between farmers and scientists working in the water quality arena of the Great Barrier Reef (GBR). This apparent lack of trust has been increasing in recent years, and the introduction of the Reef Protection Regulations in 2019 has exacerbated the situation. The recent Senate Inquiry referenced this lack of trust numerous times. The consequence of this lack of trust is that farmers are less likely to modify their farming practices if they don't trust the scientists, their information, or their practice change recommendations. Thus, to improve the quality of the water entering the GBR, the level of trust between farmers and scientists needs to improve.

A mixed methods research design enabled the collection of qualitative and quantitative data, while a purposive sampling technique was used to initially identify suitable literature and respondents for a survey. Snowball sampling was then used where the initial respondents of the survey were asked to nominate other suitable respondents and relevant literature. An online survey using SurveyMonkey was used to collect both qualitative and quantitative data and asked seven predominantly open-ended qualitative questions. The literature review began by examining already published NESP TWQ reports. Additional sources suggested in the results of the survey were then gathered. Other reports, books, and journal articles that were referred to in the previous items were then sourced. Finally, Google Scholar was searched for relevant items relating to trust in agriculture. The resulting literature gathered was then analysed and categorised, revealing key themes.

The following key themes were identified: trust, distrust, rebuilding trust, social capital, engagement, participative research, project management, communication, relationship, credibility, and transparency.

The results and recommended approaches were then woven into the following five sequential steps that project leaders can follow when designing and leading a behaviour change project: team selection, project design, project planning, project implementation, and monitoring and evaluation.

Whilst trust is intangible and often elusive, it is the glue that holds the people involved with effective projects together. Strong levels of trust improve communication and increase levels of cooperation. By increasing trust, you increase the speed of transactions and reduce their cost. Without it, behaviour change in reef water quality projects will be nigh-on-impossible to achieve. It is well worth taking the time and effort to incorporate the necessary processes for building trust into new projects.

1.0 INTRODUCTION

'Trust each other again and again. When the trust level gets high enough, people transcend apparent limits, discovering new and awesome abilities of which they were previously unaware.'
David Armistead

1.1 NESP Tropical Water Quality Hub

The Australian Government, through the National Environmental Science Program (NESP), has been funding research in environmental and climate science since 2015, with a budget of $145 million over six years. Specifically, the NESP targeted research in marine, coastal and freshwater ecosystems, sustainable communities and waste, threatened species, climate systems and other key environmental issues. All NESP-funded projects focused on practical and applied research to deliver accessible results and improve decision-making processes.

The program, which builds on its predecessors (the National Environment Research Program – NERP – and the Australian Climate Change Science Program) aimed at facilitating delivery of the best available information in order to support better understanding, management and conservation of Australia's environment (Department of Agriculture Water and the Environment 2020). The Tropical Water Quality (TWQ) Hub was one of six multi-disciplinary research hubs within NESP, investing AU$31.98 million on delivering innovative research to maintain and improve tropical water quality from catchment to reef (NESP 2020), mainly in the GBR and adjacent tropical waters. It was structured into three main themes:

- Theme 1: Improved understanding of the impacts, including cumulative impacts, and pressures on priority freshwater, coastal and marine ecosystems and species;
- Theme 2: Maximise the resilience of vulnerable species to the impacts of climate change and climate variability by reducing other pressures, including poor water quality; and
- Theme 3: Natural resource management improvements based on sound understanding of the status and long-term trends of priority species and systems.

Research projects within the TWQ Hub covered a wide spectrum of fields, from genes to ecosystems, including a better understanding of controversial species such as the invasive crown-of-thorns starfish (COTS), iconic organisms such as dugongs and marine turtles, seagrass, coral reef resilience, water quality (including impacts of sediments and nutrients in the marine environment, their sources and management responses), and wetland restoration science that maximises values and services. The TWQ Hub also had an overall strong focus on cumulative impacts and climate resilience, while building Indigenous connections and capacity in management of Queensland land and sea country.

The NESP TWQ Hub was delivered through a collaborative, multi-disciplinary research network composed of six leading Australian universities and research institutions. The institutions were the Australian Institute of Marine Science (AIMS), James Cook University (JCU), Commonwealth Scientific and Industrial Research Organisation (CSIRO), Central Queensland University (CQU), University of Queensland (UQ) and Griffith University (GU), with coordination of the network by the Reef and Rainforest Research Centre (RRRC). These

partner institutions have collaborated for over 20 years and have established an extensive network of research end-users, including government, industry, NGO's, Indigenous and other community groups. The partners contributed to the success of the Hub through co-funded research programs (e.g. in-kind contributions to specific projects through staff expertise or research facilities and resources), while also fostering partnerships across the other Hubs and with a wide range of relevant stakeholders. Researchers in the NESP TWQ Hub have worked collaboratively with a number of research organisations, industry bodies, stakeholder groups and landholders. Examples relevant to this report include CANEGROWERS, Sugar Research Australia, Burdekin Productivity Services, Farmacist, Queensland Department of Environment and Science and Queensland Department of Agriculture and Fisheries and many individual sugarcane farmers. This collaboration has been an extremely valuable feature of the research.

This report is one in a series of technical reports designed to synthesise the findings of NESP TWQ Hub research on topical issues most relevant to policy and stakeholder groups. These include: Improving coral reef condition through better informed resilience-based management (Pineda and Johnson 2021), Innovations in crown of thorns starfish control on the GBR (Erdmann *et al*. 2021), Reducing end of catchment fine sediment loads and ecosystem impacts (Pineda and Waterhouse 2021), Overcoming barriers to reducing nitrogen losses to the GBR (Waterhouse and Pineda 2021), Restoring ecosystems from catchment to reef (Waterhouse *et al*. 2021), Determinants and principles of establishing greater trust between scientists and farmers to further improve behaviour change (James 2021), Learnings from applied environmental research programs (Long 2021) and Integrated environmental assessment to inform environmental decisions. The reports are supported by individual project research publications, in addition to several targeted case studies and fact sheets accessible through a dedicated website (linked through the NESP TWQ Hub website[1]).

1.2 Context

An inception workshop for this synthesis project was conducted on 3 March 2020 in Townsville. The participants were scientists and other stakeholders from AgForce, CSIRO, JCU, Terrain NRM, and the Office of the Great Barrier Reef (Queensland Government). They discussed the desired project outcomes and indicated they sought a synthesis of existing relevant information. The purpose was to assist future land and water quality managers and policymakers to improve the design of water quality improvement programs and enable desired behaviour change, for improved water quality outcomes for the GBR. The participants agreed it should be a guide to best practice in (re)building trust. Consequently, this report takes a pragmatic approach to trust and ways of building and rebuilding it.

There is a perception of a lack of trust between farmers and scientists working in the water quality arena of the GBR (Dale, 2018; Dale *et al*., 2016; Emtage, 2009; Emtage & Herbohn, 2012b; Hay & Eagle, 2018, 2019; MacKeracher *et al.*, 2018). This apparent lack of trust has been increasing in recent years, and the introduction of the Reef Protection Regulations on 1 December 2019 has exacerbated the situation, as noted by several respondents to the recent Senate Inquiry into regulation of farming practices in the GBR catchments (Commonwealth of Australia, 2020).

[1] https://nesptropical.edu.au/

These regulations are being rolled out over three years in different regions based on the improved water quality management priorities. As a result of COVID-19, the commencement of the new or expanded cropping and horticulture activities requirement has been deferred until 1 June 2021, and consultation has been suspended. However, the existing minimum practice agricultural standards for grazing in the Burdekin region and banana production in the Wet Tropics region came into effect on 1 December 2020. Compliance officers from the Department of Environment and Science (DES) are responsible for enforcing the new regulations.

The Senate Inquiry, *Identification of leading practices in ensuring evidence-based regulation of farm practices that impact water quality outcomes in the Great Barrier Reef*, was initiated in September 2019 and received a large number of submissions. The 157-page report was released in October 2020 and referenced the lack of trust numerous times (Commonwealth of Australia, 2020).

The implied consequence of this lack of trust is that farmers are less likely to modify their farming practices if they do not trust the water quality scientists, their information, or their practice change recommendations. Thus, to improve the quality of the water entering the GBR, the level of trust between farmers and scientists needs to improve.

1.3 Background

1.3.1 Stakeholders

While the lack of trust has been portrayed as being between farmers and scientists, there are many more stakeholders involved in the system. In fact, according to many of the submissions to the Senate Inquiry (Commonwealth of Australia, 2020), much of the distrust has been exacerbated by the circulation of conflicting information by some industry bodies which helped to discredit the underpinning science. Some submissions also blamed the way the Reef protection regulations were created and communicated for contributing to the distrust. However, the inquiry also received a number of positive submissions regarding the way that many scientists, extension officers, and advisors have worked collaboratively with farmers over the years.

While it might be convenient to use collective nouns such as farmers and scientists, it is important to note that both these groups are very heterogenous and the members have varied priorities, understandings, and values (Vanclay, 2004; Vanclay, Mesiti, & Howden, 1998). This diversity is based on the relationship between their use of management values, environmentally-sound practices, socio-economic characteristics, demographics, risk perceptions, attitudes and norms, and worldviews (Emtage, Herbohn, & Harrison, 2007; Lankester, Valentine, & Cottrell, 2009; Morrison, Durante, Greig, Ward, & Oczkowski, 2012; Rolfe & Gregg, 2015).

The NESP TWQ Hub research primarily focused on sugarcane farming and grazing in efforts to ameliorate poor water quality from GBR catchments. Farmers are a diverse group of people with no two the same. This is important for scientists to consider when they are designing and implementing their behaviour change projects, as treating farmers as a homogenous group is fraught with danger. For example, farmers include part-time and full-time workers, male and

female, young and old, experienced and inexperienced, and those who speak English as their first language and those who do not. There are those who come from multi-generational farming families and those farming for the first time. Their farming enterprises can be focused on sugarcane, grazing, cropping, dairy, bananas, or a mix of several different commodities. In fact, the term farmer is probably too narrow, as it should include other landholders, such as utility companies, mining companies and government departments. All of these potential differences need to be kept in mind, but for brevity, the collective nouns of famers and scientists will be used in this report.

Other actors in the system include Traditional owners, funders, policy makers, researchers, evaluators, educators, chemical manufacturers and resellers, machinery manufacturers and resellers, marketing agents, wholesalers, retailers and consumers. There are hundreds of different organisations working in the reef space—it is a complex and interconnected system.

1.3.2 Best Management Practices

Best Management Practice (BMP) programs are voluntary, industry-owned and industry-led programs that have been designed to support farmers to identify and use practices that can improve the long-term profitability and sustainability of their businesses, while also contributing to improved water quality entering the Great Barrier Reef. Both the federal and state governments have invested significant funds to support best management practice uptake in the reef catchments with the state government underwriting the various BMP programs including Smartcane BMP, Grazing BMP, Banana BMP and Hort 360 (Horticulture BMP).

The Reef 2050 Water Quality Improvement Plan (2017-2022) target was for '90% of land in priority areas under grazing, horticulture, bananas, sugarcane and other broadacre cropping are managed using best management practice systems for water quality outcomes (soil, nutrient and pesticides)' (State of Queensland, 2018). The total investment by federal and state governments to improve the water quality of the GBR from 2013 to 2024 has been estimated to be more than $900 million (State of Queensland, 2021a).

While there has been encouraging progress, with improved agricultural practices leading to a reduction in pollutants, the Reef Water Quality Report Card for 2019 (see Figure 1) indicates more work is required (State of Queensland, 2021b). This will only be achieved through increasing the level of adoption of best management practice systems through behaviour change.

For the governments to realise the maximum benefit from the significant investments they have made to improve the reef water quality, it is timely to review and synthesise insights from existing NESP Tropical Water Quality Hub research. The purpose of this report is to do that and determine the principles for establishing greater trust between scientists and farmers, so as to further improve the level of behaviour change.

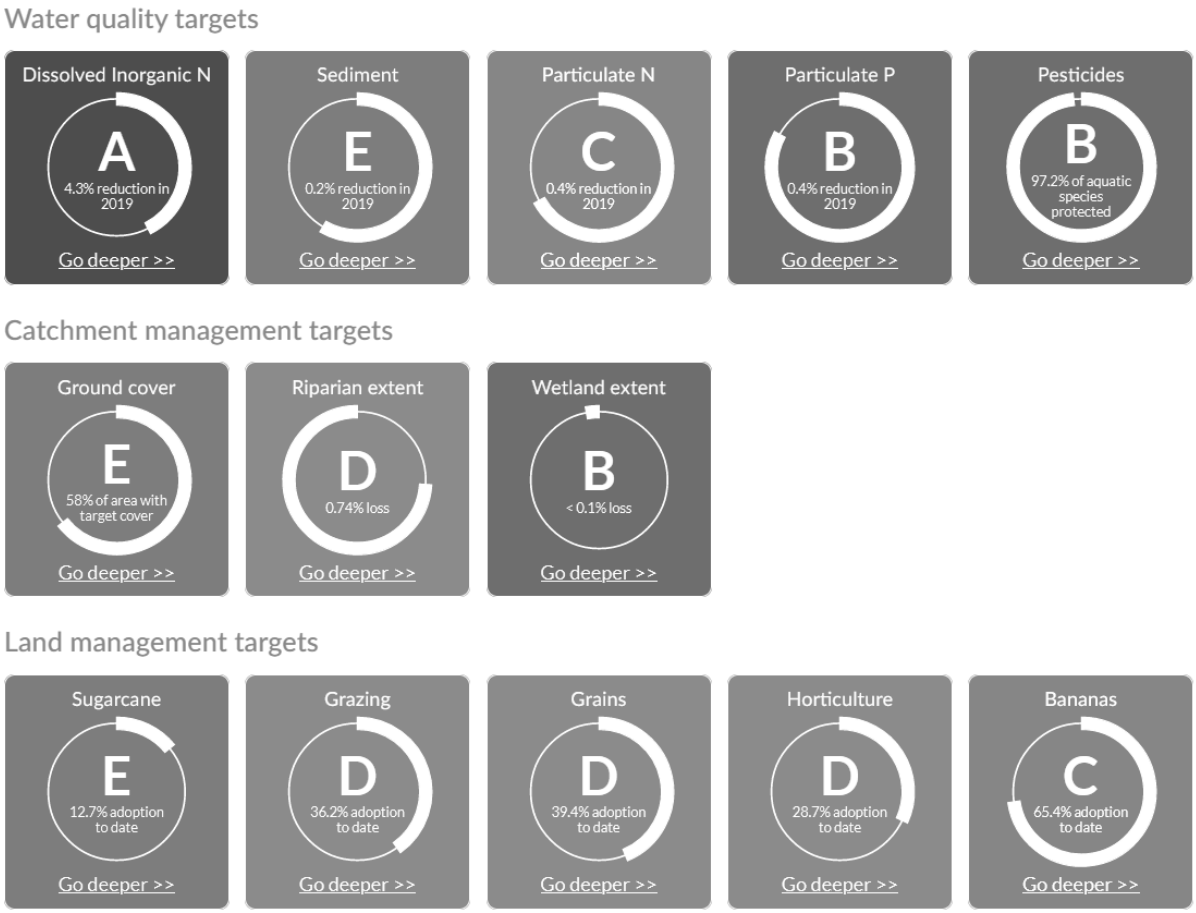

Figure 1: **Reef Water Quality Report Card 2019.**

Source: State of Queensland (2021b).

2.0 METHODOLOGY

'Trust is the glue of life.
It's the most essential ingredient in effective communication. It's the foundational principle that holds all relationships.'
Stephen Covey

2.1 Survey

A mixed methods research design enabled the collection of qualitative and quantitative data. An online survey using SurveyMonkey collected both quantitative and qualitative data and asked seven predominantly open-ended qualitative questions. This was undertaken to quickly engage with key stakeholders and understand their perception of the trust dynamics between farmers and scientists.

A purposive sampling technique (Silverman, 2013) was used whereby an initial email from the Program Director of the Reef and Rainforest Research Centre was sent to the 10 attendees of the inception workshop for this project plus another 22 individuals on 14 September 2020. It outlined the project objectives and mentioned that a short survey would be sent to them in due course. On 15 September 2020 a subsequent email was sent to them by the author of this report, inviting them to complete the survey using the embedded link. A reminder to complete the survey was sent on 23 September 2020. As additional names (particularly including farmers) were suggested by the respondents, they too were sent the explanatory email and invitation to complete the survey. While the respondents were invited to provide their contact details, they were not obliged to do so.

2.2 Literature review

A purposive sampling technique was also used to initially identify suitable literature based on previously published NESP TWQ reports (see Table 1). Additional sources suggested in the results of the survey were then gathered. Other reports, books, and journal articles that were referred to in the previous items, and were perceived to have particular relevance to this study, were then sourced. Finally, Google Scholar was searched for relevant items relating to trust in agriculture. The resulting literature gathered was then analysed and categorised, allowing key themes to emerge.

3.0 RESULTS

'The best way to find out if you can trust somebody is to trust them.'
Ernest Hemingway

3.1 Survey

Of the initial 32 people invited to complete the survey, 10 did so, even after a reminder was sent. A further 50 people were invited to complete the survey, which resulted in another 6 responses. In total, 16 responses were received and analysed, representing a 20% response rate. The results (shown in Appendix 2) helped clarify the context and identified further sources of useful literature. It is acknowledged that the small sample size does not represent the wider population of scientists or farmers in the reef catchments.

