Maximising impact handbook

Making the most of agricultural research, development and extension activities

Enablers of Change | SCARLATTI Evaluation | Analytics | Insights | COUTTS J&R MANAGING AND EVALUATING CHANGE

About the authors

Enablers of Change, Scarlatti, and Coutts J&R are a strategic partnership of leading extension consultancy groups working across Australia, New Zealand, and beyond, combining their unique strengths to deliver agricultural and natural resource management outcomes.

John James at Enablers of Change specialises in fostering innovation through contemporary extension practices, including digital extension and professional development, particularly for early-career professionals.

Denise Bewsell at Scarlatti brings expertise in data-led research, extension, and evaluation, providing insights into social change and skills development, with a focus on primary industries.

Finally, Jeff Coutts at Coutts J&R contributes his extensive knowledge and experience of monitoring, evaluation, and impact reporting, ensuring informed decision-making and successful project outcomes.

Together, they leverage their collective wisdom and experience to deliver cutting-edge solutions that support change and innovation.

Primary contact

For any questions related to the project contact Dr John James at: Enablers of Change, PO Box 321, South Hobart TAS 7004, Australia or at john@enablersofchange.com.au.

Funders

This project was funded by Hort Innovation Frontiers, with support from AgriFutures Australia, Dairy Australia, CRDC, FRDC, GRDC, LiveCorp, NSW Government, Vic Hub Drought & Innovation, and Wine Australia.

Preferred citation

James, J., Bewsell, D., & Coutts, J. (2026). *Maximising impact handbook: Making the most of agricultural research, development and extension activities*. Prepared as part of the Research for Impact project (LP22001). Enablers of Change, Scarlatti, and Coutts J&R.

Purpose of this handbook

This handbook has been developed to help those working across agricultural Research, Development and Extension (RD&E) think about and plan for impact. It is for anyone designing, delivering, managing or supporting extension work, whether starting a new project, improving something already underway, or thinking about how extension can support change across a sector.

It is not a step-by-step manual or a checklist that has to be followed from start to finish. Instead, it is a practical guide you can come back to when you need ideas, prompts, examples or to test some thinking.

How to use this handbook

This handbook is not designed to be read cover-to-cover but is meant to be used when and as needed.

We suggest that it is worth starting with the principles on page 8. From there, go to the sections that feel most useful for your role, project or audience.

The case studies are useful to see what the principles can look like in practice. They can also be used to spark conversations with your team, producers or stakeholders about how a principle might apply in your own context.

Who can use it?

Project managers and program leads to guide project design, delivery planning, partner conversations, reporting and continuous improvement.

Researchers and technical specialists to think about how research, tools or technical knowledge can be turned into something useful, trusted and practical.

Policy, strategy and investment teams to understand what good extension can look like on the ground, and to shape funding, investment decisions, program expectations or sector-wide strategies.

RDCs, industry bodies and state extension teams to create a shared language for planning, coordinating and improving extension activity across regions, commodities or programs.

Collaborators and delivery partners to clarify roles, identify gaps, avoid duplication and support extension across the system.

Extension practitioners, advisors and consultants to plan activities, shape engagement, test your thinking, and reflect on what is working in practice. It can also help support conversations with producers, tailor advice to different situations, and think about what helps people make changes in practice.

Contents

List of figures

List of tables

Summary: Principles in practice

Context

How do we move beyond good intentions to actually change practice in agricultural RD&E? The Research for Impact project supported ten agricultural research organisations to embed adoption thinking early on into their project. This turned recommendations from an earlier project, Designing the integration of extension into research projects, into action. By integrating extension into project design from the start, the aim of the program was to lift the impact of RD&E through better planning, delivery and evaluation.

This summary translates the project's learning into practical guidance. It describes each principle, the key activities that can help put it into practice and the resources available to support implementation.

Principles

1 Think in systems

Purpose: To understand how interconnected elements and stakeholders influence each other.

Key activities

1. Identify which framework to use
2. Fill out the systems mapping worksheet
3. Establish a project reference group
4. Gather alternative evidence
5. Demonstrate a systems perspective when applying for funding.

Resources

- Choosing a framework of best fit
- Systems mapping worksheet
- Systems thinking worksheet.

2 Focus on people

Purpose: Ensure the project is engaging, practical, and caters to real-life needs.

Key activities

1. Use empathy mapping and end-user-needs table
2. Build problem statements
3. Brainstorm the range of possible solutions
4. Create prototypes of solutions
5. Test using prototype testing feedback questions.

Resources

- Empathy map
- End-user needs table
- Problem statement recipe
- Prototype feedback testing worksheet.

3 Engage with stakeholders

Purpose: Engage stakeholders early and throughout the project for better relevance and sense of ownership.

Key activities

1. Appoint team members with communication, facilitation, and networking skills to manage stakeholder engagement
2. Create and implement plans to engage stakeholders
3. Create materials for engaging stakeholders.

Resources

- Menu of extension possibilities
- Example end-user integration and extension plan.

4 Co-design wisely

Purpose: Tailor approaches for appropriate solutions to the problem and context.

Key activities

Determine your level of co-design based on:

1. The state of needs and outputs
2. The stage of your project.

Resources

- Co-design by outputs and needs.

5 Design for impact

Purpose: Plan projects to maximise real world adoption and change.

Key activities

1. Define your destination by writing impact statements
2. Map out the route to your goal (Theory of Change)
3. Conduct a pre-mortem exercise
4. Design and conduct monitoring and evaluation.

Resources

- Impact statement
- Theory of change
- Activity sequencing
- Pre-mortem
- Monitoring and evaluation.

6 Stay flexible

Purpose: Adapt based on feedback and changing conditions.

Key activities

When staying flexible utilise:

1. Sprints
2. Kanban boards
3. Adaptive milestones.

Resources

- Choosing a framework of best fit
- Systems mapping worksheet
- Systems thinking worksheet.

7 Communicate clearly

Purpose: Maintain consistent, two-way communication for trust and clarity.

Key activities

1. Complete a communication and engagement plan
2. Develop materials and templates for the plan
3. Leverage digital communication tools.

Resources

- Communication plan template
- Digital communication tools.

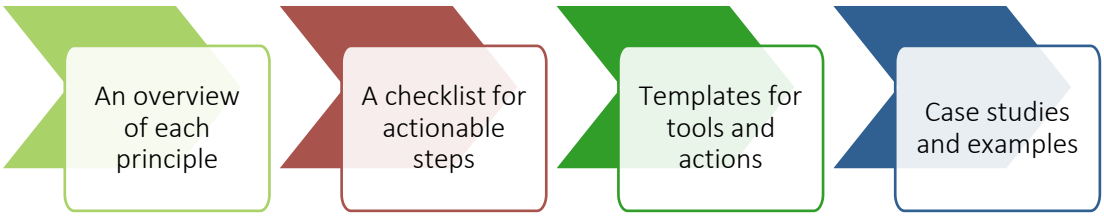
Background

Context

The *Research for Impact* project is building the capability of researchers across ten agricultural research organisations so that they can effectively integrate adoption thinking and practice into their processes. This project builds on the recommendations from pilot work delivered via the project *Designing the integration of extension into research projects* (HA21001), which aimed to improve adoption and impact through designing a process which can be initiated at the beginning of project scoping, that supports adoption rate, reach and effectiveness.

The seven principles developed in the previous project are being piloted in this current project with researchers and extension practitioners engaged in projects across different rural research and development corporations (RDCs) and other investor organisations.

Over the course of the project, several tools have been trialled and processes developed that convert the principles into action. This document captures and outlines the following:



The extension puzzle: Importance and hurdles

What is extension?

Agricultural extension has had many definitions over the years. The agreed definition from all the Australian state and territory governments back in 2006 was:

> *Extension is the process of **enabling change** in individuals, communities and industries involved with primary industries and natural resource management. SELN, 2006*

As outlined in Figure 1, the nature of modern extension is constantly evolving, with each new approach building upon those that came before it. Beginning in the 1960s, traditional advisory services focused on technology transfer, a linear knowledge transfer approach in which landholders were encouraged to adopt innovations or practices that had been developed in a research setting. Since then, extension approaches have added more participatory and farmer-centric models, emphasising co-design and community resilience. There has been a growing recognition that the success of extension initiatives hinges on the collective efforts of all stakeholders involved. This includes producers, researchers, advisors, policymakers, funders, and more.

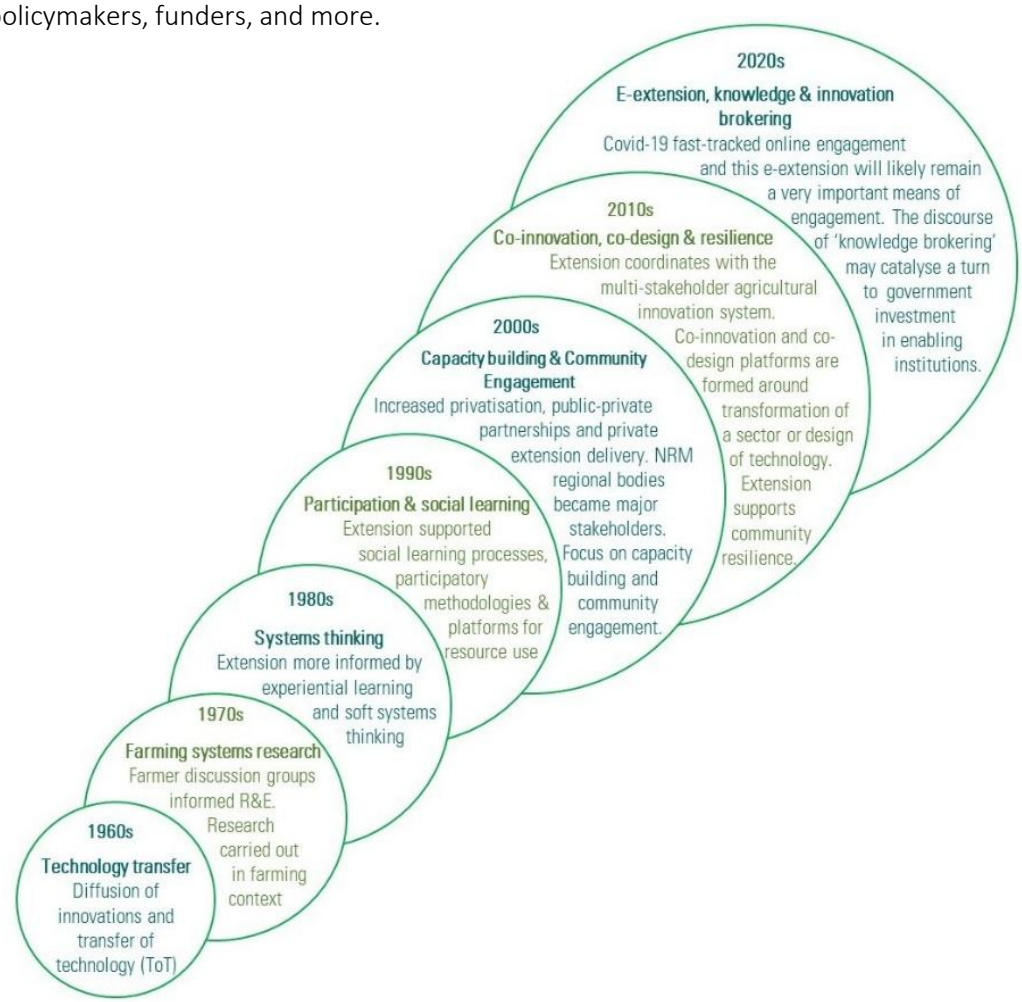


Figure 1. Overview of modern extension (Source: van Bommel et al., 2023)

So, why is extension important for R&D projects? In a nutshell, incorporating extension from the beginning of a research initiative supports the **reach**, **adoption rate and effectiveness** of its intended output(s). Specifically, this:

- Ensures the benefits of agricultural research **directly reach** the end-users.
- Helps the research outputs **fit local conditions** so that innovations and practices are not just theoretically sound but can be applied in the diverse climates, landscapes and farming systems in Australia.
- Facilitates a **feedback loop** that can provide researchers with insights into the challenges faced by producers and an understanding of stakeholders' and end-users' needs. This helps guide research direction and ensuring that it remains relevant and responsive.

Why is it difficult to build extension into R&D?

Extension can be assumed to be easy if the research is 'right' and adds complexity to project planning and implementation. Extension that connects the research outputs with the problem(s) faced by the target audience sounds simple in theory, but can be difficult to achieve due to the following reasons:

Too many players

The innovation system within the Australian agricultural sector is incredibly complex, with different industries, research funders, research and extension providers, industry representative groups, producer networks... and the list goes on. Often each stakeholder has their own interest at play, and getting everyone on the same page with extension can be a formidable task.

Narrow focus on R&D

Even though extension is part of the RD&E pipeline, funders still often contract projects with a relatively narrow focus on R&D, with extension as an afterthought. Investments can feel very narrowly focused and keep processes stuck in a traditional linear approach from research to adoption. Funders can also struggle to effectively support projects to embed good practice extension, particularly when expectations are not communicated clearly or early, the time and resources required are underestimated, or adequate guidance and tools are not provided.

