



MASSEY
UNIVERSITY
TE KUNENGA KI PŪREHUROA

UNIVERSITY OF NEW ZEALAND



HE WHIENUA TIPU

TRANSFORMATION OF
MĀORI AGRIBUSINESS AND
THE FOURTH INDUSTRIAL
REVOLUTION (4IR) REPORT



PREPARED FOR:
OPEPE FARM TRUST
TAUHARA MIDDLE LANDS TRUST
TAUHARA MIDDLE 15 TRUST
TAUHARA MOANA TRUST

WRITTEN BY DR ACUSHLA SCIASCIA,
TEMUERA HALL, DR JASON MIKA,
DR MATT ROSKRUDGE

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Dr Acushla Dee Sciascia

Project Lead, He Whenua Tipu research project

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HE WHAKARĀPOPOTONGA EXECUTIVE SUMMARY

Taupō-nui-a-Tia

The incoming Fourth Industrial Revolution (4IR) is causing vast technological innovations, from exponential increases in computing power and data, to closing the gap between physical, digital and biological worlds. These innovations are impacting all people, cultures and economies, and even going so far as to challenge the essence of what it means to be human. He Whenua Tipu – Transforming Māori Agribusiness in the 4IR explored how Māori Agriculture businesses navigate, thrive and survive in this new era.

This project is a partnership project between Opepe Farm Trust and Massey University, through which relationships have been established with three other trusts that are associated with Opepe Farm Trust (ā whakapapa, ā whenua hoki) including Tauhara Middle 15, Tauhara Middle Lands and Tauhara Moana Trusts. The project drew on literature and case study data to explore the dimensions of the 4IR and how they are perceived, understood and utilised in various Māori agribusiness models. From this exploration, we focused on the elements that are altering or are catalysing narratives on business identity, resilience and sustainability for Māori enterprises in this sector.

This project is a partnership project between Opepe Farm Trust and Massey University, through which, other relationships have been established with three other Trusts that are connected into (ā whakapapa, ā whenua hoki) Opepe Farm Trust

KEY FINDINGS

- The importance of values for the Ahu Whenua Trust¹ case studies indicate that decision-making at the board level is consistently guided by sets of values as they set both social and environmental goals and outcomes. While tensions were identified by Trust board members between balanced decision-making that upholds values that lead to the protection of the whenua and wai and the wellbeing of their beneficial owners on one hand, and improving financial returns on the other, these Trusts recognise that new pathways and considerations for the future of farming need to be carved out and pursued;
- There was a strong indication that Ahu Whenua Trusts would tend more toward the adoption of 4IR technologies that not only improve efficiencies but also enhance social and environmental objectives. On the contrary, they indicated aversion to technologies that would focus on economic gain at the expense of social and environmental benefits. In other words, ancestral cultural values have a significant influence on decisions and direction in regard to technology adaption and implementation;
- Efficient farm management systems indicate increasingly sophisticated on-farm technology such as milking systems, waste processing and environmental monitoring. These technologies carry potential benefits to production efficiency, regional government compliance and data that helps inform key decision-making (what type of 4IR knowledge or practice does this represent?);
- Communication, engagement and connectivity increase the ability for land owners and others to communicate and engage with each other on the land, supporting important social and cultural ties to people and the land as well as across/within Ahu Whenua trusts;
- Competitive pressure within the agriculture industry is likely as the agribusiness sector increasingly adopts technologies like those being utilised by our Ahu Whenua Trusts, and others. The relative competitive position of firms, including Māori firms, within the industry is likely to increase;
- Ahu Whenua Trusts, despite the competitive nature of the agricultural industry, have a strong desire to work together, with the aim to advance and honour whakapapa, connections, and mātauranga, as well as to share business expertise;
- Ahu Whenua Trusts stand to benefit from changes in the agribusiness landscape resulting from transformational technology which can yield both economic and environmental benefits. However, these benefits are not without risk, and the implications of 4IR biotechnologies and the destabilisation to employment and local communities have been identified as areas of concern for these trusts;
- Ahu Whenua Trusts aspire to land use diversification, including thinking differently about the future of farming and alternatives that consider the long term impact on the environment. Some trusts were actively exploring these alternatives during the development of this project such as Hemp farming and koura farming; and
- Climate change policies and practice are increasingly becoming more important as Māori agribusinesses have the opportunity to alleviate effects of climate change through land use diversification that promotes not only a sustainable future for the whenua and wai, but one that is thriving.

This project only scratched the surface of the depth and breadth of each of these unique Ahu Whenua Trusts, their kaupapa and their future visions for their whenua, wai and hapori. Given the expected trajectory of the 4IR, the need to develop an evidence base for the implications and opportunities for Māori business became apparent. We sought to identify what elements of the 4IR are changing Māori business, increasing connectivity between other similar organisations and developing new Māori Agribusiness conceptual and implementation discourse. We hope to build on this important research and will be looking at a Phase Two of He Whenua Tipu in the near future.

¹ While this research focuses on Ahu Whenua trusts, which are the main type of legal entity used by land owners for administration and control of Māori land. However, the research has implications for other forms of Māori land entities.



HE KUPU WHAKATAKI INTRODUCTION

Tauhara Middle 15

PURPOSE

The purpose of this report is to present and discuss the findings and implications of research on how Māori agricultural business navigate, thrive and survive in the Fourth Industrial Revolution (4IR), particularly with agriculture-based technologies in Aotearoa New Zealand. The aim of the research is to identify whether and how Māori agribusinesses are engaging in technologies and their reasons for doing so. From this investigation, we present some key findings into what drives Māori Agribusiness models, Ahu Whenua trusts and land owners to make the decisions they need to for the betterment of the whenua (land), wai (water) and iwi (people). whenua (land), wai (water) and iwi (people).

Our aims were to identify elements of the 4IR that are changing Māori businesses, increase connectivity between key organisations, and develop new Māori business discourse

FUNDING

The Connect Scheme under the Vision Mātauranga programme of the Ministry of Business, Innovation and Employment is an emerging area of enquiry for Massey University. We (the University) were fortunate to partner with Opepe Farm Trust with a framework for assessing the impacts and opportunities of 4IR on Māori Agribusiness models, sustainability and opportunities. Funding from MBIE totalled \$100,000 (plus GST) in partnership with Massey University and Opepe Farm Trust who provided \$44,000 and \$10,000 in kind (respectively) to this kaupapa – thus a modest project spanning 12 months (June 2018–July 2019). Capability outcomes of the project reached across other participating organisations, Māori Agribusiness and other Ahu Whenua Trusts, and New Zealand’s agricultural sector.

Nō reira, e rere nei te tai o mihi ki ngā kaupūtea i tautokona te kaupapa rangahau nei.

RESEARCH OVERVIEW

Our aims were to identify elements of the 4IR that are changing Māori businesses, increase connectivity between key organisations, and develop new Māori business discourse. In addition, the proposal contributed to Māori researchers’ technical capability and capacity to analyse and evaluate evolving technological innovations. Science and technology advances have absorbed much of the 4IR research focus by building new algorithms, robotics and acceleration of technologies. However, the cult of disruption, the ceaseless advance of technology, and our own fundamental appetite for novelty and convenience have combined to speed up every aspect of daily life. These new cultural norms are driving new cross disciplinary research into how businesses will survive to thrive.

The project focuses on four case studies with four Ahu Whenua Trusts of Ngāti Tūwharetoa iwi: Opepe Farm Trust, Tauhara Middle Lands, Tauhara Middle 15 Trust and Tauhara Moana Trust (located in the Taupō region). Specifically, we explored the values of their trust and the business model they work within to understand how the two connect, and how Māori Agribusiness contributes to resilience and sustainability. Two key areas of inquiry were intended in this programme and subsequent research questions provided the scope for our inquiry:

TE URUPARE

How Ahu Whenua trusts respond to changing global systems and demands.

- 1 Do new models of business sustainability evolving from the 4IR align with established and evolving Māori Agribusinesses?
- 2 How do we visualise the landscape through elements of the 4IR that will accelerate change in Māori agribusiness, and that will indicate productivity for supply and demand?
- 3 What elements of the 4IR are changing Māori agribusiness?

TE TĀPAETANGA

The contribution of Māori business and knowledge to New Zealand’s evolving sustainability business narrative.

- 4 How do trusts use elements of the 4IR to diversify land use?
- 5 What role do values play in Māori agribusiness models and elements of the 4IR more broadly?

