Pohewa Pae Tawhiti
Visualising Horizons

Guidelines for the use of Pohewa Pae Tawhiti to support decisions around changes in land use

SEPTEMBER 2023

OUR LAND AND WATER
Toitū te Whenua, Toiora te Wai
National SCIENCE Challenges

TE ARAWA ARATAUA
Te Arawa Primary Sector, Inc.

Mihi

Ka takina ki runga, ka takina ki raro
Ki a Uweuwenuku, ki a Uweuwerangi
Kia homai i te tohu nui e
Aha, ka whakatau atu ake ra au
Ko te whakaariki, ko te whakaariki
Tukua mai ki a piri, tukua mai ki a tata
Aha kia eke mai ki runga i te
Paepae-poto-a-Houmaitawhiti
Aha ka eke te wiwi, ka eke te wawa
Ki runga i te parapara tuai, tuai, tuai
e Aha Te Arawa e!

Introduction

He kaupapa rangahau a Pohewa Pae Tawhiti i whakaritea e Te Arawa Arataua; te rōpu hai whakanui i ngā whenua Māori o Te Arawa me ngā māngai whakahaere o ngā pāmu, waihoki,ngā ngahere. Ka awhinatia e Pohewa Pae Tawhiti ngā tarati, ngā kōmiti whakahaere, me ngā kāhui e whakamana ana i ngā kereme Tiriti, e pai ake ai wā rātau whakahaere i ngā whenua e tiakina ana e rātau. He mahere tautoko whakatau a Pohewa Pae Tawhiti e whai ana i ngā pūnaha hangarau, me ngā kohinga raraunga hai whakaputa i ngā mahere whenua me ngā hononga i waenga i aua tini whenua. Ka ārahī ēnei pūnaha i ngā kai whakahaere o ngā whenua ki te whakarite i ngā rautaki whakahaere i aua whenua ki te anamata rā anō. Kia whakatinanahia ēnei rautaki ka nui ngā hua ka puta ki ngā mana o ngā whenua, ka mutu, ka whakanuia tonutia te oranga o ngā awa, ngā manga, ngā kūkūwai, me ngā ngahere kai ō rātau whenua.

Pohewa Pae Tawhiti is a research programme that has been co-designed by Te Arawa Arataua; the representatives of Te Arawa ture whenua Māori authorities as well as Te Arawa iwi authorities that administer farms and forests. Pohewa Pae Tawhiti will assist trustees, committee of management members and directors of post settlement entities to make better management decisions about the whenua that they are responsible for. Pohewa Pae Tawhiti is a ‘decision support framework’ that contains tools, models, and datasets that will help Māori land governors to develop long range strategic plans. These plans, when implemented, will increase the benefits to the owners while protecting and enhancing any rivers, streams, wetlands and forests that are on their land.

Contents

Executive Summary

Pohewa Pae Tawhiti (PPT) (Visualising Horizons) combines whakaarotau and pohewa (priorities and visions) with biophysical data (current and modelled future) to enable potential options for land use change on the whenua or farm.

It can be used by trustees, board members, committees of management and/or farmers who are working collectively around land-use decision making.

This Process Guidelines document is intended for a facilitator and has been prepared to help lead the trust or board members through the seven steps of the Pohewa Pae Tawhiti framework to explore different options appropriate to their context and land. Although these steps are presented here in a linear fashion, in practice some of steps are likely to be undertaken simultaneously or in an iterative approach depending on the situation.

Guided Process for Decision Making

The Pohewa Pae Tawhiti Framework

STEP ONE

Understanding Pohewa Pae Tawhiti – Sharing context and future vision

- Set the context and ensure everyone understands what Pohewa Pae Tawhiti involves.
- Shared understanding of Pohewa (future vision). Refer to existing strategies or strategic documents.

STEP TWO

Current situation and land-use on the farm

Understand base lines – environmental profile, social profile, strategy etc.

- Gather farm baselines and descriptions – the status quo of the property
- Biophysical land use data.
- Baseline social data: employees, farm structure etc, key resources (including people)
- Understand the way the farm currently provides for, or supports, cultural practices.

STEP THREE

Identify priorities (whakaarotau) in the context of the farm – Based on tōnuitanga (economic prosperity), whakatipuranga (growing generations, tiakitanga (guardianship), taituarātanga (support)

- Understand and discuss perspectives on whakaarotau (priorities) of the trustees. These are based on tōnuitanga (prosperity); whakatipuranga (growing generations); tiakitanga (guardianship); taituarātanga (support).
- Help individual decision-makers see their preferences for priorities, weightings and tradeoffs (using choice model and rubric process)

STEP FOUR

Identify and discuss broad land-use options – Identify alternative land-use categories/ options based on whakaarotau and understanding of the whenua

- Guided discussion to consider alternative land options based on whakaarotau and understanding of the whenua.

STEP FIVE

Presentation of alternative land-use options with guided discussion

- Provides a list of possible land use options suited for the land-block (based on PPT algorithm) and matched to the group's aspirations and values as expressed in the whakaarotau, i.e.. An aspirational ranking along with different filters, for example economic and environmental, to compare relativities between options.

STEP SIX

Reconfiguration of farm and optimisation of land-use

- Considers the impact of land use changes on the existing farm system.
  This step models potential scenarios using Overseer and Farmax.

STEP SEVEN

Group deliberation of alternatives before final decision can be made

- Group discussion to consider potential options and which option/s may require follow up with detailed due diligence process.

Acknowledgements

The Pohewa Pae Tawhiti team would firstly like to thank our participating farm trusts – Ōtamarākau Farm Trust (Te Arawa), Whāngaipeke X Trust (Tūwharetoa) and The Grange (North Canterbury) – for their willingness to be involved, their helpful suggestions and feedback to improve the PPT framework and their patience throughout the project.

Pohewa Pae Tawhiti has been a team effort and a valuable example of co-design led by an iwi primary sector collective along with a range of talented independent and Crown Research Institute researchers.

The team comprised:

- Dr Tanira Kingi, (Ngāti Whakaue, Ngāti Rangitihi), Rotorua
- Helen Percy, AgResearch, Hamilton
- Te Taru White, (Ngāti Pikiao, Tainui, Ngāti Porou), Rotorua
- Dr Rogerio Cichota, Plant & Food Research, Lincoln
- Dr Will Allen, Learning for Sustainability, Christchurch
- Reina Tamepo, (Te Whānau a Apanui, Ngāti Porou, Ngāti Awa), SCION Research, Rotorua
- Nick Spencer, Manaaki Whenua, Christchurch
- Dr Jay Whitehead, (Ngāti Māmoe, Ngāi Tahu), Matatihi Ltd, Christchurch
- Dr John Reid, (Ngāti Pikiao, Tainui), Earth Quotient, Christchurch
- Dr Grace Walker, (Ngāti Kahungunu, Ngāruahine), Think Analytic, Christchurch
- Bill Young (Ngāti Kea, Ngāti Tuarā), Rotorua

We would also like to thank those past team members who helped Pohewa Pae Tawhiti through the development stages over the last three years.

Finally, a big thank you to Our Land & Water for their support in bringing Pohewa Pae Tawhiti to fruition. Ngā mihi ki a koutou.

COLLABORATORS *NGĀ HAUMI*

agresearch
āta mātai, mātai whetū

learning for sustainability
supporting engagement, co-design and adaptation

Manaaki Whenua
Landcare Research

Plant & Food Research
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Glossary

Concepts or words in these guidelines	Our interpretation for the purpose of these guidelines
Pohewa	Visualise
Pae	Horizon
Tawhiti	Distant
Pohewa Pae Tawhiti	Visualising Distant Horizons
Whakaarotau	Priority
Whenua	In these guidelines we are using whenua to refer to the land – which includes the specific farm or farm/ blocks
Farm	Used here in the wider sense to incorporate all land for agricultural, horticultural or forestry purposes. A farm may be divided into blocks or land areas
Facilitator	Someone who can run the PPT process with a group of people. They may or may not have the technical advisory skills for all parts of the process, however, they can connect with those who do.
Overseer	OverseerFM is software that helps farmers better understand the nutrient flows on their farms and provides valuable information to support decision making.
Farmax	Farmax is a modelling and decision support tool that allows farmers to model their farm system and use it to record actual farm performance data, forecast future expectations and investigate unlimited scenarios for potential changes to the farm system.
Forecaster	Forecaster is forestry management software which provides forest managers with tools to create and explore alternative forest management plans.

Introduction to the PPT Process Guidelines

These Guidelines have been prepared as a 'user manual' for the Pohewa Pae Tawhiti framework and process.