When respondents were asked to rate their perception of the level of trust between farmers and scientists on a Likert scale from 1 (very low) to 10 (very high), the resultant mean score of 4.9 indicated that overall, the perceived level of trust was low to average. Many of the comments provided related to the levels of trust being low, though acknowledging there would be a wide variation depending on which particular farmers and scientists. Mention was made about the increased levels of distrust resulting from the Reef regulations being introduced. Respondents also mentioned that in their opinion the major schism was between farmers and the government regulators, not scientists.

Respondents identified a number of elements that help contribute to higher levels of trust between farmers and scientists. Good communication, effective relationships and collaboration were most often mentioned. Co-design, involvement, and transparency were also mentioned, together with discussion and consultation.

Conversely, the respondents identified poor communication as the main contributor to lower levels of trust. Also mentioned was the failure to consider the whole farming enterprise, conflicting information, political interference, and scientists not appreciating the complexity of managing a farming operation.

3.2 Literature review

Already published NESP TWQ reports were analysed to provide a synthesis of research findings from the Australian Government's investment in behaviour change to improve water quality entering the GBR. The key insights gleaned from each report is shown in Table 1.

Themes emerging from these reports included the importance of effective longterm trust relationships, the importance of effective engagement approaches, and the benefit of co-designing projects with farmers, allowing them to see the water quality results in real-time. Effective communication, using plain English, was also shown to be especially important for written materials, as was the credibility of the messenger.

Table 1: The NESP TWQ Hub reports which were analysed for this report and the key insights gleaned from them.

Author/s, Date	Title	Key insights regarding trust
Bell, M. J., Moody, P. W., Webster, A. J., Skcoaj, D., Masters, B., & Dowie, J. (2019).	Improved water quality outcomes from on-farm nitrogen management. [Project 2.1.8].	No mention of trust or building relationships.
Davis, A. M., Taylor, B. & Fielke, S. (2019).	*Engaging with farmers and demonstrating water quality outcomes to create confidence in on-farm decision-making ("Project 25").* [Project 2.1.7].	The importance of establishing robust trust frameworks in delivering desired program outcomes is highlighted, as is meaningful and ongoing two-way communication between science and industry stakeholders. Project 25 utilised a 'ground-up' approach, instead of the traditional 'top-down' water quality monitoring approach.
Davis, A. M., Taylor, B., & Fielke, S. (2021).	*Engaging with farmers and demonstrating water quality outcomes to create confidence in on-farm decision-making ("Project 25")*. [Project 2.1.7/4.8].	Project 25 addressed the expressed need for bottom-up water quality research, engaging more directly with farmers to establish stronger and more tangible feedback loops between water quality science and farm management. The integrated social research component highlighted the importance of investing to build a trust-based environment for dialogue between growers and scientists.
Davis, A. M., & Waterhouse, J. (2016).	*Sub-catchment scale monitoring, modelling and extension design to support reef water quality improvement in sugarcane catchments: NESP Project 1.8.* [Project 1.8].	It is critically important that technical advice be delivered to farmers via trusted local advisors and other farmers. This is often overlooked in the design, implementation and communication of water quality monitoring programs. It is critical to allow time for trust to develop between researchers, landholders, and government policy staff.
Eagle, L., Hay, R., & Farr, M. (2016).	*Harnessing the science of social marketing and behaviour change for improved water quality in the GBR: Background review of the literature. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (110 pp*.). [Project 2.1.3 Interim report 1].	A review of literature relating to behaviour change and in particular, social marketing approaches. It included a review of collaborative approaches to behaviour change, including knowledge brokerage, social learning and collaborative partnerships and co-management activity. Implications of source credibility and trust were identified.
Farr, M., Eagle, L., & Hay, R. (2017).	*Questionnaire design, sampling strategy and preliminary findings: A comparison of the Burdekin and Wet Tropics regions*. NESP Project 2.1.3 Interim report. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (70 pp.). [Project 2.1.3 Interim report 5].	This report determined that there is a need to 'sell the science' to gain acceptance of the cause-effect relationship between farming practice and water quality. It also identified the potential for extending the role of extension officers to potentially influence the increased uptake of best management practices. It was recommended that extension officers seek suitable professional development to

Author/s, Date	Title	Key insights regarding trust
		further improve their ability to build trust and engagement with land managers. It was also recommended to ensure that all communication sends consistent messages irrespective of source, and channelling communication through trusted sources.
Farr, M., Eagle, L., Hay, R., & Churchill, M. (2017).	*Questionnaire design, sampling strategy and preliminary findings: The Burdekin region. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (124 pp.).* [Project 2.1.3 Interim report 3].	This report had similar findings to Farr, M., Eagle, L., & Hay, R. (2017).
Farr, M., Eagle, L., Hay, R., & Churchill, M. (2017a).	*Questionnaire design, sampling strategy and preliminary findings: The Wet Tropics region. NESP Project 2.1.3 Interim report. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (100 pp.).* [Project 2.1.3 Interim report 4].	This report had similar findings to Farr, M., Eagle, L., & Hay, R. (2017).
Farr, M., Eagle, L., & Hay, R. (2018).	*Key determinants of pro-environmental behaviour of land managers in the agricultural sector: Literature review*. Report to the National Environmental Science Program. Reef and Rainforest Research Centre Limited, Cairns (89pp.). [Project 2.1.3 Interim report 6].	A review of literature relating to pro-environmental behaviour, behaviour change and determinants of pro-environmental behaviour in agricultural settings. Trust and confidence were identified as drivers of adoption
Gooch, M., Marshall, N., Dale, A., & Vella, K. (2018).	*Trialling an assessment and monitoring program for the human dimensions of the Reef 2050 integrated monitoring and reporting program*. Report to the National Environmental Science Programme. Reef and Rainforest Research Centre Limited, Cairns (97pp). [Project 3.2.2].	No reference to the importance of trust or building relationships.
Greiner, R. (2015).	*Ex-post evaluation of an environmental auction: Legacy of the 2008 Lower Burdekin water quality tender.* [Project 1.5].	More grass-roots engagement of actual farmers was requested by the respondents, and not just the members of peak organisations. Also requested on-going engagement, not just at the beginning of the process.
Hay, R., & Eagle, L. (2016).	*Harnessing the science of social marketing and behaviour change for improved water quality in the Great Barrier Reef: A documentary analysis of Reef Trust Tender (Burdekin) and Reef Programme. Report to the National Environmental Science Program. Reef and Rainforest Research Centre*	A documentary analysis which assessed the way that messages to landholders about water quality in the Great Barrier Reef were presented in terms of their readability, message framing, and message tone. It targeted both graziers and cane farmers in the wet and the dry tropics. It determined that the reading level was generally too complex for general comprehension. The use of Plain English

Author/s, Date	Title	Key insights regarding trust
	Limited, Cairns (95 pp.). [Project 2.1.3 Interim report 2].	improves comprehension. Both positive and negative framing, as well as fear and guilt appeals, were used. The specific aspect of trust was not covered in this report.
Hay, R., & Eagle, L. (2018).	*Land managers decision making about water quality: Views from extension officers of the Wet Tropics, Queensland, Australia*. [Project 2.1.3 Interim report 7].	Extension officers may be underestimating the importance of land manager decision influencers, leading to lack of trust. There is widespread distrust of government-originated information. Conflicting information from a range of organisations has contributed to distrust.
Hay, R., & Eagle, L., (2019).	*Findings from a longitudinal study of farmer decision influencers for best management practices, Queensland, Australia.* [Project 2.1.3 Final report].	Information from other graziers was listed as farmers' most important advisor. A reduction in the level of trust by farmers was noted for people from government departments. Developing relationships and trust takes insight.
Hay, R., Eagle, L., & Chan, J. (2018).	*Harnessing the science of social marketing and behaviour change for improved water quality in the Great Barrier Reef: Final report best practice guide for development and modification of program communication material*. [Project 3.1.3].	The credibility of the author is important and is dependent upon expertise and trustworthiness. Highly credible sources are more persuasive than others, as long as the message is perceived as trustworthy by the audience. Being an expert in the message topic does not automatically equate to trustworthiness.
Marshall, N. A., Marshall, P. A., & Smith, A. K. (2017).	*Managing for aesthetic values in the Great Barrier Reef: Identifying indicators and linking Reef aesthetics with Reef health*. [Project 3.2.4].	No reference to trust or building relationships.
Paul, K. I., Bartley, R., Larmour, J. S., Davies, M. J., Crawford, D., Westley, S., . . . James, C. S. (2018).	*Optimising the management of riparian zones to improve the health of the Great Barrier Reef*. [Project 3.1.4].	Interviews with 123 landholders found that older landholders often had a lack of understanding and acceptance of scientific information on the importance of the riparian zone to the health of the GBR, and had had little trust in the efficacy of recommended practices for riparian management.
Rundle-Thiele, S. R., Smart, J. C. R., Roemer, C., David, P., Hasan, S., Anibaldi, R., & Shawky, S. (2021).	*Measuring cost-effectiveness and identifying key barriers and enablers of lasting behavioural change in the cane industry, Draft Final Report*. [Project 4.12].	Trust was identified as one of the many enablers of enabling engagement in practice change projects. Lack of trust is a critical barrier to the adoption of practice change. Knowledge and information can be dismissed if the sources are not trusted.
Smart, J. B., Hasan, S., Volders, A., Curwen, G., Fleming, C., & Burford, M. (2016).	*A tradable permit scheme for cost-effective reduction of nitrogen runoff in the sugarcane catchments of the Great Barrier Reef.* [Project 2.2].	Successful trading requires the development of institutions for organising trade that are trusted by, and effective for, intended program participants. No mention of how to build that trust.
Thorburn, P. J., Biggs, J. S., McMillan, L., Webster, A. J., Palmer,	*Innovative economic levers: A system for underwriting risk of practice change in cane-farming.* [Project 3.1.8].	Stakeholder engagement was particularly important to ensure the approach developed was technically sound and to

Author/s, Date	Title	Key insights regarding trust
J. and Everingham, Y. L. (2020).		build understanding and trust amongst sugarcane farmers. Farmers and canegrowers were included via participatory rural appraisal processes.
Wang, E., Attard, S., Wang, E., Philippa, B., Xiang, W., & Everingham, Y. (2020).	*Improving water quality for the Great Barrier Reef and wetlands by better managing irrigation in the sugarcane farming system*. [Project 3.1.2].	Despite listing the lack of trust as a barrier in the introduction, this is not addressed in the report.
Waterhouse, J., & Pineda, M. C. (2021).	*Overcoming barriers to reducing nitrogen losses to the Great Barrier Reef: A synthesis of NESP Tropical Water Quality Hub research*. [Project 6.3].	Four stages for overcoming barriers to reduce nitrogen losses were identified: identifying actions, understanding participation, exploring new instruments and evaluating options. The second stage, understanding participation, was particularly relevant to this report.

3.2.1 Trust

In the context of the GBR, Emtage and Herbohn (2012a) state that trust between land managers and government regulators is crucial for land managers when making decisions about changing their land management practices. However, it has been shown that farmers often mistrust government sources (Bartel & Barclay, 2011) which then affects longterm behaviour change associated with improving best land management practices (Eagle *et al*, 2016). As reported by Emtage and Herbohn (2012b, p. 358), many landholders in the Wet Tropics 'lack trust and confidence in governments' appraisal of causes and extent of 'environmental problems'". Understanding these trust relationships is critical for developing effective behaviour change programs.

Several studies have shown that farmers generally trust other farmers like themselves the most (Blackstock *et al.*, 2010; Hay & Eagle, 2019; Pannell *et al.*, 2006; Pickering *et al.*, 2020). To a slightly less degree they also trust veterinarians (Fisher, 2013; Small *et al.*, 2016), and productivity groups (Pickering *et al.*, 2018). Often government officers are among the lower trusted sources (Hay & Eagle, 2018, 2019; Pickering *et al*., 2018; Small *et al*., 2016).

This was recently reinforced by Rust *et al*. (2020) who showed that farmers trusted other farmers the most and trusted traditional experts far less, particularly agricultural scientists from academic and government institutions. The farmers perceived that these experts were not empathetic towards their needs and did not fully appreciate their situation. Consequently, the use of people from similar farming backgrounds or other trusted networks to deliver behavioural change messages is critical for success of behaviour change programs (Davis & Waterhouse, 2016).

The Behavioural Change Stairway Model (Vecchi *et al*, 2005) outlines the steps involved in a relationship-building process. It starts with active listening (allowing someone to be heard and understood) which enables empathy to be built. Empathy implies an identification with, and understanding of, another's situation, feelings, and motives (Mehrabian & Epstein, 1972). As the level of empathy increases, rapport begins to develop, characterised by an emotional

connection or a state of harmonious understanding. This then leads to the development of trust, as shown in Figure 2.

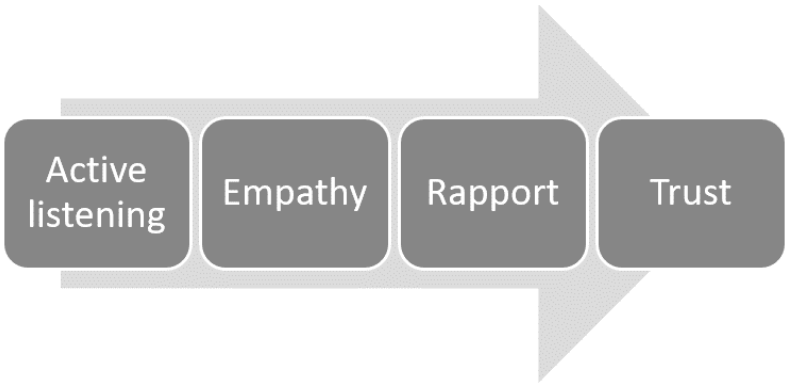

Figure 2: **A modified Behavioural Change Stairway Model. Source: Based on Vecchi, Van Hasselt, & Romano (2005).**

Trust is 'the basis for almost everything we do' (Frei & Morriss, 2020, p. 116) yet it is complex and fragile. It takes significant time to build and yet can be lost in an instant. It forms the foundation for effective working relationships and constructive communication. While many of us know intuitively what trust is, researchers have not yet come to a consensus regarding what it is. A systematic review of the literature published over a 50-year period identified 96 different definitions of trust (Castaldo *et al*., 2010).

One of the foundational papers on trust was written by Mayer, Davis, and Schoorman (1995) and defined trust as 'the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party' (Mayer *et al*., 1995, p. 712).

The authors described the factors of perceived trustworthiness as ability (that group of skills, competencies, and characteristics that enable a party to have influence within some specific domain), benevolence (the degree to which a trustee is believed to want to do good to the trustor), and integrity (the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable). These and the trustor's propensity lead to trust, as shown in Figure 3.

This broke away from the previously widely accepted approach, that trust was dispositional and trait-like, whereas these authors asserted that trust was an aspect of relationships. The authors proposed that the effect of integrity on trust would be salient early in the relationship, while benevolence would increase over time as the relationship developed.

Based on a cross-disciplinary meta-analysis, trust was defined as 'a psychological state comprising the intention to accept vulnerability based upon positive expectations of the intentions or behaviour of another' (Rousseau *et al.*, 1998, p. 395). More simply, trust has also been defined as 'confident positive expectations regarding another's conduct' (Lewicki *et al*., 1998, p. 439), and the result is that it facilitates cooperation by lowering the transaction costs of working together (Pretty, 2003). Trust is considered fundamental to human relationships (K.

Cook, 2001) and is seen as the ultimate root and source of our influence (Covey & Merrill, 2006).

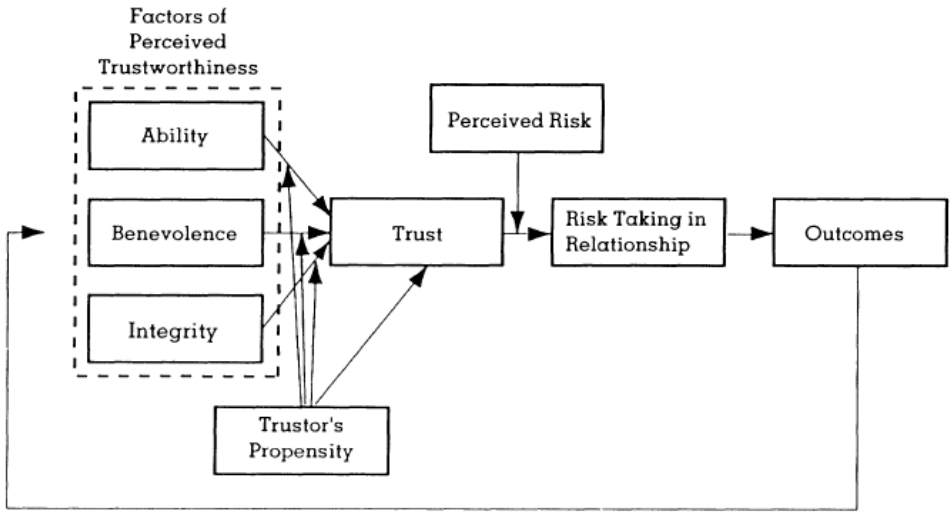

Figure 3: A model of trust. Source: Mayer, Davis and Schoorman (1995, p. 715).