This project contributes to an emerging Māori agribusiness narrative for the Fourth Industrial Revolution. Mātauranga Māori, Applied Business and Scientific knowledge, will inform and identify opportunities for making the most out of the existing resources available and expansion into new areas of investment e.g., introduction of technology to production, values-based decision making and sustainability for future generations.



TUKANGA RANGAHAU METHODOLOGY

Tauhara Middle Lands

OVERALL METHODOLOGY

Our research project is qualitative utilising Kaupapa Māori methodology and Design Thinking with Māori Agribusiness case studies. Four focus groups and one design thinking session were conducted with Ahu Whenua Trust board members and key staff, such as dairy farmers, to inform our understanding of the roles of technology and values, and how these inform Māori Agribusiness models. From this data capture, we have developed four case studies to facilitate the development of a Māori narrative for future sustainability focussed business models.

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Our team used dialogic approaches, detailed literature and media analysis as well as focus group interview data to develop case studies. Furthermore, we held one design thinking wānanga with key staff and members of the four case studies to elicit a Ngāti Tūwharetoa narrative for Māori Agribusiness in the 4IR with a particular focus on future thinking for the four Ahu Whenua Trusts. The four case study organisations came together in this way and shared food and discussion on the future of their Ahu Whenua Trusts.

Key organisations, including the New Zealand Sustainable Business Council, Te Tumu Paeroa, Poutama Trust, and Plus Group, were consulted on the development of the research design. We worked closely with Opepe Farm Trustees to write all reports and findings for this research project.

LIMITATIONS

As with all research projects, there are limitations that we need to identify and recognise. In this project, we identified that the project overall is largely a scoping project, a pilot study to unlock some of the narratives and discourse around Māori Agribusiness and the Fourth Industrial Revolution. However, we recognise that the data sample itself is limited (with just four case studies and one design thinking workshop as the key data) coupled with an extensive literature review and media analysis. Our focus was on Ahu Whenua Trusts in the Ngāti Tūwharetoa regional area based on our relationships with these organisations. We recognise that our project and findings are not representative of the entire industry, yet speak to the narrative of four main Ahu Whenua.

Similarly, we recognise that an international partner would have provided some interesting comparisons in terms of Indigenous farm lands, particularly their use of whenua and wai in the context of sustainability and the climate change challenge we are currently faced with. These are areas that we would like to build on and continue to develop in the next potential phase of this research. This is discussed further in 'Future research'..

KNOWLEDGE SHARING

As part of our research project, we committed to producing the findings of this project in a range of ways for dissemination and sharing. This is especially important for us not only as academics, but as Māori researchers to contribute to transformative outcomes for our people. If we are not able to effectively communicate our research to a range of communities that makes the research accessible, understandable and useful, then we are doing our community a disservice.

We recognise that there are a range of audiences involved in this kaupapa and who will have an interest. First and foremost, our partner organisations and Ahu Whenua Trusts that we have engaged to participate in the research are our priority. In this way, we have produced a series of visual narratives through video to represent key findings of the research. Similarly, we have a commitment to the funder to produce a summary of this report, which was submitted to MBIE in July 2019. Some of the ways in which we are sharing this knowledge include, but are not limited to:



Short videos (2-3 minutes long) summarising the research through the voices of the Trustees and footage of each of the Farms



Presentation of research report and videos to four Ahu Whenua Trusts in September, 2019



Video files shared with Ahu Whenua Trusts via online document share for distribution to land owners and posting to website, e-newsletter, emails, etc



Peer reviewed and published full report
Summary report
Final summary report for MBIE (funder).



HE KŌRERO TŪĀPAPA BACKGROUND

Pākira Marae

Previous industrial revolutions made mass production possible and brought digital capabilities to over half the world's population. The incoming Fourth Industrial Revolution (4IR) is seeing technological innovations – from exponential increases in computing power and data, to closing the gap between physical, digital and biological worlds – impacting all people, cultures and economies which is even challenging the essence of what it means to be human. He Whenua Tipu – Transforming Māori Agribusiness in the 4IR explores how Māori businesses like Opepe Farm Trust can navigate, thrive and survive in this new era.

The incoming Fourth Industrial Revolution is... impacting all people, cultures, and economies which is even challenging the essence of what it means to be human

It is in our hands to ensure that the potentially disruptive shifts of the Fourth Industrial Revolution (4IR) rebalance opportunities and outcomes across geographic, generational and cultural boundaries in New Zealand. In New Zealand, there is growing support for Jeremy Rifkin's Third Industrial Revolution (3IR) Philosophies that explore how Internet technology and renewable energy are merging to create a powerful new engine of economic growth. Regardless of whether New Zealand businesses follow 3IR or 4IR viewpoints, recent policy developments have been made to transition to a low emissions nation, as well as the goal to make electricity 90 percent renewable by 2025. Legislated environmental change will certainly impact on the way that our economy functions in the near future.

Technological innovations – from exponential increases in computing power and data to the closing gap between physical, digital and biological worlds – is impacting all people, cultures, economies which is even challenging the essence of what it means to be human (Schwab, 2017)². It is in our hands to ensure that the potentially disruptive shifts of the Fourth Industrial Revolution (4IR) rebalance opportunities and outcomes across geographic, generational and cultural boundaries in New Zealand. In New Zealand, there is growing support for Jeremy Rifkin's Third Industrial Revolution (3IR) Philosophies that explore how Internet technology and renewable energy are merging to create a powerful new engine of economic growth. Regardless of whether New Zealand businesses follow 3IR or 4IR viewpoints, recent policy developments have been made to transition to a low emissions nation, as well as the goal to make electricity 90 percent renewable by 2025. Legislated environmental change will certainly impact on the way that our economy functions in the near future.

There is growing global commentary on the 4IR; however, there is still little research that identifies how communities and businesses can better prepare for the rapid transformations in technology, markets and land use. Science and technology advances have absorbed much of the research focus.

Alan Kay (1971), a visionary responsible for the concepts which have propelled personal computing forward over the past thirty years, said, "The best way to predict the future is to invent it." This is encapsulated in the whakatauaākī by Kīngi Tāwhiao, Māku anō e hanga tōku nei whare. For the authentic voice to be heard, projects like this need to be seeded to develop our unique discourses in this space³.

WHAT ARE AHU WHENUA TRUSTS?

The difference between Māori Agribusiness and non-Māori Agribusiness is essentially that a Māori Agribusiness is an agricultural operation carried out upon communal or multiple owned Māori land that has been bequeathed to the current owners by their ancestors.⁴

As land is held under multiple owners, in an effort to contain the negative effects of title fractionation, the Te Ture Whenua Māori Act (1993) enables the establishment of ownership structures, where elected representatives administer the land interests on behalf of the owners (Kingi, 2013)⁵. The structures by which these lands are commonly held are Ahu Whenua Trusts or Incorporations (Incs). Ahu Whenua Trusts are the structure which hold the majority, with 60% of Māori land using this governance structure (MAF, 2011 as noted in Kingi, 2013). The number of members or beneficial owners can be as few as 100 for the smaller Trusts and Incs, with the larger Trusts and Incs ranging from 2,500 to above 10,000 owners. A third entity is the Whenua Topu Trust where ownership lies with hapū rather than individuals with registered interests, but its use among Māori is minimal (Kingi, 2013).

² Schwab, K. (2017). The fourth industrial revolution. Currency

³ Hutchings, J., & Reynolds, P. (2007). Māori and the McScience of New Technologies; Biotechnology and Nanotechnology Development. Matariki: Te Mata o Te Tau Monograph Series Number 1 (pp. 81–111). Wellington: Te Mata o Te Tau

⁴ Hall, 2018, personal communication.

⁵ Kingi, T. (2013). Cultural bastions, farm optimisation and tribal agriculture in Aotearoa (New Zealand). In Proceedings of the 22nd International Grassland Congress (pp. 1898-1904)

There are several distinctive features and values of Māori owned land which sets the type of land apart from non-Māori owned land:



Tāonga Tukuiho (inherited treasures)

Refers to the inheritance of the land. Land is not purchased in one's interest; instead, it is expected that Māori land is passed on to the next generation.



Tūrangawaewae (place of standing)

This principle refers to how the land represents a deep sense of belonging, both to that place, and to the surrounding region.



Whakapapa (genealogical connections)

Refers to the relationship between the owners through descent from one or more common ancestors.

Taking these features into consideration, agribusiness operates according to a set of Māori values and principles that guide the governance, management and operations of the business activities, people and behaviour. These Māori cultural values set the business apart from a typical 'western' agribusiness.

