Systems Thinking for Future Farm System Design

Our Land and Water National Science Challenge

Rural Professional Fund Project 2022-23 Funding Round

Contents

Executive Summary

A facilitation framework for rural professionals that utilises Systems Thinking and Systems Thinking tools has been developed through this project. The purpose of this facilitation framework is to enable rural professionals to engage with farmers in supporting their development of more resilient and robust farming systems into the future. Advisors are being challenged by the many integrated factors impacting on future farm system design and in many cases the confronting conversations that need to happen in order to challenge their farming clients to think about the future in a different way. This is difficult because change is happening at a fast pace, there are many variables to consider, and we often have incomplete science to support our decision making.

A farming business is an example of a complex and integrated system. Integrated systems (such as those involving land, water, air and people) are good opportunities for utilising a Systems Thinking approach. Within a farming system, actions taken on-farm have repercussions for systems off-farm. These issues are also connected in time and space and at different scales. With increased pressure to operate farming businesses that are not only productive and profitable, but also sustainable when soil, water and emissions challenges are considered, consultants need tools and resources to support farmer decision making. These tools and processes to need to be suitable for use within a commercial consulting world, and effective when engaging with farmer clients.

The value of a Systems Thinking approach is in the way of thinking and the discussion that results. It provides a way to understand the complexities of farming challenges while avoiding a silo approach where aspects are looked at in isolation from the rest of the farming business. Using Systems Thinking tools, it is easier to ask difficult questions, consider different perspectives and as a result, challenge the status quo in a non-threatening way.

Given the number of challenges facing farmers, and the complexity of farming systems there is no quick-fix solution to redesigning resilient production systems. The process developed through this project can support farming decision making but only when the consultant also possesses the prerequisite skills and knowledge identified. Just as the principles of Systems Thinking are designed to avoid quick fix options, this process does not deliver a quick-fix solution. The process and tools incorporated into the final facilitation framework can however add value to the client-advisor relationship with opportunities for use by consultants.

This project has highlighted:

- A facilitated strategy session using a whole of system approach with a trusted rural professional is an effective way to capture ideas and discussion.
- There are a number of prerequisite skills required by the consultant in order to support the redesign of resilient production systems utilising a Systems Thinking approach. These include:
  - A trusted client-advisor relationship
  - Training in Systems Thinking
  - Knowledge of mātauranga Māori
  - Facilitation skills
  - Knowledge of factors influencing production systems both inside and outside of the farm gate
  - Awareness of what you do not know

- The framework enables consultants to ask questions regarding their clients' businesses that are confronting and challenging in a non-threatening way that is also welcomed. The framework helped to remove emotion or judgement and made it safe for those discussions.
- The iceberg tool can be applied by farmers with their teams in order to hear their perspectives, providing them greater insight into their teams' view of the world.
- Mapping of Causal Loop Diagrams and identifying leverage points can give farmers more confidence in their decisions regarding where to focus energy on change for their future systems. However, the mapping process is time consuming and difficult to fit within a 2-3 hour workshop. There is an opportunity for a separate process to explore casual loop diagrams and to include a wider stakeholder group in this.
- There are opportunities for follow up meetings and team discussions to explore findings further which supports the client – consultant relationship.
- The framework can develop an overview to help explain that components of a farming system cannot be viewed in isolation and in some cases many factors may need to be considered for great outcomes.
- The principles of mātauranga Māori can be aligned with Systems Thinking frameworks to create an holistic approach to problem-solving and decision-making. The observations we make and the tools we use in both bodies of knowledge are grounded in a similar underlying principle recognising the intricacies of the connections that make up the whole.
- A sound farmer relationship and facilitation skills are required to work through this framework at a strategic level. The tools can, however, be used at various scales and for many different situations.

1. Background and Context

In New Zealand, there are growing concerns about the declining state of our soil and water resources and the role of current agricultural practices in this. It is challenging for farmers and those rural professionals supporting them to decide how to change their production systems to become more sustainable and resilient while taking account of the dynamic state of environmental, regulatory, policy, market, community and personal pressures.

To understand the impact of agricultural practices on the environment requires knowledge of space and time. Decisions taken at the farm level have impacts on ground and surface water, and the atmosphere far from the farm gate. There are delays in the system (often referred to as lag phases) that mean that the consequences of an action taken today may not be seen until years later. The interactions between farm scale, catchment scale and the receiving environment increase the level of complexity and uncertainty. Farmers are turning to their trusted advisors for support in negotiating this complexity and to develop more resilient production systems. Advisors are being challenged by the many integrated factors impacting on future farm system design and in many cases the confronting conversations that need to happen in order to challenge their farming clients to think about the future in a different way. There are opportunities to explore different tools and approaches for supporting farmer decision making into the future that can be incorporated within a consultancy business.

Education in agricultural science teaches farmers to make adoption decisions or to change practices based on sound science-driven principles that are robust, well proven and can be invested in with confidence. Compared to the component understanding of soil, plant and animal interactions, the science relating to the impacts of farming on the environment and atmosphere is incomplete with far more uncertainty and longer lag phases. The integration of mātauranga Māori principles and local cultural context is also fundamental, yet many farmers are just starting to learn how this connects to their farming businesses. This is unsettling, yet change is required, and farmers are being asked to invest in change before they have complete confidence that it will result in the improvements that they and their community seek.

To focus farmers on their environmental impacts, there can be many regulations and consent conditions to negotiate. Often the regulations and their overlap are confusing and difficult to interpret at farm level. While the regulations and limits are well intended, with similar environmental stewardship objectives, they are not considered in the context of the whole farm business. At implementation, not one applies the principles of mātauranga Māori in recognising the interconnectedness and dynamic relationship of broader ecosystem functions that underpin both farm function and the connected ecosystem. Several rule implementors hold the farm business to historical land use and provide a bureaucratic permission process to seek change, even if the change is positive for the environment.

Many farm businesses operate in an integrated way. In Canterbury for example, many use multiple sources of irrigation water and produce more than one product. For these farmers there will be more than one rule implementor often limiting the farm business to historical land use, and a bureaucratic permission process to seek change even when that change is positive for the environment. These challenges result in unintended consequences and duplication at the same time as the farmers are facing very real operational issues such as a changing climate, biosecurity risks and a constrained workforce.

Farmers planning production systems that will be viable into the future meeting both market and catchment sustainability assurance objectives need to take a more holistic view to design innovative farming options. They also need to know where to start. The principles of mātauranga Māori are well aligned to an holistic view and there is an opportunity here to explore Systems Thinking as a means of integrating these principles at farm level and minimising unintended consequences.

Systems Thinking is a way of making sense of complexities by looking at something in terms of the whole system and its relationships, rather than by splitting something down into its parts (Meadows, 2008). Systems Thinking provides a way of understanding complex situations that can help to identify key points of intervention or leverage points (potential solutions) within the system that will have the most significant impact.

2. Objectives and Outcomes

2.1 Aim of the Project

The aim of this Project is to design a facilitation framework that professionals can utilise when supporting farming clients in the design of resilient and sustainable production systems fit for the new world. The framework would draw on Systems Thinking tools to ensure a more holistic approach and the integration of mātauranga Māori principles within the design.

A successful facilitation framework and workshop approach for this project will result in:

- A documented approach suitable for other farm consultants or advisors to apply when facilitating re-design of farm production systems.
- A sound re-design of a production system that meets farmer operating profit targets, environmental obligations and connects with cultural aspects.
- Production systems with reduced risk of unintended consequences to the environment particularly in situations where input-based controls are a barrier to positive change and for integrating the principles of mātauranga Māori at farm level.

Using a case study and co-innovation approach this project aims to deliver on other important associated aims that includes:

- Succession of Systems Thinking knowledge within the sector through the connection of emerging farm consultants with an experienced Systems Thinking mentor (Dr Liz Wedderburn).
- Development in capability of a farm consultant of Māori descent through inclusion within the project team allowing him to explore the synergies of Systems Thinking with mātauranga Māori principles and in turn share his cultural knowledge with the broader team.
- Re-design of resilient farm production strategies for two large farming businesses currently grappling with change.

The project outcomes and outputs were documented by the project team at the beginning of the project (table 1). With these outcomes in mind the framework was designed by the project team using a co-innovation approach. The approach needs to add value for both the consultant and their farming client and be able to be incorporated in a commercial environment.

Table 1 Project Outcomes and Key Outputs

Output	Project Outcomes
Tools/Framework/Processes that is repeatable and suitable for use by other farm consultants	Systems Thinking approach adds value to advisor/farmer relations (repeatable process). Systems Thinking approach able to be built into a service package.
Characteristics of future production systems	Improved capability of advisors and participating farmers. Refined knowledge of future system: gaps, synergies, trade offs
Draft strategy for resilient systems of case studies that can contribute to redesign of production systems	Farmer participants have increased confidence to cope with increasing complexity. Resilient farm systems
Key learnings, evaluation report, journal article	Effective communication of the story

Findings from this project have been made available through the New Zealand Institute of Primary Industries Management Journal (June, 2023).

In addition, the learnings from this project regarding the use of Systems Thinking as a tool for rural professionals can be made available to contribute to a learning module for consultants in conjunction with the MPI Careers Pathway Programme.

3. What is Systems Thinking?

Systems Thinking is a way of making sense of complexities by looking at something in terms of wholes and relationships, rather than by splitting something down into its parts. Dr Liz Wedderburn, an expert in Systems Thinking, created and ran a one-day workshop with the project team as an introduction to Systems Thinking. Michael Goodman, a systems thinker defined Systems Thinking as:

- The whole is greater than the sum of the parts, the product of interactions
- An emphasis on relationships, interactions, connections, behaviour and,
- Acknowledges the circularity of the world

(Goodman, 2018).

This contrasts with the world being mechanical where if we pulled it apart and understood each part on its own, then we can explain everything by cause and effect (Goodman, 2018). Often this difference in thinking can be referred to as reductionism versus holism. Reductionism refers to an entity being the function or sum of its parts where holism considers a system to be more than the sum of the parts. If we liken it to a bicycle

– when the parts are all joined together you have a functioning bicycle. If you take the bike apart into its parts it no longer has the same meaning, nor does it function as it once did. The parts cannot be put back together without knowledge of their interactions and connections. Systems Thinking is about the bigger picture and understanding how the parts affect the whole.

Systems Thinking recognises that changes or actions in one part of a system can have unintended consequences elsewhere. It emphasises understanding the underlying structures, feedback loops, and patterns of behaviour within a system to identify leverage points for effective intervention and change, all concepts and terms that are discussed within this report. A Systems Thinking approach also supports the interrogation of underlying principles or beliefs that those involved (stakeholders) with the system hold. This way of thinking relies on understanding perspectives and Systems Thinking tools can help to dig deeper into stakeholder perspectives.

This holistic perspective allows us to see the bigger picture, explore the dynamics of complex systems, and gain insights into how they function and evolve over time. Systems Thinking is applied in various fields, such as environmental sustainability, organisational management, public policy, healthcare, and engineering, to address complex problems and develop more effective strategies for creating positive change (Meadows, 2008).

By considering the interconnections and feedback loops between different elements, Systems Thinking provides a valuable framework for analysing and understanding the complexities of real-world systems and finding innovative solutions to systemic challenges.

To understand the principles of Systems Thinking we compared traditional thinking skills to Systems Thinking skills using a diagram produced by Barry Richmond through an article written for 'The systems thinker' webpage (Richmond, 2018). The diagram (figure 1) shows that thinking skills are fundamental to mastering a systems approach to problem solving. Traditional skills focus heavily on analysis and events. This focus tends to lead to straight-line relationships where events are considered in isolation, often only skimming the surface of the casualty. The risk with this when problems are complex is that we are drawn to quick solutions that often fail in the long term. The thinking skills posed by Systems Thinking experts involves a deeper consideration of patterns of behaviour over time, relationships and structures, and flow on effects (Dr Wedderburn, pers. comm.). If we can truly understand a problem within a system using systems thinking skills we can avoid knee-jerk reactions to events that, whilst might provide initial relief, do not address true causality.

TRADITIONAL BUSINESS THINKING VS. SYSTEMS THINKING SKILLS		
TRADITIONAL SKILL	**SYSTEMS THINKING SKILL**	
Static Thinking Focusing on particular events	**Dynamic Thinking** Framing a problem in terms of a pattern of behavior over time	Specify Problem/Issues
System-as-Effect Thinking Viewing behavior generated by a system as driven by external forces	**System-as-Cause Thinking** Placing responsibility for a behavior on internal actors who manage the policies and plumbing of the system	
Tree-by-Tree Thinking Believing that really knowing something means focusing on the details	**Forest Thinking** Believing that, to know something, you must understand the context of relationships	
Factors Thinking Listing factors that influence or are correlated with some result	**Operational Thinking** Concentrating on getting at causality and understanding how a behavior is actually generated	Construct Hypothesis
Straight-Line Thinking Viewing causality as running one way, with each cause independent from all other causes	**Closed-Loop Thinking** Viewing causality as an ongoing process, not a one-time event, with the "effect" feeding back to influence the causes, and the causes affecting each other	
Measurement Thinking Searching for perfectly measured data	**Quantitative Thinking** Accepting that you can always quantify, though you can't always measure	
Proving-Truth Thinking Seeking to prove models to be true by validating with historical data	**Scientific Thinking** Recognizing that all models are working hypotheses that always have limited applicability	Test Hypothesis

Figure 1 Traditional Business Thinking versus Systems Thinking Skills (Richmond, B. The Systems Thinker).

The link between mātauranga Māori and Systems Thinking relates to and connects through the understanding that both mātauranga Māori and Systems Thinking principles view issues or systems from a holistic perspective or understanding that the world is an organic whole, and no individual or system exists in isolation of the context. Mātauranga Māori is about connectedness and the interrelationships of the world around us. Systems Thinking is grounded in acknowledging that the whole is greater than the sum of the individual parts. The observations we make and tools we use in both bodies of knowledge are grounded in a similar underlying principle recognising the intricacies of the connections that make up the whole.

Given this alignment, we consider that the Systems Thinking framework could provide confidence to local Rūnanga that strategic planning for future farming systems was being considered holistically. In addition, it can enable deeper consideration and challenge of the relationships and interactions between components, provide a means of communicating the complexities of a system to another party, and it could be utilised by Māori for Māori.

3.1 When to Use Systems Thinking

Problems that are suited to a Systems Thinking intervention have the following characteristics:

- The issue is important
- The problem is chronic, not a one-time event
- The problem is familiar and has a known history
- People have unsuccessfully tried to solve the problem before

Integrated systems, such as those involving land, water, air and people are good cases for a Systems Thinking approach (Dr Wedderburn, pers. comm.). We know that within a farming system that actions taken on farm have repercussions for systems off the farm for example within water, greenhouse gasses, biodiversity, and communities. These issues are connected in time and space and at different scales. The lag phases observed between an action on farm and the flow on impact on water quality are a good example. The interactions for greenhouse gases are felt at a global scale with international challenges. Food security, water use, climate change, biodiversity loss, economic wellbeing, social equity and justice and animal welfare are all heavily influenced by the primary sector.

Mātauranga Māori is a traditional intergenerational knowledge system that has been developed over hundreds of years by Māori as a result of living within the ever changing and the occasionally challenging physical environment as it moves through periods of landscape evolution. This system is underpinned by core principles and values which have shaped Māori culture. The system is based on the intimate connections and understandings of the landscape within which Māori have lived and is derived from a complex combination of observation based, practical responses which have enabled Māori to remain resilient when faced with landscape evolution. These knowledge systems are underpinned by intimate connections and understanding of the environment, traditional knowledge of approaches and practices that can be undertaken to adapt to landscape change. This is the heart of Māori culture and is itself a system that shares characteristics of Systems Thinking principles. Many of the concepts are analogous to those used within Systems Thinking.

3.2 Systems Thinking and Farm Consultancy

The challenges facing farmers and the rural professionals supporting them are comparable to problems or issues that are suited to Systems Thinking intervention. Rural professionals are being challenged by the number of factors influencing farm systems and it is difficult to know where to intervene within an existing farming system that isn't delivering on expected outcomes. The knowledge that existing systems are not delivering on expected outcomes may come from only one indicator, or many. Examples may be profitability or compliance issues, others could be off farm indicators such as market signals or declining water quality.

Without complete knowledge or consideration for all of the factors, relationships and behaviours that impact the farming system it is very easy to offer solutions that have unintended consequences. This can occur when we consider solutions for the first indicator that appears without consideration of how that will impact the rest of the system. Both farmers within our project team consider that rural professionals are often too concerned about saying the wrong thing and their next job, to truly challenge them on aspects of their business. Although this is based on the opinion of two farmers, this is a risk for rural professionals supporting farming clients. The way of thinking that is developed through Systems Thinking can support the adoption of wider perspectives and encourage rural professionals to consider their clients businesses more holistically.

In other situations, consultants may recognise that their clients' system is at risk, and struggle to clearly articulate this back to their clients. The tools associated with Systems Thinking can allow for robust discussion and debate because you are focused on understanding causality and flow on effects. The tools support a deeper understanding and as a result can provide a space for asking difficult or challenging questions with less confrontation.

Whilst Systems Thinking can provide a means for understanding the complexities of farming systems it does not provide an immediate solution to redesigning resilient farm production systems. A Systems Thinking framework is in itself not a quick-fix solution. In order for a rural professional to utilise Systems Thinking to

support the redesign of production systems with their clients there are prerequisite skills and knowledge required.

4. Prerequisite Skills and Knowledge

Given the challenges facing the primary sector and the complexities of farming businesses, there are prerequisite skills and knowledge required of the consultant to support farming clients in the successful redesign of their production systems. This stems from the ability and trust required to be supporting farming clients at a strategic level. These skills include:

Systems Thinking training

The facilitation framework has been developed with Systems Thinking tools and takes a Systems Thinking approach. Prior knowledge of what that involves, coupled with the language and tools is important for the lead consultant. The project team acknowledge that there could be some initial learning or training to complete upfront (for those new to the concept of Systems Thinking) before this framework or process could be utilised within a consultancy business. Because of this we have included more comprehensive information relating to the tools and how you can use them with clients within the appendices of this report.

A common language enables systems to be clearly defined and maintains the focus on the complete picture to reduce the risk of factors being considered in isolation. The tools used support the way of thinking which is at the core of using a systems approach well.

If the lead consultant/facilitator has prior training in Systems Thinking, the client would only require a brief introduction to the concept. With a trusted client-advisor relationship the consultant can then lead their client through a Systems Thinking framework.

Trusted Client – Advisor Relationship

Trust is the foundation of a client-advisor relationship and in developing sound rapport. Challenging and redesigning production systems taking a whole of system approach requires an existing client relationship and specific client knowledge. This project has considered that there would be an existing relationship and was not intended for use within the first meeting with a new client.

Understanding of farming production systems

Knowledge of client specific systems and also wider system inputs/outputs to support questioning through any meetings or workshops. The knowledge of what farming businesses may need in the future that they do not have at present is also useful when considering the development of future systems.

Knowledge of broader challenges and opportunities beyond the farm gate

Supporting farming clients in their production systems, in a holistic way requires knowledge of factors that may contribute beyond the farm gate. This could include an understanding of regulations, market drivers or value chains and of other factors such as anticipated changes in climate patterns, new regulations, or emerging biosecurity threats.

Mātauranga Māori

The future success of AoteNew Zealand relies on the ability to work collectively with consideration of both traditional and new ways of thinking, including emerging research. Co-governance is a pathway that has been intended as a step towards restoring Treaty obligations and upholding Treaty principles. An understanding

of the principles of mātauranga Māori is important for understanding the cultural context for a farming business and for future Iwi engagement.

Facilitation Skills

The project aim is to use a facilitation approach that utilises Systems Thinking and tools. It is therefore an important prerequisite to have experience and practice in facilitating client meetings. The process requires careful framing, and facilitation techniques in order to capture the value from the tools in relation to the thinking and discussion that is prompted. Effective facilitation is important to:

- Create a Safe and Inclusive Environment - an environment where all stakeholders feel comfortable expressing their perspectives and ideas. This inclusivity encourages diverse viewpoints, leading to a more comprehensive understanding of the system and its complexities.
- Actively Listen - Systems Thinking requires understanding multiple perspectives and gaining insight into the underlying dynamics of a system. It is important to ensure that everyone's contributions are heard and valued.
- Ask Questions – practiced facilitators can ask thought-provoking questions that encourage participants to explore the deeper causes and effects within a system.
- Managing Group Dynamics – if there were multiple stakeholders present there could be different interests, priorities, and perspectives.