The aim of Pohewa Pae Tawhiti has been to develop an approach to assist decision making around alternative land uses. The project has been led by Te Arawa Arataua (Te Arawa Primary Sector Inc.) and the focus has been on Māori land blocks, where there are multiple owners and decisions have far-reaching intergenerational implications. However, the expectation has always been that Pohewa Pae Tawhiti will be used by Māori and non-Māori land-owners and decision makers alike to assist with decision-making processes around future land use options.

The original aim of the project was to pilot a data-driven tool that could be used to visualise what future land use could look like on any particular farm, while placing equal emphasis on Māori values and aspirations as well as quantitative economic and biophysical environmental

data. It soon became apparent, however, that a decision support tool on its own would be insufficient to support the complexity around decision making, which of course is very context specific. It also was beyond the scope of this current project to have access to the data needed to support all the potential land-use options, and in multiple regions. The link with another Our Land and Water programme, Whitiwhiti Ora, provided access to biophysical and economic data layers, however, it needs to be acknowledged that data at the scale needed for the land block decisions making is still patchy in many cases, and information is not yet available on many new crops or land use opportunities. We expect this to change over the next few years, so this initial version of Pohewa Pae Tawhiti should be viewed as a pilot that will be developed further.

As we piloted the approach, it was clear that a **Guided Process** was needed to sit alongside the modelling and visualization tools. These guidelines present the overall **Pohewa Pae Tawhiti framework**, that breaks the process down into steps, and then some suggested approaches as to how that Guided Process can work in practice, by providing suggested prompts and questions for discussion. The appendices of these guidelines provide the underlying methodologies of the overall framework and tools. They are there as part of documenting the process from a research perspective, as well as providing the confidence that Pohewa Pae Tawhiti has been developed using robust research approaches.

As stated earlier, Pohewa Pae Tawhiti was designed as a framework to be used by landowners and their representatives such as Trustees and Board. These Guidelines have been specifically developed for those who will be working alongside landowners to guide and facilitate decisions regarding land use changes. This includes advisors, consultants and technical experts. We also expect the Guidelines will be of interest to science providers (in particular the technical details contained in the appendices), as well as policy makers for example local and central Government advisors, and industry organisations.

An approach to assist decision-making around alternative land uses

Introduction to Pohewa Pae Tawhiti

Pohewa Pae Tawhiti (Visualising Horizons) is a transdisciplinary research programme, co-led by Te Arawa Arataua, a collective of Māori landowner entities of the Te Arawa iwi in the Bay of Plenty region of Aotearoa-New Zealand.

The purpose of the programme has been to co-design a decision-support framework for Māori governance boards, who are responsible for decision making on behalf of multiple landowners, to make better decisions around future land use on their farms. 'Better decisions' in this context means governance decisions based on cultural, social, and environmental values and indicators, as well as traditional economic decision-making criteria.

Background and context

Māori Land Trusts and Incorporations

In Aotearoa New Zealand, 1,403,693 ha of land is held as Māori Freehold Land in 27,608 titles while an additional 1,204 ha is held in Māori Customary Land Title[1].

Most Māori land enterprises operate through a Māori Land Trust or a Māori Incorporation legal entity. To give a sense of scale, there are 5,410 Māori Land Trusts or Māori Incorporations managing a total area of 1,019,016 ha[2].

14 entities are over 10,000 ha in size with the largest entity being 'The Proprietors of Mangatu Blocks' Māori Incorporation in Tairawhiti at 45,447 ha. Of these 5,410 entities, 172 or 3% are over 1,000ha and 97% (5,238 entities) are under 1,000 ha. However, this 3% of entities manage 70% of the land area or 713,550 ha. There are also:

- 809 entities sized between 100 ha and 1,000 ha; and
- 3,193 sized between 4 ha and 100 ha.

Due to climate change, environmental or farming policy, local government regulation or market forces, most if not all will be facing land use change decisions in the next decade.

Iwi decision-making environment

To make quality land use change decisions, Māori Land Trusts and Incorporations require advice from a range of specialists for guidance including accountants, lawyers, land use managers, land use advisors, and perhaps a selection of land use scientists and researchers. Land use options are narrowed down until a likely candidate is agreed on and a feasibility study or due diligence process is undertaken. Once this is complete, more expertise is required to interrogate the study to increase the chances of a successful decision.

Unfortunately, this capability is only available to the larger or more successful entities. The vast majority do not have the financial capacity to access or the experience to utilise this information, which undermines their ability to make complex decisions successfully.

In addition, Māori land governors face a range of unique challenges when it comes to making decisions about their land.

Unlike other farmers who might decide to invest elsewhere if market conditions change or if farming regulations become too onerous, it is highly unlikely that Māori land governors are able to sell their land and move on. Generally, they must stay and persevere and find a path to profitability no matter what the challenge.

Māori land governors feel this solemn responsibility for their hapū or iwi land due to their long history of occupation and any subsequent loss of land would have a devastating impact on the mana of the hapū or iwi, not to mention the governors, providing additional gravity to their decisions.

Also due to history, Māori land governors are often appointed because of whānau relationships rather than due to sufficient skills, knowledge or experience, which then constrains the quality of an organisation's decisions. The lack of financial resources to contract in expert advisors exacerbates this issue.

Furthermore, with land being unable to be utilised as collateral for bank loans, especially for small to medium-sized entities, development of the land is slow due to lack of access to capital.

Finally, close scrutiny of the land entity's performance, or lack thereof, at an annual general meeting of owners and beneficiaries provides another test for governors' nerves to convincingly explain the situation.

Together these factors promote a strongly risk-averse environment for decision-making amongst governors and so the pressure to maintain the status quo far outweighs the risk of making change, which going forward will only be to the detriment of Māori enterprise.

The aim of Pohewa Pae Tawhiti is to overcome this potential decision paralysis by providing land governors with some confidence to move along the land use change decision-making pathway through the delivery of an informative and culturally-appropriate process utilising the best data available.

Providing land governors with some confidence to move along the land-use change decision-making pathway

Pohewa Pae Tawhiti Framework

Pohewa Pae Tawhiti has been developed on the basis that decision-making around land-use change is complex. Data sets alone cannot make a decision; a decision-support tool on its own is insufficient to take into account the aspirations and values of the person or people making that decision. The complexity is increased when it is a group of people (for example a Māori Trust or governance group) that are making the decision on behalf of others.

The following framework is the Pohewa Pae Tawhiti process, that combines whakaarotau and pohewa (priorities and a vision) with the biophysical data (current and modelled future) to provide potential options for future land use. These options can then be discussed with the governance group and short-listed.

The land uses can be interrogated further through a due diligence process before a final decision is made. In other words, the framework will provide a process to enable the narrowing down of options based on economic, social, cultural and environmental preferences of the group. It relies on a combination of discussion-based methods (Guided Process) and data-driven reality. Thus we are seeking to achieve the aim of democratising decision making – particularly within the governance of land entities – to ensure that diverse perspectives are considered, and taking into account different levels of expertise around the decision-making table.

Figure 1 shows the overall framework, and the different stages are outlined in further detail below. This is followed by a discussion around the use and potential limitations of this framework.

Figure 1: Pohewa Pae Tawhiti Framework to assist decision making

Guided Process for Decision Making

The Pohewa Pae Tawhiti approach was co-developed with Ōtamarākau Farm Trust (Te Arawa), Whangaipeke X (Tūwharetoa) and The Grange (North Canterbury) in late 2022 until June 2023 using their actual farm data.

Insights from the trustees has been extremely valuable in helping to shape the process, and we thank them for their contributions. Feedback from the trustees included a desire for a simple and straightforward process. They appreciated the inclusive approach we employed and acknowledge that a guided process, which incorporated facilitated discussions, had great potential usefulness compared to relying solely on a tool, such as a web-based tool or app.

With this background in mind, the following approach, based on the steps outlined in the framework is presented below. We acknowledge that it won't necessarily be a linear process – this is not an exact recipe to follow. However, we trust that it will provide a starting point for conversations, and provide a structure that can be picked up, used, and adapted to particular contexts as needed.

We have written these Guidelines assuming that someone will take the lead in facilitating the process and guiding the discussion. We suggest that this is an independent consultant, extension agent or facilitator, although a trust or entity with facilitation skills within its own membership could also undertake their own assessment.

Throughout the rest of the document we'll refer to the **Facilitator** which is the person or people running the Guided Process, and the **Participants**. By participants we mean land governors who may be trustees, board members, committees of management, landowners and/or farmers who are working collectively around land-use decision making.

Although our focus has been on group processes, this could equally apply to an individual farmer with a consultant or facilitator.

We have written the Guided Process assuming a face to face (kanohi ki te kanohi) environment, although they would also work through virtual interactions (e.g. zoom). The emphasis is on supporting an active discussion amongst decision makers.