The ownership structure, cultural connection, and expectation that the land will be passed down to the next generation mean the land represents far more than an asset on the balance sheet. Due to the fact that Māori owned land cannot generally be sold, this bears financial implications; unlike most other land-based activities and businesses, it is difficult for Māori land to be used as collateral to raise finance. This land ownership structure is a key differentiation between Māori agribusiness and non-Māori agribusiness.

The predominant driver from multiple owners is the expectation of the adoption and implementation of indigenous cultural values, including those mentioned above. Adhering to these values can place further financial limitations on the business regarding land-use practice and economic development opportunities of the land, demonstrating a specific contrast to non-Māori agribusiness, which often has economic growth as the primary goal.

Durie (2002)⁶ alluded to a set of criteria which set Māori business apart from non-Māori business. Commonly, these are:

- Māori operate the business Māori own the business
- Māori own the business Māori staff are employed
- A Māori style of governance and management is present
- Māori staff are employed
- A focus on kaupapa Māori is lived

In considering a Māori businesses contribution to development and advancement, Durie (2002, p.7) considered another criterion: "Does it return dividends to Māori, either through profits or services, does it affirm a Māori cultural identity; does it create employment for Māori; and, does it create Māori wealth in economic terms and human capital terms".

Durie proposed six guiding outcomes from which a Māori business could be identified when viewed from this perspective:

- makes a substantial focussed contribution to Māori development and advancement
- is part of a Māori network, whether it be with hapū, rūpū or community
- adopts Māori values in both governance and management
- is geared to Māori realities and recognises Māori diversity
- creates choice for Māori consumers
- adopts principles and goals that give shape to a Māori business ethic.

⁶ Durie, M. J., et al. (2002). The business ethic and Māori development. Maunga Ta Maunga Ora Economic Summit March

Other constraints associated with Māori land are often linked to the way in which land blocks were divided up and given back to Māori

Other constraints associated with Māori land are often linked to the way in which land blocks were divided up and given back to Māori. Harmsworth (2017)⁷ explains that this has resulted in fragmented land blocks, which limit growth capacity or opportunities for Māori agribusinesses to collaborate easily. Many land blocks have absentee owners, or no active management. The type and quality of land is mostly low quality and steep, which can result in much land being underdeveloped, undeveloped, or under-utilised. There are also difficulties in gaining access to high quality information on Māori land. The information that is available is often highly technical, such as GIS, land evaluation, and soil reports, which can be hard to understand for owners who lack specialised capability.

Opepe Farm Trust

Does it return dividends to Māori, either through profits or services, does it affirm a Māori cultural identity; does it create employment for Māori; and, does it create Māori wealth in economic terms and human capital terms

⁷ Harmsworth, G. R. (2017). Unlocking the potential of Māori land: A kaupapa Māori approach to using and developing integrated knowledge, models and tools.



In order to understand the impacts of 4IR on Māori Agribusiness, we must first explore what 4IR is and it's whakapapa.

Examples of these intelligent network systems are self-driving cars, gene-editing tools and artificial intelligence which run sales strategies

WHAT IS THE FOURTH INDUSTRIAL REVOLUTION (4IR)?

In order to understand the impacts of 4IR on Māori Agribusiness, we must first explore what 4IR is and its whakapapa. Klaus Schwab, founder and executive chairman of the World Economic Forum (WEF)⁸, is responsible for labelling today's advances as a new revolution, the Fourth Industrial Revolution (4IR). Schwab (2017) describes the fourth major industrial era as a fusion of technologies which are blurring the lines between physical, digital and biological spheres.

Schwab (2017) explained that just like previous revolutions, the 4IR has the potential to raise global income levels and improve the quality of life for populations around the world. Schwab alludes to technological innovation of the 4IR as leading to extreme supply-side efficiency gains: transport and communication costs will drop, logistics and global supply chains will be more effective, and the cost of trade will consequentially diminish.

However, Schwab (2017) also suggests that the revolution could lead to greater inequality. He refers to changes in the labour market, giving the example of the automation of jobs and/or a segregation between low-skill/low-pay and high-skill/high-pay roles. These changes carry the potential to escalate social tension. In the context of Agribusiness, this labour market revolution will have, and is already having, considerable impacts on Ahu Whenua Trusts, who are faced with the challenge of employing whānau, hapū and iwi into these roles or replacing those roles all together with robotics and automated systems.

Bloem et al. (2014)⁹ refer to the 4IR as "Cyber-Physical Systems". The outcome of far-reaching integration between production, sustainability and customer satisfaction forms the basis of intelligent network systems and processes. Examples of these intelligent network systems are self-driving cars, gene-editing tools and artificial intelligence which runs sales strategies and even discovers new drugs. The automation and computerising of society will become increasingly more normalised as the 4IR becomes more widespread.

⁸ World Economic Forum (2018). *Harnessing the Fourth Industrial Revolution for life on land*. Geneva, Switzerland

⁹ Bloem, J., Van Doorn, M., Duivestein, S., Excoffier, D., Maas, R., & Van Ommeren, E. J. T. T. (2014). *The Fourth Industrial Revolution*.

WHAKAPAPA OF THE 4IR

To understand how we got to the 4IR and such inventions like the driverless car, we need to understand what transformations came before. An industrial revolution reflects a period in time where a significant lift in energy efficiency and output occurs. Priscearu (2016)¹⁰ describes the first industrial revolution as taking place from approximately 1760 to the beginning of the 1900s. It is characterised by the use of water and steam as sources of power; this revolution was dominated by the mass extraction of coal to mechanise production

The second revolution varies in dates according to literature. Stearns (2018)¹¹ sites this era as being between 1870 and 1914; however, Priscearu (2016) sets his dates slightly later, from 1900–1960. Despite these discrepancies in timeframes, the characteristics of this revolution are generally agreed on across literature. Scholars note the emergence of new energy sources, most notably electricity, gas and oil. During

this period, the telephone rapidly reformed means of communication. Other major advancements from this time include the development of the internal combustion engine, growth of the steel industry, and advances in chemical synthesis, giving birth to fertilizer.

The exact timing and traits of the third industrial revolution are again contentious in literature. Some scholars believe that we are currently experiencing the third industrial revolution, whilst others such as Stearns (2018) and Priscearu (2016) note that this era began approximately in 1960. It is underpinned by nuclear energy and the rise in electronics with the development of the transistor and microprocessor. Often these traits are used to differentiate the third from the fourth industrial revolution.

Figure 1: Timeline of the Industrial Revolutions (Priscearu, 2016).

Period	Energy resource	Main technical achievement	Main developed industries	Transport means
1760–1900 Transition period (1860–1900)	Coal	Steam engine	Textile, Steel	Train
1900–1960 Transition period (1940–1960)	Oil, Electricity	Internal Combustion engine	Metallurgy, Auto, Machine Building	Train, Car
1960–2000 Transition period (1980–2000)	Nuclear Energy, Natural Gas	Computers, Robots	Auto, Chemistry	Car, Plane
2000– Transition period (2000–2010)		Internet, 3D Printer, Genetic Engineering	High Tech Industries	Electric Car, Ultra Fast Train

¹⁰ Priscearu, P. J. (2016). Challenges of the fourth industrial revolution. 8(1), 57.

¹¹ Stearns, P. N. (2018). The industrial revolution in world history: Routledge.

IMPACTS OF THE 4IR

According to Stearns (2018), the impact of digitalisation and the internet is substantial enough to determine that we have experienced a shift in efficiency and output from the third industrial revolution to today. Hence, the fourth industrial revolution began approximately in the late 1990s, and is still continuing to this day.

The presence of the 4IR is exponential in that it is disrupting almost every industry in every country, and transforming entire systems of production, management and governance at a pace incomparable with past revolutions (Schwab, 2017). Schwab is the leading scholar on the 4IR and its global impact, specifically discussing how technologies of the 4IR will change the way humans interact with governments, industry and the environment. The scale of future change is unknown at this point, although one thing remains consistent across the 2019 World Economic Forum community: that the world should expect change at a greater rate than ever previously experienced in human history. As the world experiences a new era of hyper-connectivity, the technological impact of the 4IR will alter the way all humans think, behave, learn and relate to each other and the environment (Yoon, 2017)¹². However, this change may not be realised evenly by everyone at the same rate.

The 4IR will disrupt all areas of the economy. This disruption will have both positive and negative impacts for example, the digital impact on business will disrupt the ways in which we work, communicate information, and share ideas. The 4IR will also have a significant impact on global governance. For example, the anti-globalism movement is a risk to international trade and multi-lateral agreements. This can restrict market access, therefore disrupting the way we do business at the firm level and engage with governance at the government level. The ability to process and analyse significantly larger information flows from production and auxiliary processes is enabling companies to operate in a more flexible and innovative way, increasing productivity across the globe (Bloem et al, 2014).