Pitsis *et al.* (2004, p. 58) define trust as the confidence or faith in someone, 'based on a probabilistic expectation that they will act in certain ways, and that these ways will be in conformance with a mutually shared interest, rather than be self-interested in a way that does not take account of the expectations, needs and desires of these others'. Trust is having confidence in how one will be dealt with by the other, and can only be established through experience.

An aspect of trust is having a safe learning environment where participants trust each other with the information and scientific data that they share. Wolfenden and Evans (2007, p. 12) stressed that a 'safe learning environment is critical and must be based on sustainable levels of trust between community members and partnerships'.

Covey and Merrill (2006) have postulated that there are five types (or 'waves' as described by the authors) of trust: self-trust, relationship trust, organisational trust, market trust and societal trust. Self-trust results from an interaction of character and competence and has the four sub-elements of integrity, intent, capability and results, as shown in Figure 4. Integrity, which relates to one's character, is about being honest and fair and having a reputation for being authentic. Having good intent is about being caring, transparent and open – not trying to deceive or protect anyone, and not having hidden motives. Capability relates to having suitable skills, knowledge, and experience for a given task. Importantly, capabilities relate to our ability to establish, grow, and restore trust. Finally, good results demonstrate a good reputation, credibility, and that you've shown your capabilities effectively in the past with favourable performance.

The benefits that accrue from strong levels of trust include improved communication (O'Reilly & Roberts, 1976) and increased levels of cooperation (Deutsch, 1973). Trust has been described as the relational glue that enables both formal and informal social interactions, knowledge sharing, and innovation processes (Mayer *et al.*, 1995). Trust allows individuals to predict how others 'will behave in a mutually acceptable manner' (Newell & Swan, 2000, p.

1294) and enables people to manage their perceived sense of risk and personal vulnerability in their interactions with others (Mayer *et al.*, 1995).

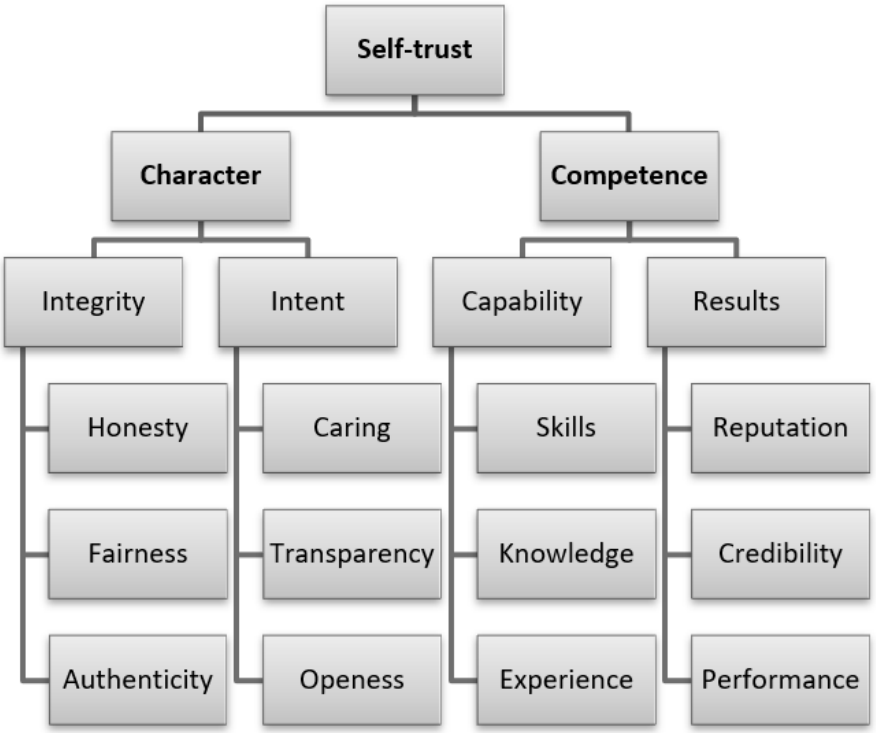

Figure 4: The core elements of self-trust. Source: Based on Covey and Merrill (2006).

Covey and Merrill (2006) point out that by increasing trust, you increase the speed of transactions and reduce their cost. The traditional formula for business is that strategy (S) times execution (E) equals results (R) i.e., S x E = R. However, according to the previous authors it should include the hidden variable of trust, making it strategy times execution, multiplied by trust (T), equals results i.e., (S x E) T = R.

Similar to the concept of an 'Emotional bank account' that was described in *The 7 habits of highly effective people* (Covey, 2004), his son Stephen M. R. Covey proposed a 'Trust account'. He suggested that when you behave in ways that build trust, you make deposits into this account; and likewise, when you behave in ways to destroy trust, you make withdrawals. The balance reflects the amount of trust in that particular relationship at any given moment. This is a good analogy, as it helps us think in terms of unique accounts for each person with whom we interact, and that it fluctuates over time. Importantly, it is suggested that withdrawals have a greater impact than deposits. He goes further and suggests that it isn't a shared trust account between two individuals, but each person has their own trust account, so it's important to monitor the other person's account to ensure it has a healthy balance. This can be done by having a constructive conversation on a regular basis, where amongst other things, you can check to see how they are feeling about the level of trust.

Regarding relationship trust, there are 13 behaviours described by Covey and Merrill (2006), as shown in Figure 5. The first five relate to character: talk straight, demonstrate respect, create transparency, right wrongs, and show loyalty. The next five relate to competence: deliver results, get better, confront reality, clarify expectations, and practice accountability. The final

three relate to a combination of character and competence: listen first, commitments, and extend trust.

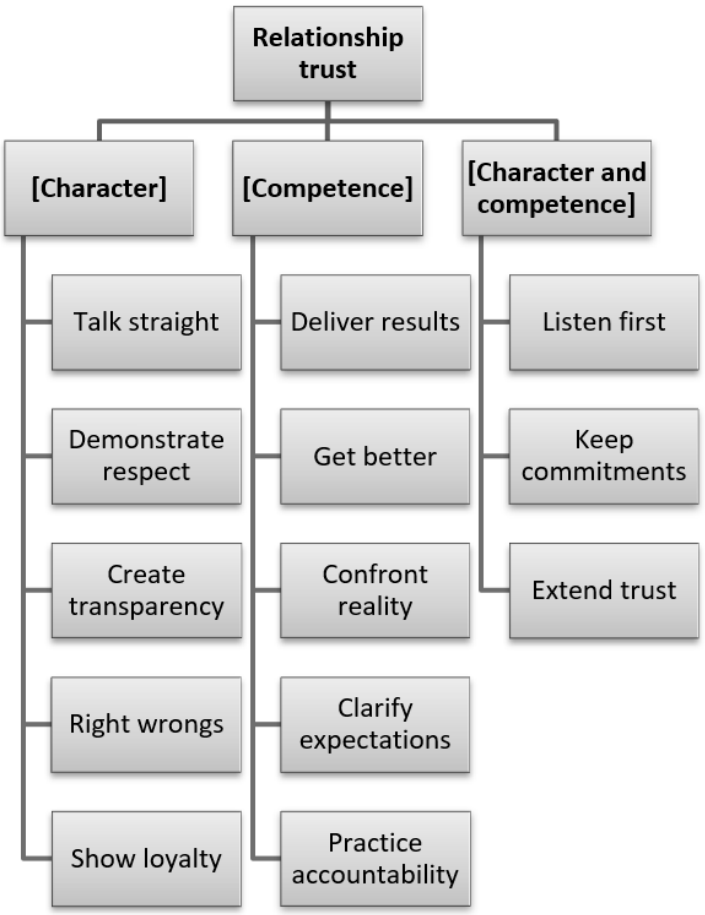

Figure 5: The core elements of relationship trust. Source: Based on Covey and Merrill (2006).

Covey and Merrill (2006) maintain these 13 behaviours are key for building effective trust relationships and describe them as follows.

1. Talk straight. Communicate so that your message cannot be misunderstood. Begin your discussions by declaring your intent, so you're clear about what you are thinking. Contrary behaviours include deliberately withholding information and flattery. Be honest in your communication and call things what they are. Don't manipulate people or misrepresent facts.
2. Demonstrate respect. This behaviour is based on the principles of fairness, kindness, and civility. The opposite is to fake respect or concern, or worse, to show respect and concern for only those who can do something for you.
3. Create transparency. Be real and genuine and tell the truth. Be open and authentic, erring on the side of disclosure and not having hidden agendas. The opposite is to obscure and pretending things are different than they are.
4. Right wrongs. Instead of just apologising, make restitution. Apologise quickly and demonstrate personal humility. The opposite is to deny or justify wrongs, or worse, cover up mistakes.

5. Show loyalty. Give credit to others where possible and speak about people as though they are present with you. Don't take credit or misrepresent people unfairly and don't disclose other people's private information.
6. Deliver results. Take the time to define results upfront. Establish a good track record of making things happen, being on time and on budget, and not making excuses for not delivering. Instead of over-promising and under-delivering; under-promise and over-deliver.
7. Get better. Continuously improve by learning and growing. Don't be afraid to make mistakes but learn from them. Develop formal and informal feedback systems and respond to them.
8. Confront reality. Take the tough issues head-on. Engage the creativity, capability, and synergy of others in solving problems. Don't ignore problems, hoping they will go away. Address the real issues and lead courageously in discussions about uncomfortable topics.
9. Clarify expectations. Create shared vision and agreement up front. Don't be vague about specifics. Most circumstances involve three variables; quality, speed, and cost; but you can only have two. Never assume expectations are clear or shared.
10. Practice accountability. Hold yourself and others accountable. Don't point fingers. Don't avoid or shirk responsibility, and be clear on how you'll communicate progress.
11. Listen first. Before trying to give advice, genuinely understand the other person's thoughts and feelings. Don't pretend to listen while waiting for your own chance to speak. Use your eyes and your gut to listen as well as your ears, and don't presume you know what matters to others.
12. Keep commitments. Don't break commitments or make vague, unreliable commitments. Both family and work commitments are equally important. Keeping commitments is the quickest way to build trust in any relationship.
13. Extend trust. Be a more trusting person. Don't withhold trust or extend false trust by giving people responsibility but no authority or resources to complete a task. Don't follow-up behind people and micro-manage.

It should be noted that in relation to the focus of this report, trust operates at multiple levels. There is the traditional focus of relational trust, such as the trust between farmers and scientists conducting their work. Then there is the trust in the processes being used, as in the scientific rigour of an experiment. Finally, there is the trust in the purpose or the underlying intent of the work being undertaken. This report focuses on the level of trust in information sources and advice networks related to improved farming practices.

'Project 25', one of the major projects of the NESP TWQ Hub is an example of a project designed to build the levels of trust between farmers and scientists, while maintaining research practice and data transparency. An explicit guideline used in the project was the development of local scale trust, and the role of informal learning and training was critical in the project achieving its intended outcomes (Davis *et al.*, 2021). A particular emphasis was placed on appropriate information confidentiality and data dissemination frameworks to allow for grower engagement and collaboration. Temporary embargoes on the data being released to the public allowed access by the project stakeholders, providing local farmers an opportunity to work through the data collected and develop strategies and implement activities to address any problems identified, prior to public data release. The project invested in establishing collaborative trust frameworks between stakeholders from the beginning, and used collaborative and participatory dialogues to build relationships.

As a result of the successful design and implementation of Project 25, farmers involved reported improved communication with the scientists involved, in addition to an improved trust environment with more direct oversight of monitoring data, and 'space' to learn and experiment as contributing factors. Farmers interviewed described the presence of 'meaningful and ongoing two-way communication between science and industry stakeholders, and two-way trust and recognition of the value of bridging on-farm knowledge with water quality monitoring data' (Davis, Taylor, & Fielke, 2019, p. 26).

3.2.2 Distrust

A recent study determined that one reason for distrust between farmers and scientists was that the scientists had different goals from the farmers, in that the scientists were seen to be focused on publishing journal articles and achieving further research funding, rather than creating direct benefits for farmers (Rust *et al.*, 2020). Another reason provided was that it was difficult to build a trusted relationship with government scientists and advisers due to the high staff turnover, which can result in personal relationships being difficult to build (McKitterick, Quinn, & Tregear, 2019).

While the traditional view is that trust and distrust are at opposite ends of the same continuum (Schoorman *et al.*, 2007), it is contended by Lewicki *et al.* (1998) that trust and distrust can occur simultaneously. Those authors defined trust in terms of 'confident positive expectations regarding another's conduct', and distrust in terms of 'confident negative expectations regarding another's conduct' (Lewicki *et al.*, 1998, p. 439).

Relational trust involves not only beliefs in the positive intentions of the trustee but also in the absence of negative intentions, which leads to the condition of high trust/low distrust. Relationships should be viewed as complex, multi-dimensional constructs where it is possible to have trust in one facet of the relationship but distrust in another simultaneously, as illustrated in Figure 6.

Interdependence between the parties to relational trust is likely to increase over time as new opportunities and initiatives are pursued. This relational trust can expand and contract, where experiences over time can escalate positive beliefs regarding the intentions of the other, or conversely, exacerbate negative beliefs. Under the conditions of Quadrant 3, low trust and high distrust, the actors have no reason for confidence in one another and plenty of reasons to be wary. These conditions make it extremely difficult, if not impossible, to maintain effective relationships over time. The conversations are likely to be cautious, guarded and laced with sarcasm and cynicism. Each party is unlikely to trust the motives of the other and will attribute negative intentions to the other person's behaviour.

A useful example is provided by Dawes and Thaler (1988). They describe a vegetable stall alongside a roadside, where a farmer displays their produce for sale with a cash box for payment nearby. Customers are expected to place the correct amount of money in the cash box in exchange for the produce they take. While this seems very trusting, the cash box only has a narrow slit for the money to easily pass through one-way. The box is also secured to the stall, making it difficult to steal. This is an example of trust (the farmer leaving the produce and the table being unmanned) and distrust (a cash tin with a narrow opening which is bolted to the table) occurring simultaneously.

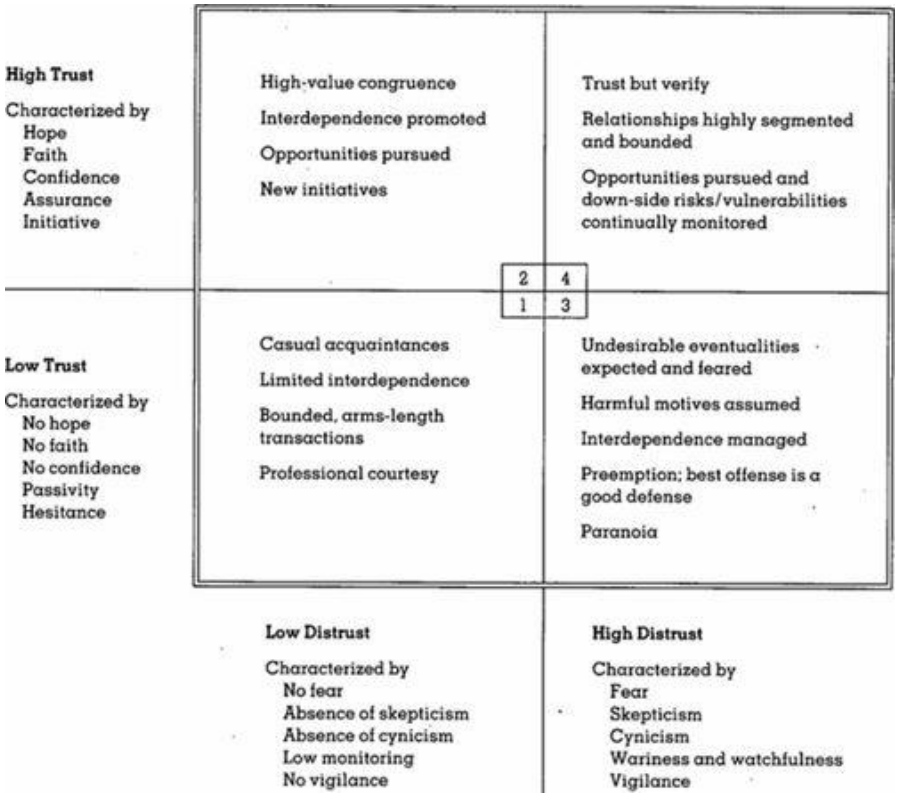

Figure 6: Interaction between trust and distrust. Source: Lewicki *et al.* (1998, p. 445).

3.2.3 Rebuilding trust

Once trust is broken, it is difficult to rebuild. Trust involves having confidence and an expectation regarding how one person will be dealt with by the other. While unmet expectations can affect trust, broken promises are worse and produce anger and erode trust in the relationship (S. L. Robinson & Rousseau, 1994). A psychological contract is defined as one's own belief in the reciprocal nature of the exchange relationship between oneself and a third party, based on the promises made or implied in their interactions. Once a psychological contract is broken, rebuilding the relationship is extremely difficult. This is because once a psychological contract is violated, it involves a breach of promise and trust. This then goes beyond disappointment and produces feelings of betrayal. Violation of a psychological contract undermines the very factors, such as trust, that led to a relationship being established (S. L. Robinson & Rousseau, 1994).