Low appeal to researchers

Researchers are highly skilled and experienced in their specialist fields. This does not often include extension. Research organisations rarely have behaviour change or extension specialists. While we are not expecting them to develop specialist extension skills or to become extension practitioners, adding another job to their list is not appealing. Research teams / managers lack the time, awareness, enthusiasm, or aptitude to undertake effective extension, even when it is an explicit requirement of the project.

Lack of practical extension resources

Just as we hope research findings will be practical for end-users, resources designed to help researchers with extension can also be too theoretical and fail to outline the practical steps needed to integrate extension thinking. Any resources, including the principles developed as part of the Research for Impact project, need to provide clear guides, and be easily adapted to accommodate the wide variety of research projects' goals, fields, and contexts.

Resources

State Extension Leaders Network (SELN). (2006). Enabling change in rural and regional Australia: The role of extension in achieving sustainable and productive futures – A discussion document produced by the State Extension Leaders Network, August 2006

van Bommel, S., Coutts, J., James, J., & Nettle, R. (2023). Trends in Extension in Australia. In *Rural Development for Sustainable Social-ecological Systems: Putting Communities First* (pp. 45-75). Cham: Springer International Publishing.

Overview of the principles

Seven key principles for better integrating extension into research projects.

1. **Think in systems.** A system is a human construct to help us better understand how a set of elements work together to form a unified whole, often involving processes and practices. We need to be cognisant that we're working in an Agricultural Innovation System where many of the elements are interconnected and where feedback loops are important. Additionally, we're often working with multiple stakeholders along the value chain.

2. **Focus on people.** This is important because we are predominantly working with the humans in the system, even if we're studying the plants or animals. This is similar to the farmer-first approach but is wider to include all key stakeholders. Design thinking is a human-centred approach to innovation that integrates the needs of people, the possibilities of technology, and the requirements for business success.

3. **Engage stakeholders.** Do so throughout the project (ideally prior to writing a funding application). This ensures the problem is well understood and defined, and that potential solutions are appropriately tested with end-users. This also provides greater ownership of the outcomes of the project, hopefully leading to widespread adoption where appropriate.

4. **Co-design wisely.** While co-design is a good principle, it should be applied appropriately; so, it's suitable for the problem being addressed. Some projects have a focus where they are extending technologies and practices that have already been developed and used elsewhere, or are required by regulation (e.g., water quality practices). In this case, it is not appropriate to go into a deep co-design activity with end-users. It may be that such a product easily slips into the new situation, or it may need to be modified, trialled or demonstrated.

5. **Design for impact**. We're often good at planning and implementing projects, but we need to spend more time designing them for success - in this case, the adoption of R&D. To achieve this, we can use design thinking, build a theory of change, and understand the psychological drivers for change.

6. **Stay flexible.** When appropriate, as these enable a collaborative approach, allowing end-users to provide feedback throughout the process. It increases flexibility, allowing the team to adapt more easily to change and minimise risk by failing-fast.

7. **Communicate clearly**. Frequent and targeted two-way communication with key stakeholders will ensure everyone has a clear understanding of their roles and the project's desired outcomes and impact. Use of multiple contemporary processes such as peer-to-peer learning, social network analysis, and social media will help to empower end-users to make informed decisions about adoption. The time invested in communicating and engaging helps build trust and rapport with all stakeholders, and especially end-users.

Principle matrix

The following translates the seven principles into a practical, at-a-glance guide for designing and delivering research projects with extension built in from the start. It shows what each principle is trying to achieve, the tangible outputs to aim for, when and how to apply them across the research project, and who needs to be involved. Used together, the matrix helps research teams and farm advisors move beyond good intentions to deliberate, coordinated action that supports adoption and impact.

Think in systems (use a systems perspective)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed systems map demonstrating the broader context in which the project sits.	Set up a meeting with key stakeholders and complete the systems mapping worksheet.	At the beginning of the research project. Updated every 6 months.	Research team and funder at the beginning, then the Project Reference Group (PRG).	To map out the stakeholders (actors / institutions) that are part of the system. To ensure the research project is solving a real issue.
An established PRG or steering committee.	Identify who should be involved in the discussion and decision-making of the project's direction based on the systems map.	At the beginning of the research project. Reviewed every 6 months.	Research team and funder at the beginning, then the PRG.	To guide the project effectively, ensuring it aligns with strategic goals and incorporates diverse expertise and perspectives.

Focus on people (use human-centred design)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed customer groups / end-users template.	Set up a meeting and fill it out.	Towards the beginning of the research project.	Project team.	To clearly define who the project is for and prioritise effort towards those whose behaviour or practice needs to change.
A completed **empathy map** for end-users.	Set up a meeting (with end-user representatives) and fill this out.	Towards the beginning of the research project.	Project team.	To develop a shared understanding of end-users' needs, motivations, and decision-making.

Engage stakeholders (involve end-users)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed end-user integration plan.	Do this with the project team, end users, stakeholders.	Towards the beginning of the research project.	Project team.	To plan meaningful end-user involvement across the project to support relevance, ownership, and adoption.
Designed feedback forms, surveys, and polls to gather feedback from end-users.	Get help from an extension specialist.	Towards the beginning of the research project.	Project team.	To establish feedback loops that inform project design, delivery, and refinement.

Co-design wisely (use an appropriate level of design)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed co-design table.	Use the IAP2 and the quadrant spectrum to decide appropriate approaches for this research.	Towards the beginning of the research project.	Project team.	To apply co-design deliberately and proportionately, based on the nature of the problem and readiness of solutions.
Activities and approaches for extension.	Use the CSU/ Southern NSW Innovation Hub co-design approach.	Towards the beginning of the research project.	Project team.	To ensure extension activities are fit-for-purpose and aligned with goals and end-user needs.

Design for impact

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed Theory of Change diagram.	Do this with the project team, end users, stakeholders.	'Problem definition' phase. Amended semi-regularly.	Project team.	Clear visual representation, everyone is on the same page.
A completed Pre-mortem document.	Use the process outline in the Enablers of Change episode on pre-mortems	'Problem definition' phase.	Project team.	Anticipates what might go wrong with the project.
A completed Monitoring and Evaluation Framework	Do this with the project team, end users, stakeholders. Use the Institute of Rural Professionals material.	After completing the Theory of Change diagram – to know how you'll know if progress is being made.	Project team.	To track progress, support learning, and demonstrate outcomes and impact.

Stay flexible (use agile management)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	What's the goal? *Outputs*
Calendar dates for regular milestone reviews with funders and project teams.	Use the agile agenda document to guide discussion and thinking around agile methods. Communicate findings with whole team / stakeholders	Throughout the duration of the project.	Project team.	Managing funding team vs. research team goals. Taking a step back: regular review and reflection.

Communicate clearly (communicate and engage effectively)

What's the goal? *Outputs*	How to do it? *Process*	When to do it? *Stage of research*	Who to involve? *Stakeholders*	Why to do this? *Purpose*
A completed Communication plan for research team and stakeholders.	Set up a meeting with key stakeholders (from the systems map) and fill out the communicate-on plan. Put meeting dates into calendar.	From the beginning of the research project. Revised / amended quarterly.	Project team.	To ensure smooth, two-way communication between necessary parties.

Potential use of AI

Artificial Intelligence (AI) can help us achieve the seven Research for impact (R4I) principles by providing tools, analytics, and automation that enhance decision-making, stakeholder engagement, and overall project agility. Throughout this document we have outlined ways in which AI can assist with each principle to drive greater impact in R&D and streamline processes.

Resources

- James, J. (2022). Designing the integration of extension into research projects. *Enablers of Change.* https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/ha21001/
- Nettle, R., Major, J., Turner, L., & Harris, J. (2022). Selecting methods of agricultural extension to support diverse adoption pathways: a review and case studies. *Animal Production Science*, *64*(1). Available online
- State Extension Leaders Network (SELN). (2006). Enabling change in rural and regional Australia: The role of extension in achieving sustainable and productive futures – A discussion document produced by the State Extension Leaders Network, August 2006
- van Bommel, S., Coutts, J., James, J., & Nettle, R. (2023). Trends in Extension in Australia. In *Rural Development for Sustainable Social-ecological Systems: Putting Communities First* (pp. 45-75). Cham: Springer International Publishing.
- An overview of different extension activities. Available online. This is part of a larger resource held by the Institute of Rural Professionals on facilitating learning and change.

Description

Research projects are integral to advancing agriculture, but they are also part of a larger ecosystem. Agriculture doesn't just involve crops and livestock, but is a complex network of people, organisations, and processes all working together. Many elements in the network are interconnected. For example, introducing a new crop variety that requires less water could have implications beyond saving water resources. This could have the potential to alter land use patterns, affect local biodiversity, and even change labour requirements. Keeping a systems perspective to understand how the project fits into the broader picture is essential, because this helps identify support networks, indicates best problem-solving approaches, and makes sure that the research is effective and targeted.

Cynefin framework

One challenge in RD&E projects is to know which problem-solving approach to use. Certain frameworks have been developed to help teams pick the most appropriate methodology based on the type of system they are working with. One of these is the Cynefin framework, as shown in Figure 2.

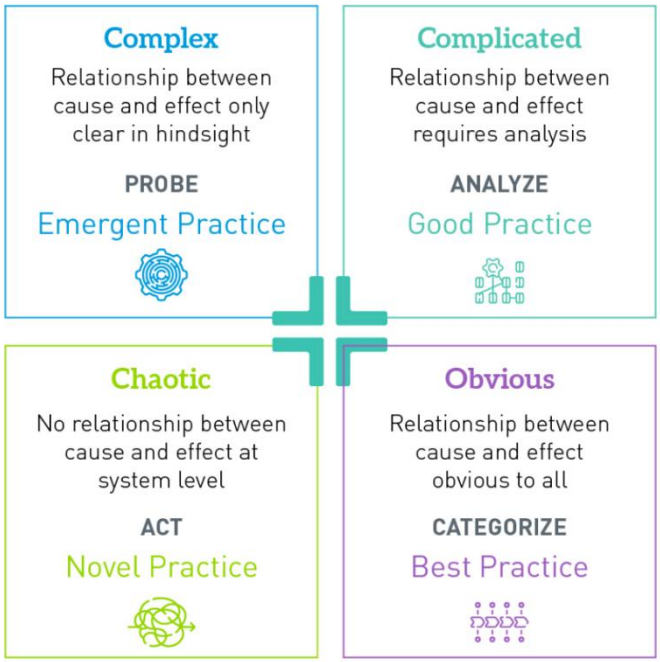


Figure 2. The Cynefin framework.

The Cynefin framework helps us make sense of this complexity by distinguishing between different types of situations and the kinds of responses they require. As shown in the figure, some challenges are obvious, where cause and effect are clear and well-established best practice can be applied with confidence. Others are complicated, where relationships still exist but require analysis and expertise to identify good practice. Many RD&E challenges, however, sit firmly in the complex domain, where cause and effect can only be understood in hindsight and where solutions need to emerge through probing, learning, and adaptation alongside farmers, advisors, and other actors in the system. At times, projects may even

encounter chaotic conditions, such as during biosecurity incidents or extreme events, where there is no clear relationship between cause and effect and the priority is to act quickly to stabilise the situation before learning can occur. Using the Cynefin framework encourages us, as researchers and enablers of change, to avoid defaulting to technical fixes, and instead to consciously match our problem-solving approach to the nature of the system we are working in, improving the likelihood of adoption and impact.

Most RD&E projects either belong to the domains of complicated or complex:

Complicated problems have been encountered before and have a clear relationship between cause and effect, but require a special skill set or time to analyse and resolve. These sorts of problems are best solved by **identifying facts about the problem, analysing them, and then responding**. For example, developing target-specific pesticides involves research and development within a controlled framework. The outcome, creating a pesticide that targets only specific pests, is achievable through established scientific processes.

"How can we design pesticides that target only specific pests without affecting certain beneficial insects? "

Complex problems have often not been encountered before, and the relationship between cause and effect is unclear. Usually solutions emerge as progress is made. In these situations, the best approach is to **try out experiments to gather more knowledge, observe the results, and respond by adjusting the experiments.** For example, enhancing native bee populations involves finding the right balance between keeping the nature healthy and keeping orchards productive. This complexity arises from the interplay between preserving biodiversity, adopting bee-friendly agricultural practices, managing economic costs, navigating policy constraints, and addressing social and environmental impacts.

"How can we increase native bee populations in commercial fruit orchards to improve pollination rates and fruit quality? "

CATWOE

In systems analysis, using Checkland's CATWOE model helps us surface and test different perspectives on a problem situation before jumping to solutions. Developed within Soft Systems Methodology by Peter Checkland, CATWOE prompts us to consider Customers, Actors, the Transformation process, Worldview, Owners, and Environmental constraints, as shown in Figure 3. Working through these elements encourages us, as analysts and enablers of change, to make explicit whose interests are being served, what change is being proposed, and which assumptions are shaping our thinking. This structured reflection is particularly valuable in complex agricultural and RD&E contexts, where multiple stakeholders hold legitimate but differing views, and where clarifying purpose and boundaries early can significantly improve shared understanding and subsequent decision-making.