THE ROLE OF VALUES IN MĀORI AGRIBUSINESS MODELS

When defining an agribusiness as 'Māori', this fundamentally implies that the agribusiness is governed by a set of Māori cultural values. During the CNI mana whenua process 2014, Tamati Kruger, Hirini Mead and other iwi leaders described the Māori world to be based upon on the principles of Mana, Mauri and Tapu, and operates within a framework of Mana Whenua, Mana Tangata and Mana Atua.

For the purpose of applying these principles and framework to its agribusiness, Ahu Whenua Trusts have developed their own set of cultural values derived from traditional old world knowledge, te ao tahito, and deemed appropriate for their kaupapa as a Land Trust. Ahu Whenua Trusts discuss their own value systems as a board which helps to drive decision-making, each unique to their own Trust, whenua and wai.

Following on from the values framework for Opepe Farm Trust (provided later in this report), the following values are offered here as a basis which Ahu Whenua Trusts can draw on to interweave into the fabric of their Trust and kaupapa. These values are based on Te Ao Tahito Framework¹³. This framework lends itself to furthering the Māori Agribusiness discourse that decision making is underpinned with a values-based system that speaks to the values of the land, the water and the people. For each Ahu Whenua Trust, these values will differ and be prioritised differently.

¹² Yoon, D. J., (2017). What we need to prepare for the fourth industrial revolution. 23(2), 75–76.

¹³ Hall & Winitana (2018). Te Ao Tahito Framework.

WHAT CONSTITUTES RETURN (UTU)?

Ka utua tō mauri

Given, felt, or done in return

- Care for and give back to the local communities.
- Repay the special nature (life force vital essence).
- Identify what are the key drivers to success and repay the source: people, clients, environment, communities.

WHAT CONSTITUTES WAIRUA (SOUL/SPIRIT)?

Ka honotahi tō wairua

Complemental and collected

- Combining in such a way as to enhance or emphasise the qualities of each other or another; sharing wealth.
- Connect, bring together as one your spiritual essence.
- Core principles and values extend beyond physical and material gain.

WHAT CONSTITUTES WHENUA (LAND)?

Whanaungatanga tō ao

Relational, interconnected world

- Land does not exist by itself and is best considered as part of an ecosystem; thus, display connectivity and value relationships.
- Understand all your relationships: internal and external, commercial, social, environmental and cultural. Have a relationship with and care for all aspects of your environment. Inputs, outputs, environmental and social, tangible and intangible, such as behaviours and values.
- Does the land user display a relational behaviour? Do they measure, manage and mitigate their environmental and social impact? This is consistent with principles of circular economy and zero cost accounting.

WHAT CONSTITUTES TĀNGATA (PEOPLE)?

Whakatau tō kaha

Consensual – collective power

- People are part of the relational ecosystem.
- The aspect of tāngata that is important is their behaviours and ethics: relating to or involving consent or consensus, and being open and transparent.
- Acting with integrity, harnessing your strength. Understand the collective strength across the business. Manage, sustain and share those strengths. Understand what is working well and why. Apply the learning elsewhere.

WHAT CONSTITUTES WAIORA (WELLBEING)?

Kia kawa tō ora

Cyclical behaviour leading to success

- Occurring in cycles; recurrent, leading to long term sustainable growth potential. Protocols and policies around what is considered successful beyond financial success. Celebrate and acknowledge success.
- Encourage successful behaviours and practices: phase out waste and pollution; identify and demonstrate environmental reduction targets. Ka mimiti (reduce), ka tukuru (reuse), ka whakahou (regenerate).

WHAT CONSTITUTES HINENGARO?

Hūmārie tō mārama

Harmony and collective understanding

- The state of being in agreement or concord; the quality of forming a pleasing and consistent whole. Display a willingness to change, adapt and engage new technologies.
- Be good natured, genial and beautiful. Be clear and transparent, displaying honesty and integrity, with clear communications. Be conciliatory and collaborative in negotiations so that situations can be win-win for everyone wherever possible.

HOW CAN WE WORK COLLECTIVELY TO ENAGING IN TECHNOLOGIES THAT ENHANCE OUR WHENUA?

The 4IR is characterised by a fusion of technologies, blurring lines between physical, digital and biological spheres. But what also sets this period of the 4IR apart from the previous industrial revolutions is the increasing awareness of the threats of climate change and bio-diversity degradation, and the impact these threats have on water and food quality, supply and security. The collective modelling of these global challenges leads to a culmination of significant population displacement, along with widespread increase in poverty and socio-political unrest if they are not mitigated.

With the increasing awareness of these global environmental challenges and the call to action by international intergovernmental organisations, as well as academic and business leaders, there is another differentiator of this 4IR to previous IRs. If the new developments of each previous IR have been applied to address the challenges of that time and to achieve or enhance the socio-economic goals of that time, it can be inferred that the new technologies of the 4IR will be directed toward environmental sustainability and regeneration, and socio-economic wellbeing. The 4IR will be effectively targeting the reversal of the exploitative drivers of the technologies from previous IRs.

Thus, the network of Ahu Whenua Trusts within Ngāti Tūwharetoa are individually strong and are focussed on their kaupapa, beneficiaries and trustees. As a collective, these Ahu Whenua, who are closely related and share strong whakapapa links, will share information, resources, and knowledge in order to move forward together. In order to consider the least impact on the environment. In order to cater to their beneficiaries. In order to produce a financial return. These priorities, while simple, represent what our case studies revealed – all the participants in this research have affirmed this.

When asked what type of 4IR technologies they are most likely to adopt, while the answers were in various forms the common inference was, 'Technologies that will help protect and enhance the land in our care.' This sentiment essentially echoes the importance of Kaitiakitanga: 'Care for the land and the land will care for us.'

NGĀ AHU WHENUA CASE STUDIES



TAUHARA MOANA TRUST

MANAAKI WHENUA, MANAAKI TANGATA, HAERE WHAKAMUA
CARE FOR THE LAND, CARE FOR THE PEOPLE, PROGRESS FORWARD

Block name: Tauhara North No.3B
Area: 715.305 ha

Tauhara Moana Trust

- Tauhara Moana’s main business is dairy farming. The trust has formerly a sheep and beef farm.
- The trust has geothermal potential, and a joint venture partnership with Contact to develop this at a future date.
- The trust’s values were adapted from Miraka, a large scale Māori owned and operated dairy factory of which Tauhara Moana is a minor shareholder.
- The trust established a limited partnership and the appointed directors manage the farm.
- Operational risk, activity and decision-making is contained within the limited partnership.
- The trustees set performance expectations and receive quarterly reports on progress, and the directors operate the business.

5-6 km
Centre of Taupō

Technology and innovation is evident in the new milking shed with the best available equipment used and an on-farm effluent dispersal system called Re-Gen. The farm is a commodity trader of milk, which is subject to severe price fluctuations. These fluctuations can be reduced by using Dairy Futures, which is essentially a “hedge” against uneven pricing. The trust is a demonstration farm for Dairy NZ. The trust relies on 10-day reporting on all farm-related activity, which is critical to addressing problems and improving performance. A farm advisor is retained. Other milking shed innovations include a cooling system for milk, and recycling water for washing the shed.

For future direction, the main goal is to reduce debt, which gives flexibility to do other things. The trust is staying with Miraka, which has a strong focus on environment, animal welfare, and human wellbeing under Te Ara Miraka system. When Miraka’s standards are high, it requires the same of others to raise their standards. Robots and automation are not major features of the trust’s plans. The trust takes its environmental responsibilities strongly, investing \$500,000 to upgrade their systems on the basis of their aspiration to be good “stewards”, but capital is limited.

Māori values like kaitiakitanga do influence decision making by the trust, which is also reflected in its involvement with other similar organisations such as the Waikato River Authority, Tūwharetoa Māori Trust Board, and relationships with local and regional government. Taupō catchment farms are restricted in terms of nutrient output. The trust anticipates regulation by operating as though higher standard regulations were in place.

On the connectivity of the trust with others, there are many Ahu Whenua Trusts in the region and most of them are “very autonomous in nature and they’re relatively mature”.¹⁴ Ahu Whenua Trusts in the region do come together for two reasons: when a new policy presents a common threat, typically from local council or land law, and co-investing with each other to pursue larger-scale investment opportunities, such as purchasing property. According to one of the participants, co-investing is made easier through the limited partnership structure which allows all kinds of entities to participate, including companies, Māori authorities and charities “otherwise, within the farm gates we just do as best we can with what we’ve got”¹⁵.