Awareness of what you do not know

Full comprehension of a complex system is challenging, and our understanding of a system is always limited by available information and knowledge. There may be hidden variables or interactions that are not yet discovered or understood. This can lead to gaps in our understanding. It is important to acknowledge that the findings and outputs from this project will not guarantee the effective redesign of resilient farm production systems for clients on its own (it is not a quick fix).

Whilst broad knowledge and specialist skills are required to support clients in the development of resilient farming systems, the process and tools developed through this project could be utilised in a group. This would enable a collective approach within a business with different people supporting as experts as and when required.

5. Framework Design

The methodology followed can be found in Appendix 7.1 along with the facilitation plan. A co-innovation and case study approach was used in the design of the process and tools chosen. This approach is well aligned with Systems Thinking as we considered the perspectives and views from multiple participants including farmers.

Using Systems Thinking tools, the methodology involved developing an initial process to test with our first case study farmer Richard Wright. Using feedback from Richard, reflections and insights from the project team a version two of the process was developed. This was tested with case study farmer Tony Coltman in workshop two. Feedback and reflections were again sought to build a third iteration of the process that was case studied by a consultant within Agri Magic who was not part of the project team, and a third farming client. The combined insights and knowledge gained have been built into this final report.

The process and tools were also shared with Kaumatua Henare Edwards in a meeting (hui) to discuss (korero) the alignment of the principles of mātauranga Māori with Systems Thinking. Kaumatua Henare supported

Piripi's views that there is a nice alignment between the two approaches. It is important to acknowledge that mātauranga Māori is a taonga (treasure) that has been passed down from tūpuna, it has its own complexities and will inevitably vary between iwi, hapū and in some cases whānau. The same acknowledgement is required when working with farming clients for their businesses and values.

5.1   Case Study Farmer Selection

Richard and Tony run large farming businesses within Canterbury who recognise that future farming systems will need to look different from the past, and are considered by others as forward thinkers.

Both farmers are grappling with a high degree of change within their businesses including the impact of changing climate patterns and extreme weather events, biosecurity risks, a reduced workforce and an increase in the number of fragmented and disconnected nutrient and land use related regulations. Richard and Tony are well connected in their communities, and have often been early adopters of new ideas, innovations and/or technologies. The reason for asking these particular farmers was to test the methodology and framework with those that consider that the future will need to be different from the past.

Each of their businesses include more than one main income stream, and a team of people responsible for overall performance and delivery on outcomes. Richard's farming system is particularly diverse and also includes a 'pasture to plate' component where they produce and sell their own beef through their own brand. Both recognise that change is required in order to run resilient businesses into the future and want (and are ready) to prepare for this. Richard and Tony saw that there is a need for support in this space when thinking about future strategies, and both were willing to be involved in the co-design process to develop a framework that could support other rural professionals in discussions with their farming clients.

5.2   Key Tools

Two key Systems Thinking tools were used through this project - the Iceberg and Causal Loop Diagrams (CLD).

The iceberg model is used in Systems Thinking to demonstrate the various levels of construct (or layers) to a situation or an organisation. Like an iceberg, a large percentage of what is occurring in our world is hidden from view. This model helps to bring these parts into view and supports understanding by using a series of layers. The layers help to unearth what sits below what we observe everyday (ie. the tip of the iceberg) (creative commons, version1.1).
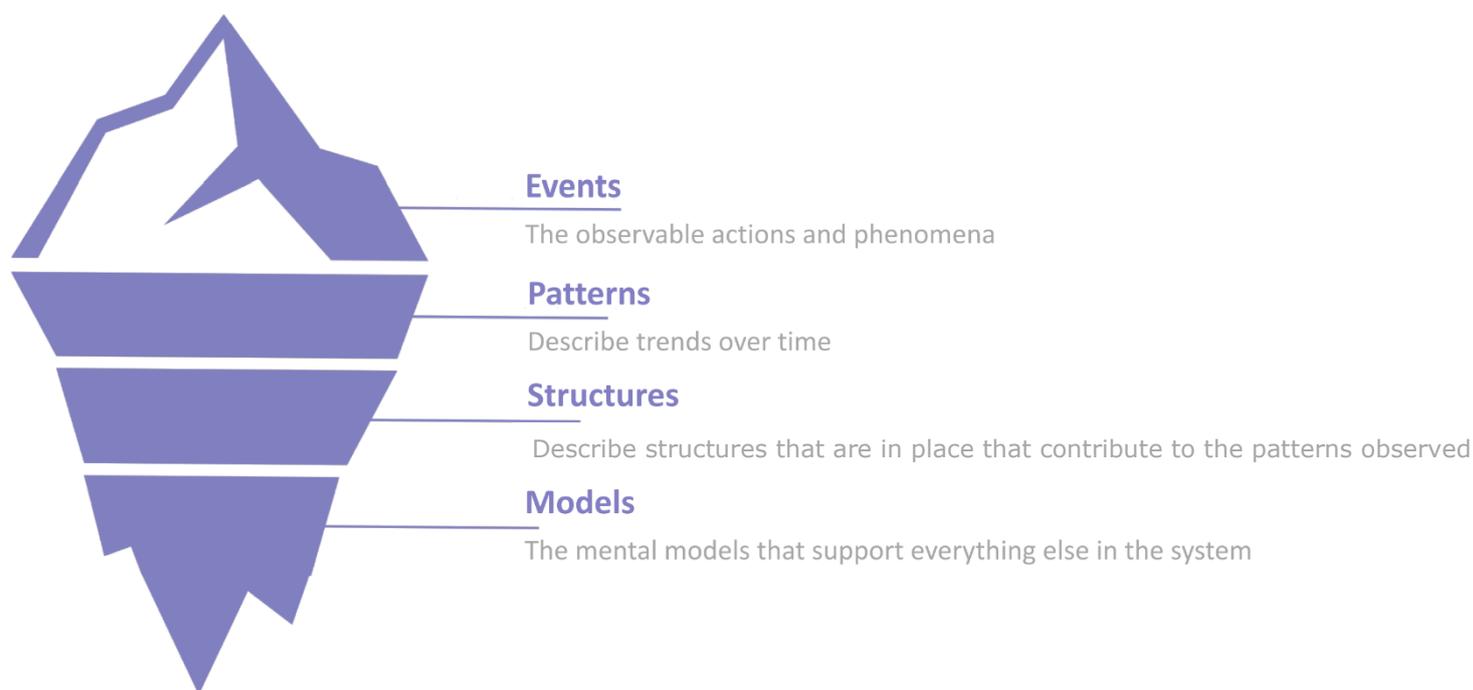
Figure 2 Iceberg Model (creative commons)

Figure 2 shows an iceberg canvas that can be used to help reveal the different levels/layers within a system. To identify the detail, you begin at the tip of the iceberg and work down.

The observable events:

These are often what is front of mind and happening at that point in time. Events are similar to newspaper headlines. These might also be known facts about parts within the system. Within a farming context, for example this might be a headline related to intensive winter grazing and water quality. Given the complexities of farming systems there are likely to be more than one event. An iceberg related to intensive winter grazing has been included in appendix 7.2.

Patterns that describe trends over time:

What are the underlying patterns that have been occurring over time, (behaviour over time, BOT) related to the event? These patterns or trends might be quite obvious and easy to pinpoint, or alternatively may be happening subtly in the background requiring more thought to identify. When considering the patterns that are emerging over time it is important to consider what is happening at a broader scale and with other stakeholders. An example of this might be related to public perception.

Structures in place that have contributed to the patterns:

The structures that are in place impact or support the trends that have been observed. The structures that are in place can often be the reason why things are done a certain way and can have a strong impact on patterns that emerge. In determining structures, we can think about what rules, norms, policies, or guidelines are in place. These could also be informal ways of doing things that have become established either formally or informally, for example on farm policy documents.

Mentals models – the way you see the world:

Mental models explain the way you see the world. The mental models support the broader functioning of the system and are often the aspects that aren't obvious or seen. Identifying mental models can be

challenging. The use of questioning can help to get to true mental models. It is also important to consider the views of others at this point as that insight can be valuable for system change later.

As you move down the iceberg it becomes increasingly hard to identify the components at each level. Equally, the amount of leverage that can be gained from an intervention also increases as you move down the iceberg. An intervention at the event level is often a "quick-fix" or referred to as a fix that fails. Interventions at points further down the iceberg are much more impactful. Points of intervention are considered as 'leverage points'.

Leverage Points:

In Systems Thinking, a leverage point refers to a specific point or intervention within a system where a small change or action can lead to significant and lasting shifts in behaviour, structure, or outcomes. Leverage points are strategic places in a system where targeted interventions can produce the most significant results or influence the system's behaviour in a desired direction (Meadows, 2008). Donella Meadows, a renowned expert in Systems Thinking has demonstrated that the greatest leverage involves transcending existing paradigms and embracing new ways of thinking, often through a deep change in worldview or philosophy (Meadows, 2008). This only occurs with change that occurs at the base of the iceberg.

Leverage points are not always immediately apparent and can vary depending on the specific system being analysed. Identifying and targeting the right leverage points is crucial for creating effective interventions and achieving desired outcomes within complex systems.

The questions asked and prompts given at each stage are key to being able to gather a clear picture of a system in this level of detail. Although aspects can be difficult or confronting (such as discussion on mental models) the tool itself is an effective way to remove the emotion from a situation. It is also an effective way to get those involved to put themselves in someone else's shoes to reflect on how a situation may impact them. Leverage points can sometimes be difficult to identify using the iceberg process alone. The Causal Loop Diagram (CLD) is a second tool that can help make leverage points clearer and easier to identify.

The iceberg model allowed for the current farming system to be explored first and provided the same framework for transitioning to consider what a future system might look like from the bottom of the iceberg model back up (as shown in figure 3 below).

Current System

Iceberg Canvas

Emerging System

Current Events

Events are the individual activities or facts about the state of things in the system. Write in the box below the events and associated variables in the system.

Current Patterns

Patterns are the changes in variables that occur over a period of time. They are the trends that we perceive taking place over time. List the patterns you see in the system.

Current Structures

What are the rules, norms, policies, guidelines, power structures, distribution of resources, or informal ways of work that have been institutionalized? Post up all your ideas.

Current Models

What are the key mental models expressed through beliefs, attitudes, morals, expectations, values or culture which allow current structures to continue? Post all your ideas up.

Future Events

What new events would we hope to emerge from the new underlying patterns and structures we have outlined above? Post up any ideas on this.

Future Patterns

What new patterns may emerge from the new structures and mental models? Post up any ideas you may have.

Future Structures

What new structures would emerge from those new mental models and values? Post all your ideas.

Future Models

Post up your ideas for the new mental models and values that might be needed to shift the paradigm.

Figure 3 Iceberg Model used for Workshops (creative commons)

A casual loop diagram (CLD) visually describes a system, making transparent relationships between factors and enabling identification of leverage points. A CLD can help to explain cause and effect whilst capturing the complexities within a system. The process of creating the diagram and the conversations that are generated through the process of creating a CLD are as equally powerful as the diagram itself once completed. The process and the way of thinking is the key driver of significant change when utilising Systems Thinking. The diagrams themselves are useful to understand a system's underlying feedback loops or structures, identify key points of leverage and can help to identify constraints within the system that could impact the ability to change.

Ideally, diagram construction is most effective when different stakeholders (for example the farmer and rural professional) work together as the process reveals the different perceptions they have of the system and its behaviour. Stakeholders could also include a broader group for example: regulators, mana whenua or neighbours. Used in this way it can accelerate an understanding of perspectives and the identification of shared leverage points.

The development of CLDs is not a quick process and it takes practice to develop easily. It was not anticipated getting to the point of developing a causal loop diagram within the project workshop. The discussion had through the explanation of a CLD and the key variables that each farmer considered to be relevant for a resilient farming system were included within the workshop design. A CLD was created post- workshop to provide information back to the participant for further discussion.

The process for the development of a causal loop diagram has been included within appendix 7.3.

The system described in figure 4 (developed following the completion of Workshop One) shows the diversity of interrelated factors in a biological system, business process, skilled people and softer variables such as trust and confidence. The CLD can be interpreted by starting at any point. The arrow to the next factor determines the direction of influence, the smaller arrow and 's' or 'o' determines if the next factor is increasing or decreasing and in what direction (same or opposite). Where two factors influence each other there may be a reinforcing cycle. The diagram can also help to identify what factors may be needed to contribute to an outcome. For example, starting with top quality animal welfare. If animal welfare is improved then there is also a likely increase in how fit for purpose the pastures and stock are. This is reinforcing as it also works in reverse. Additionally this shows that without strong biosecurity it is difficult to have top quality animal welfare and this has a direct influence. As biosecurity increases, so too does animal welfare. The link from animal welfare to profitability is driven through the production system.

What are the Factors, Relationships & Behaviours That Define a Resilient Farm Business
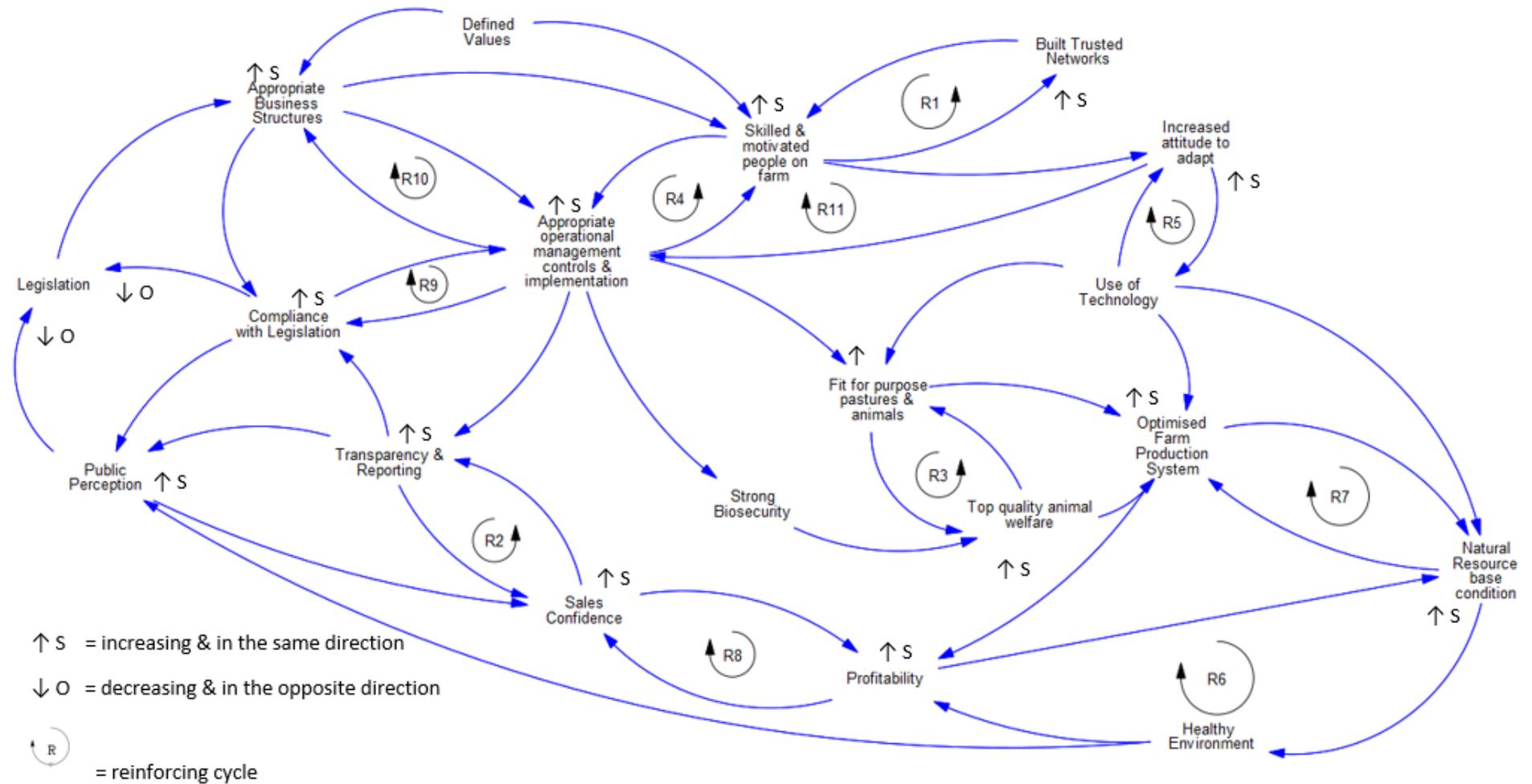
Figure 4 Example of a Causal Loop Diagram

5.3 Workshop One

The workshop was designed to cover:

- Introduction to Systems Thinking
- An overview of the tools to be used
- Application of the tools
- Evaluation and feedback

Workshop one was run by the project team (Anna Higginson, Piripi Perry Smith and Dr Liz Wedderburn) with farmer Richard Wright. PowerPoint was used to introduce Systems Thinking and provide examples of the tools. The PowerPoint slides and information captured during workshop one can be found in appendix 7.4.1. This includes the feedback captured from Richard.

The key learnings from the workshop are captured in table 2 below. The table highlights what worked well (positive), what didn't work well (negatives) and what was interesting to note.

Workshop one identified that Systems Thinking can support a consultant to view a farming system in a more holistic way. The training in Systems Thinking as a way of understanding systems was fundamental for this. The tools used with the client generated good discussion and allowed the identification of gaps and potential leverage points within the existing system. It was however not enough on its own to redesign the production system. The workshop could be delivered in 2 hours if the causal loop diagram was prepared afterwards. The development of the causal loop diagram and summary document could be prepared in the same day. As a result this process including the follow up required could be completed within one to two days of work. The preparation time required is greater when still developing Systems Thinking knowledge, and it is anticipated that this would improve with reiteration of the tools and approach.

Table 2 Insights from Workshop One

What worked well (+)	What didn't work well (-)	Interesting
Having examples at hand to help describe the principles of Systems Thinking and how the tools can be used. Examples related to production agriculture worked the best as they resonated with Richard.	Structures were difficult to pinpoint and explain. We identified this was because we had not clearly isolated the scale to which we were applying the tools (eg. Operational vs strategic)	The information was easy to capture and came freely through each stage of the iceberg. When establishing patterns we had to prompt for any negative trends and they were less forthcoming.
Having the client hold the pen and use the whiteboard to capture thoughts themselves as we facilitated the steps.	Mental models are more difficult to isolate. There is the ability for the client to still say what they think we wish to hear. Strong client understanding and facilitation is required to unpick mental models. This section is hardest for both the client and the consultant. Prior context and framing could help to acknowledge that the "gold" moments often stem from conflict and/or difficult discussions.	There is no right or wrong answer. Facilitation was the key skill needed to generate the discussion and capture insights from the client.
Identifying patterns over time that have been emerging provided the most insight into what was impacting the business.	The language around 'mental models' was confusing.	Richard considered this a new way to consider the farming system and it had prompted him to think in ways he hasn't had to think before and to consider his business differently.
Prompts and questioning worked well to encourage deeper thought and to bring other views or factors up for discussion	The causal loop diagram appears confusing and is overwhelming when shared. Although Richard was interested in spending time understanding it.	It was easy to transition from the current system to the future system because Richard already knows that change is required.
The process allowed us to ask difficult questions easily (as it was considered part of the tool and was easier to frame). Richard was aware of the parts of	We weren't that polished in the delivery given it was the first workshop using these skills and tools. This highlighted that more preparation would be	The workshop in itself was not enough to redesign the production system. This would require follow up and additional work.

process that were designed to challenge him so he was not caught off guard.	required initially by consultants looking to utilise the tools within their own client meetings. This impacts the overall time and cost of the approach.	
The explanation of the causal loop diagram (using a prepared example related to resilient farming systems) provided a way to hear Richards thoughts and ideas. He also shared what he agreed with and disagreed with.		Richard was interested by the causal loop diagrams and thought it would be interesting to use a diagram of the system and work through what would happen under different circumstances such as shock factors. Asking "if x or y happened is it still resilient?".

There could be a separate workshop style service product that focused on the causal loop diagram as a tool for discussion within a group setting (eg. with a farm team) |
| The client did not have to do any preparation before the meeting. | | Comparison of the future patterns and structures against those in the current system can identify gaps. Examples could include governance structures, or could be linked to specific tools or knowledge.