Attributes for those facilitating the guided process

This is about **guiding** the participants through a series of options, and helping them to narrow down what is best for their context. Therefore, some facilitation skills or experience with participatory group process are needed, as well as an understanding of the context within which the participants are operating in. For Māori land governors this implies the cultural context within which they are part of. The facilitator does not need to be a technical expert in all areas, however, they should know where to go to access technical information – this might be for example, specialised horticultural or forestry consultancy. Likewise, they don't necessarily have to be able run farm systems models (Overseer, Farmax etc.), However, they should be able to access those who can.

Running the Guided Process based on the Pohewa Pae Tawhiti Framework

STEP ONE
Understanding Pohewa Pae Tawhiti

STEP TWO
Current situation and land-use on the farm

STEP THREE
Identify priorities (whakaarotau)

STEP FOUR
Identify and discuss broad land-use options

STEP FIVE
Presentation of alternative land-use options with guided discussion

STEP SIX
Reconfiguration of farm and optimisation of land-use

STEP SEVEN
Group deliberation of alternatives before final decision can be made

STEP ONE

Understanding Pohewa Pae Tawhiti

Sharing context and future vision

Introducing this step

This is about setting the context and ensuring everyone is on the same page about what Pohewa Pae Tawhiti involves. How much time is spent at this stage depends very much on the participants, whether they have an existing relationship with the facilitator, and the overall context within which this is happening. For example, the set-up stage may happen over time and with a number of preliminary interactions, before the participants are ready to work through the steps below.

It is also the time to check in on high level goals, aspirations, or strategies of the group. If there are existing strategic documents (road maps, strategic plans, visions etc.) they should be pulled out and referred to at this stage.

Facilitator

Introduces Pohewa Pae Tawhiti framework and the overall process that will follow:

For example

"Pohewa Pae Tawhiti is a framework to help with land use change decisions. It combines whakaarotau (aspirations and values) with the biophysical data (current and modelled future) to enable potential options for land use in the context of your farm/ land block. These options are intended to be a guide of what could be done, which can then be interrogated through a further due diligence process (outside of the Pohewa Pae Tawhiti framework)."

Things to consider before starting

- Outline of how this process will be run (e.g. over several sessions) and how long it might take.
- Explain the process is not necessarily linear – some steps may happen in parallel while others may be iterative.
- Ensure that the Group is comfortable with what is going to be achieved, and how this process can help them get there.
- Is there an appetite for change amongst the Group? What are some of the drivers towards exploring land use change options at this point?

Shared understanding of Pohewa (future vision)

Things to consider before starting

- Are there existing vision, strategies, road maps etc. that have been prepared previously which could be used.
- If there are no existing visions or strategies, the facilitator may want to take the group through a simple group visioning exercise (see examples in the **Appendix**).

STEP TWO

Current situation and land-use on the farm

Understand base lines – environmental profile, social profile, strategy etc.

Introducing this step

This is about focusing on the land in question and helps to ground the participants for the future conversations.

It is about understanding the different perspectives of the whenua as it is currently. This means considering the biophysical land use data, however, it also includes consideration of strategic documents; recent financial reports, and things like the number of employees, and the way the farm currently provides for or supports cultural practices.

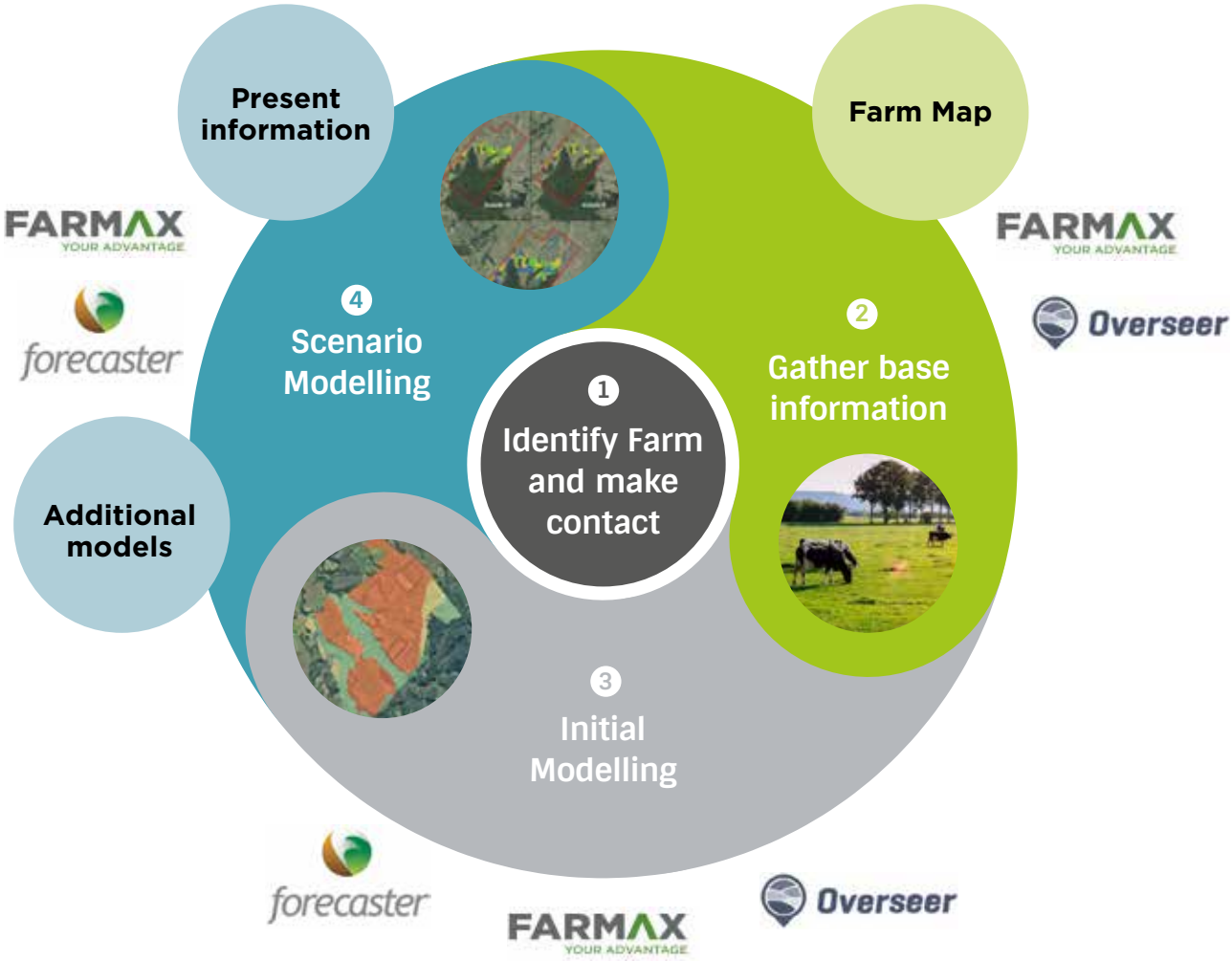
At this stage it's about taking a high-level view and not being overly concerned with minor details.

Current state modelling

This is the first stage of the farm modelling process in order to set the baseline performance of the farm. The second part involves reconfiguring the farm with potential scenarios (scenario modelling) which occurs later in the process at Step 6. Baseline and scenario modelling uses a range of tools which include Overseer[3], Farmax[4], Forecaster[5] and Arc GIS[6]. Some questions which may arise at this stage include:

Facilitator	Prompts
How much of the current livestock system are you willing to change to an alternative land-use?	An example might be 'reduce pastoral platform by 15%
Where on the property should land-use change occur?	• Steep areas that could be retired? • Access to roads for the alternative land use (e.g. forestry blocks when due for harvesting
Are you wanting to maintain the current farming operation at the same production level?	
Which environmental regulations or policies need to be considered	Regional plans, NPSFM, climate change etc.

Figure 2: Overview of tools used for baseline modelling (Step 2) and scenario modelling (Step 6).



Overseer Modelling

Overseer is a farm-level decision support model that helps farmers manage annual budgets and understand the environmental impact of farm management changes. The model does assume actual and reasonable inputs, good management practises, and the farm being at a steady state. Overseer can model pastoral systems, but modelling some of the horticultural, vegetable and tree crops is limited.

Overseer was developed initially to determine fertiliser recommendations in the 1980s and has since been further developed to provide estimates for farm nutrient leaching and greenhouse gas emissions using data sets (i.e., climate, soil) and long-term climate averages.

Overseer is used to model the current state of the property. If the farm has an Overseer file, then this can be used to determine a baseline file. If there is no Overseer file, then one will need to be developed. There is a template example for the information needed for a Dairy Farm (see Appendix).