Trust has been described as having a 'spiral reinforcement', in that an initial decline in trust often then leads to a further decline in trust. This is then associated with a decrease in the quantity and quality of communication (O'Reilly & Roberts, 1976), and also cooperation (Deutsch, 1973). This in turn may reduce subsequent trust, hence the downwards spiral.

Covey and Merrill (2006) and Schoorman *et al.* (2007) also agree that restoring trust is difficult. They suggest that it is important to determine how the trust was lost in the first place and specifically try to rebuild it from there. They state that a loss of trust created by a violation of

character (integrity or intent) is far more difficult to restore than a loss of trust created by a violation of competence.

Frei and Morriss (2020) assert that there are three core drivers for trust, authenticity, logic, and empathy, as shown in Figure 7. People trust you when they believe they are interacting with the real you (authenticity); when they have faith in your judgment and competence (logic), and finally when they feel that you care about them (empathy). When you lose that trust, it can usually be traced back to a breakdown in one of these three drivers.

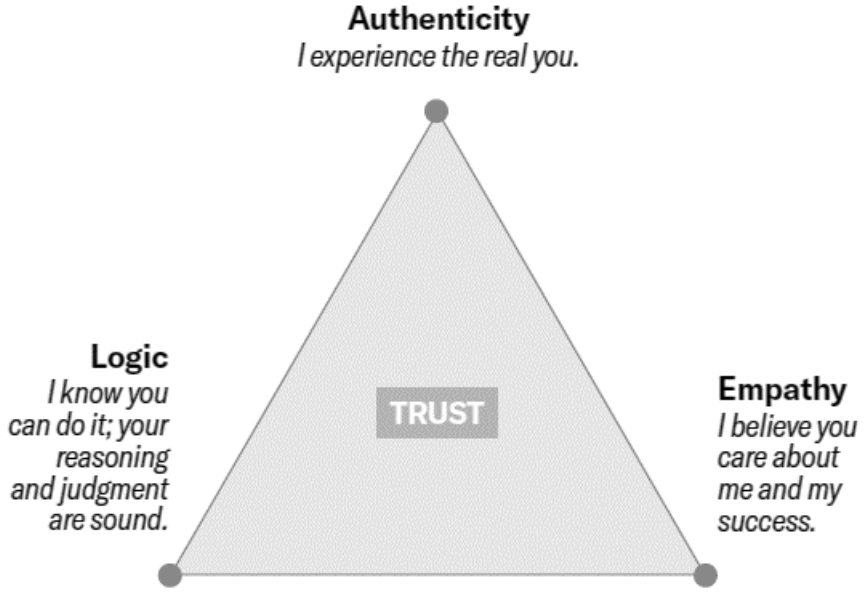

Figure 7: The trust triangle. Source: Frei and Morriss (2020, p. 117).

To rebuild the trust, the authors suggest you invite a close confidant to help you explore recent interactions that may have led to the reduction in trust and identify the key driver responsible. If it is related to empathy, people may think that you care more about yourself than them. This can be communicated by you checking your phone during meetings when others are speaking and when you should have been listening. Or it might be that you haven't taken the time to learn the names of the farmer's family or key workers, or fully understand the complexity of their farming situation.

If you think the trust issue is related to logic, then perhaps the people don't have full confidence in the rigour of your ideas or your ability to deliver on them. Instead, be sure that you can confidently provide the data or rationale for your thinking. If you don't know the answer to a question, admit it and commit to finding it out later. Often though, it may merely be the perception of poor logic due to poor communication. Instead of telling a long story to get to your point, start with the main point and then provide the supporting evidence.

A lack of authenticity becomes a problem when people don't feel they know the real you, in that you behave differently in different situations. When people feel you are hiding the truth from them, then they are more likely to hold back, as well. Therefore, be as authentic as you can in your interactions.

The issue of rebuilding trust amongst government, traditional owners, and industry members in northern Australia has been raised by Dale (2018) as a result of analysing several high-profile pastoral industry and landscape-scale conflicts. He proposed an approach of co-design and co-management by developing longterm partnerships between the various layers of government, traditional owners, and relevant industries. Rebuilding trust and mutual cooperation would require the various governments and other major sectoral interests involved to demonstrate 'higher levels of respect for those people, industries and communities who actually manage north Australia's vast landscapes' (Dale, 2014, p. 335). His suggested approach included the key stakeholders negotiating their shared values and better understanding the nature of the problems being faced. This shared understanding of key issues could then lead to the co-design of solutions, including the implementation, monitoring, and evaluation. This approach would require a solid foundation of mutual respect and trust, which needs to be developed over time.

3.2.4 Social capital

Social capital represents 'features of social organization such as networks, norms, and trust that facilitate coordination and cooperation for mutual benefit' (Putnam, Leonardi, & Nanetti, 1994, p. 35) and has also been described as 'connections among individuals – social networks and the norms of reciprocity and trustworthiness that arise from them' (Putnam, 2000, p. 18).

Social capital works to benefit the broader community by building respectful social networks and promoting cooperation and has been seen as important for farming sustainability (McShane *et al.*, 2016). It was originally described as comprising 'bonding' (exclusive) social capital and 'bridging' (inclusive) social capital (Putnam, 2000). Bonding social capital includes specific interest groups and associations that reinforce exclusive identities; whilst bridging social capital is achieved by the ability of those groups to support broader community linkages and disseminate information. Bridging social capital was reported as one of the key determinants of successful innovation processes by King, Fielke, Bayne, Klerkx, and Nettle (2019).

A third form, 'linking' social capital, was described as the 'norms of respect and networks of trusting relationships between people who are interacting across explicit, formal or institutionalized power or authority gradients in society' (Szreter & Woolcock, 2004, p. 556). This is particularly pertinent to the relationships within the GBR system, given the vast power differentials at play between the various actors. This will undoubtably present a challenge to overcome in order to create the conditions necessary to achieve effective trust relationships.

In a study of farmers in England, Fisher (2013) found the levels of 'linking' social capital between farmers and the government were low, created by high levels of distrust and a lack of confidence in the information provided. However, high levels of 'bridging' social capital were found between farmers and vets, due to long-term, regular, and consistent contact, which was associated with high levels of trust and knowledge sharing. 'Bonding' social capital was also important in encouraging knowledge exchange among the farmers. Although, overly close ties were found to potentially lead to exclusive networks which in turn led to the development of distrust between those groups.

Social capital is important for the management of natural resources (Pretty, 2003), due to the concept of social bonds and norms guiding individual actions. When levels of social capital in groups are high, the members are confident to invest their time and energy in collective activities, knowing that others will, as well. It is the trust relationships that lubricate this cooperation, reducing the transaction costs between individuals. People are able to trust one another to act as expected, saving time and money of monitoring and controlling.

Di Bella, O'Brien, Nash, and Wegscheidl (2015) reported the benefits of social capital accruing from their water quality monitoring program in FNQ. They found that organisations that previously worked in isolation, were afterwards discussing whole of catchment issues and the practices that were being implemented to address specific issues for their various land uses.

When Project 25 was being developed, particular emphasis was placed on building the required social capital, as to have a tight group of growers and advisors (i.e., bonding social capital). These strong social ties, shared beliefs, and norms were seen as helping prepare for using peer-led strategies to encourage changes in behaviour or establishing new norms within the group of sugarcane farmers being targeted (Davis *et al.*, 2021).

3.2.5 Engagement

The literature regarding stakeholder engagement spans fields such as business management, community psychology, and natural resource management (Sterling *et al.*, 2017). Stakeholders are defined as the people and organisations who affect, or are affected by, a particular decision; and can be directly or indirectly involved in an endeavour (Freeman, 2010). Stakeholder engagement is defined as the 'practices that the organisation undertakes to involve stakeholders in a positive manner in organisational activities' (Greenwood, 2007, p. 318).

In the context of this report, engagement relates to the engagement of individuals and groups, and refers to the two-way interaction between two or more parties. Community engagement has been defined as 'the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people' (US Department of Health and Human Services, 2011, p. 7). Johnston and Lane (2018, p. 634) added a relational element in their definition: 'Community engagement is a dynamic relational process that facilitates communication, interaction, involvement, and exchange between an organization and a community for a range of social and organizational outcomes'.

Arnstein (1969) defined eight levels of participation, depicted as rungs on a ladder (see Figure 8), which are often used to describe community engagement activities. These were categorised as non-participation (manipulation and therapy), tokenism (informing, consultation, and placation) and citizen control (partnership, delegation, and citizen control). The higher the rung on the ladder, the greater the amount of real participation.

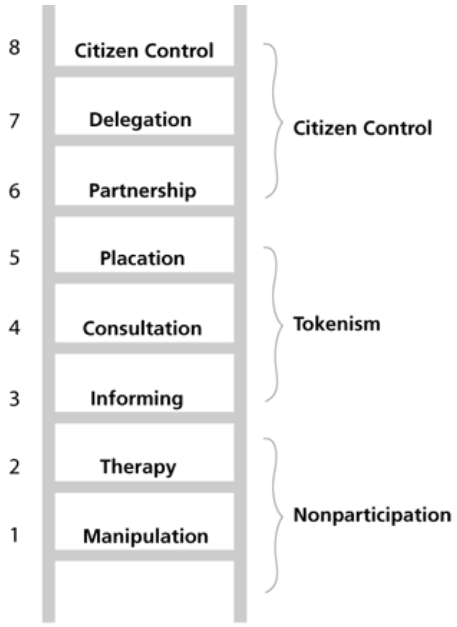

Figure 8: Arnstein's ladder: Degrees of citizen participation. Source: Based on (Arnstein, 1969, p. 217).

In an effort to better define and measure levels of engagement, the International Association of Public Participation (IAP2) developed a public participation spectrum (IAP2, 2007). It uses the scale Inform, Consult, Involve, Collaborate and Empower, with increasing degrees of engagement, as visually represented in Figure 9.

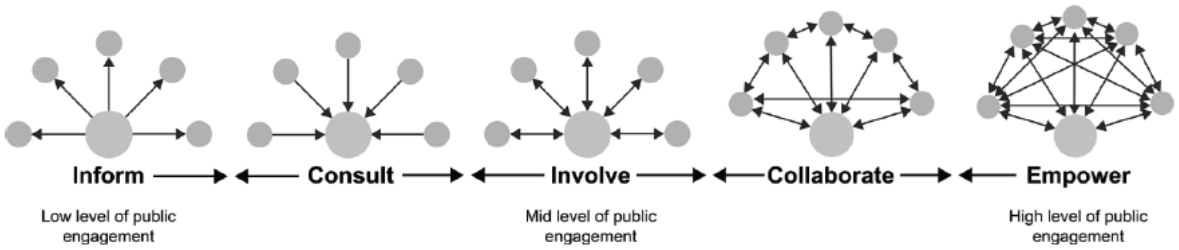

Figure 9: A visual representation of the IAP2 public participation spectrum. Source: Victorian Auditor General's Office (2017, p. 1).

The goal of each level of the spectrum is as follows:

- Inform: To provide citizens with a balanced and objective understanding of a problem,
- Consult: To obtain feedback from citizens on a policy challenge or problem,
- Involve: To have direct engagement with citizens to better understand their needs and concerns,
- Collaborate: To partner with the citizens to develop alternatives and identify preferred solutions, and
- Empower: To provide decision making authority to the public.

Without suitable targeted engagement activities, it is difficult to build trust with stakeholders, and particularly with older ones (MacKeracher *et al.*, 2018). It has been shown that in the GBR catchments, engagement plays an important role in building trust and social resilience, and also contributes to creating local knowledge and tailoring plans to local contexts (Taylor &

Eberhard, 2020). There has been a call for greater engagement of GBR farmers, and especially the hands-on farmers and not just those in the peak organisations, so that their perspectives can be better heard and understood (Greiner, 2015). It's suggested that some project personnel would benefit from receiving specific training in engagement techniques, so as to improve their interactions with farmers (Blackman *et al.*, 2015).

Stakeholder engagement was seen as particularly important by Thorburn *et al*. (2020) in ensuring that their project's approach was technically sound. Additionally, it built understanding and trust amongst the canefarmers and other key stakeholders.

The importance of proper engagement of primary producers as a means to 'strengthening cooperation and collaboration between scientists, farmers and governments' was a key theme to arise from the recent Senate Inquiry (Commonwealth of Australia, 2020, p. 105). It was noted that when these partnerships exist, farmers benefit through improved productivity and profitability. It was stated that a bottom-up approach of involving farmers from the point of defining the problem and deciding how to engage people, would be highly beneficial. This citizen science style approach seeks to involve farmers with their firsthand experience of land management practices. It is through this style of engagement that the scientific community can gain 'an improved understanding of what is happening on the land, as well as fostering trust' (Commonwealth of Australia, 2020, p. 108).

The critical role of stakeholder engagement was noted and doing "research 'hand-in-hand with stakeholders', which ultimately fosters trust between scientist and farms" (Commonwealth of Australia, 2020, p. 114). The use of forums as a way of bringing together farmers, researchers, natural resource management organisations, and governments to exchange information was also noted by the inquiry.

Davis and Waterhouse (2016) note that the appropriate mechanisms for industry engagement and buy-in is an important consideration. However, it is often overlooked in the design and implementation of water quality monitoring programs, especially those aimed at creating behavioural practice change in agricultural sectors. Industry engagement was a critical part at the commencement of Project 25. Building industry faith in the overall process helped to establish the desired robust trust frameworks between the science and industry communities (Davis *et al.*, 2021). For that project, a stakeholder steering committee was formed and deliberately included the major local industry players, as opposed to the usual willing farmers. These then became advocates and spokespeople for the project. The committee also included state-level CANEGROWERS members and local scientists to provide the policy and technical oversight.

As a practical example of the benefits that accrue from effective engagement, the Project 25 sensors which record nitrate measurements every 10 minutes, helped identify that it is primarily the first early wet season rain in November and December that carry nearly half the damaging nitrates from urea-based fertilisers off the cane properties and into the waterways. This was contrary to the previous understanding that the later torrential summer rains that cause big flood events were responsible. As a result, canefarmers are now planning to insert automatic gates, controls or baffle boards at the end of their existing drains, pipes, and channels. This allows them to hold back the flow of water into the rivers by two to three days so that the nitrates are naturally dissipated (RRRC, 2020).

3.2.6 Participative research

As opposed to the traditional, reductionist, scientific research undertaken in an almost clinical environment with minimal interaction between the researcher and the subjects, more modern participative research approaches are inclusive and engaging (Neef & Neubert, 2011). The selection of a particular approach should be determined by the desired outcome of the research project (Saunders *et al.*, 2019).

Stakeholder participation in agricultural research is a multi-dimensional process and the various participatory elements should be explicitly considered during planning, implementation and evaluation (Neef & Neubert, 2011) who proposed the following six dimensions detailed below and shown in Figure 10.

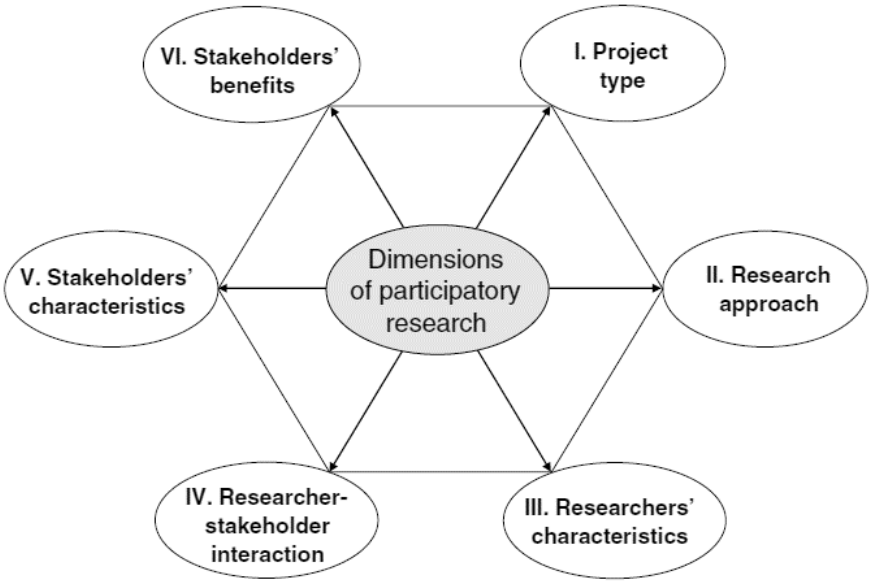

Figure 10: The six dimensions of participatory research. Source: Neef and Neubert (2011).

