Co-design evidence-based tools to improve sustainability performance

To maintain market access and achieve significant improvements in sustainable land management, we need to empower NZ land managers to make rapid and informed decisions in a cost-effective way. Here we outline a transparent and robust co-design process for developing online sustainability assessment tools, which we tested with a proof-of-concept tool for biodiversity assessments on NZ farms.

By balancing the different needs, priorities, skills, and time constraints of a diverse range of stakeholders and experts (Fig. 1), we demonstrate a co-design process in which multiple parties work together to build trust, engagement, and understanding. Our process (Fig. 2), which gains a fast-start by building on existing international resources and protocols,[a,b] addresses three challenges to deliver multiple benefits:

A. To deliver a **tool that is useful and relevant to NZ stakeholders** requires incorporating features most helpful for their planning, management, and reporting needs.
B. To empower NZ stakeholders to make informed sustainable land management decisions requires making **best use of local expertise and global scientific evidence** when evaluating the expected sustainability outcomes of management actions.
C. To narrow the gap between sustainability practice and performance requires tools for **farmers and growers to self-assess rapidly and easily** whether their management actions are expected to improve key sustainability outcomes.

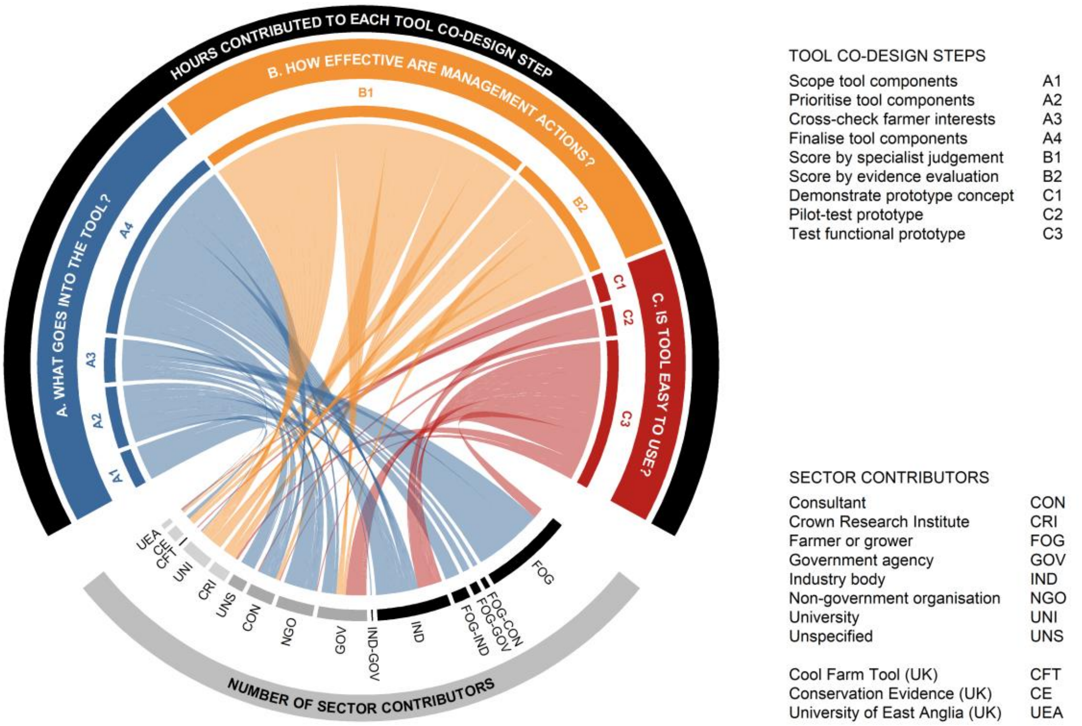

Figure 1: A diverse range of sectors help co-design a biodiversity assessment tool for NZ farms. Track widths are proportional to the number of people involved within each sector ('Sector Contributors') and hours they contributed to each tool co-design step (A1 – C3).