A more significant structure for a future production system could be a viable market. |
| Richard asked to take a copy of the detail we worked through back to go through with his team on farm. He wanted to use the process to gain better insights from his team and to hear their perspectives. | | |
| The summary report with process, key insights and identified leverage points was a useful starting point | | |

for the redesign of the future systems for Richard. Included within appendix		
The process was aligned with the principles of mātauranga Māori. Specifically enabling a holistic approach, understanding relationships between factors, and sustainability. Additionally the iceberg offered a safe place to consider how local iwi may be impacted by both the existing and future systems.		

5.4 Key Changes ahead of Workshop Two

The changes made ahead of workshop two have been summarised below. Given that the value gained from the first workshop was through the discussion, the project team reflected on the facilitation style and improvements that could be made there. This included:

- Clarifying the scale at which the farming system is considered. It was agreed to focus at a strategic level (rather than operational).
- Recognising which prompts worked well and where (including the type of questions asked)
- Getting the participant to hold the pen and draw their own patterns over time when working through the iceberg.
- Using some more examples to help with explanations – this was particularly important for explaining the concept behind exploring mental models. Given this term (mental model) did not resonate with the farmer, the terminology was changed to 'how you see the world', and examples were provided. A winter grazing example for the iceberg process was included (included in appendix 7.2)
- Matching the explanation to the correct slide and not skipping ahead
- Checking for participant clarity along the way
- Visual aids (eg. diagrams) are more effective than words to explain the process
- Adding in a visual aid to show the current system as separate to the future system (despite being shown within a 'u' shape on the iceberg diagram). This has been included in appendix 7.4.3.

5.5 Workshop Two

Workshop two was run by the project team (Anna Higginson, Piripi Perry Smith and Dr Liz Wedderburn) with farmer Tony Coltman. Updated PowerPoint slides were used to introduce Systems Thinking and provide examples of the tools. The PowerPoint has been included in appendix 7.5.1.

The key learnings from workshop two are shown in table three.

On completion of workshop two a separate model for describing the transition from the current system to the future system was developed (see appendix 7.10). The process and tools were not able to produce a redesigned production system at the conclusion of the meeting, but were able to facilitate discussion and ideas that can contribute to the development going forwards. The process has encouraged the farmers to take ownership for their decision making. The process and tools (particularly when they hold the pen) is a technique of facilitation that gives the control to the person with that pen – in this situation the farming client. When ownership is taken of ideas and thoughts they are more likely to be followed through.

The approach has reconfirmed the key prerequisites that would be required in order to successfully utilise this process and the tools involved. Consultancy businesses would therefore need to recognise the prior training required in order to build this knowledge and approach into their services.

Feedback from both case study farmers was positive. They considered that the way of thinking and the tools used would be of benefit to rural professionals in supporting their clients. Workshop two was easier to deliver with less preparation time required. Workshop two highlighted that the farming client also needs to be prepared for working through an approach that may be quite different to that they are used to. This would require pre-meeting discussion and framing to ensure that the process and tools were appropriate for the client and their situation.

Table 3 Insights from Workshop Two

What worked well (+)	What didn't work well (-)	Interesting
Having examples that were related to agricultural production to explain the concept of systems thinking and how you could apply the tools.	We spent too long discussing and interrogating the patterns of behaviour over time within the current system. This was again impacted by facilitation skills.	The client considered that many advisors are too afraid to ask difficult questions and so the opportunities that come from debate and conflict are missed in many cases.
The approach made the client think about his business in a different way that was both refreshing and challenging (in a good way)	The diagrams showing the transition from the current to future systems did not resonate with Tony. Both appeared visually as hard work or backwards steps.	The preparation time was less as we felt more comfortable with the concept of systems thinking.
Iceberg to unpick the current system and identify which aspects to keep, remove or add for the future systems.	Having the client capture their thoughts and ideas on paper in front of them where the group couldn't all see. Capturing information where everyone could see enabled easier facilitation and better discussion.	The process wouldn't be useful for a large audience (ie. as an extension tool) however it would be really insightful to run with a number of business stakeholders.
The process and the tools provided a safe way for difficult questions to be asked.	The workshop itself didn't result is a redesigned production system. The discussion and summary notes however can be used by the farmer in supporting the next step.	Tony challenged us to consider the output as a strategic session that you would run over the course of a day or half a day with all key business stakeholders.
Having the scale clearly defined made exploring system structures much easier when compared with workshop one.	Causal loop diagrams were still complex when included within the follow up report. The discussion and factors that came from the initial conversation were good and a useful part of the process.	The client felt that the causal loop diagrams would be good to explore as a group where time could be taken to go through them in detail and to discuss potential 'shock' factors.
Capturing the patterns of behaviour as mini graphs.		The consultants in the project team have historically had less involvement in Tony's business compared to Richards. Whilst this made some parts of the

		facilitation process challenging, we were still able to work through the process using the tools. It is harder to gauge if mental models are true without prior knowledge of the client and an existing relationship.
Using the concept and example of a causal loop diagram to capture thoughts and ideas on what would be needed for a resilient farming system. This built on information captured through the iceberg process and formed the foundation for what to consider in designing the new systems.		
Using key questions to prompt thinking. Many of the questions have been included within the appendices for future reference.		
The process and tools were adaptable to the situation and the client.		

5.6   Case Study by Third Consultant External to the Project Team

A third Agri Magic consultant that has had some exposure to Systems Thinking, (but who has not been involved in this project) took one of their clients through this framework. Through this process the following points were noted:

- The process worked well to generate good discussion.
- The framing and context at the beginning is very important and the consultant considered that this was where more time should have been spent.
- The client and consultant saw the mental models as an excellent place to provide challenge. The client encouraged the consultant to really challenge their thinking (client held strong views themselves) and suggested that this would be where the consultant could provide different views, ideas, thoughts that could encourage and/or challenge the client to think differently.
- The consultant recognised the importance of being well prepared and knowing the client in order to provide robust challenge where needed through the process. The challenge required would be dependent on the client. When there was an existing relationship the facilitation was easier as the consultant could recognise when to move on and where to spend time digging further. An example of this was that this client had already established the need for the future to look differently and could work through the current system quickly to arrive at where to for the future.
- Both the client and consultant considered that it would be a good framework for an annual meeting/catch up.
- Afterwards the consultant also noted how facilitation skills were very important, particularly to enable actions and potential gaps to be recognised as the meeting progressed and to capture as they go, whilst still remaining engaged in the discussion.

6. Conclusions

The aim of the project was to develop a facilitation framework using a Systems Thinking approach and Systems Thinking tools that can be used by rural professionals to support their clients in developing future farming systems. There were a number of identified outcomes and outputs that were summarised in section 2.0 of this report. This report provides a full summary of the process, the final framework and all learnings from the project. An NZIPIM journal article has been produced for print in the June 2023 journal.

Our key findings:

- Systems Thinking is a good fit as a tool to assist consultants when working with clients with their farming challenges as the systems are complex, with many variables and relationships.
- The value for the client is in the thinking and the discussion that the process and tools prompt.
- In order for this process to be commercially viable within a consultancy business there are a number of prerequisites that need to be met as documented in section 4.0. This could require an initial investment in training to lift knowledge and understanding.
- With the prerequisite skills and knowledge the framework can be delivered in full (including preparation and follow up) within 1 to 2 days. Therefore, as a process for supporting strategic decision making it can be delivered efficiently to clients.

- To maximise the value from the process and the tools, the clients need to be prepared to try this approach. This requires pre-meeting discussion with the client and careful framing of the tools and process.
- The principles of mātauranga Māori are well aligned with Systems Thinking frameworks, particularly given the holistic approach and focus on relationships between factors and variables within a system. The observations made and the tools used in both bodies of knowledge are grounded in a similar underlying principle recognising the intricacies of the connections that comprise a system.
- As with mātauranga Māori, the outcomes of Systems Thinking will be unique to individuals or groups and allows a customised approach suitable for the place and the people. External tāngata whenua were engaged in this process. It is acknowledged their information and perspectives are not those of all Māori as a whole, but rather based on the knowledge imparted by those who have been involved in the collaboration.
- A sound farmer relationship and facilitation skills are required to work through this framework at a strategic level.
- Systems Thinking acknowledges that no two systems are the same. Any framework that encompasses the principles of Systems Thinking needs to be customisable and adaptable to the client situation. The framework developed is better described as a process with Systems Thinking tools that can be adapted to suit the requirements of the consultant and their client.
- A facilitated strategy session using a whole of system approach with a trusted rural professional is an effective way to capture ideas and discussion. This process, however, does not result in a redesigned production system as an immediate output. The thought process, identification of gaps and leverage points are key components to the future development of new production systems. In this way the process can be an effective starting point for this redesign process.
- The framework enabled the rural professional to ask questions regarding the business that were confronting and challenging. One farmer considered that rural professionals are often afraid to ask difficult questions in fear of losing their next job, but they are the most needed questions. The framework helped to remove emotion or judgement and made it safe for those discussions.
- Both farmers used the iceberg tool with their farm teams after the workshop in order to hear their perspectives, and found it enabled a non-confrontational approach. Through this they gained greater insight into their teams' view of the world.
- Following the workshops and with the follow up summary notes each farmer was confident with their decisions regarding where to focus energy on change for their future systems. For one farmer this was centred around organisational structure and people management; and for the other there was a strong focus directed towards technology and its integration to enable further transparency within their business.
- A repeat of the workshop with more of their team was requested by both the farmers involved in the workshops. They noted that the framework forced them to think and consider their businesses in a different way, with questions they hadn't considered before.
- Both farmers saw the framework as a way to help explain that components of their system could not be viewed in isolation and in some cases many factors may need to be considered in combination for great outcomes.
- The process was not tested on a client resistant to change. A transition section has been included within the process to support discussion at this stage. It is not known how effective this (and the process as a whole) would be in a situation where change was completely resisted.

The following outputs and outcomes have been realised:

Tools, and a process that is repeatable.

The tools and process are only repeatable when the prerequisite knowledge and skills are met. It would be difficult for a consultant with no knowledge of Systems Thinking to utilise the process.

Development of a framework for rural professionals

We have been able to develop a framework that could be utilised by rural professionals with the required prerequisite skills and knowledge of Systems Thinking to support strategic discussions with clients. The framework is built using principles and tools associated with Systems Thinking and is delivered through a facilitation process with clients. There is alignment between the principles of Systems Thinking and the principles of mātauranga Māori. The process would also enable further consideration of the cultural context of a farming business as the tools provide a mechanism for introducing different perspectives.

The tools and way of thinking can be used in general consultancy or built into a specific service package for clients. There could be further opportunities for different service offerings to emerge for consultants if gaps were recognised through discussions with their clients. Whilst this was not explored as part of the project, there are also opportunities to use the tools to support the inhouse development of consultants.

Characteristics of future production systems

The iceberg tool was effective in identifying where the differences between the current and future systems were. This started initial discussions on characteristics of future production systems, particularly when the perspectives of different stakeholders were considered.

Focusing the scale of this framework at a strategic level enabled the identification of many characteristics of future production systems through the development of Causal Loop Diagrams (CLD). Although the diagrams themselves were not completed with the client, their involvement in the initial discussion identified the characteristics that would be required. The CLD presents a format that allows the interrelationships to be fully explored and understood.

An additional benefit that this tool maybe useful for is the development of junior consultants when supported by a senior as the interrelatedness of components within a farming system can be explored and shown more explicitly. It could have use as a training tool within a consultancy business. Within Agri Magic we have identified that the iceberg tool has benefits for not only considering different perspectives, but also for understanding how and why events may have impacted in certain ways.

Draft strategies for resilient systems for the case study farmers

The summary report provided following the workshop has formed the groundwork for understanding what a resilient system may look like in the future. The discussion and thoughts provoked through the process were useful for both case study farmers in supporting their thinking around what their future systems will look like. It has helped to identify where there may be gaps and trade-offs and enabled a way to document this for future reference.

The discussion through the case study workshops in using the framework and its development gave both case study farmers increased confidence to discuss what the future could look like with their farming teams. Richard (case study one) was able to take the framework approach and take his team through the concepts and tools when back on farm. He used this framework to engage his team and also to capture their perspectives. He found the framework provided a non-confrontational way to discuss different perspectives and was intrigued to hear how others in the team saw aspects of the farming system they were operating. Tony took a similar approach and also acknowledged that it would be valuable to run again with more of his team present.

Both Richard and Tony noted within their feedback that this framework would be a way for consultants to work through a strategy with farmers that provided a safe environment for more challenging questions to be asked. When the third Agri Magic consultant worked through the process, the client actively encouraged them to challenge their thoughts and it was surprising to the consultant that this framework made that less confronting. As a result, it is felt that a framework that allows for systems to be explored at this depth could add value to advisor/client relationships and support the development of strategies for more resilient systems.

The outcomes sought from the project have also been summarised below with a particular focus on the use of the knowledge gained from the project team.

Improved consultant capability

The project has successfully improved the capability of the advisors involved. This has been realised a number of ways:

1. Increased understanding of Systems Thinking skills and language that advisors are able to apply in other situations. This has been useful in understanding team dynamics, and challenging different perspectives. It has also allowed the advisors to be more aware of different perspectives and to consider those within their own work and conversations.

    The Systems Thinking principles can be applied to everyday client communications. Examples the project team have been using have included:
    -   Questioning techniques to identify patterns of behaviour that might be emerging (without having to work through the entire iceberg) such as asking if events are increasing or decreasing in frequency, asking what other things are linked to a particular pattern, or asking what would happen if certain things changed.
    -   Recognising mental models that might come across in general conversation and noting these. Mental models underpin how the client sees the world, the training in Systems Thinking has brought us more in-tune with hearing these and noticing what impact they have on decisions the client is or isn't making.

2. Piripi Perry Smith, is extending the Systems Thinking tools and approach through his Masters of Māori and Indigenous Leadership (MMIL) that he is undertaking this year (2023). As part of the MMILL program, Piripi is aiming to develop a facilitated workshop which can be run by Māori agribusiness professionals to support farming clients, Māori and non-Māori, in designing sustainable and resilient farm systems that are capable of meeting the obligations of legislation and regulations, whilst

minimising the environmental impact and building on the cultural capability of farmers with knowledge of te Tiriti o Waitangi in Environmental regulations and policy. The project structure and design would draw together mātauranga Māori principles and Systems Thinking tools to work together side by side rather than trying to blend western sciences with mātauranga māori to offer an holistic approach to meeting the regulatory requirements. The similarities of the two were identified and explored through this OLW project. It is important to acknowledge that mātauranga Māori is a taonga (treasure) that has been passed down from tūpuna, it has its own complexities and will inevitably vary between iwi, hapū and in some cases whānau. The implications of this will be further explored through the masters project.

3. Learning how to develop and deliver a project using co-innovation from initial idea through to completion. A co-innovation approach offers parallels to Systems Thinking as different perspectives are considered.

7. Appendices

7.1 Methodology and Facilitation Plan

1. Introduction to the principles and tools of Systems Thinking through systems expert Dr Liz Wedderburn
2. Agreed project outcomes and outputs with project team (section 2.0)
3. Co-design of Workshop 1 to test with Case Study Farmer 1 (Richard Wright)
4. Workshop 1 undertaken with project team, systems expert and Richard Wright
5. Post-workshop 1 analysis and reflection undertaken by project team and Dr Wedderburn
   a. Documented insights, key learnings and feedback received
   b. Prepared changes from feedback ahead of workshop 2 (Tony Coltman)
   c. Documented summary report for Richard Wright including development of a Causal Loop Diagram
   d. Additional feedback documented following receipt of the summary report
6. Workshop 2 undertaken with project team, systems expert and Tony Coltman
7. Post-workshop 2 analysis and reflection undertaken by project team and Dr Wedderburn
   a. Documented insights, key learnings and feedback received
   b. Documented summary report for Tony Coltman including development of a Causal Loop Diagram
   c. Additional feedback documented following receipt of the summary report
8. Final framework prepared with documented approach to be trialed by a third consultant (not within the project team)
9. Explore relationship between Systems Thinking approach and mātauranga Māori.
10. Document feedback from the third consultant and write up final framework including the relevance of using Systems Thinking tools to support redesign of farm production systems in light of "new world" challenges with reference to the integration of Te ao Māori view.
11. Reflection on key learnings as a result of completing the project and developing the final framework with Dr Liz Wedderburn
12. Journal Article prepared in conjunction with final paper.

Table 4 Facilitation plan for workshops

Time	Activity	Purpose/Outcome	Resources	Who
8-8.15 (15 min)	Karakia Introductions to attendees and the project	Scene setter Gain clarity of expectations	Couple of slides with key points (note participants have had a copy of the proposal)	Piripi Anna
8.15-8.45 (30 mins)	Introduction to Systems Thinking and the tools	Familiarise participants with the concept and tools, understand why it is helpful	PPT covering context, Iceberg, CLD, future focus CLD prepared by Agrimagic	Anna Piripi

			Personal insights of Agrimagic	
8.45-10.15 (90 mins)	Application of tools	Testing if the approach works	Post it notes Pens Flip Charts	Anna Piripi
10.15-10.30 (15 mins)	Evaluation	Gain learnings and insights from the session	Flip chart	Anna
10.30	Next steps Closing Karakia			Anna Piripi

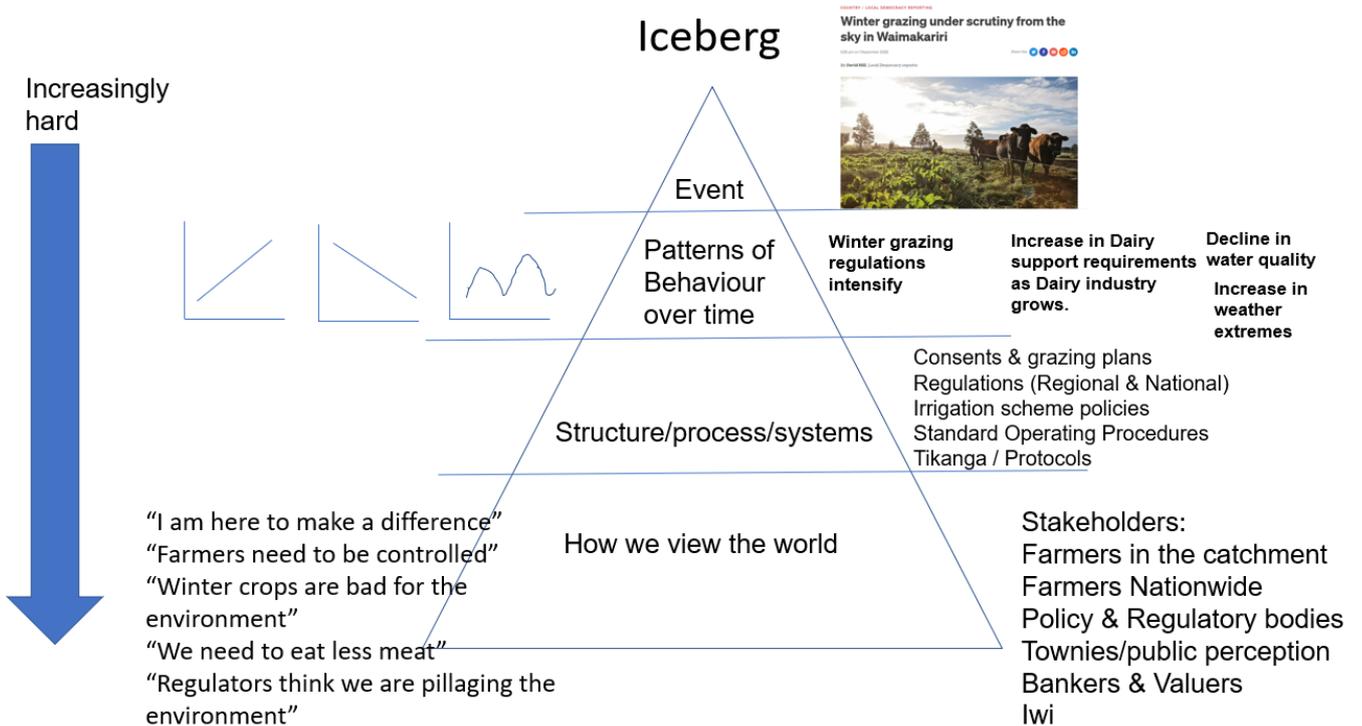## 7.2 Example of an Iceberg related to Intensive Winter Grazing

Figure 5 Example of an Iceberg related to Intensive Winter Grazing

7.3 Development of a Causal Loop Diagram

The process to develop a Causal Loop Diagram involves:

1. Articulating the question or situation you are looking to explore or understand.

A carefully thought through question/situation/statement is important so that those involved have clarity and can understand the scale being considered. Through training it was evident that a well thought through question can help to draw a deeper understanding and broaden and deepen thinking. For example, instead of focusing on what 'factors' might influence something you can also include what 'relationships' or 'behaviours' might influence the same thing. This encourages those participating to explore beyond what might be considered the more obvious variables (eg. like an event) to also think about the interrelatedness of components and the behaviours that might also be impacted.