Figure 3. The CATWOE model (Source: https://slidemodel.com/).

PESTEL analysis

Using PESTEL analysis in systems analysis helps us step back and consider the broader external context shaping a project or intervention. By systematically examining Political, Economic, Social, Technological, Environmental and Legal factors, we are better able to identify forces outside the immediate system that may enable or constrain change. This approach supports more realistic planning by surfacing risks, opportunities and assumptions that might otherwise be overlooked. Applied early, PESTEL analysis strengthens strategic thinking, helps anticipate unintended consequences, and ensures proposed actions are grounded in the wider operating environment rather than focusing narrowly on technical solutions alone.

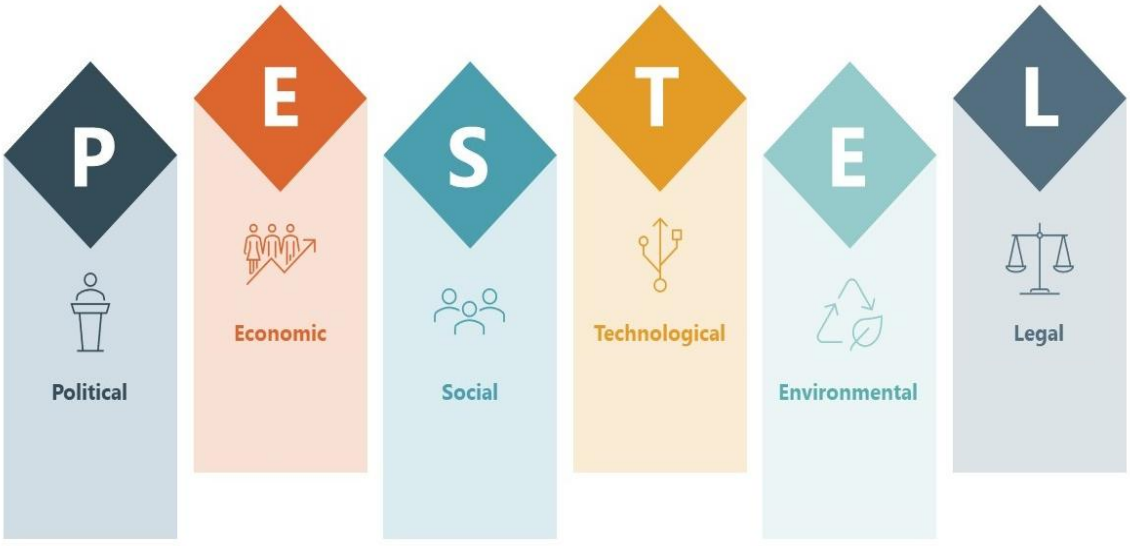


Figure 4. PESTEL analysis (source: https://slidemodel.com/).

Bayesian analysis

Bayesian analysis is a statistical method that updates the probability of a hypothesis as more evidence or information becomes available, using Bayes' theorem to combine prior beliefs with new data. It treats parameters as random variables with probability distributions rather than fixed values, making it highly flexible for modelling complex scenarios. Rather than treating data as fixed and complete, this approach combines prior knowledge with new information to generate revised probabilities, making assumptions transparent and open to revision. Bayesian analysis is particularly valuable where data are incomplete, conditions are changing, or decisions must be made iteratively over time. It supports learning-oriented decision-making by framing analysis as an ongoing process of belief updating, rather than a one-off search for definitive answers.

Activities

To adopt a systems perspective when developing a project and applying for funding, the research project team can:

Identify which **problem-solving approach** to use, such as using the Cynefin framework referenced above. Knowing the type of problem the project aims to address can help inform research strategies.

Fill out a **systems mapping worksheet** (see Table 1 for a template) to demonstrate how the wider system has been considered, identifying key collaborators and stakeholders who can be supporters and advocates.

Establish a **Project Reference Group (PRG)** or steering committee based on the systems map you developed. This step is essential, as this group will play a pivotal role in the design process working closely with the research project team, including implementing the other principles and taking part in the associated activities. Although the composition of a PRG or steering committee varies depending on the project's needs, it would ideally consist of representatives from each of the groups in your system map to ensure the discussions and decisions being made are comprehensive. A good run-down on what steering committees are, and how to put them together, can be found here.

Gather evidence that clearly demonstrates the project is addressing a problem worth solving and contributing to the wider system. This may involve communicating with other research groups, talking to end-users and comparing with other countries' systems. During this process, consider if there are leverage points where interventions could influence beneficial outcomes.

When applying for funding, clearly **demonstrate** a systems perspective. Show how your project aligns with broader industry priorities and how it considers the complexity of the agricultural ecosystem. Other than outlining the evidence, you have gathered above, you can also identify how your project aligns with or contributes to the specific **high-level strategies or milestones** outlined in the funders' long-term plans.

Potential use of AI

AI could assist in the following ways:

Systems mapping and simulation: AI can assist with using modelling tools which can simulate various elements of agricultural systems, offering insights into how changes in one part affect the whole. This enables researchers to visualise system interactions and feedback loops, helping them anticipate outcomes in complex systems.

Pattern recognition in data: Machine learning (ML) can analyse historical and real-time data from biophysical and behavioural sources to identify patterns or anomalies that could inform more effective systems interventions.

Stakeholder sentiment analysis: AI tools can analyse text data from stakeholders (e.g., surveys, feedback forms) to capture prevailing sentiments and concerns, which can help in understanding the human elements within the system.

Tools

While there are no examples of free AI tools for systems thinking, you can use ChatGPT or equivalent in conjunction with the non-AI tools below.

Kumu: Free for small projects, Kumu offers systems mapping and visualisation, which can help researchers map complex agricultural systems and interactions.

Graph Commons: Free for personal use, Graph Commons supports relationship and network mapping, which can clarify the interconnected elements within a system.

Resources

Systems thinking cheat sheet

The frameworks presented above each all have their unique benefits; however, we developed a cheat sheet that distils some of the most valuable elements into four clear steps to engage in systems thinking. Additionally, we have collected some prompts to explore system factors that might otherwise be missed when doing systems thinking in people and roles, political, legal, economic, social / cultural, technological, environmental, and on-farm and industry areas.

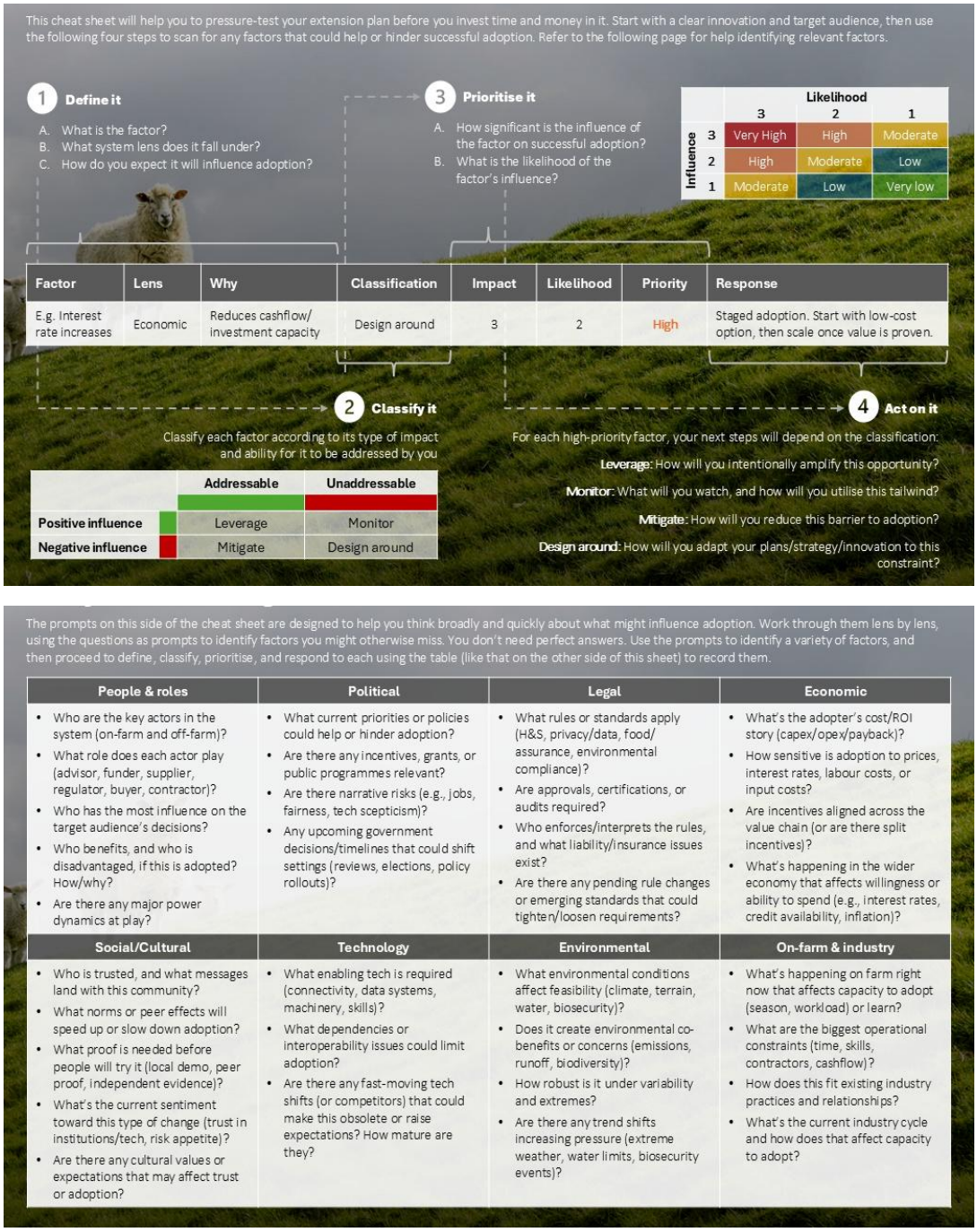


Figure 5. Systems thinking cheat sheet

Systems mapping worksheet

The systems mapping worksheet shown in Table 1 helps us step back and understand the wider system our project sits within, beyond the immediate research team. By identifying key groups, their roles, and how we both contribute to and benefit from their goals, we can make relationships explicit, uncover gaps or overlaps, and clarify where influence and support are most needed. Used early and revisited over time, the worksheet supports more strategic engagement and helps ensure the project is grounded in the realities of the broader agricultural innovation system.

Group	Role in project	Level of involvement	How we can contribute to their goal	How they can support our research
State government				
Federal government				
Peak bodies/ industry orgs				
RDCs				
Farmer/ producer orgs				
NRM				
Education				
Agribusiness consultancy				
Consumers/ general public				
Other				

Table 1. Systems mapping worksheet.

Case study: Thinking in systems in mushroom production

In agriculture, what causes a problem and where that problem appears can be far apart. A project team working on mushroom pest and disease management put this idea to the test by applying the principle of systems thinking to farm-level challenges.

Farm-level challenges are actually highly complex and interrelated. To better understand these connections, the project team applied elements of systems thinking to explicitly map out how each step of the mushroom production cycle interacts. This included looking at the full production cycle, from sourcing and storing compost ingredients, to pasteurisation, filling and harvesting, and considering how each stage can influence pest and disease expression.

This approach has enabled the project team to better resolve specific on-farm issues by addressing the broader production system impacts, rather than attempting to treat pest problems in isolation.

Key takeaway: Thinking in systems helps teams understand how connected parts of a production cycle influence each other. In this case, mapping the mushroom production cycle helped the team look beyond visible pest and disease issues to the wider conditions shaping them.

Case study: Thinking in systems in mungbean extension

Knowing your audience in agriculture means more than identifying producers. A project team working on mungbeans found that the principle of thinking in systems helped them work through what effective extension required, particularly thinking about who shapes on-farm decisions about crops so they could understand how a specific crop fits into the broader farming system and how different actors within that system operate.

This highlighted that effective extension is not always as simple as communicating directly with growers. It also requires understanding who is involved in the system, who influences decisions, and where information is most likely to lead to practice change.

To apply this, the project team is looking closely at who is their primary and secondary target audience for mungbean extension. This includes considering whether extension activities should be aimed directly at growers, or whether they may be more effective when focused on the agronomists and advisors who support grower decision-making.

This more targeted approach is expected to help extension activities reach the right people, depending on how decisions are made within each farming business.

Key takeaway: Taking a systems perspective helps project teams look beyond the most obvious audience and understand who actually influences decisions in practice. In this case, thinking in systems helped the team shape extension activities around how decisions are made on-farm.

Focus on people: use human-centred design

2

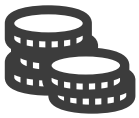
Description

Focusing on human-centred design means we put **people** at the heart of our work right from the beginning. Even when the research is looking into plants, animals, or machinery, it's the people involved, farmers, farm workers, and others in the community, who will make the changes proposed or adopt new practices and innovations. This principle builds on farming systems research where farmers are put first. However, it goes further to include **everyone who plays a part and will use the solution your project aims to develop** (your 'end users').

In human-centred design, we develop solutions that are **truly practical and useful** that supports successful farm businesses while solving a real problem:

We start by understanding what the target end users actually need (we listen and make this our starting point).