The outputs from the Overseer file that are used in the visual display are:

- Total GHG emissions (eCO2/kg/ha/year);
- Methane (eCO2 kg/ha/year);
- Nitrogen oxide (eCO2 kg/ha/year);
- N leaching (kg N/ha/yr); and
- P leaching (kg P/ha/yr)

Farmax Modelling

Farmax is a modelling a decision support tool, which allows users to enter their own farm information to record farm data, forecast future expectations, and run scenarios to understand the impact of potential changes. Farmax is a farm-scale simulation model using monthly estimates from pasture, farm, and stock information to provide production and financial performance indicators.

Farmax is used to model the current state of the property. If the farm does not have a Farmax file, then one will need to be developed, this will be the baseline file. The outputs from the Farmax file that are used in the visual display are:

- Stocking Rate (Su/ha);
- EBITDA (Earnings before Interest, Tax, Depreciation and Amortisation) ($effective/ha); and
- EFS (Economic Farm Surplus)

Forecaster Modelling

Forecaster is a forest simulation tool, which simulates tree growth, log products and clear-fell age. There are several versions of Forecaster that are available, some of which are typically only available to forest consultants. These models are complicated to use, and it is best to get a forestry expert to run these.

The link below is to the forecaster calculator for radiata pine and Douglas-fir. It was developed on the same set of models as the desktop Forecaster used by the forestry industry but is free to use.

forecastercalculator.integral.co.nz

Arc GIS

The current state/system models how the farm is currently operating given the biophysical properties found on the property. The first step in the process is to gather broad biophysical information using Arc GIS map layers (refer to Table 1).

Table 1 – Arc GIS map layers

GIS Layer	Description	Link	Scale
FSL (Fundamental Soil Layer)	Contains spatial information for 16 key attributes related to soil. These attributes fall into three key categories soil fertility/ toxicity, soil physical properties and topography/climate.	https://lris.scinfo.org.nz/layer/48079-fsl-new-zealand-soil-classification-v10	1: 50,000
S-Map[7]	Digital Soil map of NZ, it is more detailed than FSL by providing more precise and accurate soil information. S-Map does not have total coverage for NZ but is considered a better source of information than the FSL layer.	https://smap.landcareresearch.co.nz	1:50,000
LCDB (Land Cover Database)	Describes the extent of vegetation cover, water, grasslands, and built environments across NZ. These images are based on satellite imagery.	https://lris.scinfo.org.nz/layer/104400-lcdb-v50-land-cover-database-version-50-mainland-new-zealand/services/wfs	1:50,000
LUC (Land Use Capability)	Land is categorised into eight land use classes based on its long-term capability to sustain one or more productive uses based on physical limitations.	https://lris.scinfo.org.nz/layer/48076-nzlri-land-use-capability-2021	1:50,000
LUCAS (NZ Land Use Map)	National Map that divides NZ into 12 land uses. This map is of particular use for monitoring forest changes and the ETS.	https://data.mfe.govt.nz/layer/52375-lucas-nz-land-use-map-1990-2008-2012-2016-v011	1:50,000
Slope[8]	Understanding the slope of the property will strongly influence what land uses are suitable.	https://data.linz.govt.nz/layer/51768-nz-8m-digital-elevation-model-2012	

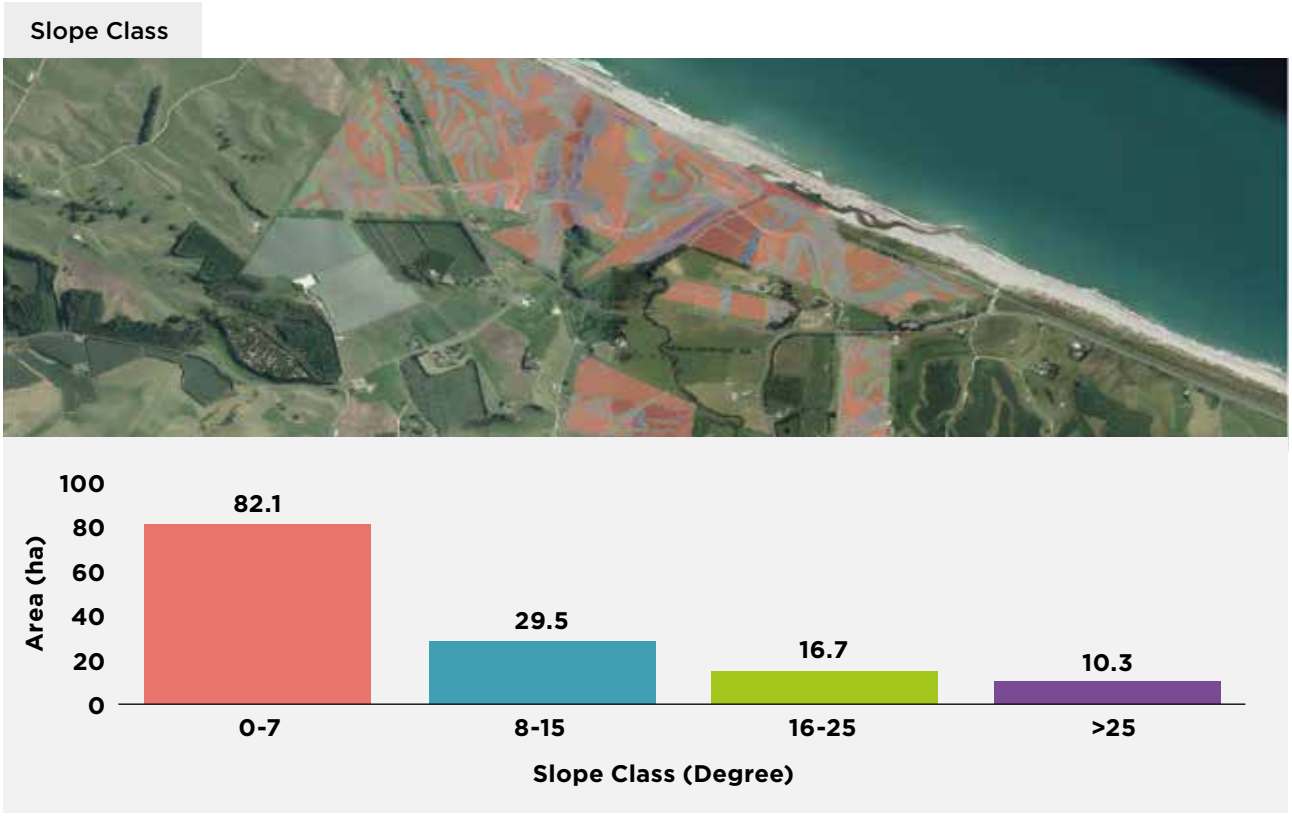
NOTE: Most of these layers are at a regional scale of 1:50,000, which means that they were developed for regional planning use, not farm-scale maps. If possible, more detailed maps would be preferable if they are available, although to gain a high-level understanding of what biophysical properties are on the farm, these are sufficient.

Additional biophysical properties that should also be collected are listed below (refer to Table 2), these can be sourced through NIWA Climate Information[9].

Table 2 – Additional physical features

Average annual rainfall (mm)
Growing degrees-day (annual accumulated thermal time) (°C.d)
Mean daily temperature (°C)
Chill hours, from May to Aug (h)
Frost risk (average number of frosts per year)
Heat stress risk (average number of events per year)

Figure 3: Example of Slope GIS layer



Farm Baseline Data

After the initial baseline modelling and maps are produced, the information on the Farm Baseline Data or current state is presented back to the trustees.

Figure 4: Example of presentation dashboard showing baseline data or current state

Farm Baseline Data
EBITDA 4,844 ($/Effective ha)
Stocking Rate 9.5 (SU/ha)
Total GHG Emission 2,209 (eCO2 kg/ha/yr)
Methane Emissions 1,778 (kg CO2e/ha)
Nitrogen Leaching 16 kg N/ha/yr
Phosphorus Loss 0.9 kg P/ha/yr

Figure 5: Example of Biophysical features of area

Suitability Factors
Average Annual Rainfall 1,400 (mm)
Mean Daily Temperature 14 (°C)
Growing Degrees-day 1,850 (*C.d)
Chill hours, from May to Aug 850 (h)
Frost risk 0.5 (average number of frosts per year)
Heat stress risk 23 (average number of events per year)

Additional biophysical properties or suitability factors that should also be collected are listed below (refer to Figure 6). These can be sourced through NIWA Climate Information[9].

STEP THREE

Identify whakaarotau (priorities) in the context of the farm

Based on tōnuitanga (economic prosperity), whakatipuranga (growing generations, tiakitanga (guardianship), taituarātanga (support)

Introducing this step

The aim of this step is to understand the aspirations and priorities (whakaarotau) of the participants and their relative importance amongst the group. This weighting exercise can be done in two ways - through a Choice Model and/or through developing a Rubric.