2. Brainstorm (eg. on post-it notes) all the components or variables that are related to the question or situation you are exploring. Use one variable per post-it note.
3. Group the notes into common themes or headings. These are called affinity diagrams or groups.
4. Begin to map the system (starting anywhere)

For each post-it note consider two key questions:

-   what impacts it, and
-   what does it impact.

This helps to decide what comes next on the diagram. In understanding the impact it is important to consider if the impact is direct, or indirect (ie. through something else).

5. Once mapped identify any reinforcing cycles and balancing cycles.

A reinforcing cycle within the causal loop diagram is where two or more 'factors' continue to reinforce one another in the same direction. A balancing cycle is where two factors are opposites but balance the other out.

6. Identify leverage or intervention points.

Once the diagram is complete, potential intervention points become clearer. The use of the diagram helps to avoid targeting quick fix options as you are drawn deeper into understanding the interconnections within the system. An example of a leverage point within figure 4 is operational management controls and implementation. A strategy that ensures that these are fit for purpose will have positive impacts across the system.

7. Share the diagram with others.

A causal loop diagram represents a tool for continued system analysis. The diagram is not considered as an end-product as the development of the diagram will yield further insights and discussion when shared. This will help broaden the understanding of stakeholders and wider thinking. In many circumstances the fundamentals of the CLD can be placed into software packages to develop simulation and dynamic models. This project stopped at the drawing of the CLD.

7.4 Workshop One Detail

7.4.1 Powerpoint Slides

Systems Thinking for Future Farm System Design

Our Land & Water

Toitū te Whenua, Toiora te Wai

- Introductions

- Our Land & Water

- This Project – 'Systems Thinking for Future Farm System Design'

- Roles & Expectations

- Introduction to Systems Thinking & the Tools

- Application

- Evaluation

AgriMagic
SUPPORTING YOUR FARMING FUTURE

Systems Thinking for Future Farm System Design

Output	Project Outcomes
Tools/Framework/Processes that are repeatable	Farmer participants have increased confidence to cope with increasing complexity
Characteristics of future production systems	Systems thinking approach adds value to advisor/farmer relations
Draft strategy for resilient systems of case studies	Improved capability of advisors and participating farmers (repeatable)
Key learning, evaluation report	Effective communication of story
	Refined knowledge of future system: gaps, synergies, Trade offs
	Resilient farm systems

- The whole is greater than the sum of the parts, the product of interactions
- Emphasis on relationships, interactions, connections, behaviour
- Acknowledges the circularity nature of the world

Reductionism   versus   Holism

Sum of the parts equals the whole

Can't reduce the parts and retain the meaning of the whole

- An entity is the function or sum of its parts
- You can understand something by breaking it down into it individual parts (analysis approach)

- A system is more than the sum of the parts
- To understand you need to understand the relationships between the parts, not just the parts themselves

Problems that are ideal for a systems thinking intervention have the following characteristics:

• The issue is important.

• The problem is chronic, not a one-time event.

• The problem is familiar and has a known history.

• People have unsuccessfully tried to solve the problem before.

Land, Air, Water & People – An Integrated System

- The actions taken to stabilise the on farm system have had repercussions for the connected off farm systems i.e. water, greenhouse gases and biodiversity

- The issues are connected in time and space with interactions across scales global to paddock

- Food security, water use, climate change, biodiversity loss, economic well being and social equity and justice are all tied together in pastoral agriculture

Iceberg

Increasingly hard
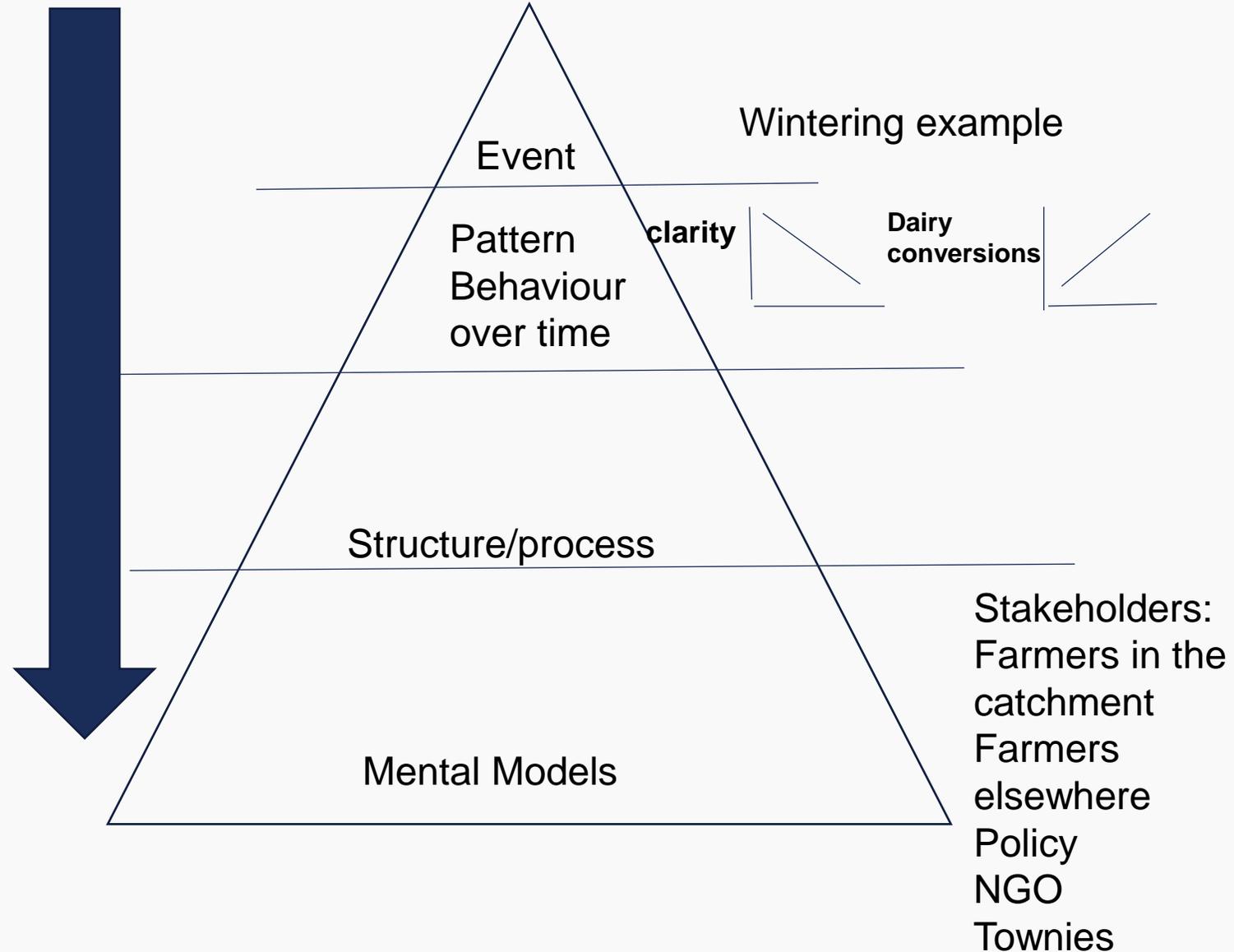
Event

Wintering example

Pattern
Behaviour
over time

clarity

Dairy conversions

Structure/process

Stakeholders:
Farmers in the catchment
Farmers elsewhere
Policy
NGO
Townies

Mental Models

What are the factors, relationships & behaviours that define a resilient mixed farm system ?

Affinity Diagrams

Eco System Health

Healthy waterways

Soil life e.g. worms

Bird life on farm

No weeds & pests

Energy & Motivation

Suitable biophysical resource base

Appropriate & adaptable resource base

Adaptive Practice

Effective Business Structures

Financially Viable

Understanding relationships

CLD
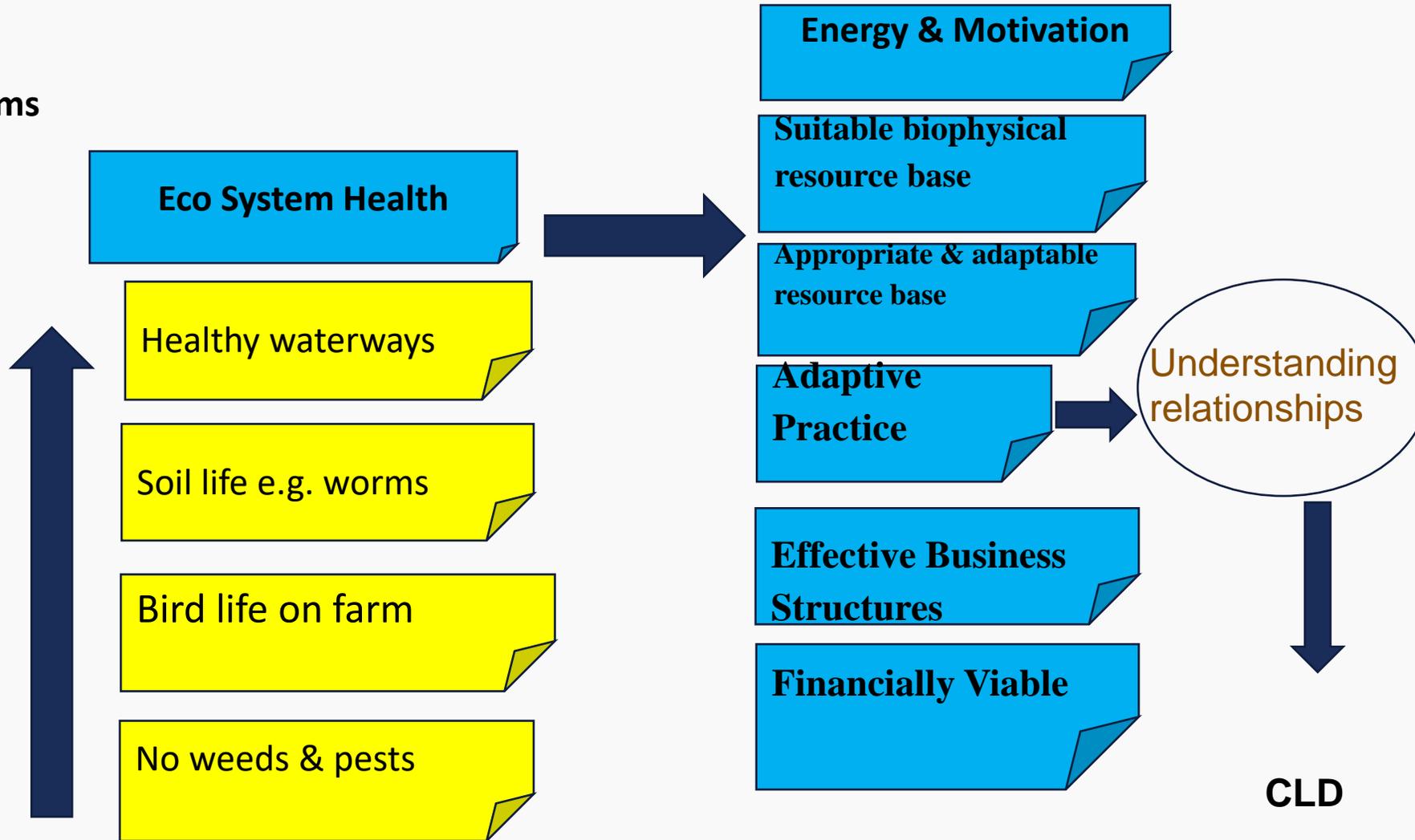
How fit into job — How do we make &
(get client outcomes)
where need more clarity
Improvements for learning/training
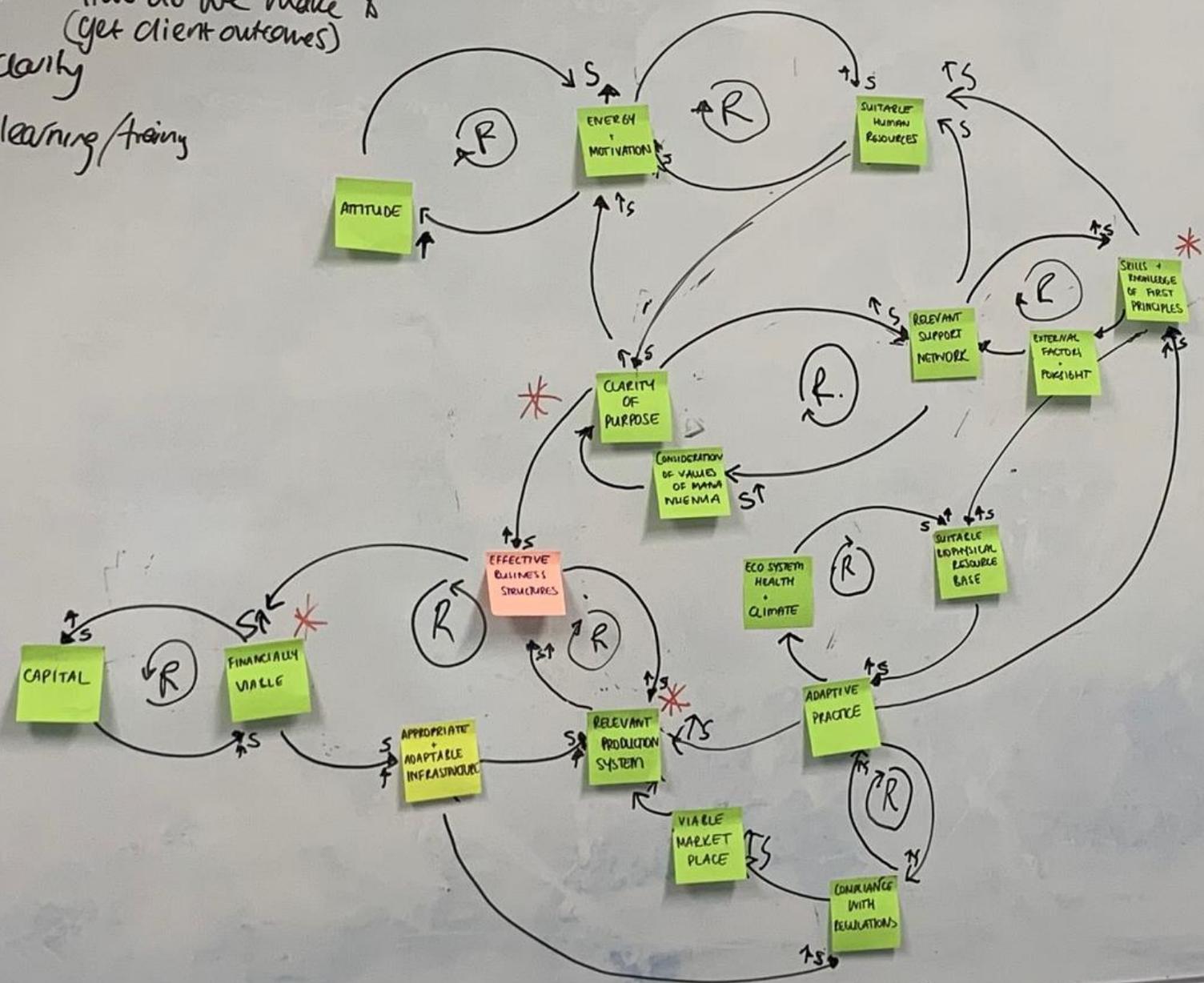
What will this influence
What influences this
Direct or via other?

WHAT ARE THE FACTORS
RELATIONSHIPS, BEHAVIOURS
THAT DEFINE A
RESILIENT MIXED FARM SYSTEM

ATTITUDE

ENERGY + MOTIVATION

SUITABLE HUMAN RESOURCES

SKILLS + KNOWLEDGE OF FIRST PRINCIPLES

CLARITY OF PURPOSE

RELEVANT SUPPORT NETWORK

EXTERNAL FACTORS FORESIGHT

CONSIDERATION OF VALUES OF MANA WHENUA

EFFECTIVE BUSINESS STRUCTURES

ECO SYSTEM HEALTH + CLIMATE

SUITABLE BIOPHYSICAL RESOURCE BASE

CAPITAL

FINANCIALLY VIABLE

ADAPTIVE PRACTICE

APPROPRIATE + ADAPTABLE INFRASTRUCTURE

RELEVANT PRODUCTION SYSTEM

VIABLE MARKET PLACE

COMPLIANCE WITH REGULATIONS

Iceberg Canvas

Current System

Current Events
Events are the individual activities or facts about the state of things in the system. Write in the box below the events and associated variables in the system.

Current Patterns
Patterns are the changes in variables that occur over a period of time. They are the trends that we perceive taking place over time. List the patterns you see in the system.

Current Structures
What are the rules, norms, policies, guidelines, power structures, distribution of resources, or informal ways of work that have been institutionalized? Post up all your ideas.

Current Models
What are the key mental models expressed through beliefs, attitudes, morals, expectations, values or culture which allow current structures to continue? Post all your ideas up.

Emerging System

Future Events
What new events would we hope to emerge from the new underlying patterns and structures we have outlined above? Post up any ideas on this.

Future Patterns
What new patterns may emerge from the new structures and mental models? Post up any ideas you may have.

Future Structures
What new structures would emerge from those new mental models and values? Post all your ideas.

Future Models
Post up your ideas for the new mental models and values that might be needed to shift the paradigm.

Source: Creative Commons

Evaluation

	1 = not at all 5 = just right	WHY
Has this process been valuable for you in thinking about your future farm system?		
Do you consider this process valuable to other farmers/growers?		
Was there enough background context on systems thinking as a tool?		
What outputs would you like from this project?		
Would you be prepared to participate in something like this again?		
What would **you** use systems thinking tools for?		

7.4.2 Insights from the 'Business as Usual' Iceberg Process

Events

There were a number of events identified by Richard. It became apparent that the changing climate is having a big impact with flow on effects to animal welfare, farm boundaries, and overall sustainability of the business. It was useful to frame this section with the question "if you were speaking to a family member overseas and you were telling them about what was happening within the farm business at the moment what would you say". It is important to emphasise that there are no right or wrong answers and the events are what they are. It is useful to consider them all regardless of them being 'good or bad'. This section was quick and straightforward.