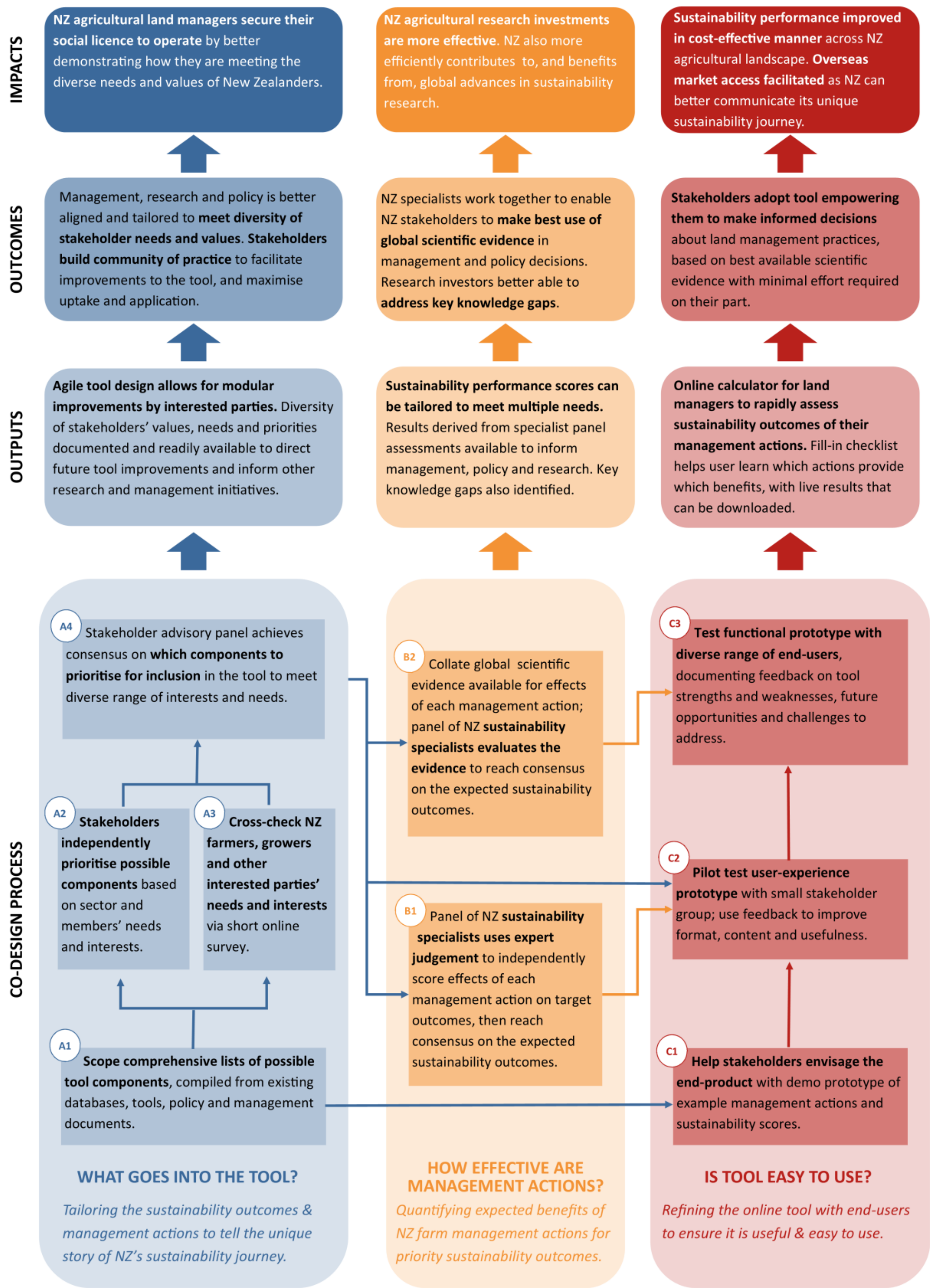

Figure 2: *Co-design evidence-based tools relevant to NZ: process, outputs, outcomes and impacts.*

Stakeholders co-design a tool that includes what matters to them

Understanding which sustainability outcomes matter most to NZ stakeholders and which management actions are most commonly used to achieve those outcomes involves four steps:

A1. Scoping candidate components: Develop verifiable and comprehensive candidate lists[c] of possible sustainability outcomes and actions relevant to the NZ farm management issue. Benefits include:

- Limiting potential bias that can arise from a single set of values or reporting criteria.
- Capturing interests and needs of diverse stakeholders in a single tool.
- Ensuring transparency of what is included or excluded and why; this can also inform future developments.