I. Project type

- Type of research
- Research objectives
- Potential users and beneficiaries
- Institutional context of the research project
- Risks involved in the project

II. Project approach

- Research methodology
- Research epistemology
- Research plan
- Research process
- Research methods for accessing local knowledge

III. Researchers' characteristics
- Previous experiences with participation
- Attitudes towards participation
- Attitudes towards local stakeholders
- Accountability towards the potential users
- Commitment to the problem-solving cycle

IV. Researcher–stakeholder interaction
- Involvement of stakeholders in the research process
- Control of research and centers of decision-making
- Contribution to the generation of knowledge
- Type, frequency, and intensity of interaction
- Investment of resources and payment

V. Stakeholders' characteristics
- Local stakeholders' experiences with previous projects
- Local stakeholders' perception of the research project
- Local stakeholders' perception of the researchers
- Time availability of local stakeholders
- Local stakeholders' scope for action

VI. Stakeholders' benefits
- Innovations, improved practices
- Creation of knowledge and awareness
- Improvement of skills
- Empowerment and social capital
- Improvement of livelihoods

Wicked problems

The challenge of improving the water quality entering the GBR could be described as a wicked problem, as it is inherently complex with no obvious simple solution, has many interdependencies, and multiple stakeholders involved with conflicting values. As a result, interventions may lead to unforeseen consequences (Churchman, 1967; Eberhard *et al.*, 2017; Rittel & Webber, 1973). To deal effectively with the uncertainty of wicked problems, adaptive, participatory, and transdisciplinary approaches are widely recommended (Duckett *et al.*, 2016; Head *et al.*, 2016).

There is growing agreement that sustainability and environmental challenges require new ways of approaching knowledge production and decision-making (Lang et al., 2012). Where behaviour change is the desired outcome, the following approaches are suggested as they more explicitly involve the target audience in the research process, which has been shown to improve adoption (Pannell *et al.*, 2006; Sanova, 2017).

Transdisciplinary approach

Farmers make decisions based on a wide array of often complex information, and there are multiple factors that influence their decisions, including their attitudes, circumstances, and location (Blackstock *et al.*, 2010; Dale, 2018; McGuire *et al.*, 2013; Pannell *et al.*, 2006). It is

therefore necessary to approach these situations with a combination of scientific disciplines (Ahnström *et al.*, 2009; Tress & Tress, 2001). A transdisciplinary approach (Elzinga, 2008; Hirsch Hadorn *et al.*, 2008; Lang *et al.*, 2012; Pohl & Hadorn, 2007) is useful when dealing with complex societal and environmental problems, such as dealing with water quality issues affecting the GBR. Lang et al. (2012, pp. 26-27) define transdisciplinarity as 'a reflexive, integrative, method driven scientific principle aiming at the solution or transition of societal problems and concurrently of related scientific problems by differentiating and integrating knowledge from various scientific and societal bodies of knowledge'.

Stakeholders participate in both researching the complex problem and also in implementing the solutions. This typically involves 'multiple disciplines, fields and professions in teams that co-design research, co-produce solution-oriented knowledge, and reintegrate the knowledge into strategies for problem-solving and the development of new scientific insights' (Bammer et al., 2020, p. 6). This allows collaboration and transfer of knowledge across disciplinary boundaries and unites dimensions that are usually the domain of individual disciplines (Tress & Tress, 2001).

Bohnet *et al.*, (2011) used a transdisciplinary approach when developing a typology of graziers located in the Bowen-Broken basin, acknowledging that the graziers and the grazing land they managed was part of a larger grazing ecosystem.

Agricultural Innovation System approach

An Agricultural Innovation System (AIS) approach acknowledges the various actors interacting in the system and has been defined as 'a network of organisations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organisation into economic use, together with the institutions and policies that affect their behaviour and performance' (World Bank, 2006, p. 16). The AIS includes people, linkages, infrastructure, and institutions and emphasises the need to consider the interactions throughout the entire value chain including beyond the farm gate (Klerkx *et al.*, 2012).

Acknowledging the complexity of the system and actively engaging in the system's approach helps to build greater understanding between the various stakeholders and reduces the tendency to look for simplistic short-term fixes. This in turn builds trust between the stakeholders as they realise that they all need each other to help solve the puzzle.

Co-innovation

Building on the AIS approach, co-innovation is consistent with using a systems-based approach to facilitating practice change. Co-innovation is best suited for complex projects where there are no simple answers and multiple stakeholders are involved. Instead of the farmer who is not adopting a particular innovation being the focus (which blames the farmer and represents a pro-innovation bias), the co-innovation approach places the problem at the centre of the whole process.

The relevant stakeholders (often referred to as actors in a systems approach) from the various areas of the value chain are identified and invited to participate on an equal footing with the scientists and other organisational representatives. All the stakeholders are involved in identifying and tackling the problem from the very beginning of the process and are engaged in finding and assessing possible solutions (Botha *et al.*, 2014). As stated by Farrell,

VanDeveer, and Jäger (2001, p. 12) ‘science is more effective if it is demand led’. This collaboration creates a foundation of improved trust and respect between the stakeholders (Dale, 2018).

This approach utilises the role of a reflexive monitor who is independent from the rest of the project team and is focused on helping all the stakeholders involved to constructively participate. They observe group processes and suggest appropriate changes to facilitate effective interaction and learning. They also help keep the project team focused on the vision (Van Mierlo *et al.*, 2010).

Co-design

Co-design is another form of participatory design approach that attempts to actively engage key stakeholders in the design process, which helps ensure that that the resulting product meets their needs (Prahalad & Ramaswamy, 2004). Knowledge co-production in the context of sustainability research is similar, and is defined as: ‘Iterative and collaborative processes involving diverse types of expertise, knowledge and actors to produce context-specific knowledge and pathways towards a sustainable future’ (Norström *et al.*, 2020).

Irrespective of which of the participatory approaches is used, it is through this continued interaction and engagement of the co-innovation process that trust is built. As Harris and Lyon (2013, p. 118) conclude, ‘trust was built through working together, openness and putting themselves at risk from others, discussing issues democratically’.

As reported by Alluvium (2020), the ongoing Landholders Driving Change (LDC) program is a Major Integrated Project in the Burdekin, which demonstrates many of the important principles of a participative research approach. While most of the land in the project’s area is used for grazing, other uses include national parks, state forests, and mines (four coal mines, a gold mine, and 119 abandoned mines). Additionally, four local councils operate in the catchment, which include major infrastructure, power transmission lines, local and main roads, and rail lines. While the project is led by NQ Dry Tropics, it involves service providers from CSIRO, JCU (TropWATER), and various Queensland government departments.

Using a co-innovation approach, it involved the key stakeholders from the very beginning. It commenced with a workshop that involved landholders from more than half the properties in the area. Again, consistent with the co-innovation approach, key actors, including graziers, representatives from mining companies, utility companies, research organisations, and government departments, were identified and invited to the workshops.

Participants at the workshop were invited to suggest what the focus of the project should be, which is an important element of the co-design process. Their suggestions included gully remediation; improving pasture cover; education and training; incentives to support better practices; and forging closer links between landholders and policy makers. The attendees emphasised that gully erosion was not just a grazier issue and added that other land users should be involved. All the ideas raised were discussed, documented, and analysed after the sessions.

As an NQ Dry Tropics representative commented: ‘In order for the project to be truly grazier-focused, it was critical to involve them from the very start of the design process… our goal is

to engage and get everybody participating and adopt a good relationship ethic. We've just got to find the trigger that does that… that means that the LDC has resulted in a design and a delivery that is very tailored to individual needs, and is very flexible in its approach' (Alluvium, 2020, p. 85).

The project team collated the landholders' ideas, then developed and prioritised them into an action plan. Over the following months, a group of local graziers, scientists, government officers and technical specialists met regularly to design appropriate activities. It was decided that these activities should reflect the advice of the local community, reduce levels of sediment runoff to the reef, and help achieve enduring sustainable and productive land management. A variety of tools and interventions are being used, including: one-on-one extension, peer-to-peer learning, trialling and promoting innovative agricultural practices, remediation actions, customised incentives, stewardship payments, and systems repair works.

Again, as quoted by Alluvium (2020, p. 85), 'There's a couple of really important things… one is providing an environment in which different perspectives can be heard. What we've done, particularly with the project panel, which brings together government industry, graziers, and scientists, is provide an environment that is very safe and respectful … no one perspective is right or wrong'. Alluvium (2020, p. 85) continued by stating, 'The stakeholder collaboration is very, very intense with landholders driving change. It takes time and money to invest in, support, and continue that. But it also builds that trust and allows that sharing and transferability…'.

The LDC project has used the co-design process to build trust between all those involved to promote collaboration. This is a critical ingredient for long term behaviour change and as quoted by Alluvium (2020, p. 85): 'I don't think you can undervalue or underestimate the importance of trust… At the end of the day, land managers need to trust us, in terms of going on the journey, and in terms of the advice we are giving'.

An interesting outcome from this project was the transformation that appears to have occurred in the relationships between some of the key players. As a result of their involvement with this project, one of the senior scientists seems to not only be more accepted by the landholders, but also appears to be more accepting as result of the exposure to landholders (S. Crawford, personal communication, 2 October 2020). This is presumably as a result of the increased trust and open communication. Further, it could be due to the Client centred therapy concept that people change through relationship with others (C. R. Rogers, 1951).

The LDC project has built trust at different scales, providing opportunities for one-on-one interactions, peer-to-peer learning, cluster groups, sub-catchment and whole-of-catchment events. All of this helps build the social capital in the region. This lays a solid foundation for future activities and helps lubricate the way for future practice change. The project has already achieved some good outcomes, particularly with 80% of landholders participating in two or more activities, up from 49% prior to the project (Alluvium, 2020).

Similarly, Project 25 also used participative research methodologies, utilising a bottom-up approach to integrate sub-catchment monitoring and intervention to identify hot spot sub-catchments through localised water quality monitoring (Davis *et al.*, 2021). The project emphasised industry ownership, and enabled growers to participate directly in the design and

management of the water quality monitoring program. The development of real-time information and feedback on local water quality was a relatively novel approach to farmer engagement (Waterhouse & Pineda, 2021). Initial feedback has indicated that the participants highly valued the quality and quantity of engagement, particularly the ongoing two-way communication with scientists, leading to high levels of trust. As a result, some of the grower participants were able to act as leaders and influencers within their local farming community, increasing the adoption of water quality improvement approaches (Davis *et al.*, 2021).

3.2.7 Project management

The *Management synthesis for Reef programs* report was undertaken to 'ensure that projects are designed to be fit-for-purpose to each individual context and situation, and delivered effectively and efficiently to ensure maximum impact' (Alluvium, 2020, p. 37). A framework for Reef project design and delivery was developed, highlighting 10 key principles, as shown in Figure 11. Whilst not all of the principles relate to building trust, the ones that do will be covered in the sections below.

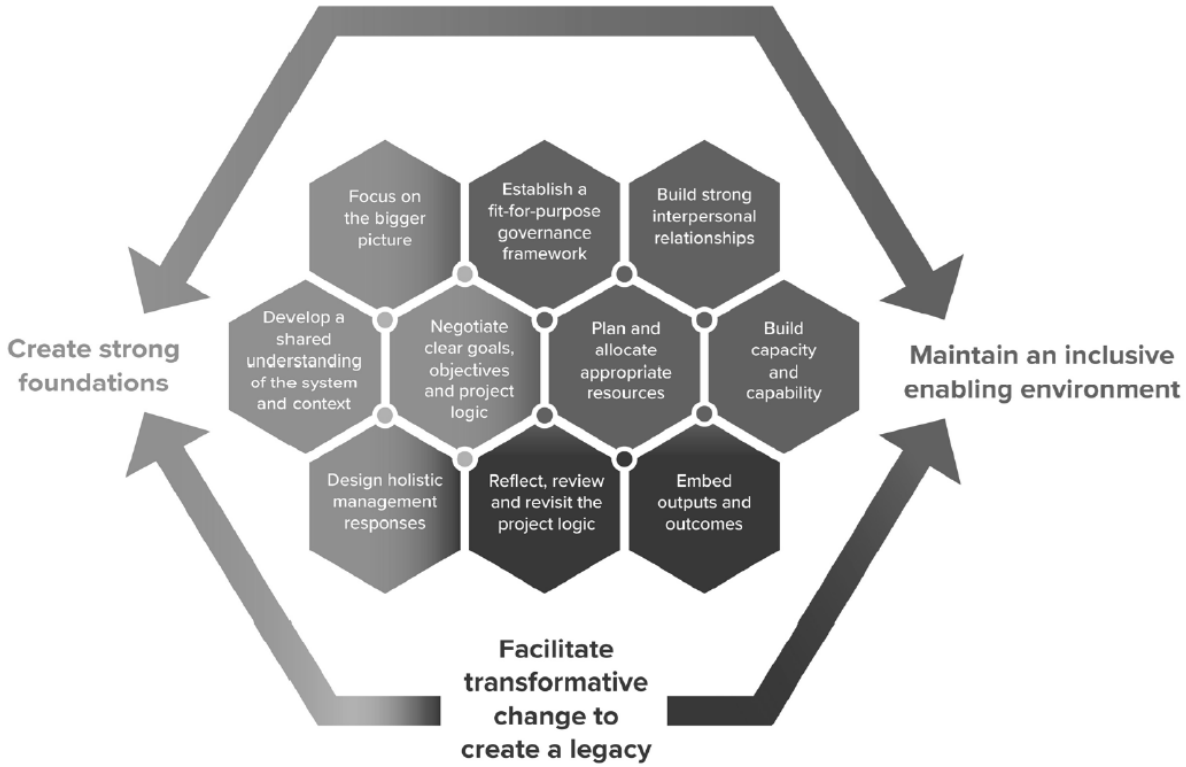

Figure 11: The framework for Reef project design and delivery. Source: Alluvium (2020).

Develop a shared understanding of the system and context

Since reef water quality projects are undertaken in a complex environment with multiple contextual factors and stakeholders to consider, developing a solid foundational understanding of the system and context is critical. This ensures that the problem is accurately defined, the risks are understood, and clear goals are formulated.

Project teams need to develop a shared understanding of the system and context, looking at the situation from multiple perspectives (e.g., the scientific perspective, the policy perspective,

the landholders' perspective, and the environmental perspective). It is highly desirable to have a common understanding of the problem among stakeholders who are then involved in developing the solutions. Successful projects purposefully included multiple stakeholders in this process, using participatory and collaborative approaches (Alluvium, 2020).

Negotiate clear goals, objectives and project logic

Defining a project's goals and objectives is one of the most important steps in project management (Heagney, 2016). Involving team members and collaborators in this process allows them to have ownership and trust in the overall goal and objectives and not be confused about the intention of the project.

Clear goals and objectives allow the project leader to have a clear line of sight for planning and implementing the project, whilst being flexible and using adaptive management when factors change unexpectedly. This is a common occurrence when working with living systems, especially those dependent on weather conditions. Reef water quality projects are particularly prone to change and, as new aspects emerge, usually do not proceed exactly as planned (Alluvium, 2020).

Project logic (better known as program logic, but also as theory of change, impact pathway, causal model, and intervention logic), is a process that focuses on how a project plans to achieve change by making the underlying assumptions explicit (Reinholz & Andrews, 2020). Traditional project planning focuses on what needs to be done by when and to what standard. Program logic helps you work through why you are choosing particular interventions and the logic behind those choices. This can be displayed graphically, as shown in Figure 12.

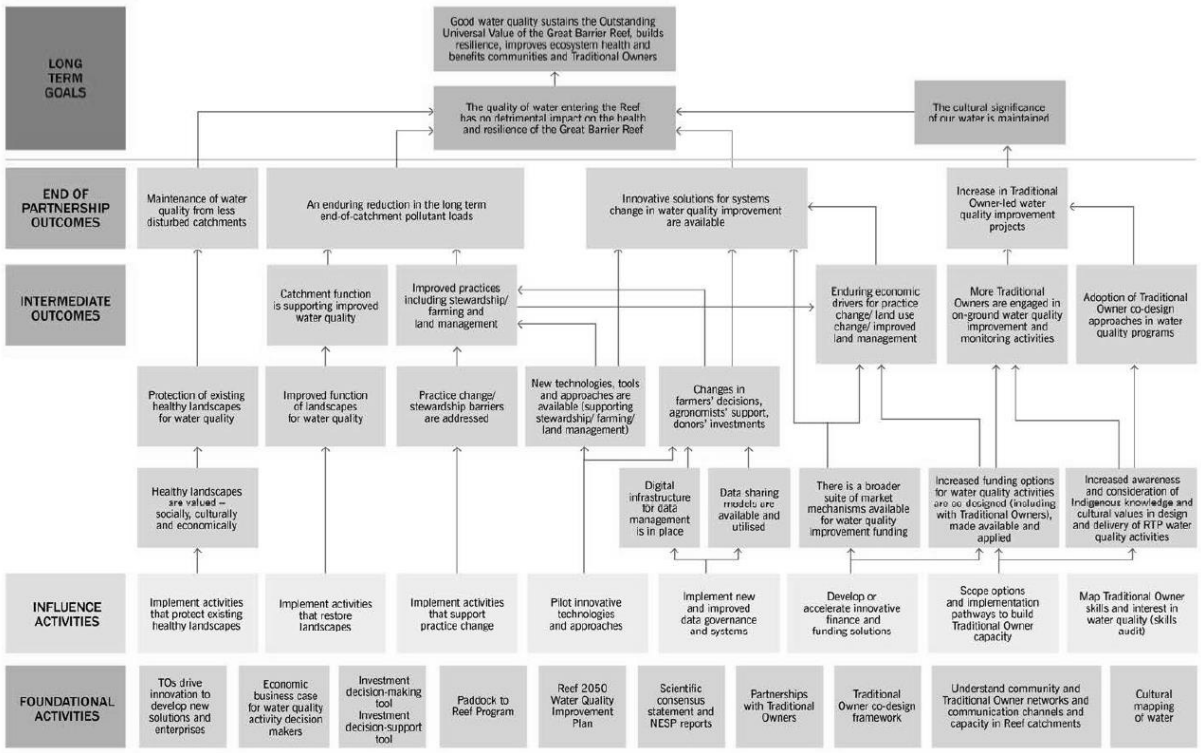

Figure 12: An example program logic for water quality. Source: Reef Trust Partnership (2019, p. 33).