From the discussion on the events we were able to recognise:

- The importance of weather extremes, responses to which have resulted in significant farm system change.
- The ability to feed and manage stock is paramount
- The client needs to be able to feel in control and to manage all the parts
- The importance of getting all the complexity onto one page

Patterns

At this point we got Richard to hold the marker pen, stand up and start drawing the patterns he was observing on a flipchart. It is much easier to consider the patterns as they would get graphed (on a graph of frequency of over time) rather than to write them down as this requires too many words and is time consuming. Figure 6 shows how we encouraged Richard to note down the patterns he has been observing over time. This was a key part of the discussion with a large number of patterns being recognised within the farming system (figure 7).
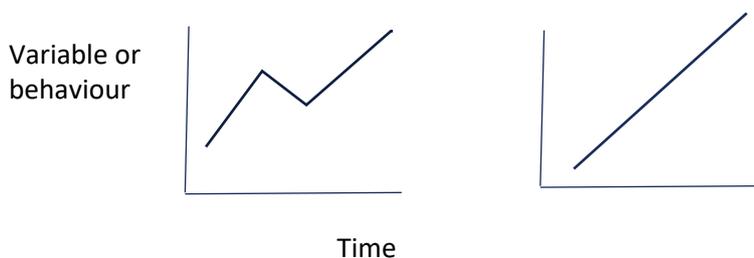

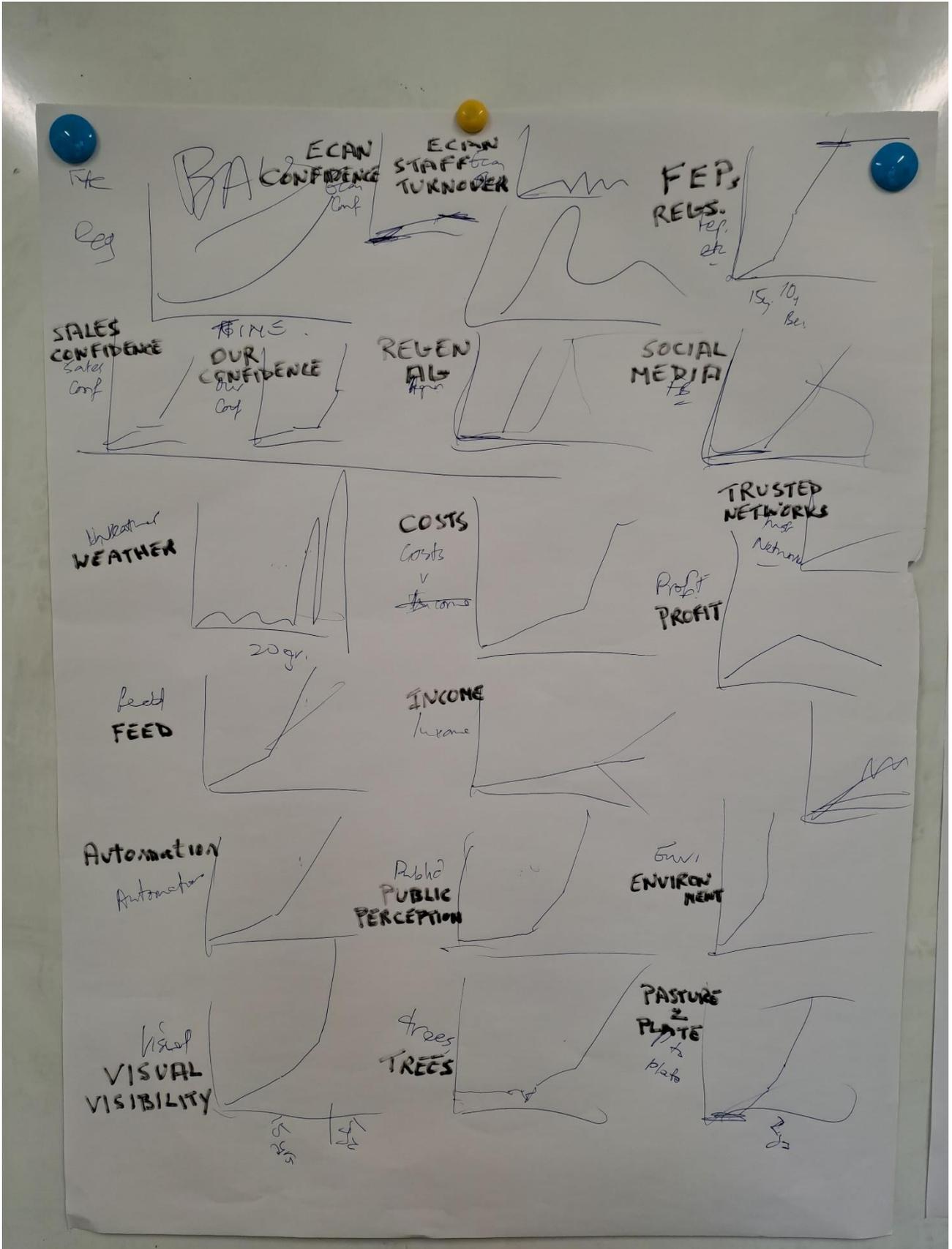*Figure 6 Examples of drawing patterns of behaviour over time*

Figure 7 Patterns of behaviour over time for Current System - Workshop One

From this discussion we recognised:

- This part holds a lot of power when the farmer is given the pen and owns what they are recognising.
- It is important to only put one factor on each graph, but to keep adding more if there are other flow on effects. Drawing them quickly (without having to overthink) is important and it was a key role in facilitating this part to keep the ideas flowing and capturing the patterns quickly.
- There is no right or wrong answer – the trends and patterns are what they are and that is ok
- Prompts were important to dig deeper, or to get Richard to consider other factors. Questions that worked well included:
  - "what about X"
  - "What is driving x,y,z"
  - "What is X influenced by and it is influencing anything else"
- The facilitator would have a role to help the client think beyond internal drivers to consider external factors.
- This part of the process had Richard questioning himself along the way
- Often in drawing up some perceived negative trends ideas were coming forward about how to solve these or how they could be worked through. It is important to capture these ideas along the way, and also to ensure you don't stop at this point and consider a quick-fix.
- A number of the factors identified through the trends/patterns would or could be main factors within a casual loop diagram (if using to draw the system out). They are also useful to help an advisor identify where support might be required. Areas of concern can easily be identified as well as gaps in knowledge.

Structures:

This step was difficult to explain. It is where the concept of scale (for example, farm operational level, strategic level or national etc) is important to clarify. We considered the farm scale with a focus on what operating structures were in put in place (from the governance team) as a start because they were within the farm's sphere of control. We also considered what other structures were in place that have an influence over that, for example regulations, normal practices and levy organisations.

The structures recognised included the environment, regulation, market pressures (consumer demands), education received, business structures, community involvement, processes on farm and the idea of automation.

Given that we had not specifically isolated the scale, we did not spend a lot of time discussing the structures. We recognised the need to refine this part and factor in more prompting questions to utilise in the second workshop.

Mental Models:

With prior training in the concepts of Systems Thinking it can be easier to identify underlying mental models on the way through. The iceberg tool made it less personal and confronting to challenge views of the world and easier to facilitate. It would be important to have a relationship with the client prior to implementing this framework, particularly at a strategic planning level. Although the framework helps with removing emotion, it is still important to have trusted relationship that would allow you as the consultant to challenge the thinking as the discussion was progressing. At this stage it was also insightful to ask Richard what other stakeholders may have as their mental models and how could this impact his business.

Through this stage we recognised:

- The language was confusing. The term 'mental model' didn't resonate so it was important to re-frame this section and relate it to 'how you see the world' as that was more relevant.
- It is useful to pull prompts from the previous sections to help understand the reasoning behind them. For example, from some of the structures, understanding why they were put in place can help to build a picture of mental models.
- Providing some examples of mental models that we picked up and discussion them with Richard was a good way to get him to think of others and also to challenge his thinking.
- Humans will find it difficult to face many of their own world views. Without knowledge of the client and facilitation skills it would be difficult to get to the heart of mental models with a client.

Examples of mental models noted were:
- If consumers re-purchase product then we are doing a good job
- Involvement in the community is important and requires give and take. It has to mean more than money.
- Don't like technology but like that the concept is exciting for the next generation
- If we don't adopt some technology we will be left behind
- It is good to be leading and change is exciting

7.4.3 Insights from the Transition Phase

The transition phase refers to moving from the mental model section at the bottom of the iceberg for the business as usual or current state system to the mental models that would ideally be in place under the future system. This is a transition from where we are now to where we would like to be. The project team had envisioned that this transition phase would be a key focus area for clients who do not feel as if there is change needed. The framework has been designed to support the design of future farming systems where the client is ready to make a transition. We feel that these tools could be useful to support change where a farmer may not see how or why change might be required however this was not tested.

In facilitating this section we asked Richard to consider what things would he be leaving behind and what things he would be taking with him. We also challenged him to consider what things would be added.

What we noticed:

- This transition was very easy for Richard. He is a forward thinker and the future is exciting for him.
- It was easy to park the business as usual and think about things differently.
- The future was focused around making things better, with particular emphasis on the community.

We reflected that it was important to acknowledge that there was a transition from the 'business as usual' system to the future system when considering the farming system. We added in a diagram (figure 8) to show this as a step or transition. This wasn't shown on the iceberg canvas as the move from the current mental models to the future mental models was shown as a continuum in a 'U' shape. The picture used to show the transition was influenced by a Systems Thinking model referred two as the 'two loop model'. This model reflects the growth and then subsequent decline of a cycle or a system and then the move to a new one. There were synergies between this concept and thinking of future farming systems differently from the current, or those in the past.
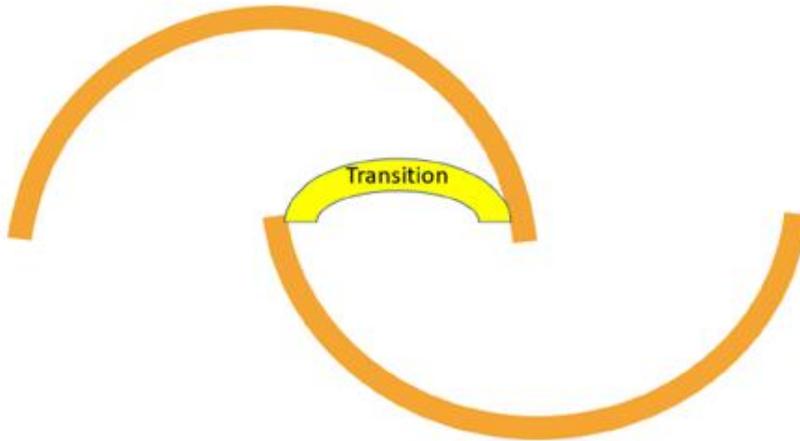
Figure 8 Two Loop diagram to reflect the transition from current to future thinking

7.4.4   Insights from the 'Future' Iceberg Process

The process of moving back up the iceberg canvas from future mental models back to the top of the iceberg was fast and straightforward. Identifying which patterns would stay the same, which would reverse and what new patterns would emerge was again a really insightful section of the iceberg. The future patterns are shown below in figure 9. In identifying where the new patterns might be and which ones would need to change you can start to build a picture of what the future system will need to include. This coupled with what future structures might be required helps to identify where the gaps might be. The identification of gaps, or where additional support might be required is useful information for consultants working with their clients to help form future service products. Using examples from workshop one we can see that in the future transparency and the use of technology feature significantly. These are two key points of difference between the future and current systems that would require additional support. It is anticipated that in identifying these points you could start to form a picture of the next steps from this point to get further into the detail of the farm system design.
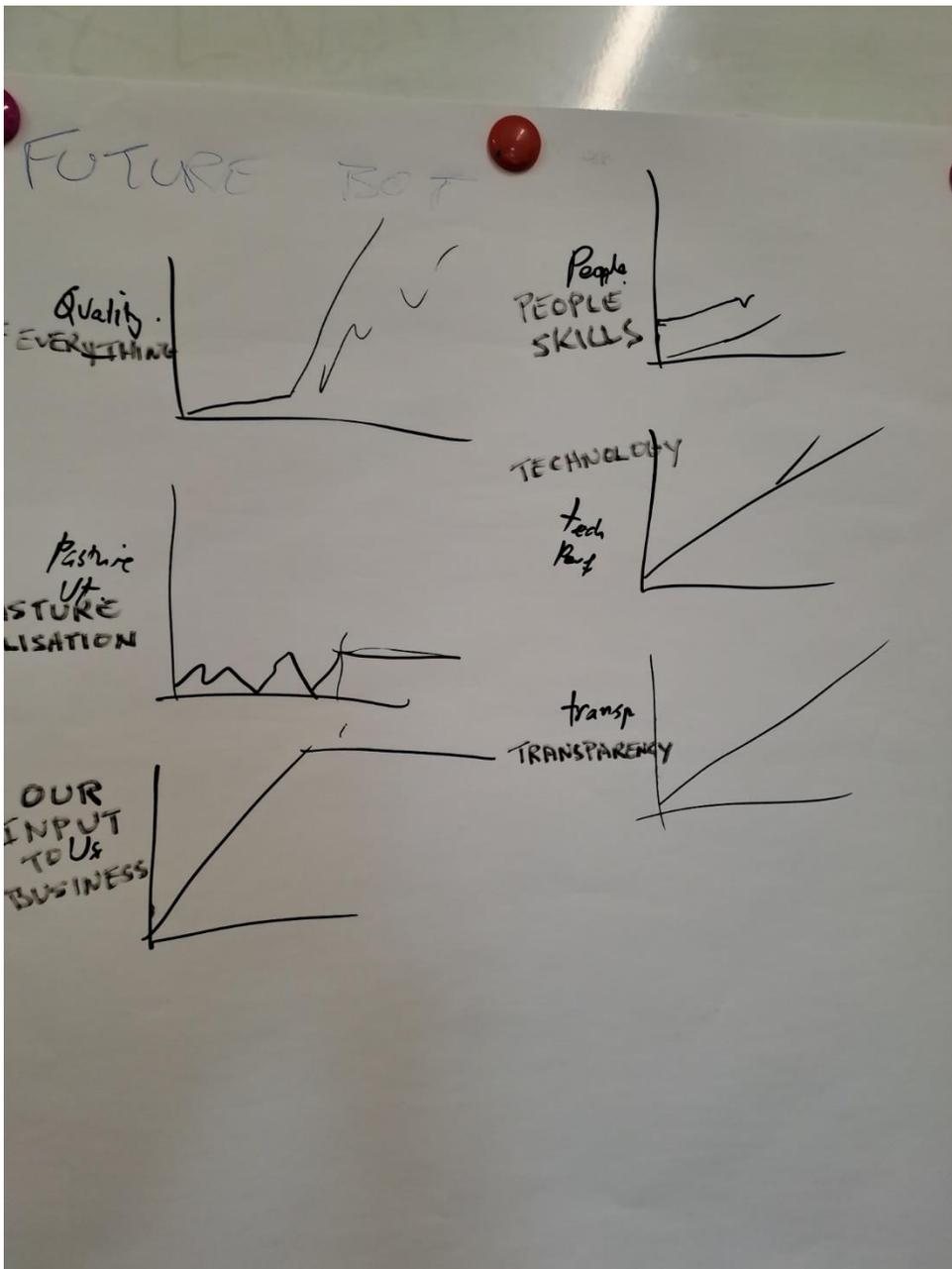
Figure 9 Patterns of behaviour over time for the future system

7.4.5 Insights from Causal Loop Diagram Discussion

Within the workshop we did not spend a lot of time discussing or designing a causal loop diagram given the iceberg framework was so insightful. This highlighted to the project team that a fixed framework was not well aligned with the concept of Systems Thinking as it requires a customised approach. Rather the concepts, process and tools could be considered as the "framework" and with Systems Thinking training enable the application with clients in a facilitated way.

The question we explored briefly in workshop one was "what are the factors, relationships and behaviours that define a resilient mixed farm system?". A number of the variables were identified through the iceberg canvas, particularly through the discussion on patterns over time.

We explained the process behind the map and gave an example. Richard considered that the process and the map were interesting and wanted to explore the ideas further. The value from the causal map diagram lies within the discussions had whilst identifying the variables (and their groupings) and then discussing how

one variable may impact another. Because of this, when used with farming clients the project team feel that the creation of the diagram is best placed as an output that can be provided in a follow up summary (as an example) rather than as a key component of a facilitated workshop or client meeting.

The diagram itself could have a place in helping to discuss the farming system with a third party. In this context it could help to explain the interconnectedness of the system and demonstrate how many variables there are when considering a farming system. This concept may help to avoid decisions being made in isolation without consideration of the consequences on other aspects of the farming system.

After the workshop the project team used the variables identified within the workshop and designed a causal loop diagram (figure 10). A tidier version of this diagram was provided as an example in section 5.2. There were some key insights gained from this process:

- The use of post-it notes and a whiteboard is valuable to allow for things to be moved around easily.
- The diagrams are difficult to produce on your own. The discussion, questioning and challenging of each other is important to capture perspectives.
- The discussion that surrounds where to place the variables and how they influence each other offers useful insight. In particular to help recognise which variables are considered as key leverage points and also what variables might be missing.
- This exercise as a Systems Thinking tool could be used with a group from a farm team as part of a facilitated workshop. Whilst the creation of the diagram was not a focus of this workshop our participant Richard considered that it could be a really interesting exercise to work through with a team from the business.

Figure 10 Workshop one causal loop diagram

7.4.6   Workshop One – Summary Report

Farm Business Strategy Meeting Documentation – A Systems Thinking Approach

6th December 2022

Who & What Was involved

Client A

Dr Liz Wedderburn (Consultant)

Anna Higginson (Agri Magic)

Piripi Perry Smith (Agri Magic)

During the Workshop:

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┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Background to   │ ──> │ The tools –     │ ──> │ Exploring the   │
│ Systems         │     │ Iceberg &       │     │ Current System  │
│ Thinking        │     │ Causal Loop     │     │ – Iceberg       │
│                 │     │ Diagrams        │     │ Process         │
└─────────────────┘     └─────────────────┘     └─────────────────┘
                                                          │
                                                          v
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Evaluation &    │ <── │ Brainstorm on   │ <── │ Exploring the   │
│ Feedback        │     │ what a          │     │ Future &        │
│                 │     │ "Resilient Farm │     │ Emerging        │
│                 │     │ Business" looks  │     │ System –        │
│                 │     │ like            │     │ Iceberg Process │
└─────────────────┘     └─────────────────┘     └─────────────────┘
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Post-Workshop:

Insight Discussion	Creation of Causal Loop Diagram from Brainstorm	Identification of Suggested Leverage Points

Background to Systems Thinking

Systems thinking places a greater emphasis on relationships, interactions, connections & behaviour. The fundamental concept is that the whole is greater than the sum of the parts & in order to understand a system & know where you might start to intervene, you need to understand the interactions between the parts. Systems thinking acknowledges the circularity nature of the world.

Reductionism   versus   Holism / Te Ao Maori

- An entity is the function or sum of its parts
- You can understand something by breaking it down into it individual parts (analysis approach)

Sum of the parts equals the whole

Can't reduce the parts and retain the meaning of the whole

- A system is more than the sum of the parts
- To understand you need to understand the relationships between the parts, not just the parts themselves

Land, Air, Water & People – An Integrated System

- Actions on farm have an impact on things off farm i.e. water, greenhouse gases and biodiversity, supporting services, communities

- The issues are connected in time and space with interactions across scales global to paddock (e.g. lag phases & water quality – domestic, GHG - International)

- Food security, water use, climate change, biodiversity loss, economic well being, social equity and justice & animal welfare are all influenced by the primary sector

System thinking and practice a common language K. Maani

A common language that will assist us in:
- System definition
- Revealing:
  - Relationships
  - Leverage points
  - Unintended consequences
  - World views
- Improving and designing new systems that address multiple outcomes

Iceberg

Increasingly hard

Winter grazing under scrutiny from the sky in Waimakariri

Event

Patterns of Behaviour over time

Winter grazing regulations intensify

Increase in Dairy support requirements as Dairy industry grows.

Decline in water quality

Increase in weather extremes

Consents & grazing plans
Regulations(Regional& National)
Irrigation scheme policies
Standard Operating Procedures
Tikanga / Protocols

Structure/process/systems

"I am here to make a difference"
"Farmers need to be controlled"
"Winter crops are bad for the environment"
"We need to eat less meat"
"Ecan think we are pillaging the environment"

How we view the world

Stakeholders:
Farmers in the catchment
Farmers Nationwide
Policy & Regulatory bodies
Townies/public perception
Bankers & Valuers

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SUPPORTING YOUR FARMING FUTURE

Iceberg Canvas

Current System

Current Events
Events are the individual activities or facts about the state of things in the system. Write in the box below the events and associated variables in the system.

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What new structures would emerge from those new mental models and values? Post all your ideas.