The first part of this exercise is a discussion with each of the participants about their aspirations for the whenua. This follows on from the earlier group discussion and is intended to elicit personal ideas about future options for the whenua both in the medium term (3 – 5 years) and the longer term (10+ years).

It is important to structure the discussion of whakaarotau around prompts that encourage the participants to think about different well-beings or the bigger picture, e.g. to think not only about farm productivity but also te taiao, people that interact with the farm, possibilities for collaboration, aspirations for their hapū or iwi, etc.

The feedback from these interviews is categorised into logical themes and these findings are presented back to the group to ensure this reflects what was discussed and to uncover any other ideas which should be included.

The four themes that developed from our groups along with their supporting attributes were classified as:

Tōnuitanga (Economic prosperity)

- Optimising land value
- Increasing return on investment
- Gaining premium for products
- Sustainable revenue

Whakatipuranga (Growing generations)

- Succession planning
- Compliance
- Increasing entrepreneurial capacity
- Improving governance skills
- Successfully managing increase of owners
- Innovative thinking
- Building youth capability

Tiakitanga (Guardianship)

- Pest management (protecting manu/ngahere)
- Protecting awa (including riparian planting)
- Protecting / increasing biodiversity
- Increasing land health to improve human health
- Wetland redevelopment

Taituarātanga (Support)

- Employment
- Papakainga housing
- Marae connecting with owners and support
- Providing health benefits

During the course of these discussions, participants should also have the opportunity to discuss and understand the different perspectives they may have on whakaarotau, both individually and collectively.

The next part involves developing importance weightings for the whakaarotau initially using a **Choice Model** process and then following that with more detailed discussion developing a **Rubric**.

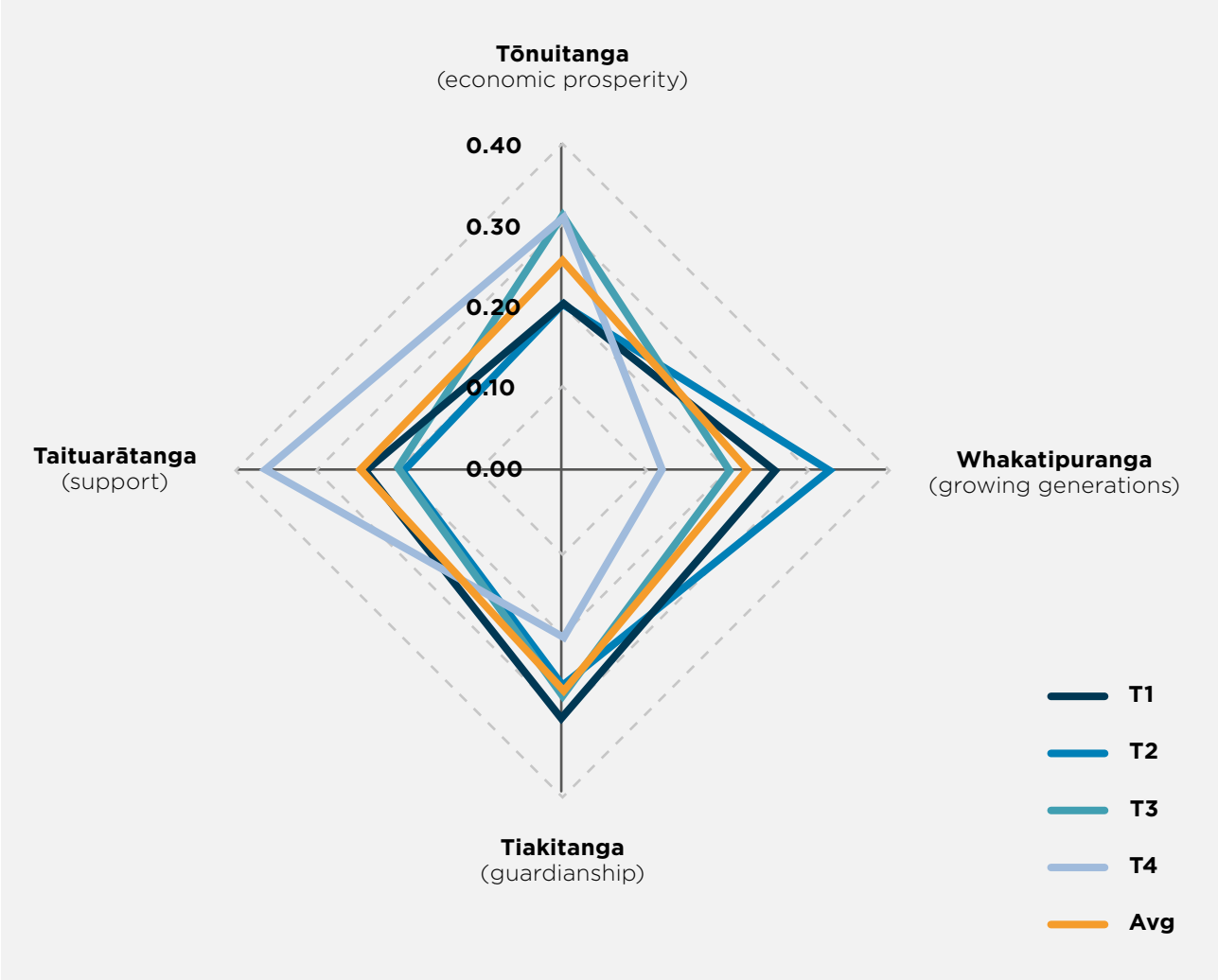
Developing weightings through a Choice Model

To develop individual weightings for whakaarotau, the trustees complete a choice model survey. In this case, the proprietary Choice Model software 1000 Minds was chosen.

The choice model presented a series of questions to participants with two options, and participants were asked to choose which of these options would be most desirable. After each choice was made, the software provides new options until an accurate profile of the relative importance of each value was determined. The outcome of this process provides a set of importance weightings for the participants and the group (outlined in orange below):

Priorities (whakaarotau)	Group Weighting
Tōnuitanga (economic prosperity)	25.7%
Whakatipuranga (growing generations)	22.9%
Tiakitanga (guardianship)	26.3%
Taituarātanga (support)	25.2%

Figure 6: Whakaarotau Choice Model weightings



The orange line on the radar map above represents the average or moderated weighted figure of the group. This process ensures that the views of the individuals are moderated and helps to democratise the group decision-making.

Developing weightings through a Rubric

With the results from the Choice Model, and if the participants wish to discuss this area further, the facilitator can work through a group exercise to understand in more depth the importance of their priorities or whakaarotau.

The facilitator works with the group to develop a shared understanding of the importance of each of the whakaarotau and an agreement of the collective weighting for decision-making using the example rubric below:

Tōnuitanga (Economic Prosperity)

- Maximising land value
- Increasing return on investment
- Gaining premium for products
- Sustainable revenue

Relative importance

Not important ☐☐☐☐☐ Highly important

Other descriptors of Tōnuitanga suggested by the group	

Whakatipuranga (Growing Generations)

- Succession planning
- Compliance
- Increasing entrepreneurial capacity
- Improving governance skills
- Successfully managing increase of owners
- Innovative thinking
- Building youth capability

Relative importance

Not important ☐☐☐☐☐ Highly important

Other descriptors of Whakatipuranga suggested by the group	

Tiakitanga (Guardianship)

- Pest management (protecting manu/ngahere)
- Protecting awa (including riparian planting)
- Increasing land health to improve human health
- Wetland redevelopment

Relative importance

Not important ☐☐☐☐☐ Highly important

Other descriptors of Tiakitanga suggested by the group	

Taituarātanga (Support)

- Employment
- Papakainga housing
- Marae connecting with owners and support
- Providing health benefits

Relative importance

Not important ☐☐☐☐☐ Highly important

Other descriptors of Taituarātanga suggested by the group	

Using the Rubric scale, this process also provides a group weighting for each of the whakaarotau which can then be utilised in the PPT algorithm in step 5.

STEP FOUR

Identify and discuss alternative broad land-use options

Identify alternative land-use categories/options based on whakaarotau and understanding of the whenua

Introducing this step

This is about the farm governance and decision makers providing their high-level ideas as to what they'd like to do on their land as well as where they are likely to implement changes before moving to modelling what this looks like at the next step.

This step comprises a reflection on the farm characteristics and current land use (i.e. information from Step 2) and how these link with the aspirations and values from step 3. This will lead to a discussion of the extent of changes likely to be required and then what kind of land use that would be appropriate for the whenua.