Then we look at what technology can do to help (maybe they need a new gadget or app).



Finally, we make sure that the solution we propose not only solves their problem but also is cost-effective so that end users will actually invest in it.

Activities

There are five steps we can go through to implement this human-centred design approach (this is called design thinking). We also developed some tools (bolded in green) and resources to help you follow these steps.

Empathise. This is about putting ourselves in end users' shoes to get a deep sense of what they experience and need. We recommend doing an empathy map exercise (see Figure 6) and then documenting your findings in the end-user needs table (see Table 2). This is also where you can tease out who should be your target audience to achieve the changes your research hopes to inspire. Are they private landholders, farm workers, or wider community groups?

Define. After learning what your target users really needs, we pinpoint exactly what needs to be solved and build our problem statements (see page 27 for a problem statement template and example).

Ideate. With a clear problem defined, we then brainstorm a wide range of possible solutions. This is where creativity kicks in, thinking about how technology could offer new ways to tackle the problem.

Prototype. We create prototypes or simple versions of our solutions to bring our ideas to life in a tangible way that people can interact with.

Test. Finally, we test the prototypes with the very people we're designing for and get their feedback (just a small number of them will do the trick). This step often leads back to earlier stages, as we refine our understanding and improve our designs based on real-world use. For example, if conflicts in ideas arise then return to the empathise stage, or if no solutions are not fit-for-purpose then return to the ideate stage. We have put together a few prototype testing feedback questions (see page 28) that you can use.

Potential use of AI

AI could assist in the following ways:

User persona development: AI can generate detailed user personas by analysing demographic, behavioural, and psychographic data, providing a clearer picture of stakeholder needs and priorities.

Predictive analytics for stakeholder needs: AI can model various scenarios to anticipate potential needs or pain points, ensuring design decisions align more closely with user expectations.

Enhanced data-driven empathy: Natural language processing (NLP) and sentiment analysis allow for real-time assessment of feedback, enabling designers to refine projects iteratively based on end-user responses.

Tools

Canva Whiteboards: Canva offers a free whiteboard feature for collaborative design and prototyping, helping teams develop user-centric solutions.
Non-AI option

Google Forms: Free and simple to use, Google Forms allows gathering feedback directly from stakeholders, an important step in human-centred design.

Resources

Empathy map

An *empathy map* is a graphic divided into four or six quadrants. It helps you visualise your end users, understand their perspectives and needs, and keep your research design and outputs pragmatic. Figure 5 shows a generic template you can use. You can customise the quadrants' themes and the prompt questions based on your research context.

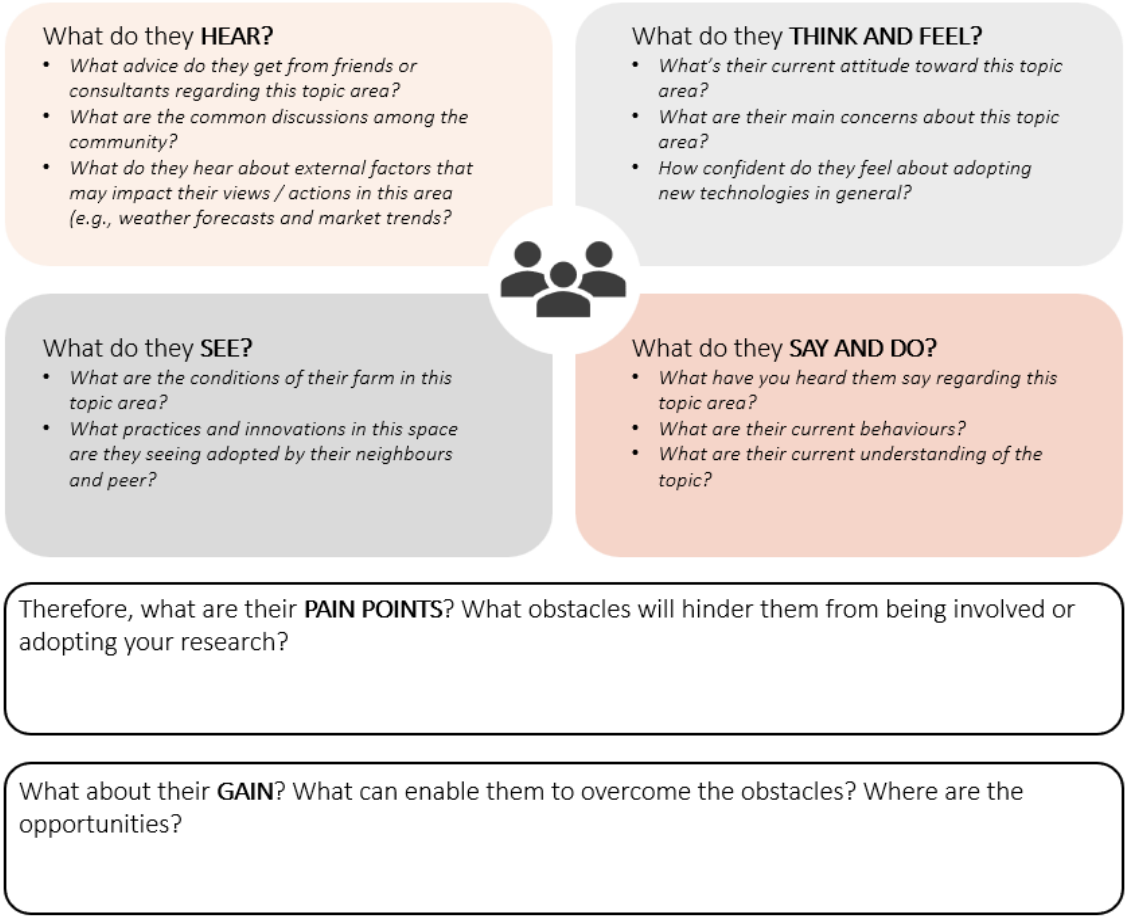


Figure 6. Empathy map template.

Get your team and PRG together, either online or in person. Use sticky notes or a cloud-based tool to easily change the map. Encourage them to use direct quotes, write down what end users hear, think, see, and say from a first-person perspective as if they are the users themselves (e.g., "Labour's getting hard to find; I hear more folks talking about automated solutions"). Some people find these following questions helpful as they work through more concrete examples:

Last time you made a decision to change practice, what information did you use?

Last time this problem occurred, when was it and what did you do?

Sticky notes are also an easy way to group themes together. Your end product may look like Figure 7.

Figure 7. Example of Empathy Mapping (Source: Enterprise Design Thinking)

End-user needs

After the empathy map exercise, document what you have discussed and found about the end users of your project, including specific segments (e.g., by age, experience, location), their unique characteristics, and needs within the research topic domain. Compiling these into a table, such as Table 2, will help you consider what extension approaches to use, as the activities should be customised to match each end-user group's knowledge level and preferred learning styles.

Target audience	Segments	Characteristics	Needs / pain points
Private landholders / managers			
Wider community and community groups			
Public landholders / managers			
Aboriginal communities / First Nations People / Traditional Owners			

Table 2. End-user needs and characteristics template.

Problem statement recipe

Below is a template to help you break down on how to write a problem statement:

Context:	The [end-user characteristics] are trying to [needs / motivation]
Goal:	So that they can [expected outcome]
Barrier:	But [challenge], which affects [impact on users, community, environment, etc.

Let's look at an example:

Context:	Rural Queensland farmers with limited digital access are trying to improve crop yields
Goal:	So that they can increase their profitability and sustainability
Barrier:	But the lack of affordable and accessible digital farming tools hampers their ability to optimise irrigation, which affects their crop's resilience to drought and extreme weather conditions, leading to inconsistent yields and financial instability

Prototype testing feedback questions

Below is a list of key questions you can use to ask for feedback from the users when testing a prototype. Since the sample size is likely to be small, we recommend using **interviews or focus groups** as they allow in-depth conversations and interactions between you and the users.

Usability	• How well does this solution fit into your existing practices or operations? • What challenges did you face when using this tool/technology?
Effectiveness	• Have you noticed any changes in your productivity or the quality of your output when using this prototype?
Long term adoption	• Can you envision integrating this solution into your long-term practices? Why or why not?
Suggestions for improvements	• What improvements or additional features would make this solution more effective or easier to use for you and people you know?

Table 3. Prototype testing feedback questions.

Payne, T. A., Turner, J. A., Rijswijk, K., McDermott, A. K., & Wakelin, R. D. N. (2016). Informing extension project design: the right tool for the job. *Hill Ctry-Grassl Res Pract Ser*, *16*, 33-38. https://www.nzgajournal.org.nz/index.php/rps/article/view/3257/2881

Case study: Using human-centred design in cotton sensor development

Focusing on human-centred design means we put people at the heart of our work right from the beginning. Even when the research is looking into plants, animals, or machinery, it's the people involved, farmers, farm workers, and others in the community, who will make the changes proposed or adopt new practices and innovations. A project focused on developing novel evapotranspiration sensors for the cotton industry described how this principle shifted their thinking from a mainly technical focus to thinking about the people who might use the technology.

This highlighted that a useful technology needs to do more than work technically. It also needs to make sense to the people who will use it, fit into their day-to-day work, and be something they can trust and apply in real farming conditions.

To apply this, the researcher involved farm managers and farm workers in the development and testing of the sensor technology. This meant the technology was shaped by the people who will use it on the ground, rather than only by technical assumptions made during development. This has also helped ensure the technology complements existing farming systems and is useful, increasing the likelihood that it will be adopted.

Key takeaway: Focusing on people helps ensure new technologies are designed around the needs, capabilities and working realities of the people expected to use them. In this case, involving farm managers and workers helped shift the project from a technical solution to a tool that could fit into everyday farming practice.

Engage stakeholders: involve end-users

3

Description

Engaging stakeholders, such as people within RDCs, can help build a clearer systems perspective because they often work across research, development and extension activities, and can see how different organisations, priorities and investments interact. If end-users are not involved, research can become disconnected from what people actually need, making products or innovations harder to adopt and reducing opportunities to adapt the work along the way. Considering a **systems perspective** and using **appropriate levels of co-design can** help address this, but effective research also needs to work with those who will eventually use the product or innovation. Involving end users and other stakeholders can therefore support better alignment across the system, while helping ensure research remains practical, relevant and responsive to end-user needs.

When end-users are not involved in the research project, things can go wrong:

There may be a **misalignment between research goals and actual user needs**, or overlooked opportunities for improvement in the solutions

There may be **lower adoption rates** due to a lack of involvement in development and collective 'buy in'

Research may not be **practical to implement or scalable**. End-users may have a different set of considerations to researchers or funders and are often more focused on considerations such as economic viability, long-term sustainability, and cultural acceptability.

Activities

Other principles in this document, such as using **human-centred design**, include activities and tasks that can help build a clearer picture of who end-users for the project are and their characteristics. The focus of activities in this section is to create practical resources for how and when these groups will be involved in the research project. There are three steps that are useful to any project:

1. Appoint a team member with **communication, facilitation** and **networking** skills and resources to manage this aspect of the project
2. Create and implement an end-user integration and extension plan that considers multiple ways to engage and integrate end-users
3. Create the materials required to carry out the activities outlined in the extension plan. This can be based of templates provided in the following section.

Which activities are most effective?

Choosing which activities to put into the end-user integration and extension plan depends on the project and goals. Figure 7 shows a range of activities for various purposes.

Legend

Workshop	Farmer-to-farmer discussion groups	Processor field days
Field Day	Farm field days	Online chats
Farm Tour	Visits to other farmer-led groups	DVDs/No 8 Wired
Webinar	Partner farms	Facebook
Conference call	Farmlet studies and trials	Twitter
Expert presentations	Learning groups (including farmers, rural advisors and scientists)	Periscope App
Mail outs/ newsletters	Research projects	VoiceByte App
Advertising/articles in farming media	Conference presentations	Vine App
Farm trial	Farmer training	Texts
One-on-one advice from retailers, rural advisors and contractors	Visits to other extension projects	Podcasts
Surveys	Rural advisor trials	Internet forums
Interviews and focus groups with farmers	Rural advisor training	Pub talk
Farmer discussion groups at farm trials	Scientist and rural advisor exchanges	Suppliers' events
Extension agent one-on-one discussions with farmers	Farm, processing, rural advisor and consumer trials	
Demonstration and focus farms	Processor training	

Figure 8. A menu of extension possibilities (Source: https://www.irpnz.co.nz).

Potential use of AI

AI could assist in the following ways:

Co-design platform automation: AI-powered platforms can facilitate co-design by automating workflows, managing feedback, and identifying patterns in responses, thereby ensuring balanced participation.

Stakeholder engagement forecasting: AI can assess engagement levels to predict which stakeholders might need more involvement, enabling better allocation of time and resources to those requiring more support.

Virtual collaboration tools: Machine learning algorithms can optimise meeting schedules and workflows across time zones and roles, making it easier to include and empower all stakeholders in the co-design process.

Tools

Miro: Miro's free plan allows basic collaboration features, helping with virtual workshops and stakeholder co-design.

Discord: Useful for creating free discussion channels and gathering stakeholder feedback in real-time, Discord can serve as a virtual co-design space with engagement options.