In terms of Opepe, they used the trust’s model, as well as some of its equipment and advisors, to focus their business. The trust shares information with Opepe to help them. Collaboration makes sense when entities are in the same industry. Some trusts want to share, while others prefer not to. Good relations with landowners is essential. Another example of collaboration is Āwhina Group, which has existed for around 20 years. This group uses its collective strength to negotiate good deals on inputs. Miraka was spawned from Āwhina Group. Some Āwhina members decided to set up a milk factory because they felt they were not being well serviced. The trust joined as an investor.

Four important themes to emerge from the Tauhara Moana case study are:

- 1 the structural separation between governance and operations, and its impact on technology investment, knowledge, uptake and use;
- 2 the concurrency of autonomy within the farm gate and collaboration on matters of common threat and opportunity outside the gate;
- 3 Māori values of kaitiakitanga do drive decision-making at the trust level on sustainability, which is affecting operational attention on environmental, human and animal wellbeing;
- 4 debt reduction is essential because it allows investments in sustainability, technology and opportunity.

In using a limited partnership, the trust has separated out the risk and responsibility of operating the dairy business to directors with relevant industry experience and knowledge. The trust is then responsible for setting the values, principles and standards (culture), performance expectations (measurement) and resourcing requirements of the dairy business.

¹⁴ Interview participant, Tauhara Moana, 2019

¹⁵ Interview participant, Tauhara Moana, 2019

NGĀ AHU WHENUA CASE STUDIES



OPEPE FARM TRUST

KIA WHANGAIHIA NGĀ URI – A TINANA, A HINENGARO, A WAIRUA.
TO PROVIDE SUSTENANCE TO BENEFICIAL OWNERS AND THEIR DESCENDANTS
– MIND, BODY, AND SOUL.

Block name: Tauhara Middle No.4A, No.2B, No.2C
Area: 4876.6479 ha



Opepe Farm Trust is located in the Taupō catchment area with other whanau farms. The farm is a 4,800 hectare (ha) Central North Island Station on the Napier-Taupō Highway, 5km from Taupō.¹⁶

The station has two 1,200 cow dairy units, 2,800 ha sheep and beef unit, 1,800 ha in exotic forestry, and 100 ha in mānuka and kānuka. The challenging climate, terrain and soil characteristics limit the ability to adjust current land utilisation. In particular, the area has low nitrogen limits due to farm proximity within the Lake Taupō water catchment, and its impact on water quality that flows into lake Taupō 17. In terms of portfolio diversification, Opepe and the adjacent farms in the northern region of Ngāti Tūwharetoa (Te Hikuwai), and within the Lake Taupo catchment, face similar challenges. Opepe has embarked on a strategy to improve its farming philosophy, putting the environment and its beneficiaries as the key drivers for the business for the future.

Opepe are “ahead of the game”¹⁸ in terms of the technologies that they currently employ to optimise business, productivity, data capture, and environmental impact on their farm. While the technologies they utilise are assisting Dairy Managers to comply with Regional Government legislation and requirements, more broadly the technologies are contributing positively to decision-making for the farm.

Conversely, Opepe Trustees discussed their concerns with the increase of robotics within the 4IR. These concerns centred on the potential impact on the labour market and ultimately the employment of their whānau, hapū and iwi members into roles. One interview participant said, “There’s also that balance in between what the technology is going to bring – robotics etc – and then skills requirement and employment for the whānau.”¹⁹

Similarly, Opepe Trustees and key farm staff discussed the possible innovations of the future that will revolutionise the ways in which we farm, and the overall impact on the environment. Discussions included ways to diversify the practices, techniques, methods of farming for Opepe through repurposing and reusing equipment. Furthermore, the Trustees discussed at length how their rangatahi are their

priority. The trustees are investing time and effort into helping to support rangatahi into career roles, not only on the farm, but in technological roles – with the recognition that it will be young people who create technologies that the Trust will require in the not too distant future.

The four case studies each discussed the opportunities and benefits for coming together as a cohort of Ahu Whenua Trusts in the Hikuwai region of Ngāti Tuwharetoa, and the connection between the four trusts involved in this research project, as they are bound by whakapapa. Opepe expressed a strong desire to connect up with other Ahu Whenua Trusts to begin conversations and discussions about working collectively, sharing knowledge and information, and supporting one another: “That’ll be the ideal, where we sit down and we all say the principle of what we want to achieve based on our values, means we should be working together as a collective.”²⁰

Opepe Trustees talked at length about the importance of values for their Trust and that while their values provide a framework for making key decisions, the Dairy Manager and their staff have a level of decision-making power based on what is best for the whenua and for financial return within the higher level values based framework. The Trustees discussed the tension between financial return and reducing environmental impacts: “It’s a real tension striking the right balance between being kaitiaki, we are kaitiaki and there’s no doubt about that, but also being economically sustainable because we’ve got an owner base of maybe 4,500 people and remembering that the trust exists for the benefit of all those people, of all those beneficial owners.”²¹

Temuera Hall, Chairperson for Opepe Farm Trust, discussed the concepts of Agribusiness and provided a framework (based on Te Ao Tahito Framework) for Ahu Whenua Trusts to consider interweaving into their strategy and values base. The following table represents the values of Opepe Farm Trust in the context of what these values look like in practice.

16 Opepe Farm Trust. (2014). Opepe Farm Trust Strategic Plan.

17 Waikato Regional Council, 2019

18 Interview participant, Opepe Focus Group 2019

19 Interview participant, Opepe Focus Group (2019)

20 Interview participant, Opepe Focus Group 2019.

21 Interview participant, Opepe Focus Group 2019.

Figure 2: Values for Opepe Trust

Value		Practice
Whanaungatanga Relational	Tō ao Collective reality	Whanaungatanga Relationships; your relational interconnected world. The entity has a clear knowledge of all their relationships and a clear understanding of their collective responsibility. It positions itself and approaches its business from this point of view. Its relational approach is reflected in its governance, management, policies, operations, employees, ethics and culture.
Whakapapa Interdependent	Tō mana Collective identity	Whakapapa Connection map The entity acts interdependently, giving considered weight to all its relationships across all their life activities, in the understanding that its business is interdependent and relies on its total environment to succeed.
Whakarongo Balanced	Tō hiwa Collective awareness	The entity strives to reach the best balance across all its relationships to succeed in its business. The idea of balance across all parts of its environment is itself part of that success.
Whakatau Consensual	Tō kaha Collective power	The entity seeks all views across all its relationships and acts on those views positively and with integrity.
Honotahi Complementary	Tō wairua Collective self	The entity complements instead of polarising competitive forces. Competitive forces are dealt with in a complementary manner rather than a competitive one.
Mahitahi Co-operational	Tō tapu Collective behaviour	The entity strives to co-operate with all forces and agents in its environment.
Utu Reciprocal	Tō mauri Collective dominance	The entity gives as much as it takes. This looks like circular economy and zero cost accounting.
Hūmarie Harmony	Tō mārāma Collective understanding	The entity strives to achieve harmony in its business across all fronts and relationships.
Kawa Cyclical	Tō ora Collective success	The entity repeats its good and reduces its bad.



“That’ll be the ideal, where we sit down and we all say the principle of what we want to achieve based on our values, means we should be working together as a collective.”