While useful in designing projects, it is equally useful for subsequently planning, implementing, and evaluating the project. Beginning with a program logic based on a system understanding is particularly useful, as it can help connect the high-level strategy with what is actually happening on the ground (Alluvium, 2020). It is important that your team members and stakeholders are given the opportunity to contribute to the program logic, as that will entrust them with greater ownership (Funnell & Rogers, 2011). The detail of the program logic can help people have greater trust in the overall process, as it helps them see the steps and assumptions involved.

While there are various ways to develop a program logic, these are the 10 steps suggested by Noble (2019). The 10 steps are grouped into three phases: situation analysis, theory of change and assumptions, as described in the following section.

Phase 1: Situation analysis

The situation analysis begins the whole process and encourages you to take a step back, allowing you to define and explore the problem or opportunity that you are focusing on. You examine its causes, the context and the systems you are working in, and the resources you have available.

Step 1: Situation analysis

Develop a brief problem/opportunity statement in just one or two sentences. This will help you and others more clearly understand it. The sharper and narrower you can make this statement, the better. Consider questions such as: who is affected, what are the consequences of inaction, what might be causing the problem, what might some barriers to change be, how might these barriers be overcome, who else is working in this area?

Then consider the resources you have available and what you can contribute. Consider questions such as: what existing resources do you have available (including experience, reputation, connections, expertise, and funding). Who might collaborate with you and what would they bring to the table? What are the high priority areas to focus on, and which are the lower ones? What approaches would you rule out and why?

Phase 2: Theory of change

Clearly define your target groups. Who are the people or institutions you aim to work with, and what are their characteristics and needs? Then define the sustained impact you strive to achieve for each of the target groups. Next, working backwards, define the shorter-term outcomes you think are needed to make this impact. Then define activities and mechanisms that you think will make the outcomes more likely. Finally, consider the sequence in which the change might occur and summarise it in a diagram.

Step 2: Target groups

Describe the types of people you want to work with directly. These are the ones you plan to focus on, even though there will probably be flow on effects to other groups as a result. Describe the target group in a short phrase or sentence. Then consider the characteristics of the target groups including both objective factors (e.g., age, location, education, and personal histories) and subjective factors (e.g., knowledge, attitudes and behaviours).

Step 3: Impact
Describe what the project hopes to achieve in the long term. Consider what you want the sustained effect on each target group or the environment to be. Think in terms of three-to-five-year horizons and the effect you would hope to see by then. Create some short impact statements that capture the desired impact.

Step 4: Outcomes
Define the outcomes which will contribute to the desired impacts. How will the situation or target groups be different in the shorter term? For your target group, what changes in knowledge, skills, attitudes or behaviours do you hope to see achieved?

Step 5: Activities
Identify the activities you will need to do to achieve those outcomes, but there is no need to go into too much detail at this stage. What will the activities look like and who will deliver them? How could people find out about the activities?

Step 6: Change mechanisms
Describe how you want the people to engage with your activities, or experience them, to make the outcomes more likely and impactful. This could be merely stating that people need to understand your advice to make a change, or it can be more subtle, such as they need to believe your advice is relevant to them and believe they can take action on it.
These should be made explicit, and defining mechanisms can be one of the hardest parts of the process. However, it is also the most useful. It is in this step you are focusing on how your work is intended to achieve change. Consider what will make the activities particularly effective, what is unique about your services, and what are the qualities that your staff or volunteers will need to exhibit.

Step 7: Sequencing
Consider the order that the outcomes and impact might occur in and stages in which it might happen. Think about how you expect the change to happen and what your contribution might be. In this step you might identify gaps in your reasoning or realise that some activities are more applicable to different stages. For long-term projects, this can help you set more intermediate objectives and early indicators of success. This step is about identifying a broad logical pattern, even though in reality we know that people will move back and forth, jumping from one stage to another.

Step 8: Theory of change diagram
Drawing a visual representation of your program logic helps you to be more succinct and possibly see new connections or spot some gaps. It is also a useful communication tool for sharing your plan with others.

Phase 3: Assumptions
The final phase encourages you to think again about how your external context might influence your theory of change and what the weaknesses or assumptions may be.

Step 9: Stakeholders and 'enabling factors'

What do you need other stakeholders or collaborators to do (or not do) to support your theory of change? What factors outside your control might affect your theory of change? What other contextual conditions might affect your theory of change?

Step 10: Assumptions

Identify the places where your theory of change is weak, untested, or uncertain. This helps clarify your biggest concerns and helps you identify your main research questions. Consider what your fiercest critic might say about your plan. What would they say the weakest part of it is and why? Why might people say your project will not make a difference? What are some possible unintended consequences?

It is important to note that the resulting program logic needs to be adaptable and able to respond to change, subsequent interventions, and possible changes in objectives (Funnell & Rogers, 2011). This will enable the project team to be flexible and use the principles of adaptive management to steer the project towards the desired outcomes, despite changes occurring in the internal and external environments.

Build the 'right' team and allocate appropriate resources

Personnel

As mentioned previously, successful projects tackling complex problems often use a transdisciplinary approach and require team members with a variety of disciplinary backgrounds and diverse skills. It can take considerable time and effort to identify these skills and recruit appropriate team members for the life of the project (Alluvium, 2020). Ideally the team would include some individuals who are already well-known and trusted by the target group. Using a co-innovation approach, these would include members of the target audience who are well respected by their peers. Include traditional owners when appropriate.

When establishing projects that require strong trust frameworks in place, the resourcing implications of having dedicated scientific staff available and responsive within the initial time period across multiple smaller groups of growers, over several target catchment areas, would need to be considered (Davis *et al.*, 2021). Networking these multiple otherwise standalone groups could form a broader, connected learning community. This could benefit both the resourcing issue and also help increase bridging social capital within the industry. This may be necessary to overcome some of the more dominant cultural issues regarding water quality.

Time

Trust takes time to build (Lewicki *et al.*, 1998; Pretty, 2003) and through numerous interactions. Wolfenden and Evans (2007) stated that it is critical to allow time for trust to develop. In their irrigation project where data sharing was critical, it did so through successive data exchanges. Eberhard *et al.,* (2013) stated that it took almost three years to establish the Fitzroy Partnership for River Health, including two years of network meetings. They commented that collaborative approaches and partnerships 'can take a long time to establish, build trust and negotiate their collective role' (Eberhard *et al.*, 2013, p. 684).

As detailed earlier in this report, trust is built over an extended time of period. It was noted by Alluvium (2020) that it can take 18 months to build effective relationships in new projects, so it may be more realistic for behaviour change projects to be funded over a five or seven-year

period, instead of the traditional three-year period. This is particularly the case when using a co-innovation approach. Involving the key stakeholders from the beginning of the project to help design the approach is time consuming and can be resource intensive with the number of meetings required.

One of the success factors identified by Alluvium (2020) was the need for new projects to consider suitable timeframes for building meaningful interactions, which allow relationships and trust to grow. In the *Management synthesis for Reef programs* report, it was stated that 'getting the conditions right to facilitate the development of strong interpersonal relationships over time, or within the life of a project, can be challenging' (Alluvium, 2020, p. 58). As one grazier commented: 'There is a saying that change will happen at the speed of trust, and it's not something that happens overnight. So you can't just put all the ingredients into one workshop and go yeah, they trust us now, off we go' (Alluvium, 2020, p. 86).

This highlights the benefit of involving those extension service providers who already have existing effective relationships with landholders (Davis *et al.*, 2019). Another key success factor identified by Alluvium was the need to maintain the continuity of the delivery team, and especially key individuals, as this is essential for building trust over time. As trust is built over timeframes greater than individual projects, involving trusted local individuals from project to project is wise. As quoted by Alluvium (2020, p. 86): 'I think some of the ingredients to building that trust over time is the experienced and well respected team members. However, through the LDC project, it has been proven that we can have new team members come on and with the right support they are able to grow their own experience, build those relationships and form their own trust levels'.

It is important that the engagement and interaction continue for the life of the project, and not just occur at the beginning. Greiner (2015) reported that while farmers reported feeling high levels of satisfaction with the initial transparency and engagement, that soon turned to frustration when it was not maintained throughout the project. Even when a stakeholder's opinion is not adopted, transparency around the reasoning enables the stakeholder to feel even more invested in the process (Haubold, 2012).

It was for these reasons that Project 25 took the time to recognise and cultivate trust frameworks at the beginning of the project, as they recognised that they do not develop instantaneously (Davis *et al.*, 2021). It was only after that initial trust was formed that any major effort was put into attempting to significantly change grower behaviour on-ground.

Other resources

It is sometimes difficult to correctly estimate the resources for a new project, especially system-based ones that have inter-connected relationships. Resourcing requirements will need to be adaptively managed when it becomes clear that additional physical resources or expertise is required to deliver the project effectively (Alluvium, 2020).

Create strong interpersonal relationships

It is imperative that strong interpersonal relationships be built from the very beginning of the project to ensure that each team member knows each other well and trusts one another. This can take a considerable amount of time, so time needs to allocated to it during regular team meetings. The continuity of the delivery team members is an important factor for building trust

over time. Therefore, it is important to retain key individuals who have developed strong relationships with farmers in the region, especially between short-term projects. Building a strong foundation for trust and effective communication will help ensure the project's success (Alluvium, 2020).

Along with building trust among the team members, it is important to do the same with the target audience, so they also trust the team members. It is suggested that initial project activities be designed as low-risk interactions for the farmers attending. Over time the risk levels can be increased as relationships and trust grow. Examples of low-risk interactions include farm walks, farm shed meetings, and activities that may have weaker links to water quality (e.g., pig shooting, or installing off-stream watering). These can provide opportunities to build relationships and trust that will then lead to higher risk activities with a much greater water quality benefit (Alluvium, 2020).

If farmers perceive that the extension officer or scientist they are working with shares common values around caring for farm productivity and profitability, as well as environmental issues, farmers will be more likely and willing to engage and share information with them. According to Alluvium (2020), demonstrating commonly held values through behaviours and attitudes is a key to successfully establishing interpersonal relationships that underpin practice change.

As mentioned previously, framing oneself as an expert and telling people what to do doesn't help persuade farmers to change their practices. Instead, farmers are more receptive to working alongside extension officers and scientists as mutually respected members of the practice change journey (Alluvium, 2020).

Reflect, review and revisit the project logic
Reef water quality projects often do not proceed exactly as planned, as new aspects emerge and assumptions are made and realised. The way to manage this is to continually reflect, review, and revisit the project logic in order to adaptively manage the project. Successful projects anticipate change and plan accordingly. Effective monitoring, evaluation, reporting, and improvement (MERI) plans are becoming more common. It is still a challenge to use these well as a tool to drive continual improvement (Alluvium, 2020).

3.2.8 Communication

Communication entails conveying information between two or more people and can be seen as imparting (one-way) or exchanging (two-way) information. It should be noted that the lower levels of the participation spectrum use one-way communication (namely, involve and consult), while the higher levels increasingly use more two-way communication. Due to the diversity of farmers involved, a diversity of approaches and delivery agents is required to effectively engage and communicate with them (Taylor & Eberhard, 2020).

When landholders seek information about how to potentially undertake a new management practice, they are more likely to look to their own social network of people with whom they already trust and share similar values and attitudes (Cary, Webb, & Barr, 2001; Pickering, Hong, Hong, & Kealley, 2017; E. Rogers, 2003). Using existing trusted communication networks facilitates the rapid sharing of information and increases the amount of information shared, particularly when it involves making economic decisions under uncertain conditions

(Breetz, Fisher-Vanden, Jacobs, & Schary, 2005). A survey by Emtage and Herbohn (2012b) indicated that neighbours and other farmers in FNQ were the most trusted and preferred source of information for the landholders surveyed. When landholders receive a range of different information and advice from various organisations, including those from state and federal governments, this can contribute to distrust (Hay & Eagle, 2018).

Improving communication materials that target farmers would improve the effectiveness of practice change efforts. A greater application of communication theory and frameworks and use of visual imagery to reinforce key messages would help with this (Hay & Eagle, 2019). Appropriately acknowledging farmers' efforts is important and may help other land managers adopt the new approaches, as well (Hay & Eagle, 2018, 2019; Hay, Eagle, & Saleem, 2019). The reading level of articles for the general public (including farmers) should be at the comprehension level of a grade 9 student, whereas the writing style of many farmer-focused publications was too complex (Hay & Eagle, 2016). Failing to use Plain English can reduce trust in that information, as it results in uncertainty and feelings of vulnerability (de Vries *et al.*, 2015). It has been shown that recommendations from scientists can be dismissed by farmers if the advice provided is too technical to understand (Halabi & Carroll, 2015), and needs to be communicated in a way that the farmer can understand, relate to and easily apply (McKitterick *et al.*, 2019).

Effective communication between stakeholders is an important aspect of project management (Greiner, 2015; Hay & Eagle, 2018; Hay *et al.*, 2019), and it was reported that farmers involved with Project 25 in the GBR catchments valued the ongoing two-way communication between themselves and scientists. This helped bridge the on-farm knowledge with water quality monitoring data (Davis *et al.*, 2019). As one grower reported: 'You take the growers with you and you will get more uptake… more of an outcome because you'll get more belief in the science' (Davis *et al.*, 2019, p. 26). Communication at shed meetings, working together in the paddock and discussions during the steering committee meetings was also seen to provide opportunities for open discussion. It not only helped to create a safe space for growers to share their thoughts, but it also enabled researchers to engage with a wider audience. The ongoing two-way communication that appreciated the farmers' expertise was seen as a critical component of engagement.

Greiner (2015) reported that growers appreciated the one-on-one consultations with technical specialists, assisting them with their tender proposals. Arklay, van Acker, and Hollander (2018) noted the importance of immediate communication to growers regarding water quality results from monitoring sites and how that helped build trust. The same authors described the importance of framing the message, as protection of the reef was not in and of itself a motivator for change, whereas productivity and cost savings were for the farmers involved in the trial. Similarly, Taylor and Eberhard (2020) state that communication that is focused on water quality improvement will have limited influence on many landholders.

A survey of almost 3000 individuals (MacKeracher *et al.*, 2018) sought to determine to what degree stakeholders trust reef-related information. Of the five sources of information studied, research institutions were the most trusted, followed by friends, family, and co-workers, non-government organisations (NGO), the Great Barrier Reef Marine Park Authority (GBRMPA), and industry groups. A demographic analysis determined that trust did not differ with gender. However, trust was negatively related to age for all sources of information except friends,

family, and co-workers. Interestingly, stakeholders living in the northern GBR region were less trusting of research institutions compared to those living in the central and southern regions. Importantly, this study determined that trust in information received from peers was independent of age, most likely due to the existence of close personal relationships and a sense of connectedness.

The results from MacKeracher *et al.* (2018) indicated the need for undertaking targeted engagement activities particularly with older stakeholders to build trust. Ideally these would use social learning and participatory approaches to encourage trust to be built. As trust in peers was relatively high for both younger and older people, the use of informal networks to disseminate information could be effective. Instead of a 'one-size-fits-all' approach, both the information content and channel should be targeted and framed to suit the audience.

One way of tailoring the message for the target audience is to use market segmentation. Care should be taken to avoid describing these segments 'without implying 'good' or 'bad' management' (Waters *et al.*, p. 47). Understanding the differences between these groups can help design effective communication and engagement strategies (Taylor & Eberhard, 2020). Bohnet *et al.* (2011) developed a typology of graziers in the Bowen-Broken basin, identifying three broad types of graziers: traditionalists, diversifiers, and innovators. The traditionalists are generally older (over 60 years of age), value their independent lifestyle and allow their livestock to graze all available paddocks without any rotation. Diversifiers are younger, are motivated to manage efficient businesses, they diversify their income stream to minimise risk, and they use wet season spelling to maintain land condition. Innovators are also younger and instead of focusing on beef production, they focus on grass production and practice cell grazing.