The free version of Zoom and its AI companion enables easy, accessible virtual meetings with end-users, allowing for regular check-ins, feedback sessions, and collaborative discussions throughout the project.

Resources

Activity	When	Why	Who (target group)	Who (team members)
Survey	*Once at the start of the project; once at the end*	*To understand key motivations and drivers of end users*	*All members of the grower association*	*Delegated team member*
Focus group	*Quarterly throughout project length; 12 total*	*To gather insights into the practicality of the research outputs*	*End-user volunteer focus group*	*Delegated team member*
Demonstration videos for social media / website	*At the end of the project*	*To assist growers with implementation*	*All growers*	*External specialist*
On-farm demonstration on commercial farm	*At the end of the project*	*To demonstrate the benefits of the new technology*	*All growers in particular region*	*Select team members*
Field day	*During the annual regional field days*	*To spread awareness of the project*	*Growers, potential funders, other interested parties*	*Whole team*
Newsletter section w/ end-user stories & feedback integration	*Every time a newsletter is published*	*To create a feedback loop, demonstrating how user feedback is incorporated into research*	*Readers of the newsletter*	*Delegated team member*

Table 4. Principle 3 resources.

Case study: Building deeper stakeholder engagement across RD&E investments

Involving end users and other stakeholders can support better alignment across the system, while helping ensure research remains practical, relevant and responsive to end-user needs. A manager of RD&E investments described how this principle strengthened their understanding of the need to build deeper connections with stakeholders, rather than relying on surface-level engagement measures.

Engagement is not just about how many people attend an event or are reached by an activity. Those numbers can be useful, but they do not necessarily show whether trust, transparency or shared ownership has been built. To understand this better, the organisation has integrated the IAP2 model into Impact Pathway frameworks, along with using established engagement texts to help make stakeholder engagement more practical and purposeful.

This has challenged the organisation to move away from activities that generate “nice numbers”, such as raw attendance figures, and focus more on activities that build stronger relationships, share power more deliberately and support greater on-ground impact.

Key takeaways: Engaging stakeholders throughout a project helps build shared understanding, ownership and trust. In this case, using a structured engagement model helped shift the focus from surface-level participation numbers to deeper relationships that can support on-farm impact.

Co-design wisely: Use an appropriate level of co-design

4

Description

The diagram below is called The IAP2 Spectrum of Public Participation. It's a framework used internationally to help determine the level of participation required for the public's role in a public participation process. On the left are approaches that require only a little or some people's involvement as the process is mostly based on providing information and obtaining reactions to that information. Co-design includes the approaches on the right-hand side (Collaborate and Empower).

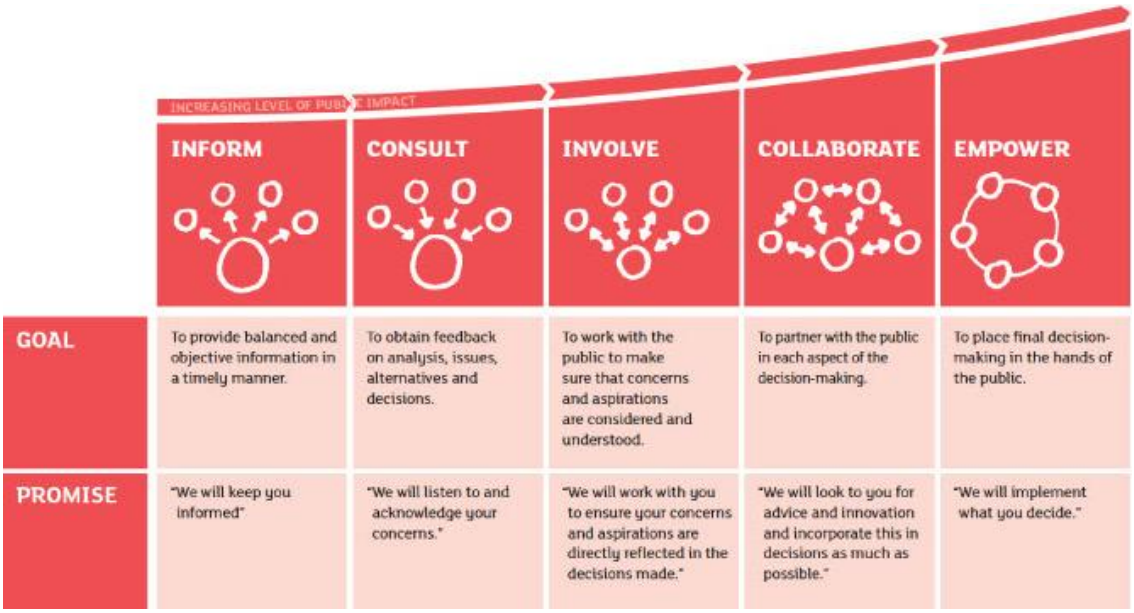


Figure 9. The spectrum of public participation (Source: IAP2).

When we say co-design, we mean engaging all participants equally, so that researchers, extension practitioners, end-users and other key stakeholders are all empowered to make important decisions collaboratively. While co-design is a good principle, **it should be applied appropriately so that it caters for the problem being addressed.** Some projects have a focus where they are extending technologies and practices that have already been developed and used elsewhere, or are required by regulation (e.g., water quality practices). In this case, it is not appropriate to go into a deep co-design activity with end users. One of the primary barriers to co-design is when the end-result is already pre-determined or set in people's mind. However, for projects without a predefined solution or technology, engaging in a more exploratory and collaborative co-design process to develop and test new ideas is appropriate.

Activities

Determine your level of co-design based on these 7 key steps:

1

Define goals and objectives. Every successful co-design process begins with a clear definition of goals and objectives. Without a shared vision, efforts can quickly become scattered, and valuable resources may go to waste. To avoid this, take the

time to engage all stakeholders and ensure they have a thorough understanding of the project's purpose and desired outcomes. Establishing these common ground rules sets the foundation for effective collaboration.

2 **Foster a collaborative environment.** Collaboration thrives in an environment of trust and open communication. Ensure that all stakeholders feel comfortable contributing their ideas and opinions without fear of judgement. An inclusive atmosphere allows for the free flow of creativity and fosters a sense of ownership among participants. Embrace diversity and encourage active participation, as it often leads to breakthrough solutions that may not have emerged otherwise.

3 **Include diverse perspectives.** To achieve true inclusivity in co-design, involve stakeholders from various backgrounds and experiences. Don't just invite our usual crowd of supportive stakeholders. Seek representatives from different demographics, disciplines, and levels of expertise. The richness of diverse perspectives will lead to more comprehensive solutions that cater to a broader range of users. Take the time to find ways to actively involve those who we've struggled to effectively reach in the past. Remember, the more voices that are heard, the more barriers that can be overcome.

4 **Use design tools and techniques.** Co-design is not just about talk; it's also about action. Use design tools and techniques to stimulate creativity and guide the process. Ideation (or brainstorming) sessions, sketching ideas, and prototyping are powerful methods to refine concepts and make them tangible. These tools encourage stakeholders to engage actively and visually express their thoughts, leading to a deeper understanding of the proposed solutions. And remember our earlier episodes: Mythbuster… is brainstorming really the best way to generate ideas and Stop brainstorming… use the 6-3-5 method instead.

5 **Iterate and refine.** Co-design is an iterative process, where continuous refinement is key to success. Embrace the cycle of ideation, prototyping, testing, and learning. Each iteration provides valuable insights that lead to continuous improvement. Don't shy away from feedback; instead, welcome it as a step towards creating a design that resonates with everyone involved.

6 **Document and communicate.** In the co-design journey, effective communication is vital. Documenting the process and outcomes ensures transparency and accountability. Share progress updates, insights gained, and prototypes developed with all stakeholders. This ensures there are no surprises for anyone along the journey. Documentation and communication not only keeps everyone informed but also allows for timely feedback, making adjustments easier and more effective.

7 **Co-evaluate and learn.** Co-design is a learning experience for all involved. After the project reaches its conclusion, take the time to co-evaluate the entire process. Assess what worked well and identify areas for improvement. The lessons learned in one co-design effort can inform and enhance future projects, making each subsequent collaboration even more fruitful.

The state of needs and outputs

You can use the model shown in Figure 10 to determine roughly which level of co-design your project will need, based on 1) the readiness of solutions or outputs and 2) the understanding of needs and opportunities. Then, identify what approaches you should use (see our recommendations in Table 5).

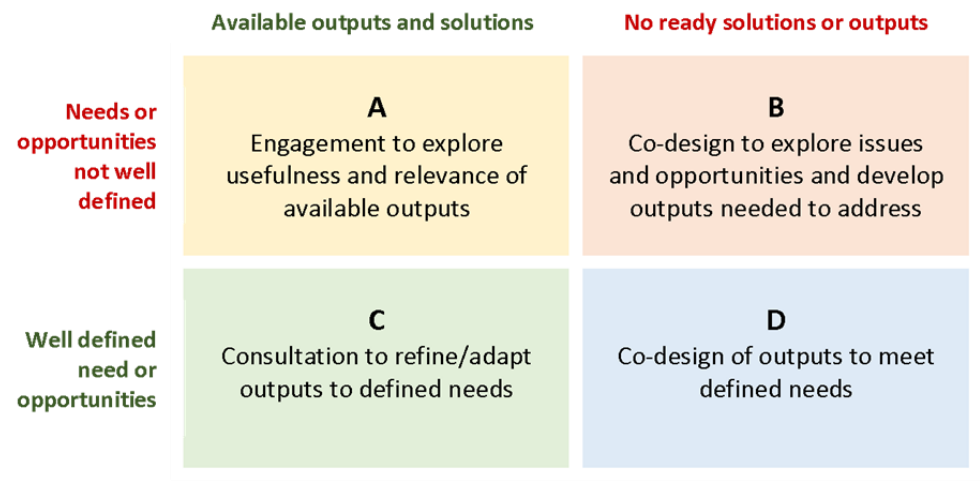


Figure 10. Determining the level of co-design. (Source: Coutts, 2021).

Stage of your project

As the project evolves, the nature of stakeholder engagement and participation often needs to be adapted accordingly to suit the project's needs:

Initial concept and design phase (lots of teamwork)**.** During the early stage, closely engaging stakeholders and end users can be highly valuable to ensure that the project's direction aligns with everyone's needs and expectations.

You can use workshops with different focuses to encourage everyone to share ideas and decide what the project should look like, such as brainstorming end-users' characteristics and needs (refer to page 27), developing a Theory of Change (refer to page 45), or undertaking a pre-mortem exercise (refer to page 47).

Development and prototyping (mix and match)**.** The level of co-design may vary at this stage based on the nature of the projects. Everyone may not necessarily be involved in everything. For technical development aspects, the co-design level might be lower, focusing more on specific feedback loops with end-users or technical stakeholders. For aspects relating to usability or user experience, a higher level of co-design might be maintained to iteratively refine prototypes. See page 19 for some prototype testing feedback questions that may be helpful.

Implementation and rollout (a bit quieter)**.** When implementing solutions, the level of co-design might decrease, as the focus shifts toward delivering the project output. However, it is still important to gather feedback from stakeholders to ensure the rollout is effective and the solution meets the intended needs.

Evaluation and scaling (team check-in and reflection). Co-design is likely to ramp up again at this stage, especially if the project is being scaled up or adapted. Engaging stakeholders to reflect and gather feedback could potentially lead to a new cycle of co-design activities.

The NSW Regional Health Partners has created a "How are we going" resource on how to check in throughout the research co-design and co-delivery process and how to sort through feedback and take action.

Potential use of AI

AI could assist in the following ways:

Customisable co-design toolkits: AI-driven platforms can recommend the level of co-design needed based on project objectives, previous data on stakeholder engagement, and contextual factors, ensuring efficient use of resources.
Needs assessment through AI: AI can perform an initial needs analysis based on previous project data, helping decide whether deep co-design or a lighter approach is suitable for specific stakeholders.
Automated stakeholder feedback analysis: AI can analyse and categorise feedback to suggest whether the project requires further co-design efforts, or if the proposed solutions align with end-user expectations.

Tools

Trello: Trello's free plan includes features for task organisation and tracking, allowing users to monitor project feedback and adjust co-design levels as needed.
Milanote: Milanote's free plan enables brainstorming and idea organisation, which is ideal for managing co-design workflows.

Resources

- Eady, J., Scope, S., & Stringer, D. (n.d). Southern NSW Innovation and Drought Hub co-design resources. https://www.csu.edu.au/research/southern-nsw-drought-resilience-hub/co-design

- Vogel, I., Wood, N., & Aston, T. (2026) Countering Misunderstanding and Misuses of Theories of Change, CDI Practice Paper 27, Institute of Development Studies, Brighton. https://opendocs.ids.ac.uk/articles/report/Countering_Misunderstanding_and_Misuses_of_Theories_of_Change/32168574?file=64240935

Co-design quadrant	Level of co-design	Goal	Approaches	Similar IAP2 Spectrum
Available outputs and well-defined needs	Low	Consultation to get feedback and refine / adapt outputs to the defined needs	Focus groups or small-scale surveys	Consult
Available outputs but needs not well-defined	Medium	Engagement to explore the usefulness and relevance of available outputs	Workshops	Involve
No ready outputs but well-defined needs	Medium	Co-design of outputs to meet defined needs	Form a partnership to seek advice on the products and incorporate their decisions into the development	Collaborate
No ready outputs nor well-defined needs	High	Co-design to explore issues and opportunities and develop outputs needed to address	Put the decision-making in their hands and we implement those decisions	Empower

Table 5. Co-design by outputs and needs.