Guided discussion process

Facilitator	Prompts
Thinking about our aspirations and values, how well does your current system meet these? (and therefore what might we do differently?	An initial discussion about change that aligns to aspirations and values
Thinking about our aspirations and values, what are the things that we could do on the land? (what would we like to do at a high level?)	An initial discussion about the broad options for alternative land uses e.g. Horticulture - tree crops Horticulture - annual cropping Horticulture - other Arable crops Other livestock Trees – plantation Trees – native Other e.g. tourism, aquaculture etc.
Thinking about options for alternative land use, where on the whenua/ farm (what blocks) could this occur? (where would we like to do this?)	Using maps of the farm/ area identify the blocks of land where this alternative land use could occur (e.g. on the flat; slopes etc.)
Based on your knowledge of the land, and the perspectives from whakaarotau, what can be produced (what can you do?)	Initial discussion based on knowledge of the land and perspectives from whakaarotau. Then consider bio-physical requirements and constraints. Support using data from **landuseopportunities.nz**

STEP FIVE

Presentation of alternative land-use options with guided discussion

Identify alternative land-use categories/options based on whakaarotau and understanding of the whenua

Introducing this step

This step involves three main parts:

1. Determining the alternative land uses suitable to the geographic location of the land;
2. Aligning the relevant alternative land uses with the group aspirations; and
3. Discussion with group.

Land-use suitability

The land use suitability work was conducted primarily by the Whitiwhiti Ora National Science Challenge project which defined land uses around New Zealand according to local land information and climate data. A range of economic and environmental impact data was also compiled as part of this project. PPT then used this data to create a 'dashboard' report listing the suitable land uses for the specific land blocks we were working with.

Aligning land uses with group aspirations

This involves running a PPT algorithm which matches the group's aspirations and values as expressed in the whakaarotau with potential alternative land uses to generate a list of possible land use options ranked according to group aspirations.

Some of the discussion might be around the validity of the data and how this information was derived.

Here is the explanation to that:

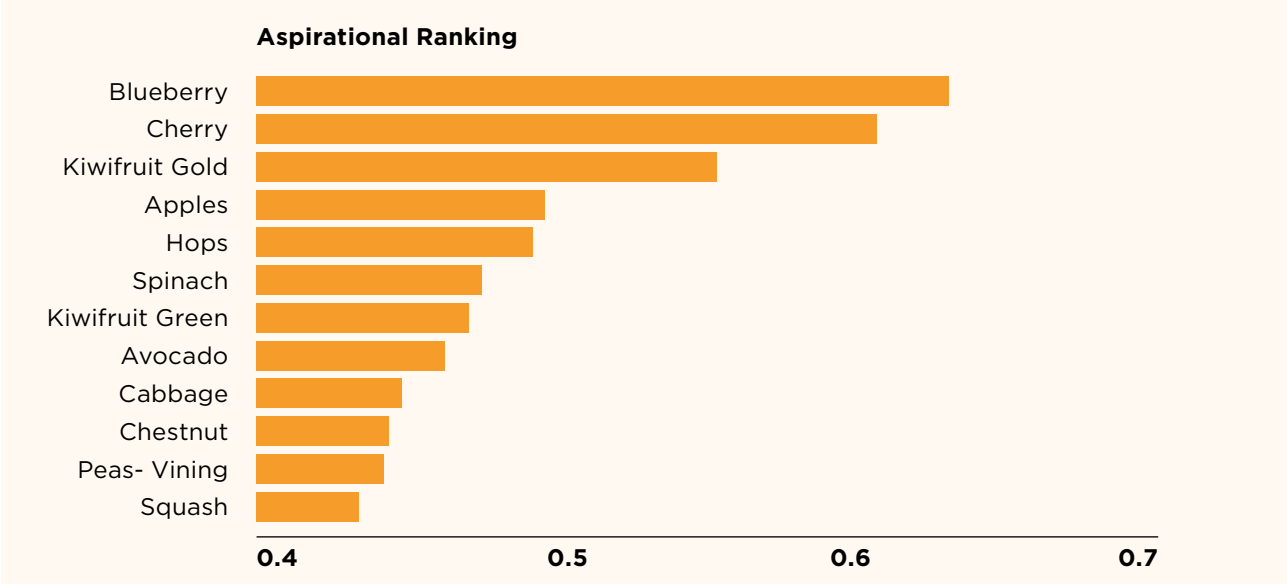
> *This information links the aspirations from the participants, represented by the utility score – which can be from the choice model approach or a rubric approach - with an index derived from potential outcomes of various land uses. The utility scores give a numerical idea of the aspirations, grouped by whakaarotau. Similarly, the indices from land use reflect their relative rank within each of the whakaarotau, determined based on specified inputs (e.g. operating profit or N leaching).*

The participants can then consider these options using different indicators, for example, economic, environmental, etc. The idea behind the algorithm is that if a group leans heavily toward environmental factors, then those land uses with strongly positive environmental outcomes would be ranked higher. Likewise for the other three factors. As it turned out, all three groups favoured economic factors as the priority.

Presenting options to the group

The land use alternatives will be presented in a graph like the one below.

Figure 7: Aspirational Ranking Graph



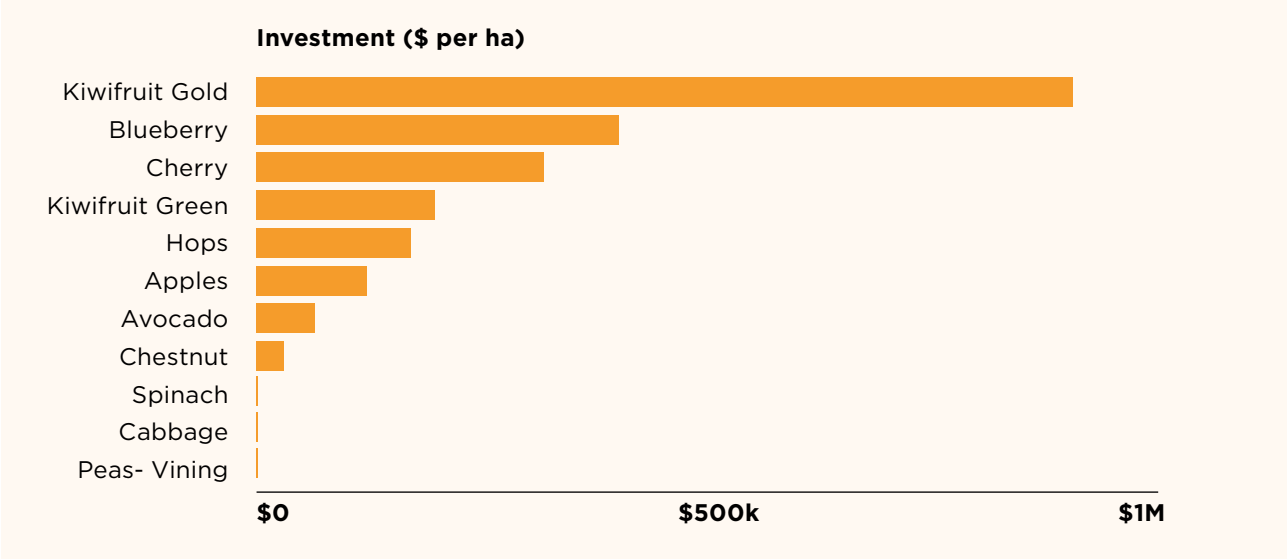
This graph provides the trustees' aspirational ranking of potential land use options that are suited for the area given their whakaarotau.

The alternative land use information provided is designed to answer the following questions:

- How much is this alternative land use going to cost? (Investment required)
- What are the likely returns? (Gross Revenue, Operating Profit)
- How long will this take to start earning? (Years to first and full production)
- What impact will it have on the environment? (Greenhouse gas impact, nutrient leaching impact).

Answers to these questions can then provide a basis for a productive discussion on which land uses may be more appropriate for the group to investigate further. For example, the Investment graph below (see figure 9) provides an indication of which land uses may better suit the trustees' investment budget.

Figure 8: Investment relativities for Alternative Land Uses suited to that area



The information about these indicators is presented as a guide only. The actual figures may change from year to year based on market fluctuations, seasonal weather variations, improvements in technology, etc. but it is more important to show the relativities between alternative land uses which can help guide the trustees to a land use which may be more appropriate for their situation.