A2. Prioritising relevant components: A diverse range of stakeholders (industry, consultancies, government and non-government) independently prioritises the candidate tool components. An anonymous online survey is completed individually or in groups, taking into consideration their own sector's requirements as well as farmer and grower interests and needs.

A3. Cross-checking farmer/grower interests: A wider group of farmers and other interested parties is canvassed, via an online survey, about the sustainability outcomes of most interest to them, and which management actions could be or are currently implemented to achieve those outcomes.

A4. Finalising a list of relevant components: An inclusive, transparent and democratic process[d] involving a stakeholder advisory panel reaches a consensus on which components of candidate lists should be prioritised for tool inclusion to meet the following goals:

- Balance diverse stakeholder interests and needs (including those identified by farmers and growers).
- Reduce the number of actions and sustainability outcomes to optimise tool length.
- Cover a breadth of management issues (vs narrow in-depth focus on specific subset).
- Document issues requiring further discussion or deferral for future developments.

Specialists work together to quantify expected benefits of management actions

Two options are available for independently scoring the expected sustainability outcomes of management actions in the context of NZ ecology and agricultural systems:

B1. Scoring by specialist judgement: A specialist panel uses their expert judgement to reach a consensus and classify each practice as more or less beneficial for the desired sustainability outcome.

B2. Evidence evaluation: The global scientific literature is systematically searched to synthesise evidence that specific management actions deliver desired sustainability outcomes. A NZ specialist panel rigorously evaluates this evidence to classify, by consensus, the expected outcome of each action for the NZ context.

Benefits of these processes include providing clear mechanisms for:

- NZ sustainability specialists to work together to provide transparent recommendations to NZ stakeholders. This reduces potential biases arising from working with one or two experts.
- Enabling NZ decision-makers to make best use of the global scientific evidence. Where evidence is lacking, judgement

scores provide a suitable alternative, particularly where there is high consensus among specialists.

- Highlighting key knowledge gaps to inform future NZ research investments.
- Delivering a succinct assessment of expected sustainability outcomes for each action that can be readily used to inform multiple management and policy needs.

Stakeholders confirm the tool empowers them to make informed decisions

A *'learn fast, fail fast'* approach is recommended to ensure the sustainability assessment tool is useful and easy to use. Prototype development and end-user testing involves three steps:

C1. Helping stakeholders envisage the end-product: Using open source software,[e] develop a tool template design that is easy to modify. Demonstrate the tool to stakeholders using sample content relevant to NZ. Benefits include:

- Minimising the transaction costs of software development at the outset, while ensuring the underlying code can be readily edited and shared.
- Allowing for future improvements such as adding new modules for other sustainability actions or outcomes.
- Keeping open the possibility of integration with existing tools (in our case the Cool Farm Tool[b]).

C2. Pilot testing a user-experience prototype: Test a prototype tool that includes prioritised content and robust sustainability performance scores relevant to NZ (Steps A & B) to:

- Determine whether the tool and its supporting resources are easily understood by and useful for NZ farmers and growers unfamiliar with it.
- Identify any critical gaps; prioritise recommended improvements in relation to available resources and likely barriers to uptake.

C3. Final testing of functional prototype: Actively promote the updated tool and its supporting online resources to explain what the tool aims to deliver, how it works and how it was designed. Provide multiple mechanisms and ample opportunity for a wide range of users, including those involved in the co-design process, to test the tool and provide feedback. Benefits include:

- Confirming with stakeholders that the tool is useful and easy to use.
- Identifying potential barriers to uptake and mechanisms for overcoming them.
- Documenting the recommended next steps, including strengthening the tool's evidence base, broadening its scope, and integrating it with other tools or sustainability outcomes.
- Highlighting advantages of the co-design process and opportunities to enhance it.

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Further Information

Biodiversity Assessment Tool for NZ farms:
Learn more about the tool and its design process
Test the prototype tool
Research resources from the co-design process

New Zealand Sustainability Dashboard

[a] http://www.conservationevidence.com/
[b] https://coolfarmtool.org/
[c] Ecology and Society 19 (2): 3.
[d] Methods in Ecology and Evolution 2: 238–2470.
[e] In our case: https://shiny.rstudio.com/