1. Support and sponsorship	2. Time and money
We need people to endorse and reinforce the approach we're taking and the outcomes we want to achieve. Sponsors and supporters help to build commitment, remove obstacles and overcome resistance as and when it arises.	To do co-design we need time and money for: • Facilitation and convening (co-design is not free) • Paying people with lived experience for their time and for any expenses • Investing in approaches (after they have been co-designed) • Supporting lived experience capability and leadership • Prototyping, testing and learning (prior to implementation) • Communicating the work throughout to build commitment
3. Culture and climate	**4. Commitments**
Supportive culture and climate include: • Authorising environments from formal and informal leaders • A focus on learning, not control • Connective tissue to share learning, failure, success • Support to adopt the mindsets, especially when we regress to old ways of being • Support to develop the skillsets for co-design • Accountability to the people we engage through co-design (they can call us out)	Commitment to co-design looks like: • Focusing on outcomes (value) over outputs (busyness) • Following through into implementation • Staying committed to elevating the voice and contribution of lived experience • Practising cultural intelligence and widening inclusion • Partnering, not parenting • Sharing decision making, power and attribution • Value and reciprocity with co-designers

Table 6. Creating the conditions for co-design (Source: Kelly Ann McKercher, 2020 / Beyond Sticky Notes)

Case study: Co-designing evaluation to reduce burden on growers

Co-design means engaging all participants equally, so that researchers, extension practitioners, end-users and other key stakeholders are all empowered to make important decisions collaboratively. A project delivery lead working in an industry with a very small number of growers described how the program made them more aware of end-users unwillingness to fill in surveys.

The principle of co-design was highlighted and can be applied not only to research outputs, but also to the evaluation and administrative processes that sit around research projects. In small industries, the same growers may be asked for feedback many times, which can create unnecessary burden.

To respond to this, project delivery leads worked together to co-design a single, industry-wide survey. Instead of each project running its own evaluation, the shared survey gathers feedback for multiple projects at the same time.

This consolidated approach was described as a *revelatory idea*. It reduces the burden on growers, while still giving projects the information they need to measure success and improve delivery.

Key takeaway: Co-design is most useful when it is applied appropriately to the problem being addressed. In this case, co-designing one shared survey reduced the burden on a small group of growers while still giving multiple projects the feedback they needed to improve delivery.

Design for impact

5

Description

At this point, you probably already have a clear understanding of your target audience, their experience, characteristics, and needs, what solutions your project aims to provide for them, and how you would like to involve them in your R&D process. Now it's time to bring everything together and make sure your project is indeed designed for success!

Design for impact is to outline the process of how your project plans to achieve changes. Imagine you're planning a journey to a new, beneficial destination for farmers. To get there, you need more than just a map; you need a well-thought-out plan that ensures everyone arrives safely and benefits from the journey. Therefore, you craft a detailed itinerary, carefully plotting each landmark (i.e., objectives along the way) you aim for the end users to reach and specify when and how (i.e., activity and target). For example, your first objective might be to increase awareness of a particular practice among farmers in the first two months through community field days.

Additionally, you proactively consider the potential challenges and risks that might arise during this journey. This involves identifying possible roadblocks, such as low engagement due to unfamiliarity with the topic, and planning detours or safety measures (e.g., pairing less experienced farmers with mentor farmers who are early adopters).

Activities

We have some instructions and tools to guide you in designing this plan for impact. Although we display them in order, it needs to be noted that this is likely an iterative process where you may go back and forth between these steps to refine your plan.

1. Define the destination by writing your impact statements to clarify your journey's end goals (intended outcome), and make sure everyone (project team, stakeholders) is on the same page with you. See page 44 for impact statement writing tips.

2. Map out the route to this goal (Theory of Change, refer to Table 8). This includes:

Confirm your end users (target audience).

Identify the landmarks of success (the objectives along the way)

Identify the methods required to reach the landmarks (activities / approaches to enable change)

Review to ensure your activities are in a logical order. This step may reveal gaps, such as landmarks being too distant from each other. Adjust the plan as required.

3 Plan for potential detours by undertaking a pre-mortem exercise. This exercise helps identify risks, rather than just focusing on the outcome. Ask: "Imagine we're in the future, we're looking back on this project, and it was a disaster. What went wrong?" This approach helps you identify potential risks to the project before they occur. There will be a range of risks identified, from overestimating farmer adoption rates or underestimating seasonal impacts on activities. Identifying these risks allows you to develop mitigation strategies, such as creating alternative engagement approaches or incorporating flexibility to adapt to unexpected conditions. Refer to page 32 for more details on how to undertake a pre-mortem exercise.

4 Establish ways to check your progress (Monitoring and Evaluation (M&E)). Along the way, you regularly check your map and landmarks to ensure you're on the right path. M&E are like these regular checks, assessing if the activities are leading to the desired outcome and enabling adjustments as needed. See Table 11 for a M&E plan template.

Here are the resources corresponding to each of the steps mentioned above, for simplicity, we used the same project example throughout to help better envisage how you can use these tools.

Potential use of AI

AI could assist in the following ways:

Impact forecasting with AI: AI can simulate potential project impacts under different scenarios, helping researchers fine-tune their designs to maximise adoption rates and meet goals.

Theory of change modelling: AI can support the development of a theory of change by processing large datasets and identifying correlations between variables, which is particularly useful in predicting behaviour change patterns.

Behavioural analysis for targeted interventions: AI can integrate psychological and behavioural data to design interventions most likely to result in adoption, tailoring communication and strategies to user motivations.

Tools

Changespark.ai: Changespark.ai allows mapping of a Theory of Change.

Notion: Notion's free plan includes flexible templates that can support the design of project impact frameworks and monitor progress toward goals.

Resources

Impact planning frameworks / tools

Below is a directory of impact planning frameworks / tools that can be drawn on for more clarity, consistency, and efficiency. Each of them serves a different purpose and the table below can help identify which framework is the most useful for your situation.

Framework / tool	Description	Developed by
ACTACT	Stands for Awareness, Concern, Trial, Adoption, Continuation, Transfer. It helps with mapping the stages of behaviour change, planning interventions, and design activities accordingly.	Agricultural extension practice
KASA	Stands for Knowledge, Attitudes, Skills, and Aspirations. It helps with understanding how and why people change behaviour. It can help measure shifts in knowledge, attitudes, and skills towards practice change	Agricultural extension practice
COM-B	Stands for Capability, Opportunity, Motivation – Behaviour. It explains that behaviour occurs when the conditions of COM are met. It can be used to understand why an innovation is not adopted, the barriers to behaviour change, and designing interventions.	Susan Michie and colleagues
TPB	Stands for Theory of Planned Behaviour. It explains that behaviour change is based on attitudes, subjective norms, and perceived behavioural control of the individual. It helps understand whether innovations are likely to be adopted given these aspects.	Icek Ajzen
Bennett's Hierarchy	A model that tracks extension inputs, activities, participation, reactions, KASA, practice change, and end results. It is useful to planning by understanding how each activity links to the final impact.	Claude Bennett

Table 7. Impact planning frameworks / tools

Impact statement writing tips

Below is a template you can use to write your impact statements. They should be at a project level and can be broad for now. Take care with promising exact numbers at this level as there are often many variables (or make clear they are aspirational). Include the bridge to 'beyond' your project to show how the project fits into a larger ecosystem (you may have already considered this through using a systems perspective) and the sustainability of your work.

By the end of the project, we will have:

(Co)Developed/demonstrated relevant [specific new knowledge/tools/approaches your project aims to develop] to assist with [end-user characteristic] so that they can [intended outcome].

Brought about/increased related [awareness/understanding/skills/ intentions/practice change] in [end user / target audience].

Developed [legacy products/capacity/relationships/pathways] for further development/adoption support and adoption momentum to continue.

Let's look at an example: The Pork Waste to Revenue Project. The project aimed to develop new waste treatment technologies to recapture nutrients in waste as feed and fertiliser products.

By the end of the project, we will have:

Developed/demonstrated relevant new waste treatment technologies to recapture nutrients in waste as feed and fertiliser products to assist the Australian pork industry so that they can reduce farming inputs and decrease the costs of primary production.

Brought about broader industry awareness of the project and a deeper understanding of the potential in those producers and regulators engaged in the co-design and testing process.

Developed relationships through the involvement of these producers and regulators in the design process to overcome barriers and developed a pathway forward through commercial companies to roll these out to the broader producer community for further development/adoption support and adoption momentum to continue.

Theory of change template

Before we go into populating the template, list the project objectives that will lead us to achieve the desired impact you wrote above. These should be specific with a narrower focus than your impact statement, and consider changes in the target audience's knowledge, attitude, skills, aspirations, and / or practice (KASAP). Each objective should focus on one or more of these aspects.

<table>
<tr><th colspan="4">Objective one</th></tr>
<tr><td colspan="4">e.g., increase knowledge among producers about the benefits and process of recycling waste into valuable agricultural input</td></tr>
<tr><td>Change</td><td>Activities to enable change</td><td>Target</td><td>Potential risks and mitigation plan</td></tr>
<tr><td rowspan="2">Awareness among producers of the environmental and economic benefits of using waste as feed and fertiliser.</td><td>Design, promote, deliver and evaluate webinars</td><td>Deliver two 45-minute webinars
60% participation rate among the target audience by the end of the first three months</td><td>Risk: Low participation rate

Mitigation strategy: offer alternative formats that suit those who cannot attend (e.g., podcasts available on the website)</td></tr>
<tr><td>Develop information flyer</td><td>Distribute 5,000 information flyers in three months
Anecdotal evidence or testimonials from producers about the usefulness of the information provided</td><td>Risk: Low engagement

Mitigation strategy: distribute via people working closely with producers</td></tr>
<tr><th colspan="4">Objective two</th></tr>
<tr><td colspan="4">xxx</td></tr>
<tr><td>Change</td><td>Activities to enable change</td><td>Target</td><td>Potential risks and mitigation plan</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

Objective three			
xxx			
Change	Activities to enable change	Target	Potential risks and mitigation plan

Table 8. Theory of change template.

You may also want to line up the activities identified above in order, specifying who is responsible for driving it, stakeholder involvement (who and in what way), and key dates (what needs to be done by when). Don't forget to note what resourcing is required, including what needs to be outsourced. While a table is useful, some people prefer a different way of documenting this (shown in Figure 11).

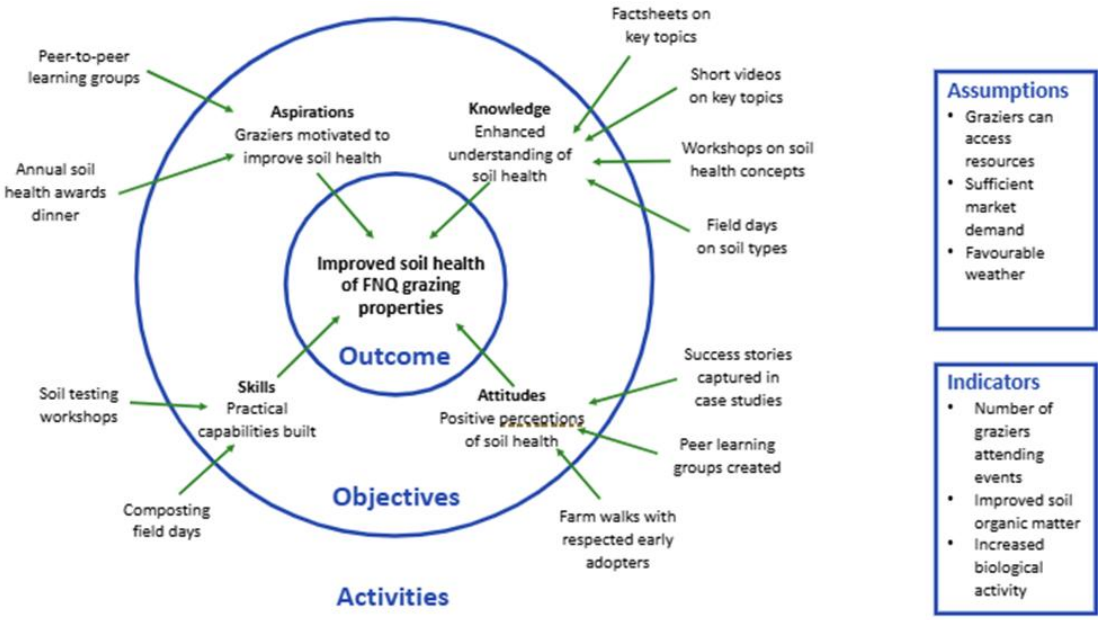


Figure 11. Alternative theory of change template (example)

#	Activity	Activity lead	Staff or outsourcing requirements	Stakeholder involvement	Key dates
1	*Develop information flyer*	*Team leader*	*Regional comms advisor – design* *Outsource - printing*	*DPI staff to peer review*	*First draft of the flyer done by [date], finalised by [date]*
2	*Design webinars*				

#	Activity	Activity lead	Staff or outsourcing requirements	Stakeholder involvement	Key dates
3	*Design workshops*				
4	*Distribute information flyer*				
5	*Promote webinars*				
6	*Promote workshops*				

Table 9. Activity sequencing template.