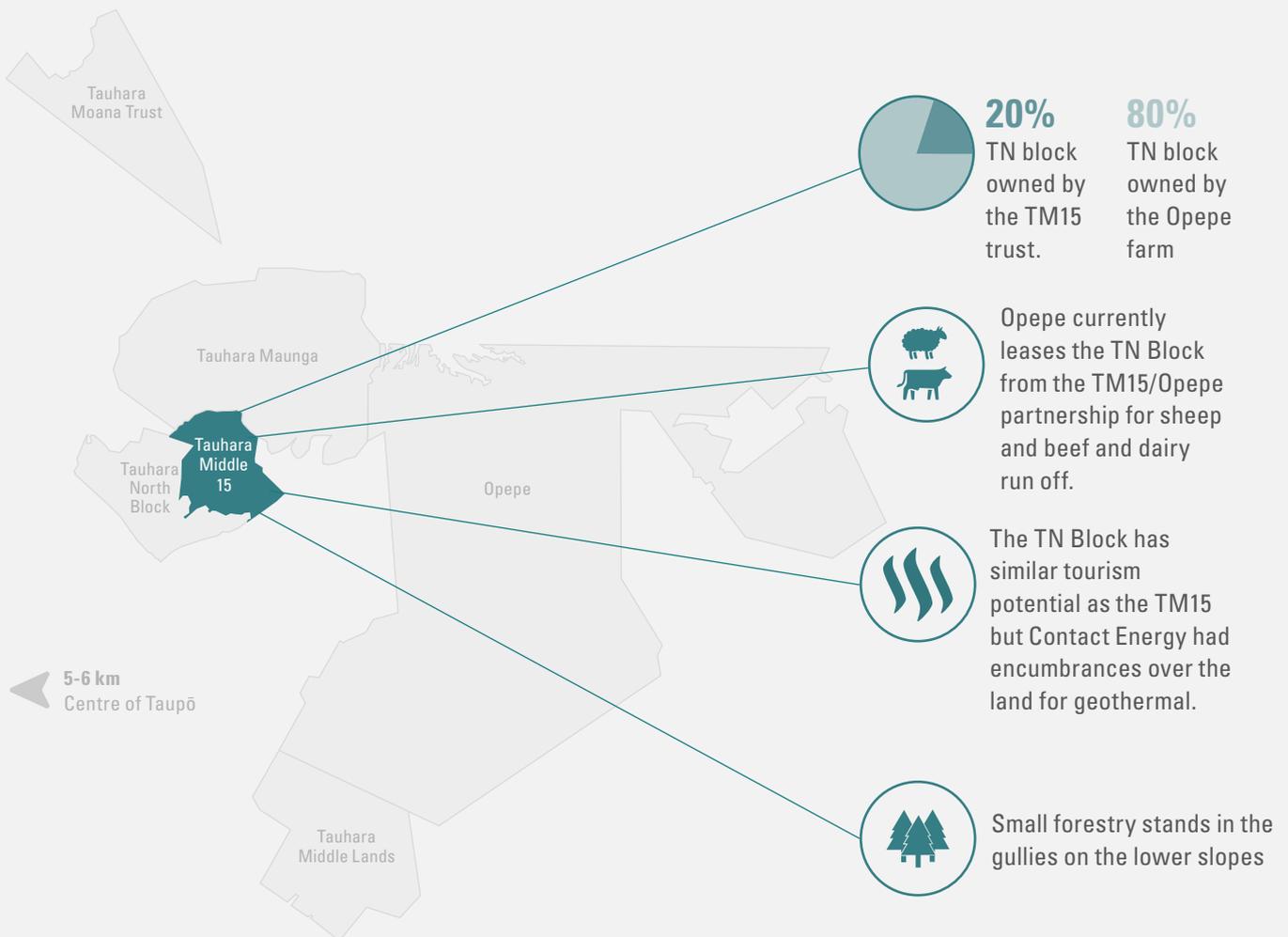
NGĀ AHU WHENUA CASE STUDIES



TAUHARA MIDDLE 15 TRUST

NŌ RUNGA O TAUHARA! KO TŌKU MAUNGA PAEPĀE, TĒNEI AU TE TUOHU NEI!
FROM ATOP OF TAUHARA! MY MOUNTAIN WHERE I STAND, HERE I BOW!

Block name: Tauhara Middle 15
Area: 248.976 ha



The Farm is in the Taupō water catchment, making it subject to the Nitrogen Discharge Allowance (NDA). The NDA is a Nitrogen Management plan under the Waikato Regional Council, Regional Plan Variation 5 – Lake Taupō Catchment (RPV5). The plan established rules that cap the amount of nitrogen entering Lake Taupō from urban and rural activities. The NDA plan is managed through a system called 'Overseer'. TM15 has a NDA allocation of 16 units per ha.

The size, soil type, grass grow rates and topography of the trust land makes it difficult to run as a stand along economic agriculture unit, therefore the Trust takes a passive farming approach, preferring to lease the land for either sheep and beef or dairy run off, and concentrate on the other potential land use opportunities. The close proximity to Taupō and the elevated site with a majestic outlook over Taupō township, Lake Taupō, and across to the mountains at the southern end of the lake, provides strong tourism potential.

The TM15 Trust is closely aligned with the Tauhara Mountain Trust. All TM15 trustees are also trustees on the Tauhara Mountain Trust plus another five representatives. Tauhara maunga is a key symbol and cultural identifier for the hapū of Te Hikuwai (Northern end of Lake Taupo). The collective of hapū situated on or near Tauhara maunga, in more recent times, are referred to as the Tauhara Hapū. It is the descendants from these Tauhara hapū that are the beneficial owners / shareholders in TM15 and Tauhara Mountain.

For future direction, the TM15 has three key forward looking objectives. TM15 works closely with the TM4A2A Mountain Trust and together they have formed the Tauhara Working Group to progress their three key work streams:

1 Project Hikoi, which is centred around the opportunities related to the Tauhara Maunga walkway. The walkway is a very popular walk to the top of the mountain for locals and visitors to Taupō. There is the potential to: develop the track and add other tracks to other high points on the maunga; charge for access; provide secondary support services and other experiences around the hikoi base start and finish point.

2 Project Kaitiaki, which is centred around the restoration of Tauhara Maunga to the time of the principal tupuna Ngatoroirangi; Ngatoroirangi is the renowned ancestor of Ngāti Tūwharetoa iwi, he was the tohunga and navigator on the Te Arawa waka. Along with his whanaunga Tia, he was the first to discover and lay claim to Lake Taupō, providing many of the place names in and around the area. This kaitiaki project involves returning the mountain to its pre-European state, free of pests and foreign flora and fauna, thus restoring the environment there to pre-European times.

3 Project Destination, which is centred around the tourism and employment opportunities that can be developed on TM15 Trust land as a result of Project Hikoi and Project Kaitiaki. The proximity of the land to the town with its great vista lends itself to many tourism opportunities, from accommodation to experiences, be they adventure, nature or cultural.

4 Geothermal Development: the TM15 Trust land is in a prime position for geothermal development, and unlike a lot of the surrounding land blocks, is not subject to the Contact Energy geothermal encumbrances. The current over-supply of the electricity market, and uncertainty with the Tiwai smelter, has seen a downturn in the development of geothermal power stations. Consequently, the Trust is maintaining a watching brief and readiness for when the time is right to explore the geothermal options again.

The TM15 Trust has a passive agriculture role, and is therefore less likely to be actively seeking new 4IR agriculture technologies than the Ahu Whenua Trusts which are active in farming their land. Cultural values of kaitiaki, retaining the land for future generations, and returning the mountain land to a pre-colonisation, natural state appear to have a strong influence on decision making.

Working collaboratively is another strong theme of the TM15 Trustees. They have formalised a collaborative process with the Mountain Trust. They are also in partnership with The Opepe Farm Trust are currently in the process of leasing the TM15 land to Opepe, with the potential for the relationship to transition into an active agriculture partnership arrangement.