Prompts for discussion based on options (to be led by facilitator)

Are there any unexpected options that have emerged, or things we haven't considered before?
Are there options that we've previously considered that now need to be discounted based on the suitability information?
Are there any other options that haven't emerged through this process (potentially because no current data available) that we need to consider
What are some preferred options to take forward (to due diligence stage)? *Return again to the earlier thinking around the whakaarotau, and the aspirations of the group/ trust*

STEP SIX

Reconfiguration of farm

Optimising animal system/adding alternatives

Introducing this step

This step is about considering the different scenarios and their impact of land use changes on the existing farm system and well as the wider environment (for example wider catchment). It acknowledges that any land use change will have implications for the farm system. The discussion allows for some initial consideration of possible scenarios, which can then be modelled for the farm using tools such as Overseer, Farmax and Forecaster. Note that PPT encourages consideration of the wider environment (beyond the farm), however, modelling the impacts is beyond the scope of our framework at this stage.

Guided discussion process

Key question

What is the impact of the proposed new land use on the farm system?

Facilitator	Prompts
What are the implications of removing the block/ land under consideration from the system?	
Thinking about if this land is no longer available for its current use and how this will impact on your farm system.	Things to consider (examples only, noting that this will be very context specific) • Stock grazing at different times of the year; • Summer or winter cropping
Thinking about if this land is no longer available for its current use: what will you no longer need to do?	Things to consider (examples only, noting that this will be very context specific) • Fencing (e.g. to keep stock out of waterways • Weed control/ maintenance
Thinking beyond the farm, are there any implications for the wider environment and catchment (positive and negative)	For example what impact will drainage have on water ways? Note that modelling the beyond-farm implications is beyond the scope of PPT

Once the options for the reconfigured farm have been considered, then use Overseer and Farmax to remodel the current state information from Step 2 alongside any forestry modelling that is chosen when developing the scenarios.

This will produce new profiles for:

- Greenhouse Gas emissions including methane and nitrous oxide
- EBITDA (Earnings before Interest, Tax, Depreciation and Amortisation) profile
- Nutrient loss profile including nitrogren and phosphorous

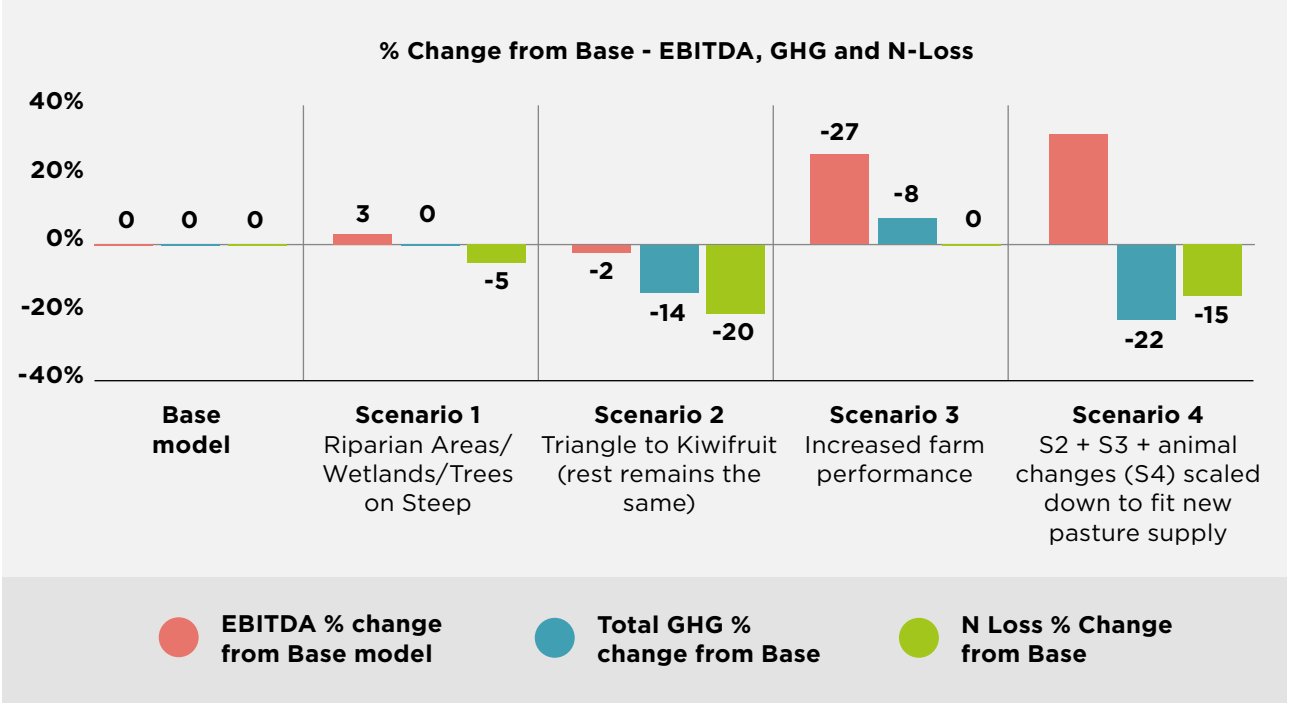
Figure 9: Current farm baseline and scenario modelling

Farm Scenario Data

Whangaipeke	**Base Line**	**Scenario 1:** Increased farm performance	**Scenario 2:** No intensification	**Scenario 3:** Increased farm performance
Pastoral Area (Ha)	756	622	622	692
Area planted in Forestry or Horticulture (ha)	378	512	512	442
Stocking rate (Cows/ha pastoral area)	9.5	11.8	10.4	10.7
EBITDA ($ effective ha/yr)	$84	$223	$43	$197
% change from Base model	0	165%	-48.8%	134.5%
CH_4 emissions (kg CO2e/ha)	1,778	1,798	1,604	1,829
N_2O emissions (kg CO2e/ha)	432	444	392	449
Total property net CO2e (kg/ha)	2,209	2,242	1,996	2,278
Total GHG % change from Base	0	-1.5%	9.7%	-3.1%
N Loss (kg N/ha/yr)	16	15	15	17

These can be graphed (see figure 10) to visually demonstrate the benefits or costs of each of the scenarios:

Figure 10: Graphs of % change of EBITDA, GHG and N Loss



STEP SEVEN

Group deliberation of alternatives

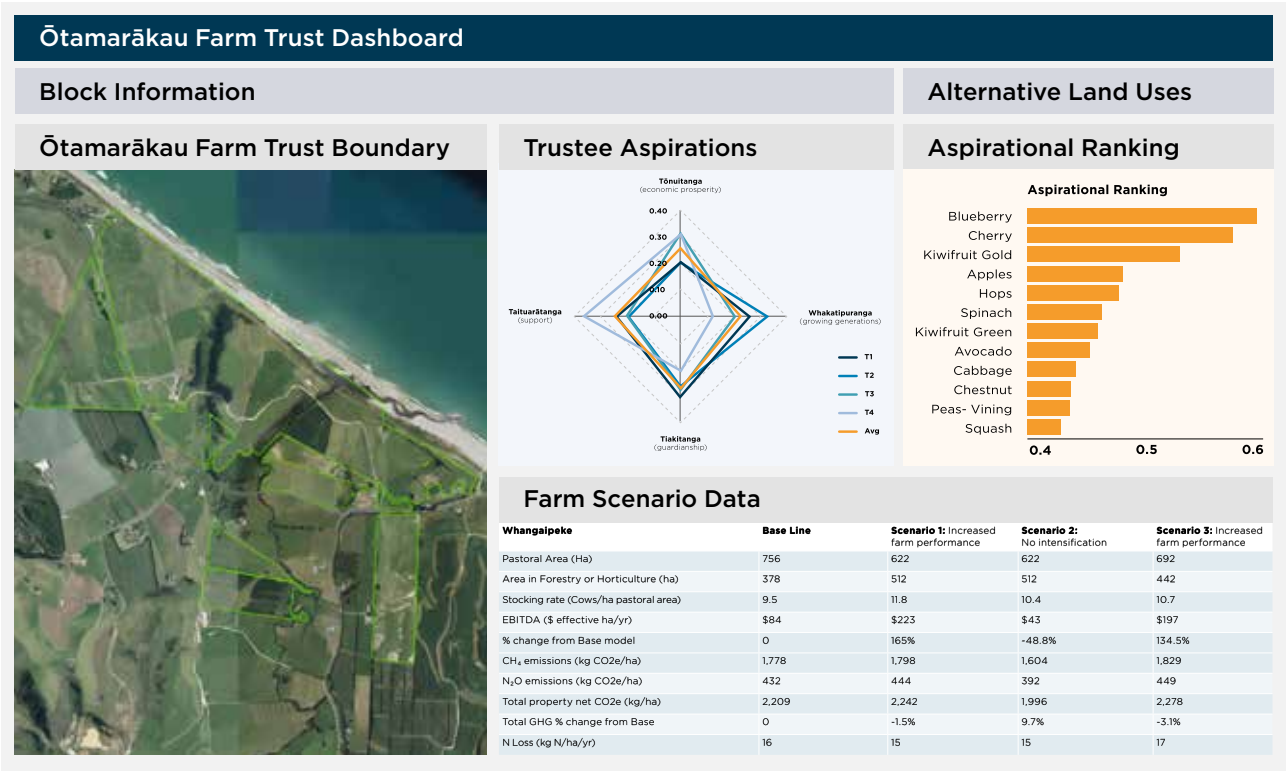
Before final decision can be made

Introducing this step

This is the final part of the guided process to discuss the options presented. It is the opportunity to go back to the Whakaarotau and Pohewa discussed earlier. There may be some very obvious choices, or the options may require more deliberations. Guided group processes can help when there is a range of views about which options to take forward.