Future Models
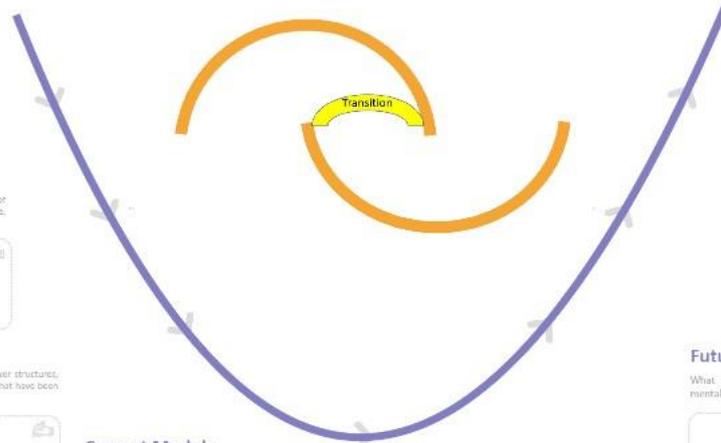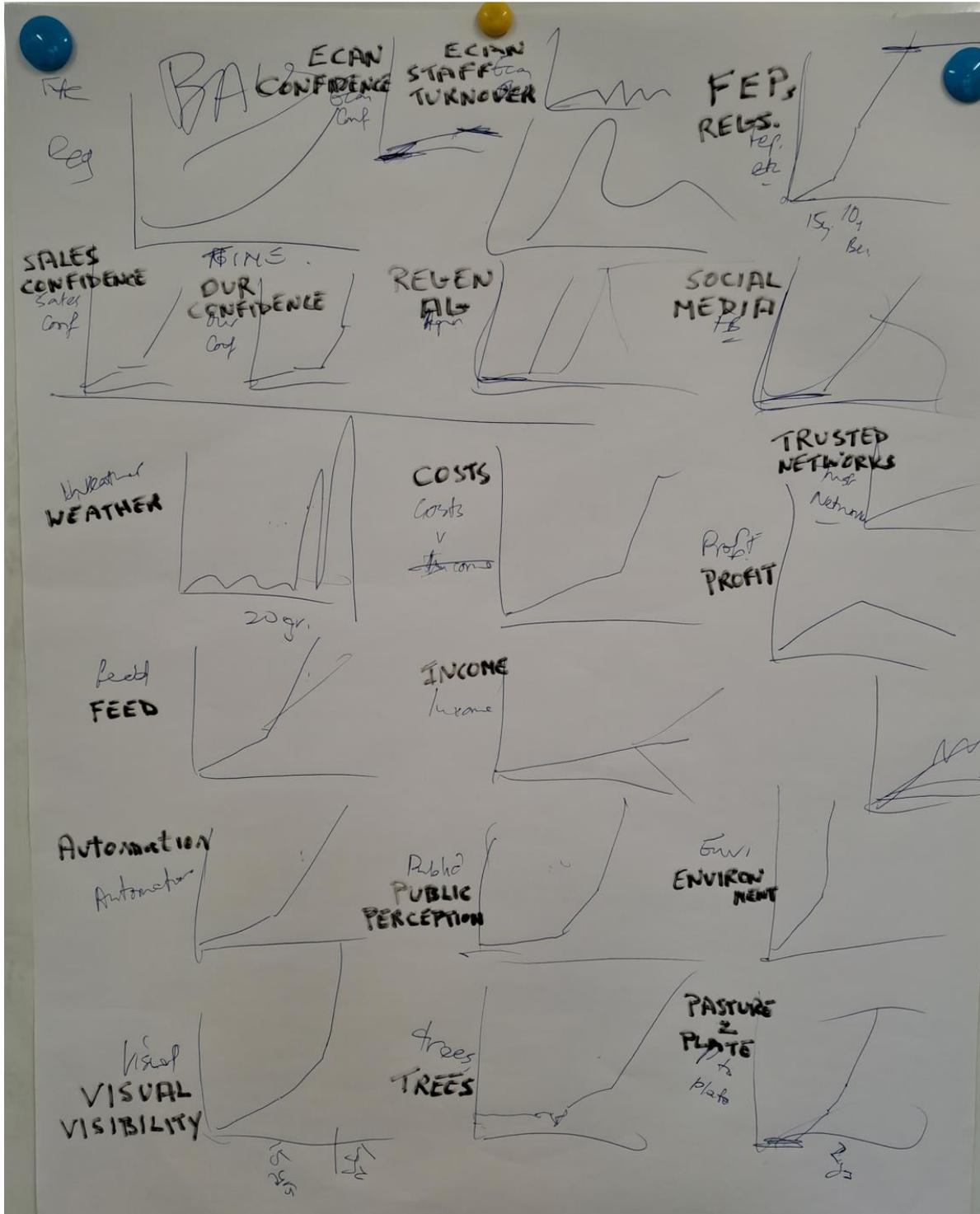Post up your ideas for the new mental models and values that might be needed to shift the paradigm.

Transition

AgriMagic
SUPPORTING YOUR FARMING FUTURE

Current Patterns

Changes in variables over time – what are the current patterns that you are observing?

What Does the Future Look Like?

- We want to make things better every time and it has to be fool proof (if too complicated then not repeatable)
- Top Quality people, equipment, models, systems, products
- Keep analysing
- Build continuation within the community – so that it is strong & stays beyond our life (intergenerational)
- Climate is changing
- Want to be a step ahead
- Be recognised for doing a great job

Future Structures

- Automation
- Alerts in place
- Reduce the risk of stuff ups
- Tell the story
- Better for animals, environment & people
- Strong relationships with people
- Community Trust
- Sharemilking model (partners)
- Team structure – no job titles
- Inhibitors

- Robots
- Diversification options (eg. Leaft)
- Control
- Sounding boards – role of support networks
- Data analytics
- Changes in type of work – opens doors for different groups of people to be involved (for example those with disabilities could work within the business without having to be on the ground doing physical aspects)

Future Patterns
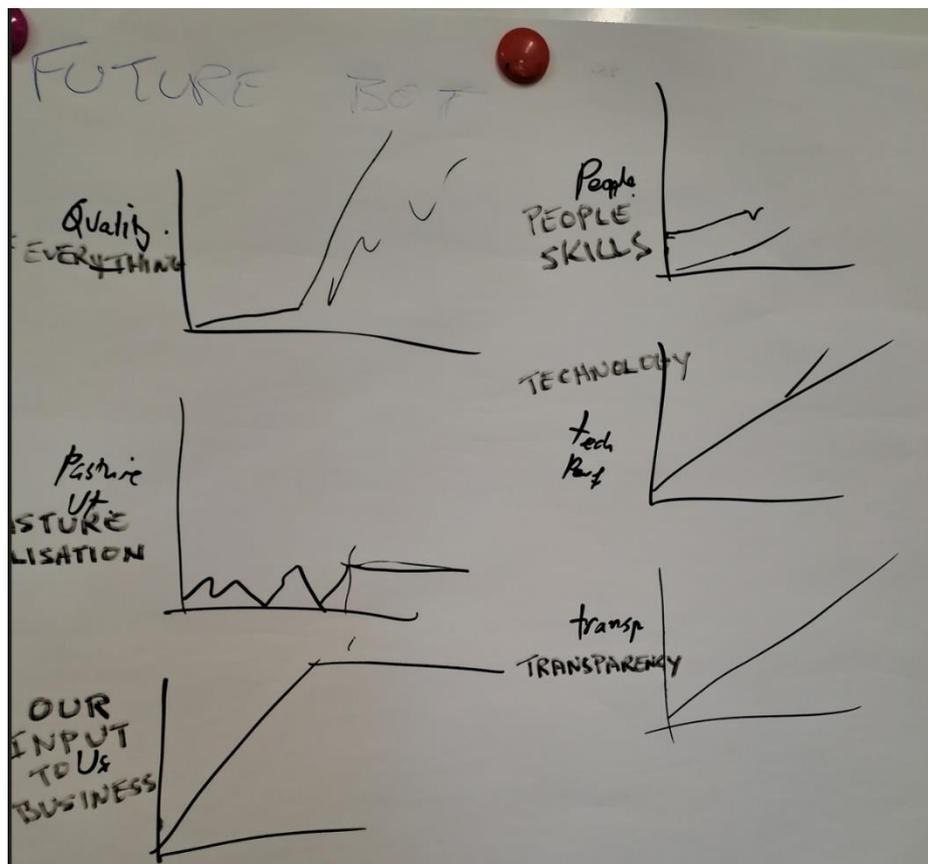
Future Events

- Recognised for proactiveness
- A model that is branded & repeatable
- Pride in the brand – The brand tells the story
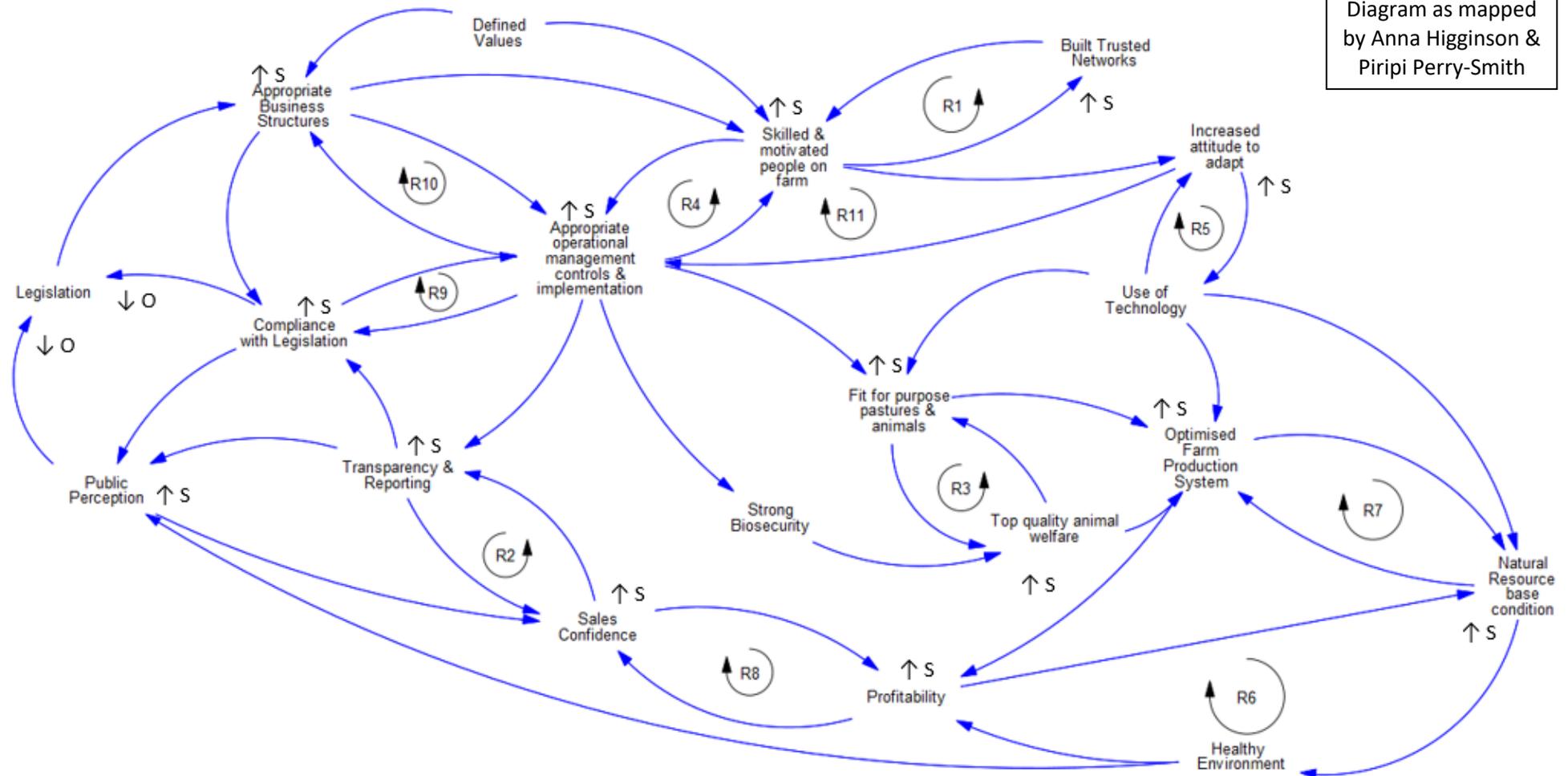- Technology keeps business ahead of the game
- Repeat consumers & sales – product sales soar
- We care about all the things (animals, environment, people, community, biodiversity, cultural connection)
- ECan adjust model to work proactively with farmers
- Getting better & better

Creation of a Casual Loop Diagram – how can we tell the story

- Design your question
- Brainstorm to capture all the "components" that contribute to answering/impacting your question (these might be factors, inputs, relationships, behaviours etc). We captured these on post-it notes. This tool can be really powerful when undertaken with a group as it is a way to capture all perspectives in a non-threatening way.
- Group your ideas into their dominant headings
- Start to map these (you can start anywhere). It is often much easier to do this part with others.
- Key questions to consider when determining where the arrows go:
  o What is influencing this?
  o What is this influencing?
  o Is it a direct influence or through/via something else?
- Once mapped – walk through the relationships
- Where would you consider the leverage points to be – this is a point where changes would have the greatest ripple effect through the system

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SUPPORTING YOUR FARMING FUTURE

What are the Factors, Relationships & Behaviours That Define a Resilient Farm Business

A Causal Loop Diagram as mapped by Anna Higginson & Piripi Perry-Smith

↑S = increasing & in the same direction

↓O = decreasing & in the opposite direction

(R) = reinforcing cycle

How to read the Causal Loop Diagram

- You can start anywhere!

For example –

If we look at "public perception":
- As 'Public Perception' improves the amount of Legislation would decrease (represented by a down arrow & an 'o' which means the reaction is in the opposite direction).
- The CLD also shows that if 'Compliance with Regulation' is increased, Public Perception improves. If the Public Perception improves then the Sales Confidence will increase.
- As Sales Confidence increases then Transparency & Reporting increases, which can re-enforce increased Sales Confidence (this is a reinforcing cycle).

Reinforcing cycles can be 'vicious' (bad) or 'virtuous' (good)

Where Would the Leverage Points Be?

A leverage point is a place within the system where an intervention, change, or shift can produce a flow-on effect of changes throughout the whole system. The systems thinking tools can help to avoid focusing on "quick fixes" or changes that are a knee-jerk reaction and draw attention to leverage points where a small shift in something can produce big changes in everything else.

Often changes that are focused at the 'event' level of the iceberg are quick fixes. Those undertaken further down the iceberg have a greater impact on the system as a whole. The casual loop diagram often makes those leverage points easier to identify.

We have identified the following leverage points:

- Business structure

Underpinned by strong & defined values, without an appropriate business structure it will be difficult to have a resilient farm business. It could be through a business structure (& likely reporting) that the operational team will be accountable.

- Operational management controls & implementation

A fundamental piece of this system. Largely due to the control over fundamental aspects such as animals, people & compliance. The flow on effects of which land at condition of the natural resource base & the state of the environment.

- Skilled & motivated people

Highlights the importance of having the right people within the team. Linked through shared values.

- Use of technology

The use of technology has been a recent lever within your farming system already. It is highlighted through this causal loop as well as being a pivotable piece to having the best stock & pastures, an ability to adapt, optimising the farming system & the flow on effects that has through to sales & profitability. In creating the CLD we have suggested that in order for the use of technology to be successful you would first need skilled & motivated people that had an appetite to adapt before they would accept the use of technology.

- Transparency & reporting

We were surprised that this piece become so important to the future when we were mapping the post-it notes out. It could be suggested that the compliance aspect is fundamental, however in the future it seems that the ability for the business to be transparent, have robust reporting & an ability to tell the story will underpin success significantly. A focus here will support compliance & drive public perception & sales confidence.

Overall, the gold is within the conversations & the thinking that this generates. There are no right or wrong answers.

7.4.7 Workshop One – Feedback on Workshop

The feedback from Richard has been included below. The key points noted were:

- Some of the language was new and didn't resonate (eg. mental models) when first explained
- The process and style would work well with farmers. It was nice for Richard to not have to do a lot of preparation.
- The discussion, questions and the way of thinking about things differently was valuable. Richard recognised that he hadn't considered thinking about the business in that way before and found it interesting.
- There was discussion around using software to make some of the casual maps live, to see real-time impacts of changes and how this could drive discussions.
- Richard wanted to take the workbook back and go through the process with his team on farm to gain their perspectives and insights. He could see a place for this framework in working with a larger team group and definitely at the business decision level.
- Richard considered the framework would be useful to help farmers to see the future differently from the past and look for opportunities.
- Richard liked that the framework posed questions that he hadn't or wouldn't have thought of asking himself (or his other business partners). He felt that within his business they had asked questions with the intent of getting to the same outcomes but it was useful framed in a different way and also coming from someone external. It was useful having a facilitator.

7.5 Workshop Two Detail

Workshop two was run on the 8th December 2022 between 8am – 11.00am. Those present included Anna Higginson and Piripi Perry Smith from Agri Magic, Dr Liz Wedderburn and Tony Coltman.

7.5.1 Workshop Two Powerpoint Slides

Systems Thinking for Future Farm System Design

Our Land & Water

Toitū te whenua, Toiora te Wai

- Introductions
- Our Land & Water
- This Project – 'Systems Thinking for Future Farm System Design'
- Roles & Expectations
- Introduction to Systems Thinking & the Tools
- Application
- Evaluation

Systems Thinking for Future Systems Design

Output	Project Outcomes
Tools/Framework/Processes that is repeatable	Farmer participants have increased confidence to cope with increasing complexity
Characteristics of future production systems	Systems thinking approach adds value to advisor/farmer relations (repeatable process)
Draft strategy for resilient systems of case studies	Improved capability of advisors and participating farmers
Key learnings, evaluation report	Effective communication of the story
	Refined knowledge of future system: gaps, synergies, Trade offs
	Resilient farm systems

- The whole is greater than the sum of the parts, the product of interactions
- Emphasis on relationships, interactions, connections, behaviour
- Acknowledges the circularity nature of the world

Reductionism   versus   Holism / Te Ao Maori

Sum of the parts equals the whole

Can't reduce the parts and retain the meaning of the whole

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- Food security, water use, climate change, biodiversity loss, economic well being, social equity and justice & animal welfare are all influenced by the primary sector

A common language that will assist us in:

- System definition
- Revealing:
  - Relationships
  - Leverage points
  - Unintended consequences
  - World views
- Improving and designing new systems that address multiple outcomes

Iceberg

Winter grazing under scrutiny from the sky in Waimakariri

By David Hill, Local Democracy reporter

Increasingly hard
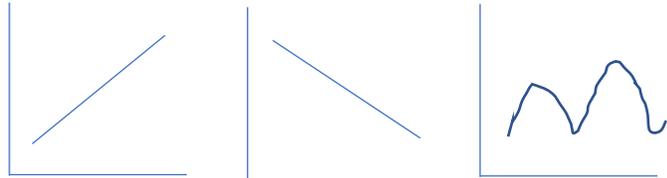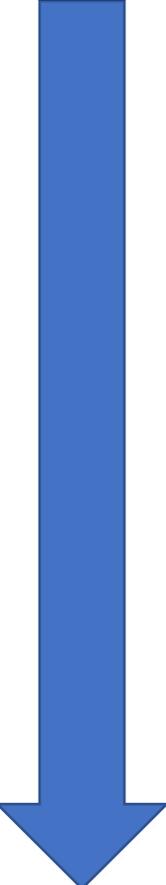
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Patterns of Behaviour over time

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Increase in Dairy support requirements as Dairy industry grows.

Decline in water quality

Increase in weather extremes

Structure/process/systems

Consents & grazing plans
Regulations (Regional & National)
Irrigation scheme policies
Standard Operating Procedures
Tikanga / Protocols

"I am here to make a difference"
"Farmers need to be controlled"
"Winter crops are bad for the environment"
"We need to eat less meat"
"Regulators think we are pillaging the environment"

How we view the world

Stakeholders:
Farmers in the catchment
Farmers Nationwide
Policy & Regulatory bodies
Townies/public perception
Bankers & Valuers
Iwi

Iceberg Canvas

Current System

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Future Structures

What new structures would emerge from those new mental models and values? Post all your ideas.

Future Models

Post up your ideas for the new mental models and values that might be needed to shift the paradigm.

What are the factors, relationships & behaviours that define a resilient mixed farm system?

Ecosystem Health

Healthy waterways

Soil life e.g. worms

Bird life on farm

No Weeds & Pests

Energy & Motivation

Suitable biophysical resource base

Appropriate & adaptable resource base

Adaptive Practise

Effective business structures

Financially Viable

What are the factors, relationships & behaviours that define a resilient mixed farm system?

Lets have a go !!

	1 = not at all 5 = just right	WHY?
Has the process been valuable for you in thinking about your future farm system?		
Do you consider this process valuable to the other farmers/growers?		
Was there enough background context on systems thinking as a tool?		
What outputs would you like from this project?		
Would you be prepared to participate in something like this again?		
What would **you** use systems thinking tools for?		
What was the value that you got from this program.		

7.5.2   Insights from the 'Business as Usual' Iceberg Process

It was evident from the start of the process that Tony enjoyed the conversation that came from each section and talking through each stage was important. With this in mind we found it difficult as facilitators when our participant was writing in the workbook and it wasn't visible for everyone to engage in the discussion. We considered that the diagrams are useful to have in front of you, but capturing the ideas as they come out on a whiteboard would enable better transparency and discussion.

As with Workshop One the events were easy to identify and were the types of things that were impacting at the time. There is a tendency to capture events that are negatively impacting – the things that keep people up at night; however it is important to consider events that are positive as well. Questioning and prompts are good tools for capturing further detail as needed.