Pre-mortem exercise

To further enhance your project's likelihood of success, lead your team (and stakeholders) to develop strategies to mitigate potential risks. Imagine that despite all our good efforts, the project or work was an absolute failure. Ask everyone the question "What went wrong?". This exercise could be done at the project level or activity level (to populate the column "Potential risks and mitigation plan" in Table 8. Theory of change template). Below is a generic pre-mortem template to document your discussion.

What went wrong	Level of impact	Mitigation plan
Those who work closely with producers are not on the same page with the research vision. The lack of support and low engagement means producers are also not engaged.	*High*	*Establish a stakeholder advisory board to provide ongoing guidance and feedback*

Table 10. Pre-mortem template.

If you have more time or want to delve deeper into this area, the NSW government website has a more comprehensive pre-populated pre-mortem template for you to visualise, identify and mitigate project risks. It provides instructions and pro tips to take you and the team through the following four steps to develop a risk management plan.

1. Imagine a future state where things have gone wrong
2. Group the reasons for failure
3. Prioritise the risks
4. Assign people responsible.

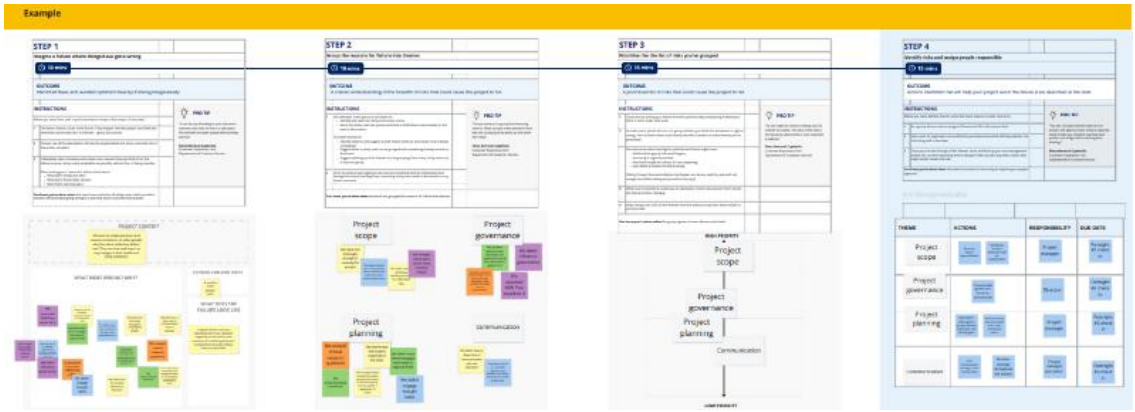


Figure 12. Screenshot of the pre-mortem template with an example project (Source: Digital.NSW).

Monitoring and evaluation template

For each activity you planned in Theory of Change, decide what data can be collected to monitor and / or evaluate to what extent it has been achieved.

Indicators can usually be taken from the target column in the ToC table. They inform the data that needs to be collected, and should ideally be **SMART** (Specific, Measurable, Achievable, Relevant, and Time-bound). For example, an indicator of the second objective we listed in Table 11 'The general understanding among producers of the methods of converting waste into feed and fertiliser' can be its target '70% of producers report being able to explain at a high level what converting waste into feed entails to others'. A question to ask landholders in order to gather evaluation data and evidence could then be 'How confident are you in explaining the waste conversion process to your neighbours?'

Objective	Indicator *(target)*	Data required	Data collection process
Awareness among producers of the environmental and economic benefits of using waste as feed and fertiliser.	*Deliver two 45-minute webinars*	*Record time/date of webinars and number of invitees and attendees*	*Spreadsheet to track numbers*
	60% participation rate among the target audience by the end of the first three months	*Participation rate – calculated using attendee data*	*Added to spreadsheet above to track*
The general understanding among producers of the methods of converting waste into feed and fertiliser	*70% of producers report being able to explain at a high level what converting waste into feed entails to others*	*Producer feedback on their confidence in explaining the waste conversion process*	*Feedback form after workshops*

Table 11. Monitoring and evaluation plan template.

Case study: Designing for impact in cotton research funding

Designing for impact is outlining the process of how a project will achieve the changes desired. A manager of RD&E investments in cotton described how this principle helped them think more deeply about how impact planning can be built into the start of the research funding process.

The principle, designing for impact, should not be something added once a project is already underway. Impact needs to be considered during scoping and application, when there is still a chance to shape the research around end-user needs and likely adoption pathways.

To apply this, CRDC used the learning to strengthen its Impact Pathway planning process. What began as a simple two-page guide has developed into an AI-enabled process built into the organisation's core project management system.

This structural change puts more emphasis on end-users during the project application phase, helping ensure funded research is designed for impact before it begins.

Key takeaway: Designing for impact means planning for adoption and success from the beginning, not after the research is underway. In this case, embedding impact planning into CRDC's project systems helped ensure end-user needs and pathways to adoption were considered during the funding and application process.

Case study: Designing for impact by using a pre-mortem to test project viability

Designing for impact is outlining the process of how a project will achieve the changes desired, including possible risks and mitigations. One project leader described how this principle introduced them to a tool, the project pre-mortem, a practical risk management tool. The exercise involves imagining that a project has failed, then working backwards to identify what may have caused that failure.

Using this tool highlighted the value of testing assumptions early, before significant time and resources have been committed. Rather than only managing risks during delivery, the pre-mortem helped the project leader assess whether the project had a strong enough case to proceed.

To apply this, they used the pre-mortem during the early scoping phase of a potential new project. The process helped them step back, test the project's assumptions and consider whether there was enough justification to continue.

The exercise uncovered blind spots and helped the project leader realise they could not justify the project's viability. This gave them confidence to pull the pin early, saving significant time and resources.

Key takeaway: Designing for impact also means testing whether a project has a credible pathway to success before major resources are committed. In this case, the pre-mortem helped identify risks and blind spots early, giving a project leader confidence to stop a project that was unlikely to deliver impact.

Stay flexible: Use agile management

6

Description

Agile methodology is a style of project management that involves breaking projects into phases, and emphasises continuous collaboration and improvement. The approach was first developed in the early 2000s by a group of software developers, who published "The Agile Manifesto" as a response to slow and cumbersome management styles that often missed the mark. At only 68 words, the manifesto itself does not have any specific processes, but many management tools and approaches have since emerged that aim to take agile ideals and turn them into useful tools. This includes standups, sprints, kanban, and scrum. Agile management is about using short, iterative cycles to ensure that projects remain on-target and adaptive to changing situations. It is often contrasted with the more traditional waterfall style project management, which takes a more linear, sequential approach, where one stage cascades into the next in one clear direction (see Figure 13).

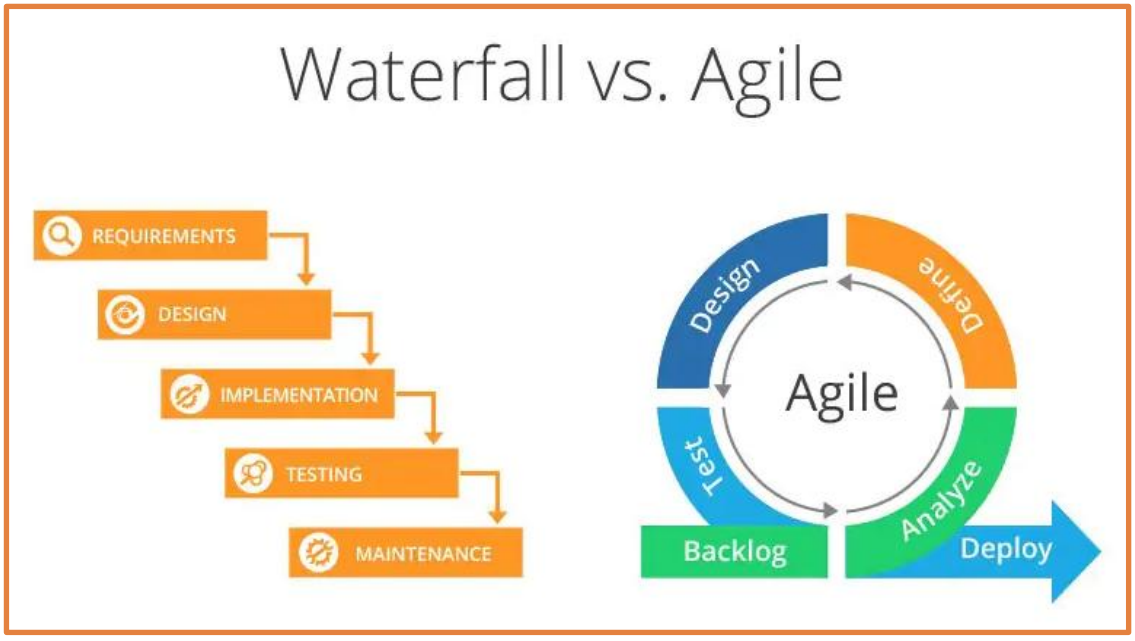


Figure 13. Comparing the waterfall and agile approach (Source: Nimble Work).

Agricultural R&D is different to software development. Often the most important thing in software development is getting prototypes out to users to test. Sometimes when scientific research demands rigorous protocols and risk management, agile is not necessarily appropriate. In addition, agile project management is a skillset, with a set of words and terminology that take a long time to understand. Using this principle does not mean we need to learn all of this, but there are some aspects specific to agricultural R&D that can apply and are useful. These are:

Helping keep everyone aligned with the research goal. Often, funding expectations, milestones, and goals need to be shifted in a changing research environment. Being agile can help keep everyone aligned.

Updating milestones by incorporating feedback and results.

Adjusting experiments and research directions based on real-time data and feedback.

Activities

Sprints

In agile management, a sprint is a set period during which certain work must be completed. Sprints allow teams to break down complex projects into manageable chunks and deliver outputs at regular intervals. Sprint durations can vary according to the team and the task, but typically last between one and four weeks in software development. They may be longer in areas such as agricultural R&D, which deals with external factors such as crop growth periods.

Because sprints are designed to be short and manageable, they allow for quick adaptation in the face of new information or changes in the research environment. They can help teams and individuals to focus in the midst of complex projects.

Kanban

Kanban is a visual project management tool that helps teams manage their work by visualising tasks, limiting the amount of work currently in progress, and maximising efficiency. The word *kanban* is Japanese and means 'signboard', and the methodology was first developed by Toyota managers in the 1940s. Typically, kanban boards are divided into columns such as 'planned', 'in progress', and 'completed,' and individual tasks are written on cards that move horizontally from left to right across the board as they develop. Boards and individual cards can be customised and tailored to any level of detail, and can be created both physically (such as on whiteboards or with post-it notes) or online (as there are a range of digital tools and resources).

Kanban boards offer the benefit of a real-time overview of the projects progress and challenges. Each team member can see the board, and items typically move forward when they are 'pulled' by the next stage (rather than 'pushed' there from the previous stage). This ensures that teams and workers are not over-extended as they 'pull' the next task towards them when they have the capacity to do so.

Adaptive milestones

Adaptive milestones are designed to ensure that project goals remain aligned with evolving stakeholder needs, technological advancements, and changes in the external environment. Unlike traditional, rigid milestones that are set at the project's outset and rarely revisited, adaptive milestones are flexible and can be adjusted as the project progresses. In fields where unpredictability is a constant factor, adaptive milestones can be redefined to reflect the most current understanding of what success looks like.

Adaptive milestones allow for a proactive, rather than reactive, approach to project management. By anticipating changes and incorporating flexibility into the project's roadmap, teams can pivot quickly in response to new challenges or opportunities without derailing the project. This forward-thinking approach reduces the time and resources spent on course corrections, allowing teams to maintain momentum and focus on innovation. In addition, through regular communication and feedback, funders and stakeholders can have a more active role in program design and implementation.

Potential use of AI

AI could assist in the following ways:

- **Automated project tracking and alerts**: AI project management tools can monitor key metrics and alert teams to potential bottlenecks, enabling faster adjustments.
- **Predictive risk analysis**: AI can assess potential risks based on historical project data and flag issues early, allowing teams to adapt strategies proactively rather than reactively.
- **Adaptive resource allocation**: Machine learning algorithms can analyse progress data to suggest optimal allocation of resources, helping the team pivot as needs evolve in agile project phases.

Resources

- Asana: Asana's free basic plan supports task tracking and team coordination, ideal for agile project management and adjusting workflows.
- ClickUp: ClickUp offers task and project management features with free tools for agile workflows and task dependencies, helping teams stay nimble.