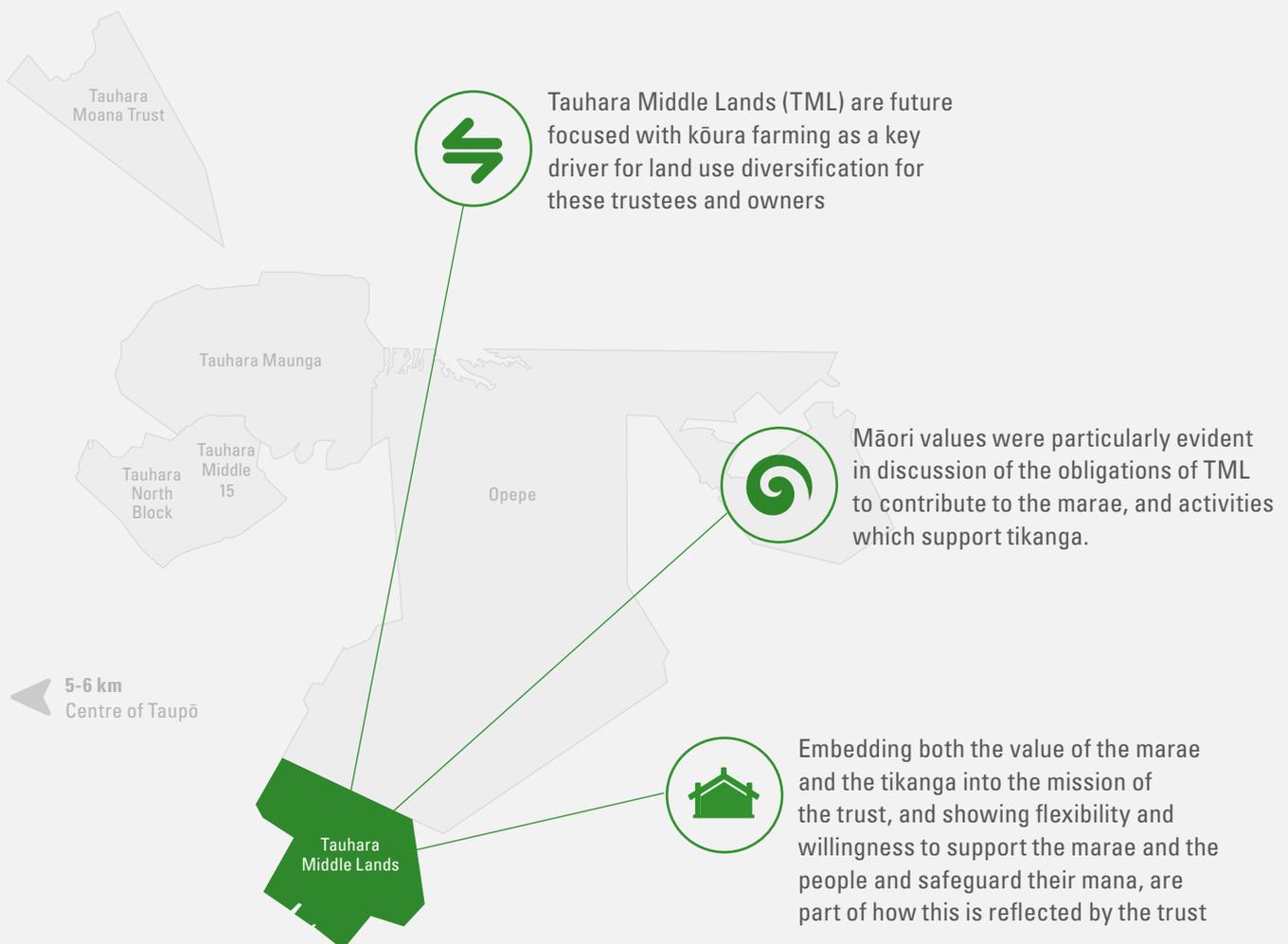
NGĀ AHU WHENUA CASE STUDIES



TAUHARA MIDDLE LANDS TRUST

WHATUNGARONGARO TE TANGATA, TOITU TE WHENUA, TIHEI MAURIORA! MAN DISAPPEARS, YET THE LAND REMAINS

Block name: Tauhara Middle
Area: 849.1729 ha



“We’re honouring what was in the past by collaboratively bringing our resources together to make better value to give back to our people”²². For Tauhara Middle Lands (TML), the importance of values prevails as their guiding principles to making good decisions for the whenua and for their people. Values were particularly evident in discussion of the obligations of TML to contribute to the marae, and activities which support cultural practices. Embedding both the value of the marae and the tikanga into the mission of the trust, and showing flexibility and willingness to support the marae and the people and safeguard their mana, are part of how values are reflected by the trust.

As with many Ahu Whenua trusts, there is some friction between the role of providing economic returns to landowners and a broader role in tikanga, expressing Māori values, connecting landowners to the whenua, engaging with tamariki and supporting hapū and marae. The Trust recognise the importance of the role of 4IR technologies and how these might assist them in developing new initiatives such as kōura farms. One trustee spoke about the exciting venture of bringing in scientists to assist them in the development of these farms, where mātauranga ā hapū, ā iwi comes together with science and technology to rebuild kōura farming and the tikanga that go with this practice. These future benefits for operators and subsequent economic benefits to the trust are of interest and hope to play a role in building and strengthening relationships and connectivity within the trust and with landowners.

Technology is suggested to have a critical role in this link, both as facilitator and barrier. As a facilitator, 4IR technology allows global connectivity as people move away from the whenua, and can allow regular contact and digital interaction with the whenua and trust. As a barrier, 4IR introduces digital recreation and accesses to a globalised culture. While this has advantages, it may also place distance between rangatahi and marae, resulting in youth who are more engaged with the 4IR world than te ao Māori. More broadly, 4IR may disconnect tangata from whenua, working against the Māori agribusiness values and the outcomes sought by the trust. These are some of the tensions that trustees raised for Tauhara Middle Lands.

In reflecting on 4IR technologies, TML raised some pertinent questions that the trustees are considering: “How does the 4IR and technological change impact on being Māori?”; “Can you be Māori after the 4IR, and if so what would that mean?”. Effectively, the role of the trusts beyond being an economic agent is not certain and may become less clear in the future given the uncertainty of the 4IR and its impacts.

Related to the discussion on technology, connectivity is discussed both in terms of connectivity within the trust, between trusts, and between partners more broadly. Collaboration within the trust is important for governance and decision making. This collaboration may be passive consent for the trustees to act in the landowners’ best interest, but would benefit from including active engagement with the trust. However, landowners want help but do not always understand and link to trusts, so trusts struggle to be able to help them. 4IR may be able to overcome these barriers through the creation and distribution of knowledge and engagement. Internal collaboration is also important for economies of scale and to provide opportunities for people to train and develop skills on smaller land blocks. External collaborations, particularly those with other trusts, are important for accessing and sharing knowledge and skills.

TML sees 4IR technologies as important for contractors and operators on trust land. In the medium-term, these technologies allow productivity to increase and more marginal land to be utilised, thus increasing the land value and subsequent fees. Therefore, the impacts of the 4IR are observed in this instance as economic.

The impact of 4IR on socio-cultural issues is seen as having a more direct relationship to TML. There is concern that the 4IR is bringing about change in the preferences and connections of tangata whenua. While it offers potential to connect people separated by distance to the marae, tikanga and whenua, it seems that instead rangatahi are engaging more in a global context and losing engagement with their local context.

Other important aspects of 4IR include using technology to improve productivity on trust land such that food security and environmental sustainability are facilitated. The wealth created can also be used to mitigate the impacts of colonisation and provide resources for whānau.

The TML Trust plays a somewhat passive role in the management of whenua and as such, appears to be less concerned with the productivity implications of 4IR technologies. However, the 4IR was salient in the thinking of TML when considering the future, particularly the relevancy of tikanga and reo as landowners are increasingly engaged in the 4IR economy through globalism, potentially resulting in further disconnection from their whenua, marae and hapū. Trustees are considering these tensions at present and exploring ways in which to reconnect their people to the whenua in innovative and exciting ways.

Intergenerational transfer of tikanga and business knowledge in relation to the Trust and whenua is important. 4IR technologies make it difficult to convince some people that managing whenua, even if it is unlikely to produce immediate financial returns, is still important.

22 Interview participant, Tauhara Middle Lands Trust (2019)



HE WĀNANGA KŌRERO DISCUSSION

Opepe Farm

The following section provides some of the findings of this research programme and insights into the four Ahu Whenua Trusts, particularly their adaptations to the changing technological advances in the current business climate. Through our four case studies of Ahu Whenua Trusts in the Ngāti Tūwharetoa rohe, we have identified key elements of the 4IR that play a role in the successful agribusiness models for Ahu Whenua Trusts, and the rationale for accessing and implementing such technologies.

Connectivity between Ahu Whenua Trusts is built upon whakapapa, historical and genealogical connections, that play a key role in the business management and sharing of information and resources across Ahu Whenua Trusts. While technological insights of the 4IR are shared across the Ahu Whenua that we focussed on, relationships between these organisational trusts are steeped in ancient and enduring connections. Underpinning the business aspect of these case studies is the key theme of a values-base decision making process, which all four Ahu Whenua Trusts are guided by. These insights contribute to an Indigenous and Māori business narrative that highlight the importance of values, tikanga and whakapapa.

In line with our research questions, the following areas of discussion respond to those questions and provide a narrative on the 4IR, Māori Agribusiness, sustainability and values.

4IR AND THE CHANGING IMPACTS ON MĀORI AGRIBUSINESS

4IR has three important characteristics for Māori agribusiness in this research:

- 1 4IR signals a transition from present economy to new economy founded upon unprecedented technological innovation;
- 2 unlike previous industrial revolutions necessarily, 4IR must address both firm-level and societal-level needs for economic, social and environmental sustainability;
- 3 global challenges represent potential local opportunities that Māori agribusiness can choose to respond to in ways that make sense for them, their owners and other stakeholders.

While globally significant issues such as climate change, food security, human security and equitable human health and development are vividly apparent in academic, business and political discourse, a fundamental question for Māori agribusiness is what to do about this.