The patterns over time were again very insightful within workshop two. At this stage Tony was particularly detailed and we did spend too long here. The role of the facilitator at this stage is to ensure that the patterns are captured quickly – they can be quickly drawn as the come to mind and the discussion can be parked as required. Techniques that can help include:

- Framing the concept of quickly capturing the ideas before you start
- Explain that there is no right or wrong and there does not need to be further explanation at this point
- Have pre-drawn axis for capturing patterns (do not need to write them down, drawing them is best)

It was discussed by the project team that it can be more difficult moving a client along when facilitating if you do not know them that well. We considered the framing of the purpose and how each section important to set the scene for how it will be facilitated at each stage. This again reemphasises the importance of facilitation skills and knowledge as a prerequisite of running a successful workshop using Systems Thinking.

With further clarity on the scale the structures section was much more straightforward when compared to workshop one. The structures that emerged were the things in place that support the delivery of the farming system and enable it to operate smoothly. This is included as examples, team training days, policies for key periods within the year such as calving and mating, winter milk contract, rosters and regulations.

The mental models were easier to identify within workshop two. As facilitators we were more in tune with identifying them, as a result of practice; and Tony had firm views. Using this tool with a group would help to identify where potential differences might lie. In this way, the tool can help to reveal those aspects in a non-confrontational way that removes the emotion from the situation. This process could enable a consultant to identify these differences or similarities.

7.5.3   Insights from the Transition Phase

Tony has a mental model that change is continuous and that farming systems will need to be adaptable into the future. Because of this the transition to consider the future was already made and it did not need to be challenged or discussed in depth.

Tony considered that the diagram of the 'U' shape with the future going back up the other side looked (in a picture) like hard work. This to him looked as if the future were an "uphill climb". Whist pictures are excellent it is important to consider how they will be perceived. The diagram developed with the two-loop concept showing the transition did not resonate as a positive change.

7.5.4 Insights from the 'Future' Iceberg Process

Future aspects were again able to be captured quickly and easily. We discussed the use of this tool with Tony to support farmers who were less motivated by change and the redesign of their systems. Tony considered that the tool and the process would offer a place for a really robust discussion and could made asking hard questions much easier.

7.5.5 Insights from Causal Loop Diagram Discussion

As for workshop one, we provided an example diagram and discussed the factors, relationships and behaviours of a resilient farming system with Tony. The discussion that came from identifying the variables that make up a resilient farming system were insightful.

Within workshop two it was evident that Tonys involvement in the business and the people involved were key to the success into the future. As a result, great systems for supporting that would be important (structures such as rosters, policy documents, etc). Looking to the future it was important for the business to have some element of control over each aspect of the system. The idea of being self-contained or requiring support land was discussed and became a key variable within the system.

After the workshop the project team used the variables identified within the workshop and designed a causal loop diagram (Appendix 7.7).

7.6 Workshop Two – Workings

7.6.1 Workshop Two – Business as Usual Patterns

Figure 11 Workshop 2 - Current patterns of behaviour over time

7.7 Workshop Two – Casual Loop Diagram Design
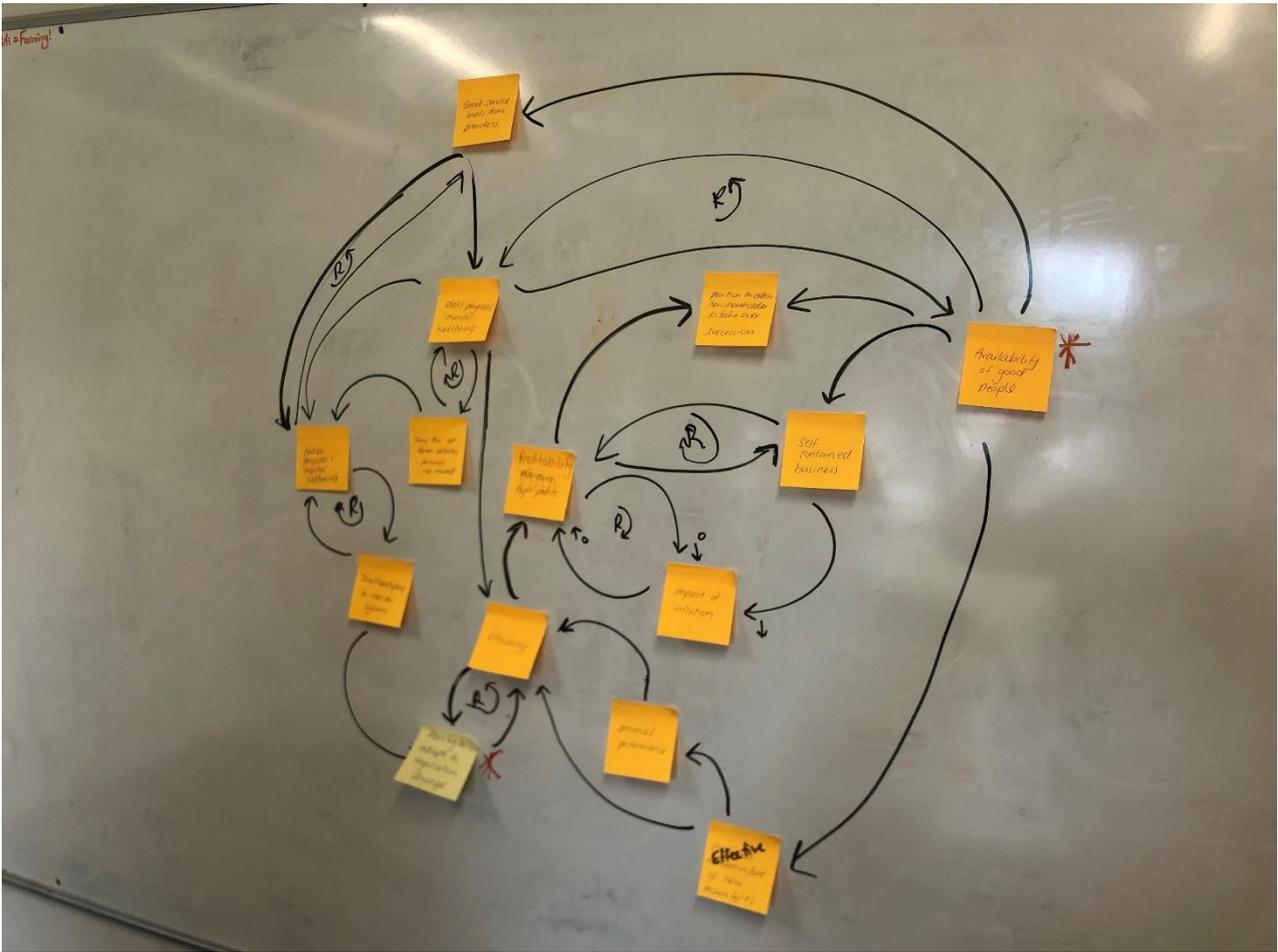
7.7.1 Version One

Figure 12 Workshop two - CLD version one

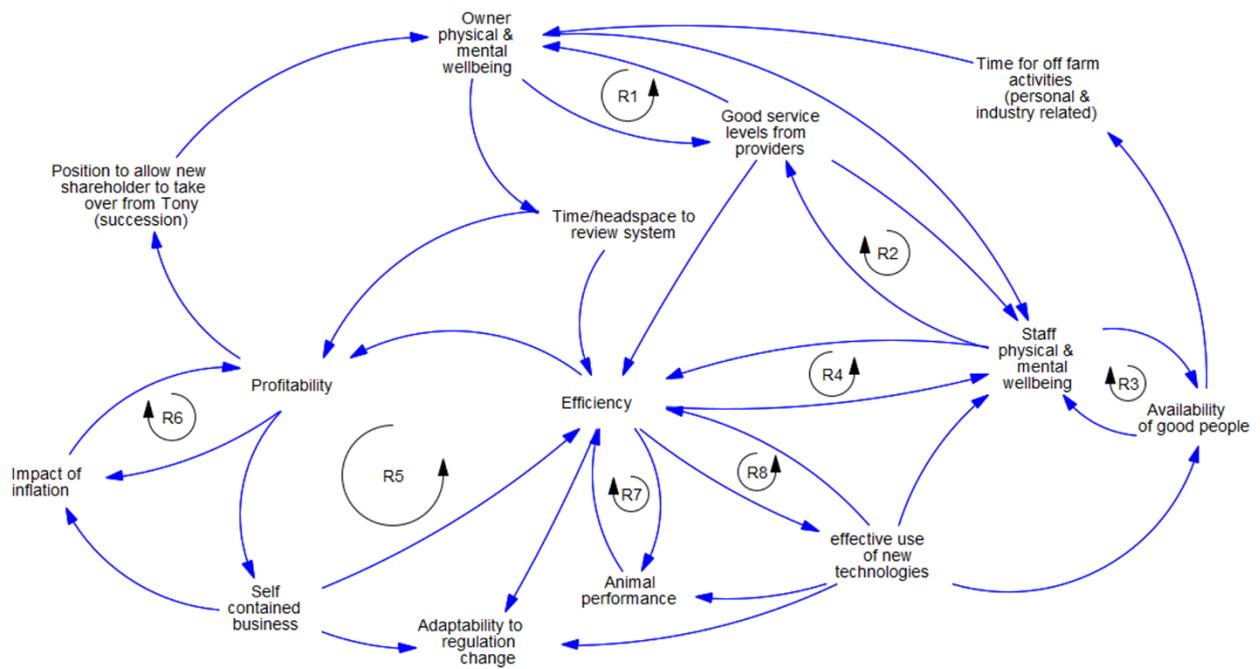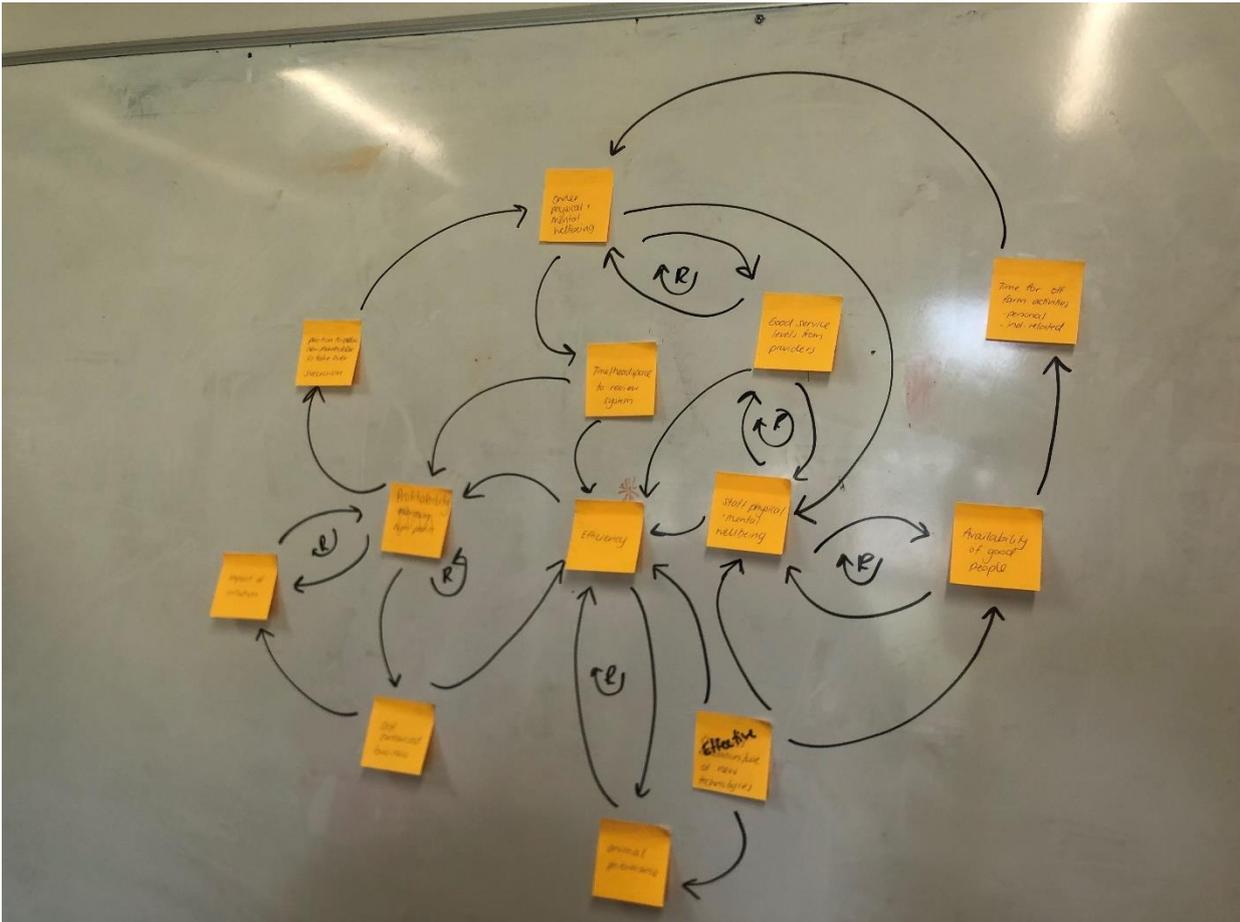## 7.7.2 Version Two (Final)

Figure 13 Workshop 2 - CLD version 2

7.8 Feedback from Workshop Two (captured verbally)

The feedback from Tony included:

- Workshop format is good to allow time and headspace with no distractions. The process was able to tease out conversation and discussion.
- It was nice to not have to do pre-work
- It is good when the material includes real examples and isn't theoretical. Using real examples of things that have an impact on your business
- This framework would be useful within a group strategy session – it would be good to have a session like this with a governance group/shareholders to look towards the future
- The framework facilitated thinking and discussion that Tony wouldn't have done on his own and it was in a different way.
- Considered that the framework could help breakdown or challenge pre-conceived ideas
- Important to get those involved to understand the tools first
- Can see the framework being able to support advisors in having more robust discussions with clients. He felt that many are too concerned about their next job and as a result may not want to challenge as much or have difficult conversations. This approach could help this.
- Wouldn't be something that you could use at a field day for the masses – it is a tool more small groups with common interest.
- After reviewing the completed casual loop diagram Tony considered that it is complex to understand but saw the value in the discussion prior to the diagram. Tony did think that there would be subsequent meetings arising from this process, so you could explore this diagram further at a later stage and revisit previous work. He also considered it as a way of thinking about how 'shock factors' could or would impact on a system.
- The tools could (and would need to be) tailored to suit the audience so it would be important for a consultant to know their client beforehand. But tools are customisable which is good.
- Considered that you wouldn't need to confine that sort of meeting/workshop to only a couple of hours. This could be a run as a strategy session that you would make time for, for example half a day.
- Important for follow up support when gaps are identified. The next step would be to work through what could fill any identified gaps.

7.9 Workshop Two – Summary of Workshop Notes Provided as Output

Farm Business Strategy Meeting Documentation – A Systems Thinking Approach

8th December 2022

Who & What Was involved

Client 2

Dr Liz Wedderburn (Consultant)

Anna Higginson (Agri Magic)

Piripi Perry Smith (Agri Magic)

During the Workshop:

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│  Background to  │ →   │   The tools –   │ →   │ Exploring the   │
│    Systems      │     │   Iceberg &     │     │ Current System  │
│    Thinking     │     │  Causal Loop    │     │   – Iceberg     │
│                 │     │   Diagrams      │     │    Process      │
└─────────────────┘     └─────────────────┘     └─────────────────┘
                                                          │
                                                          ↓
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│  Evaluation &   │ ←   │ Brainstorm on   │ ←   │ Exploring the   │
│    Feedback     │     │ what a "Resilient│     │ Future & Emerging│
│                 │     │ Farm Business"  │     │ System – Iceberg │
│                 │     │  looks like     │     │ Process (skipped)│
└─────────────────┘     └─────────────────┘     └─────────────────┘
```

Post-Workshop:

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│    Insight      │     │ Creation of     │     │ Identification  │
│   Discussion    │     │ Causal Loop     │     │       of        │
│                 │     │ Diagram from    │     │   Suggested     │
│                 │     │  Brainstorm     │     │ Leverage Points │
└─────────────────┘     └─────────────────┘     └─────────────────┘
```

Background to Systems Thinking

Systems thinking places a greater emphasis on relationships, interactions, connections & behaviour. The fundamental concept is that the whole is greater than the sum of the parts & in order to understand a system & know where you might start to intervene, you need to understand the interactions between the parts. Systems thinking acknowledges the circularity nature of the world.

Reductionism   **versus**   **Holism / Te Ao Maori**

Sum of the parts equals the whole

Can't reduce the parts and retain the meaning of the whole

- An entity is the function or sum of its parts
- You can understand something by breaking it down into it individual parts (analysis approach)

- A system is more than the sum of the parts
- To understand you need to understand the relationships between the parts, not just the parts themselves

Land, Air, Water & People – An Integrated System

- Actions on farm have an impact on things off farm i.e. water, greenhouse gases and biodiversity, supporting services, communities

- The issues are connected in time and space with interactions across scales global to paddock (e.g. lag phases & water quality – domestic, GHG - International)

- Food security, water use, climate change, biodiversity loss, economic well being, social equity and justice & animal welfare are all influenced by the primary sector

System thinking and practice a common language K. Maani

A common language that will assist us in:
- System definition
- Revealing:
  - Relationships
  - Leverage points
  - Unintended consequences
  - World views
- Improving and designing new systems that address multiple outcomes

---

Increasingly hard

Iceberg

Winter grazing under scrutiny from the sky in Waimakariri

Event

Patterns of Behaviour over time

Winter grazing regulations intensify   **Increase in Dairy support requirements as Dairy industry grows.**   **Decline in water quality**   **Increase in weather extremes**

Consents & grazing plans
Regulations(Regional & National)
Irrigation scheme policies
Standard Operating Procedures
Tikanga / Protocols

Structure/process/systems

"I am here to make a difference"
"Farmers need to be controlled"
"Winter crops are bad for the environment"
"We need to eat less meat"
"Ecan think we are pillaging the environment"

How we view the world

Stakeholders:
Farmers in the catchment
Farmers Nationwide
Policy & Regulatory bodies
Townies/public perception
Bankers & Valuers

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Iceberg Canvas

Current System

Current Events
Events are the individual activities or facts about the state of things in the system. Write in the box below the events and associated variables in the system.

Current Patterns
Patterns are the changes in variables that occur over a period of time. They are the trends that we perceive taking place over time. List the patterns you see in the system.

Current Structures
What are the rules, norms, policies, guidelines, power structures, distribution of resources, or informal ways of work that have been institutionalised? Post up all your ideas.

Current Models
What are the key mental models expressed through beliefs, attitudes, morals, expectations, values or culture which allow current structures to continue? Post all your ideas up.

Transition

Emerging System

Future Events
What new events would we hope to emerge from the new underlying patterns and structures we have outlined above? Post up any ideas on this.

Future Patterns
What new patterns may emerge from the new structures and mental models? Post up any ideas you may have.

Future Structures
What new structures would emerge from those new mental models and values? Post all your ideas.

Future Models
Post up your ideas for the new mental models and values that might be needed to shift the paradigm.

Current Events

- High inflation environment
- Increasing interest rates
- Increased government interest
- Service levels poorer – difficult to get parts, skill levels lower, people not turning up, supply chains challenged
- Requirement for staff increased – can't do it all on own
- The next generation are different – entitlement, working above capability, what they want from work & life is different
- Regulation – environmental, people side (wellness now a huge part, psychosocial hazards)
- Consumer pressure

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Current Patterns

Changes in variables over time – what are the current patterns that you are observing?