Emtage (2009) undertook a survey of rural landholders located in Far North Queensland (FNQ), and identified five groups, related to their interest in and concern about natural resource management issues and their level of adoption of best practices. The five groups were described as 'well-connected and progressive' landholders (10% of the sample), 'concerned but unengaged' landholders (20%), 'multiple objectives group' landholders (20%), 'production orientated' landholders (10%), and 'disconnected and conservative' landholders (40%). The last group was characterised by low levels of trust in other people and institutions and had low levels of adoption of best practices. They indicated that in the previous five years they had not had any involvement with government natural resource management (NRM) programs. It was noted that 'changing the behaviour of this group is unlikely to be achieved in the short term given their lack of awareness about and interest in NRM, together with their low levels of trust in others, low use of external information sources and lack of motivation with respect to their landholdings' (Emtage, 2009, p. 42). It should be noted that a study by Rolfe and Gregg (2015) into the pastoral industry cautioned that using simplistic landholder typologies may be ineffective unless they are specifically tailored to the particular issue and intended action by landholders.

An important aspect of the communication message is that it should not tell people what they ought to do. A large survey-based experiment with almost 2000 respondents in the US (Palm *et al.*, 2020) found that specific recommendations for behavioural change decreased the willingness of individuals to undertake personal actions to make positive practice changes. The authors found that regardless of the source of the information about climate change, the included recommendations related to personal behavioural changes decreased individuals'

willingness to undertake personal actions to reduce greenhouse gases, decreased their willingness to support pro-climate candidates (in the US), reduced their personal belief that the speed of climate change is accelerating, and decreased trust in climate scientists. The authors postulated that the results may be due to the concept of psychological reactance, which can be triggered when people are told what to do and where their freedom of choice is being infringed by others.

The need for communication of positive outcomes for the broader farmer community was identified by Rundle-Thiele *et al.* (2021) who encourage the greater use of positive stories. These can reach across regions, delivering hope and inspiration for others. This could be through the use of interesting case studies, allowing farmers to learn from each other.

Project 25 team members strived to develop effective communication with the canegrowers involved with their project, aiming for a bottom-up approach involving landholders, instead of the usual top-down one where landholders are told what they should do. This appeared to be well appreciated by the growers involved, with comments such as 'It has been invaluable that the growers and researchers are communicating, sharing their issues and ideas, understanding each other's challenges and building a trust framework. This approach can only have a positive effect and because of this, real gains are achieved' (Davis *et al.*, 2019, pp. 10-11).

The Project 25 team encouraged two-way communication between themselves and the more than 100 canegrowers in Far North Queensland. The scientists held regular meetings with local farmers, kept them updated of the latest scientific developments and results, and discussed practical management options for reducing the harmful impact. In turn, the canegrowers were able to educate the scientists about the financial and practical aspects of managing a cane property. This two-way communication and co-operation improved trust and understanding, leading to successful environmental outcomes for the GBR whilst also being acceptable to the canegrowers (RRRC, 2020).

A major benefit of the close involvement of growers in the program was the opportunity for constructive conversations around water quality science, and encouraged communication of government policy aims. It became evident that there was considerable confusion around GBR catchment monitoring, misconceptions about end-of-catchment targets identified in government policy, and issues such as the relative contribution of different land-use types. Project 25 provided local data (not modelled data) to help clarify these issues. Explaining the data collection process, the underlying concepts, and presenting this local data to the committee and also larger meetings enabled a greater understanding of the issues. The use of language more understandable to growers and in a coherent, clear manner proved an effective method of engagement (Davis *et al.*, 2021).

3.2.9 Relationship

Relational practice is one of the core elements of the Extension Model of Practice (Williams *et al.*, 2021) which has farmer-centred practice at its heart (see Figure 13), supported by the three core practice elements of relational practice, change practice, and technical knowledge practice. Relational practice develops rapport and seeks to understand the needs, goals and priorities of the farmer. When interacting with farmers, extension practitioners should be

supportive and empathic, by being encouraging, caring, and enthusing. Farmers should experience a sense of connection and rapport with the extension practitioners, and be seen as equal partners in the research (Neef & Neubert, 2011).

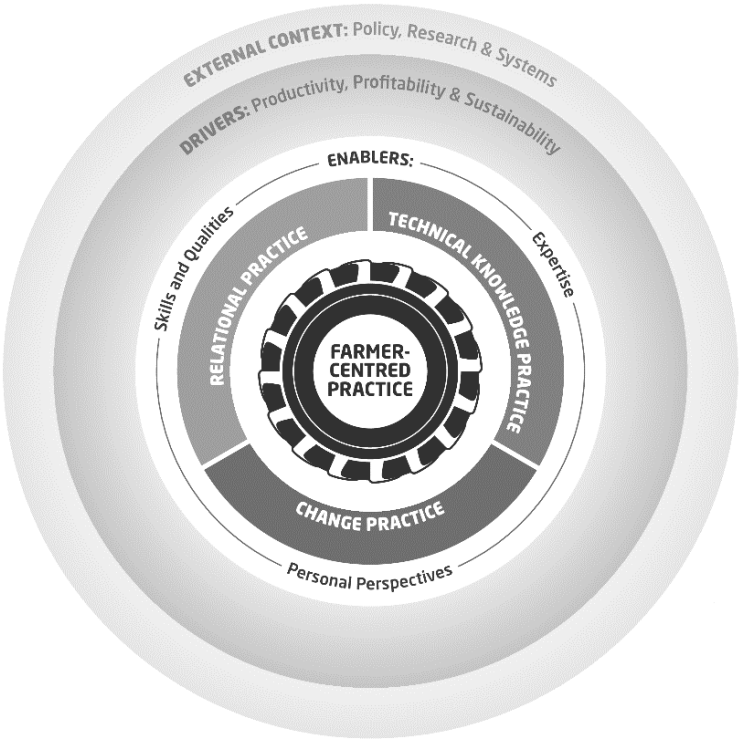

Figure 13: **A diagrammatic representation of the Extension Model of Practice. Source: Williams *et al.* (2021).**

The Client-centred therapy approach assumes that people change when in relationship with others (C. R. Rogers, 1951; Tully, 1964). Thus, it is little surprise that the provision of information alone rarely results in behaviour change (Cinner, 2018; B. R. Cook & Overpeck, 2019; Pannell *et al.*, 2006). This deficit model approach assumes that the lack of change in someone's behaviour is simply because they are not aware of some key information, rather than psychological or socio-contextual factors (Burgess *et al.*, 1998).

An alternative model is the use of relationship building, rather than education. B. R. Cook and Overpeck (2019, p. 10) define relationship as 'a long-term consensual interaction between individuals, conducted respectfully and transparently (i.e., no manipulation or predetermined ends)'. The research of Broockman and Kalla (2016) indicates that long-lasting impacts on people's attitudes, especially with regards to prejudices and controversial issues, can occur when the relationships are guided by efforts to take on the perspective of others.

Modern environmental behaviour change programs use the three historical levers of shifting material incentives, promulgating rules and regulations, and information provision, as well as the three recent ones of choice architecture, emotional appeals, and social influences (Bujold *et al.,* 2020).

The following guide for meaningful interactions (B. R. Cook & Overpeck, 2019, p. 11) is based on the work of Hicks (2011). The recommendations include:

1. Treat all individuals as neither inferior or superior to yourself;
2. Commit to all individuals being welcome in the space of interaction;
3. That all individuals be physically and psychologically safe and free from humiliation;
4. 'Give people your full attention by listening, hearing, validating, and responding to their concerns, feelings, and experiences' (Hicks, 2011, p. 25);
5. That each individual is recognized for their individual talents and potential contributions;
6. That fairness and equality guide all interactions;
7. That all people be assumed to have good intentions until proven otherwise;
8. The need to 'Believe that what others think matters. Give them the chance to explain and express their points of view. Actively listen in order to understand them' (Hicks, 2011, p. 26);
9. That all individuals are free to act on their own behalf so that they are in control of themselves and their lives; and
10. That all individuals take responsibility for past actions that might have violated others' dignity.'

According to Hay and Eagle (2019), extension officers and other stakeholders wanting to increase the trust dynamic with farmers need to be building positive long-term relationships with them. However, developing these relationships and trust takes insight (the capacity to gain a deep understanding of others' worldviews). This insight develops over time, from repeated observations of the other person's situation (Sanova, 2017). Farr *et al.*, (2017) suggest that this aspect is so important that extension officers should seek suitable professional development to further improve their ability to build trust and engagement with land managers. The need for upskilling extension providers was also highlighted by Rundle-Thiele *et al.* (2021).

The influence of time is also mentioned by Kuehne *et al.*, (2019, pp. 26-27): 'a farmer's commitment to their advisor will remain strong if they have frequent meaningful interaction over a long period of time, high perceptions of equity and value, trust and confidence'. The longevity of the relationship, and the frequency and consistency of contact, are all seen as essential elements of a trusting relationship (Hilkens *et al.*, 2018).

3.2.10 Credibility

Credibility relates to the extent to which a communicator is perceived to be believable and capable of making correct assertions. The credibility of a source is dependent upon two factors: expertise and trustworthiness. Expertise relates to the extent to which a person is perceived to be capable of making correct assertions. Trustworthiness relates to the degree to which the audience listening to a speaker perceives the assertions made by the speaker to be ones that the speaker considers valid (Hovland *et al.*, 1953). Highly credible sources are seen as more persuasive than others, as long as the message is perceived as trustworthy by the audience. It is important to note that being an expert in a topic does not automatically equate to trustworthiness (Pornpitakpan, 2004).

For achieving behavioural change, using a trusted source as the contact is important. It has been shown that in general, the higher the credibility of the source, the more persuasive it will be. This is particularly important when the message is complex, there is little available experience, and it involves a high personal risk (Blackstock *et al.*, 2010; O'Keefe, 2002). Experience and occupation are key factors that convince people of the reliability of the source. As people are more open to messages from others within their group, using people from similar backgrounds or trusted networks is likely to enhance the uptake of messages (Blackstock *et al.*, 2010; Osmond *et al.*, 2012). For example, having farmer facilitators improved the uptake of the Environment Farm project (G. M. Robinson, 2006).

Tully (1964) reported the large influence that a farmer's in-group (i.e., the farmers with whom they associate) had on their attitudes and beliefs regarding farming practices in Queensland. More recently, other research with Australian farmers showed that identification with the in-group and perceptions of group norms influenced the farmers' intentions to adopt new farming practices (Fielding *et al.*, 2008). This is congruent with the Social Identity Theory (Tajfel *et al.*, 1979), where people behave in ways that are compatible with their social identity (Sparkman & Walton, 2019).

It was for these reasons that Project 25 chose to use water quality scientists who already had established experience and rapport with the sugar industry and the related water quality issues (Davis *et al.*, 2021).

3.2.11 Transparency

Transparency, in a social context, occurs when a person operates with openness so that it is easy for others to see what is being done. Transparent communication has been identified as an important element for effective knowledge sharing and collaboration (Paschen *et al.*, 2018). Further, perceived hidden agendas and suspected vested interests were identified as a key impediment to effective knowledge sharing and collaboration. As noted by one workshop participant, 'Often it's just a perception thing [but there is a] suspicion of agendas that puts up barriers to getting the information' (Paschen *et al.*, 2018, p. 10). When there isn't transparency, it's been shown to lead to dissatisfaction (Farrell *et al.*, 2001; Greiner, 2015; Lankford *et al.*, 2004).

The issue of transparency was raised numerous times during the Senate Inquiry, and one respondent commented that scientists need to be transparent about the processes they use and, in doing so, demonstrate similar values to the community (Commonwealth of Australia, 2020).

Transparency of data and its collection was a key aspect of Project 25. High quality, long-term water quality data was collected from the sites, as the local cane industry wanted the local water quality information to be underpinned by high quality data. The project trialled the integration of relatively traditional monitoring approaches (of discrete sample collection for subsequent laboratory, with the emerging real-time (sensor-based) monitoring. The presentation of 'real, locally developed data is clearly a very effective tool for addressing known challenges or points of contention in sugarcane industry understanding of water quality issues' (Davis *et al.*, 2019, p. 21).

4.0 DISCUSSION AND CONCLUSION

'To earn trust, money and power aren't enough. You have to show some concern for others. You can't buy trust in the supermarket.'
Dalai Lama

The key elements for successful behaviour change in best management programs, as determined by this synthesis project are…

4.1 Trust

Trust is having confidence in how one will be dealt with by another person and is established through experience. The benefits that accrue from strong levels of trust include improved communication and increased levels of cooperation. Trust has been described as the relational glue that enables both formal and informal social interactions, knowledge sharing, and innovation processes. Trust allows individuals to predict how others will behave in a mutually acceptable manner and enables people to manage their perceived sense of risk and personal vulnerabilities in their interactions with others. By increasing trust, you increase the speed of transactions and reduce their cost. All these benefits help make trust a critical component of water quality behaviour change projects, because if the farmers do not trust the scientists, little change is going to happen.

Trust in an individual results from an interaction of character and competence and has the four sub-elements of integrity, intent, capability and results. Integrity, which relates to one's character, is about being honest and fair, and having a reputation for being authentic. This is particularly important for those scientists interacting with farmers, ensuring that they don't misrepresent their data or communicate their own biases. Having good intent is about being caring, transparent, and open – not trying to deceive or protect anyone and not having hidden motives. For scientists and those working with farmers, this is where having common values related to caring for farm productivity and profitability, as well as environmental issues, can result in farmers being more amenable to change. Capability relates to having suitable skills, knowledge, and experience for a given task. Importantly, capabilities relate to our ability to establish, grow and restore trust. In our context, scientists need to not only have a good understanding of water quality science, but also be able to communicate that knowledge effectively and relate to farmers. Finally, good results demonstrate a good reputation, credibility and that you have shown your capabilities effectively in the past with good performance. This is an essential quality for the extension officers working alongside the scientists, as they are often the ones who are already well-known and trusted by the farmers.

While trust can take years to build, it can be lost in an instant. Once trust is broken, it is difficult to rebuild. Being a psychological contract, once it is broken, rebuilding the relationship is extremely difficult, as when a psychological contract is violated, it involves a breach of promise and trust. This then goes beyond disappointment and produces feelings of betrayal. Violation of a psychological contract undermines the very factors, such as trust, that led to a relationship being established in the first place. Once broken, it is important to determine how the trust was lost in the first place and specifically try to rebuild it from there. A violation of character (integrity or intent) is far more difficult to restore than a loss of trust created by a violation of competence.

As a result, scientists and extension practitioners need to pay particular attention to making their intentions explicit. This will then help minimise any misunderstanding that might arise from farmers having to assume the intentions behind a particular action.

4.2 Engagement

The appropriate engagement of stakeholders and community members is particularly important. It needs to be a dynamic relational process that facilitates communication, interaction, involvement, and knowledge exchange. Without suitable targeted engagement activities, it is difficult to build trust with stakeholders, and particularly with older ones. It has been shown that in the GBR catchments, engagement plays an important role in building trust and social resilience, and also contributes to creating local knowledge and tailoring plans to local contexts. It has been seen as an important process for building trust and understanding amongst the cane farmers and other key stakeholders. It can help to strengthening cooperation and collaboration between scientists, farmers, and governments involved in water quality research in the GBR. Unfortunately, it has often been overlooked in the design and implementation of water quality monitoring programs, especially those aimed at creating behavioural practice change in agricultural sectors.

Involving people appropriately is a key aspect to participative research. The use of adaptive, participatory and transdisciplinary approaches is widely recommended for dealing with wicked problems, such as improving the water quality entering the GBR. It has been shown to be helpful to include team members from multiple disciplines, fields, and professions to help co-design the research approach and co-produce the solution-oriented knowledge. Co-innovation involves the key stakeholders in identifying and tackling the problem from the very beginning of the process and keeps them engaged until appropriate solutions are discovered. This approach also utilises the role of a reflexive monitor who is independent from the rest of the project team and is focused on helping all the stakeholders involved to constructively participate. They observe group processes and suggest appropriate changes to facilitate effective interaction and learning. They also help keep the project team focused on the vision.

The way a project is designed and managed can dramatically impact the trust relationships. Since reef water quality projects are undertaken in a complex environment with multiple contextual factors and stakeholders to consider, developing a solid foundational understanding of the system and context is critical. This ensures that the problem is accurately defined, the risks are understood, and clear goals are formulated. It is highly desirable to have a common understanding of the problem among stakeholders who are then involved in developing the solutions. Successful projects purposefully included multiple stakeholders in this process, using participatory and collaborative approaches.

Defining a project’s goals and objectives is one of the most important steps in project management. Involving team members and collaborators in this process allows them to have ownership and trust in the overall goal and objectives and not be confused about the intention of the project. Reef water quality projects are particularly prone to change and usually do not proceed exactly as planned. Therefore, using an adaptive management approach is useful. Program logic is a process that focuses on how a project plans to achieve change by making the underlying assumptions explicit. The detail of the program logic can help people have greater trust in the overall process, as it helps them see the steps and assumptions involved.

It is critical that your team members and stakeholders are given the opportunity to contribute to the program logic, as that will give them greater ownership.

4.3 Communication

Communication is another area to focus on. Due to the diversity of farmers involved, a diversity of approaches and delivery agents is required to effectively engage and communicate with them. When landholders seek information about how to potentially undertake a new management practice, they are more likely to look to their own social network of people who they already trust and share similar values and attitudes. Existing, trusted communication networks help facilitate the rapid sharing of information and increases the amount of information shared.