All the information gathered - the current land use performance along with the different scenarios, a range of farm maps and GIS layers, biophysical data and alternative land use information - is then provided to the trustees in an online 'Farm dashboard' to facilitate a productive discussion and deliberation on future alternatives for the land.

Figure 11: Example of Online Dashboard



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Total GHG % change from Base	0	-1.5%	9.7%	-3.1%
N Loss (kg N/ha/yr)	16	15	15	17

The dashboard acts as a library of useful information to answer current and future questions which may arise in the trustee's discussions around land use change.

The aim of Pohewa Pae Tawhiti is to lead the trustees to investigate land use changes that will suit their aspirations and whakaarotau as a group while also taking into their current land use operation.

The final step, and beyond the scope of Pohewa Pae Tawhiti is selecting one (or more) of their preferred land uses to take to a Due Diligence or Feasibility Study step. This will require specialist expertise (for example horticultural or forestry consultants, or an accountant) to gather more detailed information on the viability of their choice.

Decision-making questions around land-use options (when a set of options has been identified)

One way of deciding on an option is for the facilitator to use a set of questions like the ones below. In a face-to-face situation, this could be presented on a whiteboard or flip chart. The participants can 'vote' by placing a mark on scale of one to four to show where the group as a whole is thinking.

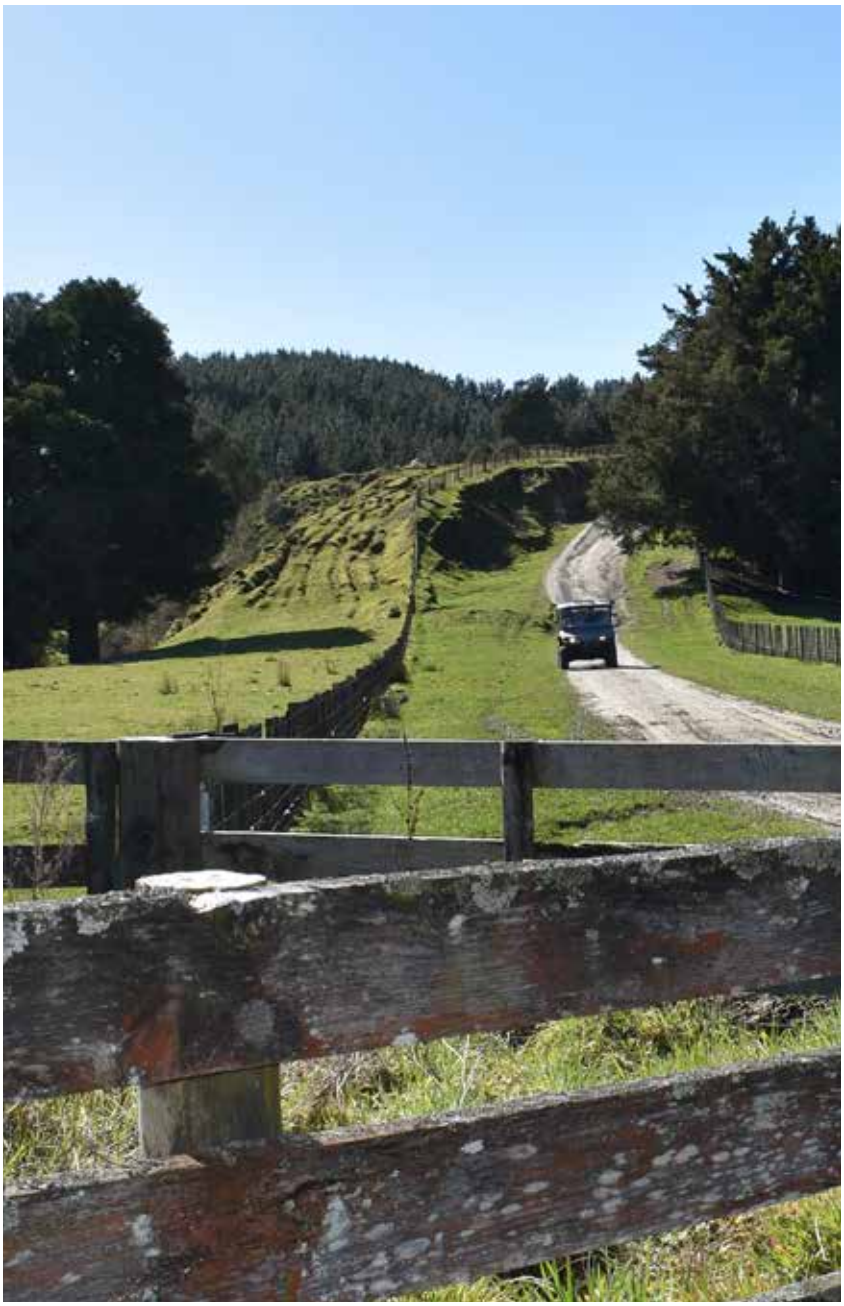
	very low			very high
Question	**1**	**2**	**3**	**4**
To what extent does (the option) fit with our values?	Very low extent: low or no fit with our values			To a great extent: high fit with our values
To what extent are we confident that the data/ information can help us to make a decision?	Very low: lots of gaps and uncertainty within the data			Very specific information that applies directly to our farm
To what extent do we have the appropriate skills to implement the proposed option?	Very low extent: we don't currently have the appropriate skill set and it will be difficult to obtain			To a great extent: we have the current skill set (or can easily obtain) to implement the proposed option
How confident are we that the current infrastructure and distribution chains are in place (or will be in place) to support our decision?	Very low confidence: infrastructure and/or distributions chains not in place, and unlikely to be in future			Very high confidence that the infrastructure and/or distributions chains are in place

Limitations of the framework

The Pohewa Pae Tawhiti framework has been co-developed with members of Te Arawa Arataua, and tested with two farm Māori trusts, as well as a third case study farm. However, it is still being presented as a prototype that will be refined over time as it is tested more widely.

Pohewa Pae Tawhiti is about narrowing down possible options for alternative land uses. It doesn't include the necessary due diligence that would be required before a final decision can be made – rather it points to some options that could then be taken to a due diligence phase.

We also acknowledge the complexity of decision making that makes it difficult to be captured within a simple process. Some decision makers will have an abundance of knowledge, strategy and technical skills; others less so. Again we emphasise the value of the Guided Process and facilitated discussions, that sit alongside the technical and biophysical data and tools.



Appendix 1

Approaches for Visioning

For step 1, if there is no existing vision, goals or strategy, then the participants may want to run through a group visioning process. There are many ways to achieve this, some more detailed and complex than others.

A simple group process is a guided visioning process, where the facilitator asks something like:

Imagine it is10 years from now [or whatever length of time is appropriate] and positive changes have been made on the farm. What are you seeing, hearing, or feeling as you walk over the whenua?

Allow the group about 5 minutes to individually write down (or draw) their ideas, then go around one at a time asking for their top idea (record on white board/ flip chart/ use sticky notes etc.), and keep going until all the ideas are up. With the group theme the main ideas and concepts together to be able to come up with some key words, phrases and/or images to describe the vision.

Some other options (more detailed processes) are available here:

www.beyondresults.co.nz/t-platform-toolkit/context-awareness/visioning-and-backcasting

References

[1]'Māori Land Update – Ngā Āhuatanga o te whenua – June 2022' | Pipiri 2022, Ministry of Justice.

[2]'All Māori Management Structures' spreadsheet, downloaded from Ministry of Justice, 18 June 2023.

[3]https://www.overseer.org.nz/overseerfm

[4]https://www.farmax.co.nz/

[5]https://fgr.nz/programmes/calculators/forecaster-calculator/

[6]https://www.arcgis.com/index.html

[7]Contact Manaaki Whenua to get the S-Map information to use in Arc GIS.

[8]This DEM is 8M national scale, it would be worth contacting regional council that your property falls into to see if they have a more detailed DEM available. Slope should also than be categorised into 4 broad categories 0 – 7, 8-15, 15-24 and 24+.

[9]https://niwa.co.nz/climate/our-services/virtual-climate-stations, https://niwa.co.nz/climate/our-services/climate-mapping