Current Structures

- Rosters (have changed over time)
- Set times of the year to be close to the action on farm
- Systems & plans for important periods (eg. Calving, mating, dry off)
- Coaching role (eg. Of water pump & empowering team to be able to solve next one themselves & learn)
- Sole decision maker
- Focus on efficiency
- Communication
- Winter milk
- Training day in July annually that is facilitated by Dana (includes team building, personality profiling, creating a plan for the season ahead, setting responsibilities & roles)
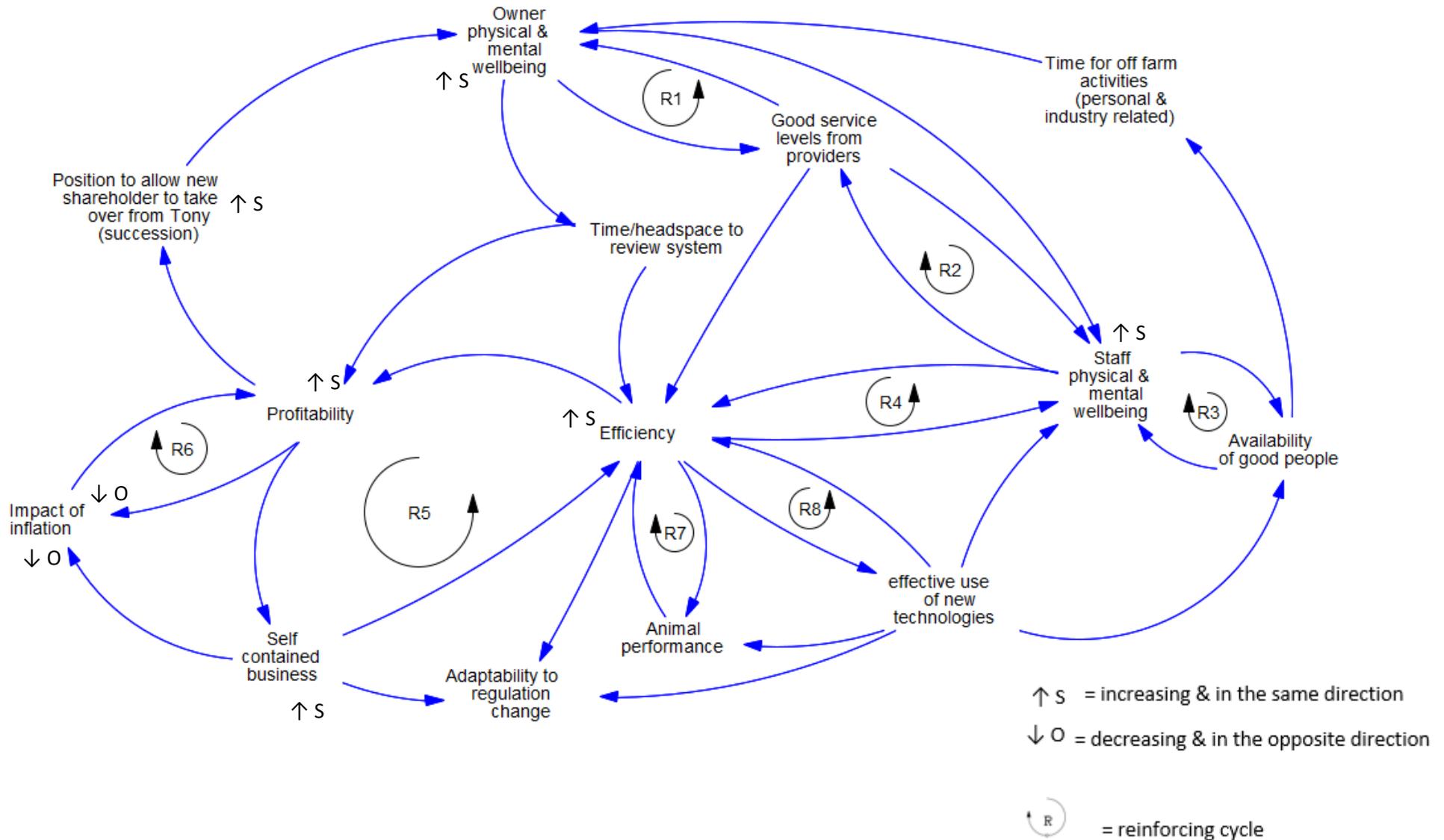
What Does the Future Look Like?

Creation of a Casual Loop Diagram – how can we tell the story

- Design your question
- Brainstorm to capture all the "components" that contribute to answering/impacting your question (these might be factors, inputs, relationships, behaviours etc). We captured these on post-it notes. This tool can be really powerful when undertaken with a group as it is a way to capture all perspectives in a non-threatening way.
- Group your ideas into their dominant headings
- Start to map these (you can start anywhere). It is often much easier to do this part with others.
- Key questions to consider when determining where the arrows go:
  - What is influencing this?
  - What is this influencing?
  - Is it a direct influence or through/via something else?
- Once mapped – walk through the relationships
- Where would you consider the leverage points to be – this is a point where changes would have the greatest ripple effect through the system

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What are the Factors, Relationships & Behaviours That Define a Resilient Farm Business

- Owner physical & mental wellbeing
- ↑ S
- R1
- Time for off farm activities (personal & industry related)
- Good service levels from providers
- Position to allow new shareholder to take over from Tony (succession)
- ↑ S
- Time/headspace to review system
- R2
- ↑ S
- Staff physical & mental wellbeing
- ↑ S
- Profitability
- R4
- R3
- Availability of good people
- R6
- ↓ O
- R5
- R8
- Impact of inflation
- ↓ O
- R7
- Self contained business
- ↑ S
- Adaptability to regulation change
- Animal performance
- effective use of new technologies

↑ S = increasing & in the same direction

↓ O = decreasing & in the opposite direction

(R) = reinforcing cycle

How to read the Causal Loop Diagram

- You can start anywhere!

For example –

If we look at 'Owner physical & mental wellbeing":

- As owner wellbeing increases, there is increased time/headspace to review the system
- As owner wellbeing increases, staff wellbeing increases, as staff wellbeing increases this an increase the availability of good people (better place to work), as the availability of good people increases, the time for off farm activities increases, as time for off farm activities increases, the owner wellbeing increases.
- Looking at the impact of inflation – as profitability increases the impact of inflation reduces, as the impact of inflation reduces, profitability can increase (reinforcing cycle. The arrows are pointing in different directions as they are opposites.

Reinforcing cycles can be 'vicious' (bad) or 'virtuous' (good)

Where Would the Leverage Points Be?

A leverage point is a place within the system where an intervention, change, or shift can produce a flow-on effect of changes throughout the whole system. The systems thinking tools can help to avoid focusing on "quick fixes" or changes that are a knee-jerk reaction and draw attention to leverage points where a small shift in something can produce big changes in everything else.

Often changes that are focused at the 'event' level of the iceberg are quick fixes. Those undertaken further down the iceberg have a greater impact on the system as a whole. The casual loop diagram often makes those leverage points easier to identify.

We could consider the following leverage points:

- <u>Efficiency –</u> is the driving force of this system being resilient.
- <u>Technology –</u> could have a significant impact on the system particularly with a close association to the ability of the system to adapt, & the impact on the people.
- <u>People –</u> also fundamental to the resilience of the future farming system

Overall, the gold is within the conversations & the thinking that this generates. There are no right or wrong answers & there will also be a lot more that goes into a resilient business – this is an example of what can be created from the discussion & information we captured during the meeting.

7.10 Final Facilitation Framework

This framework is designed to be used at the strategy level, with flexibility provided through the process and tools identified to allow for a customised approach.

There is no final solution to supporting farming clients with strategy development as we need to be continually learning and adjusting. The framework reflects some fundamental components that are important for consultants to effectively and confidently engage with their clients including:

- Client rapport and relationships
- Framing and context
- Facilitation and listening
- System complexity
- Reflection and adaptation

Figure 14 below depicts the framework as a diagram showing the stages and steps. Each of these has been expanded on below for clarity.
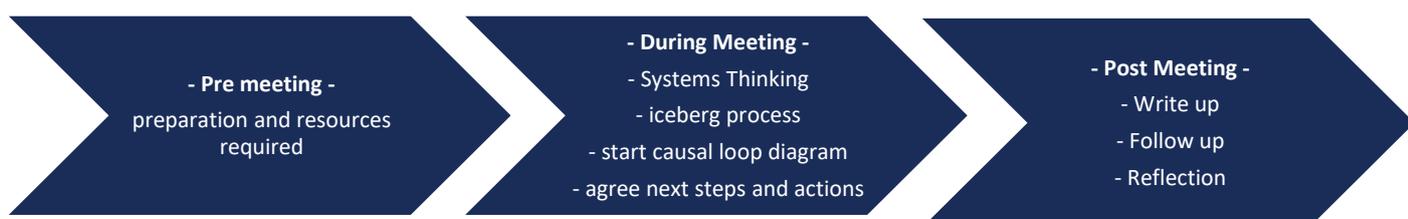
- Pre meeting -
preparation and resources required

- During Meeting -
- Systems Thinking
- iceberg process
- start causal loop diagram
- agree next steps and actions

- Post Meeting -
- Write up
- Follow up
- Reflection

Figure 14 Diagram of Systems Thinking framework

1. **Pre-meeting preparation and resources required.**
- Introduce the proposed approach through initial client contact. Ensure clients understand that you may be using a different framework (to previous meetings) and the concept of Systems Thinking. Introduction information including a meeting agenda is recommended to be circulated prior to the meeting.
- A visual place where all those attending the meeting can see what is being written up – eg. whiteboard or flipchart with paper sheets.
- Post-it notes
- Iceberg canvas as shown in Figure 3 (section 5.2)
- Examples to have at hand to help with facilitation process

During the Client Meeting

Through the meeting the consultant will have a role to facilitate discussion, help recognise and capture actions and identify gaps as they emerge.

2. **Client Introduction to Systems Thinking.**

Prepare key points prior to the meeting to help introduce the concepts fundamental to Systems Thinking. If prepared this could also be provided to the client in advance of the meeting.

The fundamental concept to explain in relation to Systems Thinking is that the whole is greater than the sum of the parts and in order to understand a system and know where you might start to intervene, you need to understand the interactions between the parts. The key points to get clearly across were:

- Systems Thinking is about the relationships and interconnectedness of the system. It is understanding that the whole is more than the sum of the parts.
- Systems Thinking is a good fit for farming challenges as the systems are complex with many variables and relationships.
- The value is in the thinking and the discussion. The tools chosen are a way of fostering that thinking process and prompting the discussion.

3. Explore the Current system using the Iceberg Canvas and capture responses on whiteboard/flipchart so it is visible for everyone.

Staring with the current system, use the iceberg tool to understand if the current system is fit for purpose and delivering what is required. Keep in mind what "great" looks like for the client and reflect on how the current system is, or is not delivering that. Utilise tools such as the whiteboard to capture each stage in a way that all meeting participants can see.

Current events – activities or facts about the state of things currently in the system

To capture events it is useful to ask the client to pretend they are speaking to a relation or friend who has been away for a long time. Ask the client if they were updating that person on what was happening, what would they tell them. Another analogy to use is newspaper headlines. Ask the client to consider headlines for their business and what they would say. This process should be straightforward and take only 5 minutes. Keep in mind::

- Farmers will focus on negative aspects so encourage positive events as well.
- Key themes will emerge, e.g.– weather, regulation, animal welfare, and people
- There is an element of relief in capturing all of things impacting on the page or whiteboard and acknowledging the complexity

Current patterns – the trends that we feel have been taking place over a period of time.

Capture these visually for everyone to see as small graphs (figure 15). The axis can be pre-drawn to speed up the process. Make sure the client holds the pen. This section can be fast paced and facilitation at this stage is to encourage the client to throw out variables and patterns quickly and to not overthink them. Ensure that only one variable is on each graph.

As facilitator it is also useful to prompt for further variables if there is a pause – we found that the following worked effectively:

- "what about X"
- "What is driving x,y,z"
- "What is X influenced by and it is influencing anything else"

The variables do not need to be within the clients control and it is useful to consider variables outside of the farm gate. Consultants may need to prompt for negative trends with certain clients and take care to not let them jump to "quick-fix" ideas at this stage.

Variables captured here are often key factors in the farming business and can form the basis of a CLD.
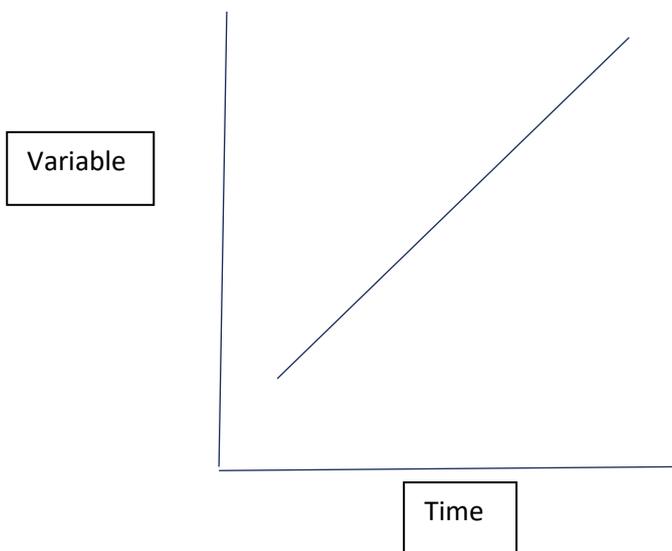
Figure 15 Example of capturing patterns using the Iceberg tool

> *Current Structures – the rules, norms, policies, guidelines etc that support/govern/inform the existing system and contribute to the patterns observed.*

Structures are easy to consider and recognise if the scale and outcomes sought are well defined. For example, structures will be different if considering an operational challenge, when compared to a strategic challenge. Given the framework is to support strategic discussions, the structures to consider are those in place that support the delivery of the farming system and enable it to operate smoothly. This could include team training days, policies for key periods within the year such as calving and mating, winter milk contract, rosters and regulations. It is useful to have examples to prompt thinking for this stage as it is often difficult to articulate.

Additional structures recognised through the case study workshops included: regulations, market demands, education received, business structure, automation (or lack of).

> *Current mental models – how do you view the world? What are the beliefs, morals, expectations etc that allow the current structures to continue?*

The language can cause confusion at this stage and is better related to understanding how you and others view the world. Provide examples and to share any mental models you may have picked up from the client already.

Using this tool with a group helps to identify where potential differences might lie. Given it is part of the framework and the iceberg tool it provides a mechanism for asking or challenging the client in a non-confrontational way that removes the emotion from the situation. This process enables a consultant to identify differences or similarities and to challenge perspective (to play devil's advocate as an example).

4. **Point out the transition stage from the current through to considering the future.**

The time spent moving from the current systems to the future systems will depend on the client. In order to identify where the gaps are the future system may need to be explored (and challenged) first before the gaps can be isolated.

Clients wanting to engage in a strategic discussion (ie. the clients that this framework is aimed at supporting) will be best placed to recognise a transition and embrace it. It is important to consider that it may not be a quick transition or a smooth one. It can also help to discuss if the existing system is delivering on the expected outcomes for the business or not. This step helps to identify the gap. The green line in figure 16 shows the number of functions or outcomes that the system needs to deliver on, and the blue line shows delivery of those outcomes. Where the number of functions needing to be delivered exceeds the delivery there is a gap. This diagram, or similar can be useful to highlight any differences.
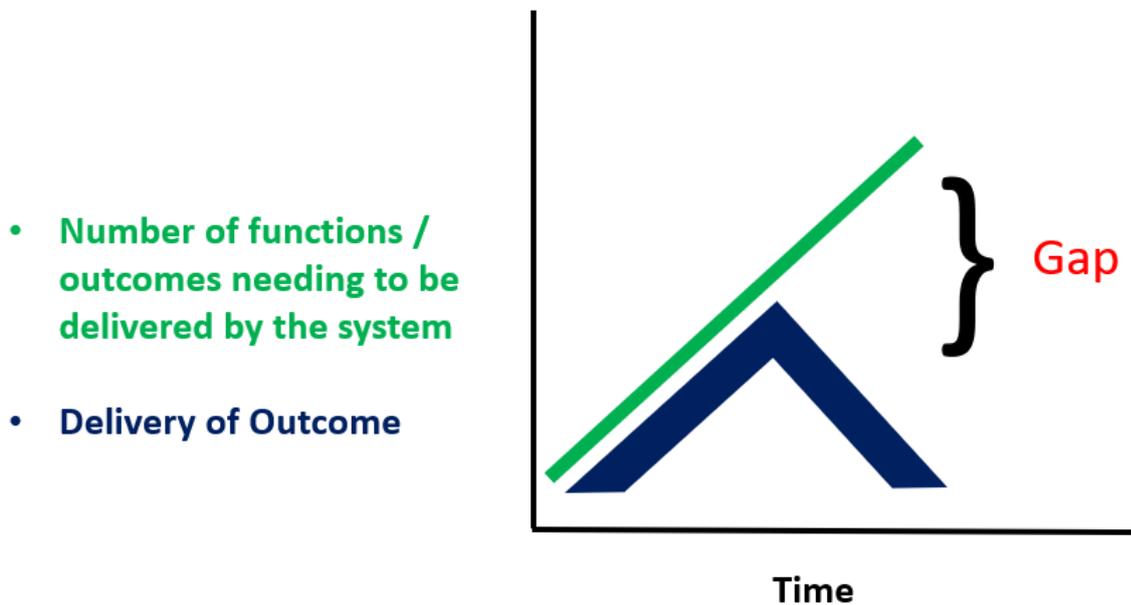

Figure 16 Diagram to visualise if the functions and outcomes of the current system are delivering on expected outcomes or not and how this has changed over time. Is there a gap?

5. **Explore the Future system using the Iceberg Canvas and capture responses on whiteboard/flipchart so it is visible for everyone.**

When considering the future system, start with future mental models and work up. It is often useful however to move up and down the iceberg as needed and as the discussion emerges.

For clients who have considered their future systems in detail, this stage can be worked through quickly. For some clients it may be valuable at this stage to consider how all of the factors and relationships might start to look when mapped in a CLD. At this stage a consultant could look to adjust the methodology to align with their client.

Future mental models – what will great look and feel like into the future and what new mental models may be required to achieve this.

It is changes at this level that commonly have the greatest impact on overall system performance (as shown through Systems Thinking research and analysis). For this stage encourage the client to:

- Consider how other stakeholders could view their farming system and operations if great outcomes were being achieved. This can then feed back up the iceberg when you consider what it takes to make that happen at each stage.

Consider which world views might be constraining to future opportunities - as an example, does the client's 'world view' of technology impact their ability to provide more automation for their staff and transparency across the business?.

Future structures – what new structures would emerge or be required.

It may be useful to 'park' regulatory issues at this stage as it was often a barrier to considering future structures differently. It is acknowledged that clients will be impacted by regulation and this process could be a tool that supports more robust discussion on proposed changes and the impacts they may have when considered holistically.

Future patterns and events that are easy to identify through the workshop can be captured quickly.

Future patterns – with those mental models and structures, what new patterns would emerge.

Future events – what would you hope to be in the headlines for your farming business looking forward.

6. **Identify the gaps.**

Through the iceberg process were there any obvious gaps between the current and future systems? Capture these visibly. Gaps can help to form the basis of a strategic plan.

7. **Discuss the Causal Loop Diagram and capture variables that could be considered for a resilient future farming business.**

In order to develop a causal loop diagram you need a robust question or situation to explore. For example 'what are the factors, relationships and behaviours that define a resilient farm business'?

Although the full diagram could be developed within a strategy meeting with the clients, it is recommended within this framework that ideas are captured and diagrams are prepared after the meeting. Recognising that a customised approach is required when working strategically with clients, the framework is adaptable and the steps for creating the CLD with the client have been provided.

The value from the causal map diagram lies within the discussions had whilst identifying the variables (and their groupings) and discussing how one variable may impact another. The completed diagram can be shared back with your client and used to prompt the next point of contact.

To capture the ideas –

- Explain the diagram and its purpose.
- Capture ideas on post- it notes.

The role of the consultant within this stage is to question and challenge as ideas are brought forward. Knowledge of what may be required into the future for a particular client is useful to ensure that all factors are captured. For example, the question "if you have all of those things do you have a resilient farm business?" was useful to challenge the overall picture. Consideration of potential shock factors can help to identify if there were variables missing. Foot and Mouth disease coming to NZ would be an example of a biosecurity shock factor.

The CLD is a good tool to explore with a greater number of stakeholders if well facilitated. This provides an opportunity for further involvement from the consultant as a point of future contact.

8. **Agree actions and next steps with client**

   - Any gaps identified and actions to close these
   - Gap identification and leverage points can form the start of a strategic plan
   - Capture the next point of check-in

9. **Post meeting summary**

Provide a follow up document that summarises the process, the information captured, and the discussions had. Create a Causal Loop Diagram using the information captured from the meeting. The post-meeting documentation enables the client to take ideas back to their teams, share the tools and to think more broadly about what the future is looking like.

Any actions will be unique to the client that is going through the process and this stage will be influenced by client outcomes. The role of the consultant may be to help bridge any identified gaps, or to help with options to consider. Where structures are required (eg. policies or processes etc) there may be a role for consultants to help in the development of those. It could also enable the generation of future service products for consultants.

8. References

Creative Commons, (2022). Iceberg Canvas. CCBY-SA 4.0 (sharealike)

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