Case study: Staying flexible when delivering project activities

Staying flexible and using agile methodology emphasises continuous collaboration and improvement. Over the course of delivering Research for Impact the project team began their webinar series the way most are started; with a plan. A Training Needs Analysis had identified key learning areas, topics were mapped out, and sessions were scheduled.

Then Artificial Intelligence (AI) became something mentioned more often and becoming a tool being used. The project team had a choice. Stick to the plan or respond to what they were hearing.

A webinar on Using AI for greater impact was designed, exploring how AI could support each of the principles along with an opportunity to exchange tips and ideas. This became one of the top rated webinars in the series (rated 9.4 out of 10 at the time and 8.8 in the final survey).

This encouraged the project team to become more flexible in their webinar planning. Rather than treating the original program as fixed, they began treating it as a starting point. New topics were sourced from conversations and ideas raised in one-on-one and team meetings. This responsiveness helped keep participants engaged.

Key takeaway: Starting with a plan is necessary. Staying attached to it can work against you. When teams listen to the conversations around them, they're better placed to respond to what participants actually need, and that responsiveness keeps people engaged.

Communicate clearly: Communicate and engage effectively 7

Description

Effective communication and engagement are critical for the success of any research project as it is the glue that holds everything together. Early, frequent, targeted, and two-way communication with key stakeholders helps ensure everyone has a clear understanding of their roles, the project's objectives, and the desired outcomes and impact. Putting aside some time to plan the channels and frequency of communication between different parties can be a very worthwhile task at the start of a project.

Communication top tips

- Establish regular touch points with the core team for checking in, providing updates, and flagging issues. These meetings should have a consistent agenda, and action points that come out of them need to have someone responsible for carrying them out.
- Respect people's time: foster a culture of never going over the allotted time and instead aim to finish a few minutes early. This gives people the chance to take notes, stretch, or use the bathroom before the next appointment.
- While online meetings are very effective for busy schedules and teams that are geographically spread, try and prioritise at least some in-person meetings. 'Zoom-fatigue' can lead to disengagement with online meetings, and communication is often much more effective, direct, and enjoyable when face-to-face.
- If you feel you aren't engaged with a particular group, figure out groups they are engaged with and engage with them as a link

Activities

Communication is at the core of any project: the larger and more complicated the project, the more important it becomes. There are several key activities that can help guide effective communication throughout a project's lifecycle:

1. Complete a communication and engagement plan that considers the relevant stakeholders (possibly taken from the systems perspective map), and details the objectives of communication, the channels, the frequency, and team member responsible for the communication
2. Develop the materials and templates that come from this plan. This could include a newsletter template; a social media page; or a project one-pager. Consider using a mixed range of formats and mediums.
3. Leverage digital communication tools, such as Google Drive Trello, Jira, Miro, and Calendly. These tools can make team communication and project management much more straightforward.

A key point is that clarifying the communication plans and tools is essential early in project development as standard communication strategies and tools are not consistent between teams and agencies, having everyone on the same page can make collaboration and future actions easier.

Potential use of AI

AI could assist in the following ways:

Personalised communication: AI can help design and automate personalised communication that resonates with diverse stakeholder groups, improving engagement.

Sentiment-driven content adaptation: Using NLP, AI can analyse stakeholder reactions on social media or feedback forms and adapt communication strategies to enhance engagement and build trust.

Network and peer-to-peer analysis: AI can identify influential nodes within social networks to optimise peer-to-peer learning initiatives, ensuring key stakeholders engage in meaningful interactions that promote adoption.

Tools

ChatGPT: can support targeted communication by generating customised content that aligns with audience preferences, refining messaging for clarity, and suggesting language to enhance engagement.

There are also a range of add-ons to ChatGPT (e.g., SocX, Social Media) that are designed specifically for social media.

Resources

Communication plan template

This communication plan template, shown in Table 10, provides a simple structure for planning, coordinating, and reviewing how we communicate with different stakeholder groups throughout the project. By clarifying objectives, channels, timing, and responsibilities, it helps ensure communication is purposeful, two-way, and aligned with project needs, rather than ad hoc. Used from the outset and reviewed regularly, the plan supports transparency, shared understanding, and trust across the research, funding, and end-user communities.

Stakeholder group	Communication objectives & obligations	Materials / outputs	Channels	Frequency	Responsibility
Project team		Weekly stand-ups in person	In the office	Weekly	
Funders		Project report	Sent by email	Quarterly	
RDC					
Growers		Updates on project progress	Facebook page	Fortnightly	
Wider Industry		One-pager	At conferences; in journals; other newsletters		

Table 12. Communication plan template.

Digital communication tools

Google Drive provides a shared, cloud-based workspace for storing, editing, and collaborating on project documents in real time, supporting transparency and version control across teams.

Trello is a visual task-management tool that uses boards and cards to help teams track work, prioritise activities, and see progress at a glance.

Jira is a more structured project-tracking platform that supports complex workflows, issue tracking, and milestone management, particularly useful for larger or technically complex projects.

Asana helps teams plan, assign, and monitor tasks and timelines, making responsibilities clear and supporting coordination across multiple workstreams.

Miro is an online visual collaboration tool that enables teams to co-create diagrams, maps, and plans in real time, supporting workshops, co-design activities, and collective sense-making.

Calendly simplifies scheduling by allowing others to book meetings based on real-time availability, reducing back-and-forth and supporting efficient coordination.

Case study: Communicating clearly in mushroom pest and disease management

Communicating clearly is critical for the success of any project. A project team working on mushroom pest and disease management described how this principle prompted them to rethink how communication needs to reflect the realities of the on-farm workforce.

Thinking about this principle highlighted that communication is not effective simply because information has been produced. It needs to be accessible, practical and easy to use for the people who are expected to apply it, especially where staff have different language backgrounds or levels of technical knowledge.

Recognising that English is a second or third language for many farm workers, the project team adjusted its communication plan. They developed how-to videos that use minimal spoken and written text, and rely heavily on self-explanatory imagery.

This tailored communication strategy helps ensure critical pest and disease management practices are easier to understand and apply by the range of staff carrying out the day-to-day work.

Key takeaway: Clear communication helps end-users make informed decisions and apply research in practice. In this case, using short how-to videos helped make pest and disease guidance more accessible to the diverse workforce responsible for implementing it.

Glossary

Term	Definition
ACT (Awareness, Concern, Trial, Adoption, Continuation, Transfer)	A framework used in agricultural extension to map the stages of behaviour change. It helps practitioners plan interventions and design activities that move end-users through each stage toward sustained practice change.
Adaptive milestones	Flexible project milestones that can be adjusted as a project progresses in response to evolving stakeholder needs, technological changes, or shifts in the external environment. Unlike traditional rigid milestones, they allow teams to redefine success criteria in real time.
Agile management (Agile methodology)	A style of project management that breaks projects into short, iterative cycles (phases) and emphasises continuous collaboration, feedback, and improvement. Originally developed for software development, it is adapted here for agricultural R&D contexts.
Agile Manifesto	A short document (68 words) published in the early 2000s by software developers that established the foundational values and principles of agile methodology in response to slow, cumbersome traditional management styles.
CATWOE model	A systems thinking tool used to analyse a problem or situation by examining six elements: Customers, Actors, Transformation, Worldview, Owner, and Environmental constraints. It supports structured analysis of complex systems.
Co-design	A participatory approach to project or product development in which end-users, stakeholders, and other affected parties are actively involved in shaping the outputs and decisions of a project. The appropriate level of co-design varies depending on the clarity of needs and availability of outputs.
Communication and engagement plan	A structured document that outlines the stakeholders to be communicated with, the objectives of communication, the channels to be used, the frequency of communication, and the team members responsible. It ensures communication is purposeful and two-way rather than ad hoc.
Cynefin framework	A sense-making framework used in systems thinking that categorises problems into five domains (Clear, Complicated, Complex, Chaotic, and Confused) to help practitioners select appropriate responses and management styles.
Design thinking	An iterative approach to problem solving involving empathise, define, ideate, prototype and test.
Empathy mapping	A human-centred design tool used to capture and visualise what a target user thinks, feels, says, and does in relation to a particular experience or challenge. It helps practitioners design extension activities that are grounded in real end-user needs.
End-user	The individuals or groups who are the intended recipients and beneficiaries of a research or extension project's outputs, typically farmers, producers, or industry practitioners. Understanding end-user needs and characteristics is central to effective extension.

Term	Definition
Extension	Extension is the process of enabling change in individuals, communities and industries involved with primary industries and natural resource management.
Human-centred design (HCD)	An approach to problem-solving and project design that places the needs, experiences, and perspectives of the people who will use the outputs at the centre of the design process. It involves empathy mapping, prototyping, and iterative testing.
IAP2 Spectrum (Spectrum of Public Participation)	A framework developed by the International Association for Public Participation (IAP2) that describes a continuum of community engagement levels, from Inform through to Empower. Used in the handbook to contextualise levels of co-design.
Impact statement	A project-level statement that articulates the intended outcomes of a project, the end-users it aims to benefit, and how it contributes to a broader ecosystem beyond the project's formal conclusion. It helps align project teams and stakeholders around shared goals.
Kanban	A visual project management tool, originating from Toyota's manufacturing practices in the 1940s, that uses boards and cards to help teams manage workflow, limit work in progress, and maximise efficiency. Tasks move across columns (e.g., planned, in progress, completed) as they are completed.
NLP (Natural Language Processing)	A field of artificial intelligence focused on enabling computers to understand, interpret, and generate human language. Referenced in the handbook as a capability that AI tools can use to analyse stakeholder feedback and adapt communication strategies.
PESTLE analysis	A strategic analysis tool that examines six external factors affecting a project or organisation: Political, Economic, Social, Technological, Legal, and Environmental. Used as a systems thinking tool to understand the broader context in which a project operates.
Pre-mortem	A risk management exercise in which a team imagines that a project has already failed and works backwards to identify what could have caused that failure. It helps identify risks and blind spots before they occur, allowing mitigations to be added into project planning.
Problem statement	A concise description of an issue or challenge facing end-users that a project aims to address. It is developed through human-centred design processes such as empathy mapping and end-user needs analysis, and helps focus project activities on real needs.
Program lead / Project manager	An individual responsible for guiding the design, delivery, and reporting of a research or extension project or program. Identified as a key audience for the handbook, they use the principles to shape partner conversations and support continuous improvement.
Prototype	An early, testable version of a solution, tool, or output developed during the design phase of a project. Prototypes are tested with end-users to gather feedback before full development or implementation, reducing the risk of investing in solutions that do not meet real needs.

Term	Definition
Scrum	An agile project management framework that organises work into short, fixed-length iterations called sprints, with defined roles (e.g., scrum master) and regular ceremonies (e.g., standups, retrospectives). Mentioned as one of several agile management tools.
SMART (Specific, Measurable, Achievable, Relevant, Time-bound)	A criteria framework used to evaluate and set well-defined objectives or indicators. SMART indicators ensure that monitoring and evaluation data is meaningful and can demonstrate project progress and impact.
Sprint	In agile project management, a set time period (typically one to four weeks in software; potentially longer in agricultural R&D) during which a defined amount of work must be completed. Sprints allow teams to break complex projects into manageable phases and adapt quickly to new information.
Stakeholder	Any individual, group, or organisation with an interest in or affected by a project's activities and outcomes. Effective extension requires early and ongoing stakeholder engagement to ensure relevance, shared ownership, and adoption of outputs.
Standup	A brief, regular team meeting (typically daily in software development) used to share progress updates, flag issues, and align on priorities. Adapted for agricultural R&D contexts as a communication and coordination tool.
Systems perspective (Systems thinking)	An approach to understanding and managing complex problems by examining how the interconnected elements, relationships, and stakeholders within a system influence one another. It helps practitioners identify leverage points, unintended consequences, and root causes rather than treating issues in isolation.
Systems mapping	A structured process used to identify stakeholders, relationships and interactions within a wider system.
Theory of Change (ToC)	A planning tool that maps out how a project's activities and outputs are expected to lead to intended outcomes and impact. It identifies the target audience, the sequence of changes required, the methods to achieve them, and the assumptions and risks involved.
Waterfall (project management)	A traditional, linear project management approach in which each stage of a project must be completed before the next begins, following a sequential, top-down flow. Contrasted with agile management as a less adaptive approach.

Acknowledgements

The Research for Impact project LP22001 is funded by the Hort Frontiers Leadership Fund, part of the Hort Frontiers strategic partnership initiative developed by Hort Innovation, with co-investment from AgriFutures, Cotton Research and Development Corporation, Dairy Australia, Fisheries Research and Development Corporation, Grains Research and Development Corporation, Hort Innovation, LiveCorp, NSW Department of Primary Industries, the Victorian Drought Resilience Adoption and Innovation Hub, and Wine Australia, with contributions from the Australian Government.

This collective investment reflects a shared commitment to strengthening how research is designed, delivered, and translated into meaningful impact for farmers, industries, and communities.

We thank the co-funders and project leaders for their strategic guidance, active engagement, and sustained commitment throughout the project. Their willingness to invest time, share perspectives, and test new ways of working has been instrumental in translating principles into practice. This leadership and collaboration have strengthened cross-organisational learning and ensured the project's outcomes are both relevant and enduring beyond its formal conclusion.