The use of language more understandable to growers and in a coherent, clear manner ensures the communication is more effective. Framing oneself as an expert and telling people what to do does not help persuade farmers to change their practices. Instead, farmers are more receptive to working alongside extension officers and scientists as mutually respected members of the practice change journey.

4.4 Relationships

Building strong interpersonal relationships are important. The Client-centred therapy approach assumes that people change when in relationship with others. Thus, it is little surprise that the provision of information alone rarely results in behaviour change. Long-lasting impacts on people's attitudes, especially with regards to prejudices and controversial issues, can occur when the relationships are guided by efforts to take on the perspective of others. Scientists and extension officers wanting to increase the trust dynamic with farmers need to be building positive long-term relationships with them. However, developing these relationships and trust takes insight that only develops over time, from repeated observations of the other person's situation. It is important to give the other person your full attention by listening, hearing, validating, and responding to their concerns, feelings, and experiences.

Scientists and extension officers also need to be credible, which relates to the extent to which a communicator is perceived to be believable and capable of making correct assertions. This is dependent upon two factors: expertise and trustworthiness. Expertise relates to the extent to which a person is perceived to be capable of making correct assertions. Trustworthiness relates to the degree to which the audience listening to a speaker perceives the assertions made by the speaker to be ones that the speaker considers valid. Highly credible sources are seen as more persuasive than others, as long as the message is perceived as trustworthy by the audience. It is important to note that being an expert in a topic does not automatically equate to trustworthiness. To achieve behavioural change, using a trusted source as the contact is important. It has been shown that in general, the higher the credibility of the source, the more persuasive it will be. This is particularly important when the message is complex and a high personal risk. As people are more open to messages from others within their group, using people from similar backgrounds or trusted networks is likely to enhance the uptake of messages. Therefore, the use of people from farming backgrounds or other trusted networks to deliver behavioural change messages is critical for success.

The final consideration is transparency, which occurs when a person operates with openness so that it is easy for others to see what is being done. Transparent communication has been identified as an important element for effective knowledge sharing and collaboration and perceived hidden agendas and suspected vested interests were identified as a key impediment to effective knowledge sharing and collaboration.

4.5 Recommendations

The elements identified above need to be used effectively to build trust frameworks into projects. Ideally this is done in the design phase of new BMP programs or Water Quality Improvement Programs, as it is more difficult (but not impossible) to retrofit these approaches into existing projects.

The recommended approaches are woven into the following five steps that project leaders can follow when designing and leading a behaviour change project:

1. team selection,
2. project design,
3. project planning,
4. project implementation, and
5. monitoring and evaluation.

4.5.1 Team selection

Begin with the people. Engage potential contributors early, ideally while still developing the funding proposal, so they can contribute their thoughts and ideas. This will increase their ownership of the potential project. Consider the overall system when identifying potential team members and collaborators, especially those with different disciplinary backgrounds and diverse skills. Ideally the team would include some individuals who are already well-known and trusted by the target group. Using a co-innovation approach, these would include members of the target audience who are well respected by their peers.

4.5.2 Project design

Then focus on the problem. Take the time to use participatory and collaborative approaches to develop a solid foundational understanding of the system and context. This ensures that a problem is accurately defined, the risks are understood, and clear goals are formulated. Project teams need to develop a shared understanding of the system and context, looking at the situation from multiple perspectives (e.g., the scientific perspective, the policy perspective, the landholder's perspective, and the environmental perspective).

Define the project's goals and objectives so they are crystal clear for the project team and potential collaborators. This is one of the most important steps, as it sets the direction of the project. Therefore, take the time to do it well.

Develop the program logic by working through why you are choosing particular interventions and the logic behind it. It is important that your team members and stakeholders are given the opportunity to contribute to the program logic, as that will give them greater ownership. The detail of the program logic can help people have greater trust in the overall process, as it helps

them see the steps and assumptions involved. Follow the 10 steps suggested by Noble (2019) to clarify and develop the situation analysis, theory of change, and assumptions.

4.5.3 Project planning

Develop the funding proposal and build in sufficient time and funding to enable trust relationships to develop and mature, which can take 18 months. Deliberately include processes and activities through the life of the project to create strong interpersonal relationships within your team and with the target audience. Be aware that it is often difficult to correctly estimate the resources for a new project, especially system-based ones which have inter-connected relationships. As a result, allow a buffer or a contingency fund. Develop the monitoring and evaluation plan, so you can track your performance and know you are meeting the required milestones.

4.5.4 Project implementation

While it is tempting to launch into delivering a suite of well-planned outcome-driven activities, it is better to take the time to develop strong interpersonal relationships with the target audience and the wider community. Strong interpersonal relationships built on trust have been shown to underpin the success of projects. Therefore, take the time to do it well.

Focus on communicating shared-values with the farmers around caring for farm productivity and profitability, as it is then more likely the farmers are going to be willing to engage and share information. Remind team members not to frame themselves as an expert and tell people what they ought to do, as that does not help persuade farmers to change their practices. Instead, farmers are more receptive to working alongside extension officers and scientists as mutually respected members of the practice change journey. It is through relationships that people change their beliefs and behaviours.

Begin with low-risk interactions for the farmers attending your activities. Over time the risk levels can be increased as relationships and trust grow. Examples of low-risk interactions include farm walks, farm shed meetings, and activities that may have weaker links to water quality (e.g., pig shooting, or installing off-stream watering). These can provide opportunities to build relationships and trust that will then lead to higher risk activities with a much greater water quality benefit.

When interacting with other team members and members of the target audience, follow the suggestions of Covey and Merrill (2006) to build greater trust in our working relationships:

1. Be honest in your communication and honour your commitments,
2. Be fair and act without bias or discrimination,
3. Be authentic and consistent in all situations,
4. Be caring towards others and find out what else is happening in their lives,
5. Be transparent about your emotions and motives,
6. Be open and receptive to new ideas and opinions, and
7. Be vulnerable and admit mistakes.

4.5.5 Monitoring and evaluation

Use the monitoring and evaluation plan to track your performance over time and to drive continual improvement. Reef water quality projects often do not proceed exactly as planned. Therefore, continually reflect, review, and revisit the program logic in order to adaptively manage.

Consider using a reflexive monitor to help monitor group processes and keep the project focused. Celebrate both the small and large wins with your team and the target audience, as this helps build enthusiasm and momentum.

4.6 Conclusion

In conclusion, whilst trust is intangible and often elusive, it is the glue that holds the people involved with effective projects together. Strong levels of trust improve communication and increase levels of cooperation. By increasing trust, you increase the speed of transactions and reduce their cost. Without it, behaviour change in reef water quality projects will be nigh-on-impossible to achieve. It is well worth taking the time and effort to incorporate the necessary processes for building trust into new projects.

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APPENDIX 1

Survey results

Q1 As you think of the various reef water quality projects that you're aware of, what is the general current level of trust between farmers and members of the science community? Rating scale: 1 (very low) to 10 (very high).

The distribution of responses to this question regarding the perceived level of trust between farmers and scientists is detailed in Table 2 and displayed in Figure 14. The mean of 4.9 indicates that overall, the perception of trust levels was almost evenly split between negative and positive.

Table 2: Perceived level of trust.

	1. VERY LOW	2.	3.	4.	5.	6.	7.	8.	9.	10. VERY HIGH	TOTAL	WEIGHTED AVERAGE
☆	0.00% 0	25.00% 4	0.00% 0	12.50% 2	25.00% 4	12.50% 2	18.75% 3	0.00% 0	0.00% 0	6.25% 1	16	4.94

Figure 14: Perceived level of trust.

The following further comments helped to reveal the thoughts of the respondents whilst responding to this question.

- *Depends on who they are and whether they are in the coastal areas or inland graziers*
- *I think distrust is currently quite high, following disputes regarding the necessity for and impact of Reef Regulations 2019.*
- *There is a lot of variation in this response ranging from 1 to 10. The progressive thinking graziers recognise the WQ challenges and are keen to address them.*
- *While I am in contact with several dedicated farmers and graziers – I do expect there maybe a few with a less trusting position. But my position with farmers is that they are scientists themselves already.*
- *For farmers currently engaged, the trust is low to OK. I suspect trust is a lot lower in those that refuse to engage.*
- *It will depend on the relationship between the farmer/s and scientist/s. If close, trust will be higher.*
- *Of course, this varies at an individual level, but on the whole, I would say trust is very low if we are focusing on Reef science.*

Q2 From your experience, what elements help contribute to higher levels of trust between farmers and scientists?

Responses to this question (with minor changes to improve formatting, grammar, and spelling), were as follows:

- *Talking to the farmers and land managers. Also, spending time with the 'extension' staff that they deal with on a regular basis. Scientists are not extension staff and should not be considered as such.*
- *Transparency, extension officers – one on one communication, willingness to try new options, whether there is general distrust of government and the general view of peers since most people see their peer group as very important and will evaluate new information in terms of what is acceptable to the broader peer group.*
- *Being involved in the process of change.*
- *Listening and discussion, rather than simply presenting information. Treating farmers as collaborators. Returning to discuss results.*
- *Are you drawing a distinction between 'scientists' and 'government/regulators'? I think there is a lower level of trust between farmers and government than between farmers and scientists. I think there is a distinction between farmers' trust in science and scientists (e.g. relating to agri-innovation) and farmers' (dis)trust of science that is put forward to support government/regulatory policy.*
- *Consistency of results. Independent research.*
- *Not sure what is meant by 'elements', but the following should help to engender a greater understanding and willingness to be part of the solution: Hearing about the science from scientists that are good communicators e.g., Dr Rebecca Bartley (CSIRO Brisbane) is one of the best. Having the science presented and where possible demonstrated on-property with a small group of graziers. Taking small groups of graziers to AIMs Townsville where feasible to meet the scientists and view their work and findings. Making clear the valid links between improving water quality, land condition, carrying capacity for cattle, and enterprise profitability. Recognise that graziers manage a beef business, not just a parcel of grazing land, therefore other aspects of the business will often need adjusting e.g., improving the reproductive performance of the breeder herd to allow for a reduction in stocking rates. Highlight that simple changes to management will go a long way to improving water quality i.e., there is no need to adopt technically challenging grazing systems. If we expect graziers to understand and believe the science, don't present quasi-science as a solution to improving water quality e.g., snake-oil about intensive grazing systems and unrealistic expectations on improving soil organic carbon levels in semi-arid environments. Develop a series of grazier/beef enterprise case studies*

of the transition from poor to good management including an economic analysis. Get graziers to present their journey.

- *Constant communication in identifying issues and solutions related to better land management that not only improves environmental conditions but also improves the productive value of their land. When it comes down to changes in environmental conditions, we are both on the same page.*
- *Good project design – co-design, consultation, etc. Monitoring and feedback of results to participants of projects and community.*
- *Trust between farmers and scientists mostly requires an extended relationship over time. Open communication and people following through on what has been agreed are essential ingredients to building trust.*
- *Consistent communication and knowledge sharing between individuals and organisations. Listening to farmers' needs, not assuming from one's own knowledge that they know it all. Times change and so do people's opinions. Assumptions are limiting.*
- *Good communication and scientists involved on the ground with sharing information and using established networks. In some areas this takes an extensive amount of time and is dependent on personalities and local group thinking. Breaking into these groups can be difficult and small wins will achieve the trust in the end.*
- *Personal interactions, taking the time to hear each other out, not having politics in the way, being solutions focused.*
- *Co-designed project. Respect for data ownership. Science genuinely supporting decision making.*
- *The relationship between the farmer/s and scientist/s. If close, trust will be higher. Opposite for more remote.*
- *Actually meeting each other, having a chat.*

Q3 Conversely, what elements help contribute to lower levels of trust between farmers and scientists?

Responses to this question (with minor changes to improve formatting, grammar, and spelling), were as follows:

- *Media and miscommunication from other areas of the community (e.g., Peter Ridd).*
- *Regulations, restrictions, what political alignment farmers have and whether it will cause them higher costs. Leanings toward science denial and scepticism probably related to ideology. Ignorance is also an important factor with its associated openness to knowledge.*
- *Conflicting information and scientific outcomes.*
- *A lot of mistrust comes from the perceived alignment between NRM-related research and opposing political ideology.*
- *Differences of opinion between farmers and scientists regarding the need for further improvements in management practice. Complexities and remaining uncertainties regarding water quality impacts on Reef health. Divisions within the scientific community.*
- *Media. Farmers already feel like they are being vilified.*
- *Poor communication skills. No or limited opportunity for face-to-face interaction with graziers. Mixing science with snake-oil. Not looking at the whole beef enterprise.*
- *Lack of communication and interference from politically motivated lobbyists who purport to be representing farmers. In this case, there can be misinformation passed around. So, better communication is very much needed between scientists and farmers so we can build strong relationships that challenge any ideological positions.*
- *Regulatory approach. Top-down approach. Black box M&E, with only high-level reporting of results e.g., annual report cards.*
- *When scientists fail to follow up and share research findings with farmers who contributed data.*

- *The opposite of above. Not listening, making assumptions based on old knowledge, family history, etc.*
- *Poor communication of information and not making information relevant to people on the farm, managing businesses.*
- *Politically motivated interferences of organisations that should be working for their growers but instead act as gate keepers. Blame game and personal attacks. Not offering solutions, only presenting problems. Taking facts out of context.*
- *Science-knows-best attitudes. Non-partnership based research. Communications that stray into policy issues without understanding policy context.*
- *1. See second answer to Q2. 2. Motivations of farmers. Some members of CANEGROWERS are obviously running a 'political' campaign against control (via regulation or other means) and will not look at the evidence openly. 3. Scientists not respecting how difficult farming is and expecting that changing management will be easy for farmers.*
- *Vested interests. In-group/out-group dynamics. Not seeking common ground or an understanding of the motivations and barriers to the acceptance of Reef science first and foremost. Lack of, or poor, communication. I think a lot of it comes from scientists not recognizing farmers as experts in their own right. That the Reef science is often conducted in isolation of the farmers or they are identified very loosely as 'end-users' of research outputs. They need to be involved right from the get-go.*

Q4 Please identify 2 or 3 other people you think we should consult to better understand the concept of trust and ways of improving it. Please provide their name and email address so we can follow up with them.

Raw data not for publication.

Q5 Much research has already been undertaken in the area of trust. Please list any particular publications (books, journal articles, etc.) that you think we should consider.

Responses to this question (with minor changes to improve formatting, grammar, and spelling), were as follows:

- *This is not my field of expertise.*
- *I don't know of any books off the top of my head. This following podcast may be useful. https://www.abc.net.au/radionational/programs/philosopherszone/what-are-we-doing-when-we-argue/12511968.*
- *Special issue (Issue 42) of Applied Economic Perspectives and Policy.*
- *Suggest graziers read Timothy Egan's book 'The Worst Hard Time' about the dust bowl in North America in the 1920s & 30s (Houghton Mifflin, 2006).*
- *I organise two groups who work with building bridges between all sorts of people with interests in tidal wetlands http://mangrovewatch.org.au/ https://www.amsn.net.au/.*
- *Not sure to be honest, there is so much out there and a lot of anecdotal evidence, too.*
- *McShane, C. J., Turnour, J., Thompson, M., Dale, A., Prideaux, B., & Atkinson, M. (2016). Connections: The contribution of social capital to regional development. Rural Society. doi: 10.1080/10371656.2016.1194326; Dale, A. P. (2018). From conflict to collaboration: Can better governance systems facilitate the sustainable development of the northern pastoral industry, communities and landscapes? The Rangeland Journal. doi:10.1071/RJ18010; Dale, A. P., Vella, K., Pressey, R. L., Brodie, J., Gooch, M., Potts, R., & Eberhard, R. (2016). Risk analysis of the governance system affecting outcomes in the Great Barrier Reef. Global Environmental Change. doi:10.1016/j.jenvman.2016.09.013.*
- *As a general area I suggest the literature on the trust element in the debate over climate change. I see a lot of parallels.*

Q6 Please provide your contact details, in case we need to follow up with you regarding your suggestions.

Raw data not for publication.

Q7 Any final comments/ suggestions?

Responses to this question (with minor changes to improve formatting, grammar, and spelling), were as follows:

- *Educate, educate, educate.*
- *I think the major schism is between farmers and government, rather than farmers and scientists per se.*
- *This is a strange survey. There is obviously a lot of banter at the moment about values vs science. I am not necessarily sure that people don't trust the science, they simply have different values, and they don't see science as important.*
- *Good luck.*
- *As noted already – but worth re-enforcing – we need to cut through any political and ideological BS by building our own direct lines of communication between farmers and scientists!*
- *There will be different levels of trust across individuals – hopefully some will have higher trust than the views of some CANEGROWERS reps would have us believe. It's all about opposing the regs!*
- *My background included working with the agricultural sector as a park ranger, and I found gaining trust with park neighbours was easier when I was introduced by a trusted colleague or a contact from a long standing and proven network. This is not new, I know, but perhaps this can add to any similar responses to add weight to support for networks and ongoing funding for facilitators at the community level.*
- *I hope you're sending this survey to farmers.*
- *Catch you soon.*

Reef & Rainforest Research Centre

Australian Institute of Marine Science

The University of Queensland
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James Cook University
Australia

Griffith University

This project is supported through funding from the Australian Government's National Environmental Science Program