Conventional tools for strategic assessment of the business environment confine analyses to appraising 4IR as either a threat or an opportunity. That is, is 4IR something to be feared and repulsed through counteractive measures, or something to be embraced and adopted because it serves the purposes for which organisations like Māori agribusinesses exist? In other words, how do Māori agribusinesses perceive 4IR – favourably or unfavourably? What is their standpoint in relation to 4IR, both in terms of its causes and consequences? The answer is to be found by referring to the values and objectives of the Māori agribusinesses, which were implicitly and explicitly shared with us through conversation, documentary analysis and observation during wānanga and site visits.

The case studies reveal four important features about the potential impact of 4IR on Māori agribusiness.

- 1 Māori agribusinesses are bound within a cosmological explanation about the origin and existence of land, sky and people as part of an interconnected whole. This is evident in the esteem given to traditional values and kinship ties as people of the land. Land, therefore, has both spiritual and physical significance as a source of identity, sustenance and wellbeing.

- 2 the land upon which Māori agribusinesses are founded have both economic and noneconomic value for owners. It is incumbent upon governors, therefore, to ensure land use and any enabling technologies contribute to and are consistent with these multiple values.
- 3 is the maintenance of diasporic connectivity: that is, providing for the continuing relationship between the land and landowners or descendants of owners, who do not live on the land, or depend on the land for their wellbeing or livelihoods. Māori land in this sense constitutes multiple forms of capital. This includes: symbolic capital as a vestige of ancestral identity; cultural capital as the embodiment of customary knowledge; social capital as the common place in which kin belong, and over which to meet and socially interact; and financial capital, as a source of economic value that is either retained to maintain and enhance the land and the activities upon it, or distributed to provide some benefit to the owners.
- 4 Māori agribusinesses, because of the legal status of Māori land, exist as legal entities under legislation which promotes land retention over alienation, inclusive and consultative decision-making, and a tendency for conservative investment practice.

OPPORTUNITIES OF THE 4IR FOR MĀORI AGRIBUSINESS AND INCREASING PRODUCTIVITY FOR SUPPLY AND DEMAND

Like other agribusinesses, Māori agribusinesses face trade-offs between economic prosperity and environmental sustainability. For Māori agribusinesses this trade-off is further informed by Māori values which motivate Māori agribusiness to take additional care with the land and landowners. Finding approaches to Māori agribusiness which maximises economic return while satisfying Māori values is an important challenge for trusts who operate these businesses.

The 4IR is likely to impact on this challenge through the associated technological change. Where these technologies offer opportunities for Māori trusts to overcome these trade-offs by concurrently pursuing economic prosperity and goals aligned with Māori values, including sustainability, they will have a major impact on the Māori agribusiness landscape.



Middle Lands

The types of transformational technologies identified as part of the 4IR include those which increase productivity while maintaining or mitigating environmental degradation from production. Examples of technologies which may increase productivity include industrial internet connectivity, digital monitoring and automation, and 3D printing. While these technologies are being primarily developed to improve economic productivity, for example food security, they can also be deployed to manage the bio-economy and support environmental sustainability.²³ Integrating these systems and technologies into Māori agribusiness will allow for greater productivity on trust land without increasing stock density or through mitigation of the impacts of increased stock density.

However, not all these technologies sit well with Māori values. These concerns could be divided into those related to the impact on the environment and the impact on people. For the environmental concerns, the most significant are those associated with biological technologies, such as genetic modification (GM). In particular, there are concerns of the appropriateness of some biological technologies (Hutchings & Reynolds, 2007²⁴) from a tikanga Māori perspective. There are also concerns associated with environmental contamination from nanotechnologies and other technologies which may have an environmental impact that is difficult to trace or detect. Hutchings and Reynolds (2007) provide a detailed exploration of the issues GM raises for Māori values, particularly those associated with whakapapa, kaitiaki and protecting Papatūānuku.

²³ World Economic Forum, 2018.

²⁴ Hutchings, J., & Reynolds, P. (2007). Māori and the McScience of New Technologies; Biotechnology and Nanotechnology Development. Matariki: Te Mata o Te Tau Monograph Series Number 1 (pp. 81–111). Wellington: Te Mata o Te Tau

As well as these environmental concerns, there are also concerns on the impact 4IR technologies utilised by agribusiness may have on landowners and Māori people more generally. Where these 4IR technologies replace labour, for example through automation, this may adversely affect employment and the socio-economic fabric of local communities. 4IR technologies are also discussed as having potentially negative impacts on the connectivity between tāngata and whenua.

Overall, it appears that Māori trusts stand to benefit from changes in the agribusiness landscape, resulting from transformational technology which can yield both economic and environmental benefits. However, these benefits are not without risks. The implications of 4IR biotechnologies and potential destabilisation to employment and local communities have been identified as areas of concern for trusts.

SUSTAINABLE BUSINESS MODELS WITH MĀORI AGRIBUSINESS

The four case studies in this project highlight that the whakapapa (genealogical and ancestral connections) of the whenua is important when it comes to making key decisions for the use of land and water on these farms. Balancing the technological advances of the 4IR with the need for sustainable practices results in a raft of challenges. The challenge of decision making, as has been noted by the Trusts, can come up against what is good for the whenua and therefore its people, and what is good for economic gain and therefore its people. Making these decisions is never easy. Those in leadership roles and board members have the challenging role to make key decisions while taking into account what is best for a range of factors and benefactors.

Sustainability and climate change are becoming more of a government priority – with the Climate Change Response Zero Carbon Amendment Bill currently undergoing submissions, as well as the first National Climate Change Risk Assessment Framework that has been developed and will be implemented in 2019. Agribusiness and specifically, Māori agribusiness, must comply with local government and adhere to local and national policies, but also be based on ethical grounds and a kaupapa Māori position – looking after the land for future generations is paramount.

Primary production in New Zealand is at the heart of the economy, so balancing global demand for these commodities and environmental sustainability is one of the country's largest challenges. According to Tunstall (2013), as noted by the University of Waikato (2015), the New Zealand Government had set the target to increase agricultural exports from 30% to 40% of GDP by 2025. This clearly presents challenges for Aotearoa New Zealand to become a low carbon economy – rapid changes in energy production is likely to trigger economic, societal and geopolitical risks across the globe. Regulatory policy changes, such as increases on the carbon price, will change the mobility of people, the mobility of businesses, and the mobility of our global production networks. Māori Agribusinesses must balance all these changes with current complexities that already exist, particularly pertaining to their governance structures and poor land use capability (LUC).

The majority of Māori land is held as indigenous forest, scrub and exotic forest. These LUC place constraints on the economic development potential of land. For Māori, harvesting indigenous forest can go against cultural values, even though under the Forests Act 1949, sustainable harvest is permitted, provided the owner has a registered sustainable forest management plan and permit. The potential to develop other land sustainably is difficult because the LUC is not suitable for other types of land-use. Making these decisions is even more difficult due to the ambiguity in regulatory reform following government's response to climate change.

As Ahu Whenua Trusts, kaitiakitanga is intrinsically part of the values based system that Māori operate within. Kaitiakitanga is more than guardianship of taonga; it is deeply entrenched in whakapapa and the connections between the environment and people. This connection spans all the way back to the creation narrative of Ranginui and Papatāūnuku and their offspring, who are deities, and are representative of the environmental elements. Kaitiakitanga is essentially the conceptual and practical embodiment of conservation, protection and sustainability. All of the Ahu Whenua Trusts who were a part of this research spoke about kaitiakitanga as intrinsically underpinning their business models. For some Trusts, technology helped to bring about solutions to some areas of agribusiness that proved to have a considerable impact on the whenua and wai.

4IR TECHNOLOGIES TO DIVERSIFY USE OF LAND

The 4IR brings about many expectations that technology and innovation will improve our natural capital and achieve environmental sustainability. However, risks to our planet's natural resources are increasing, not reducing. This means that meeting global food demand is subject to increasing risk. Agricultural systems are vulnerable to rising temperatures, particularly where biodiversity is low and monoculture crop production is prevalent. A key example of biodiversity loss in New Zealand due to agriculture is in the vineyard ecosystem. A reduction in flowering plants amongst vines decreases the availability of pollinating species. This can severely impact crop production and neighbouring plant habitats. Due to these threats on global food supply, widespread famine and hardship are major risks for the generations to come.

Land diversification is seen as important from an economics perspective to protect against shocks and changes to an industry. For example, if a trust invests entirely in dairy production on their whenua, and there is a sudden decline in the return on dairy, then that could have a major financial impact on the trust. By diversifying the use of the whenua to include a range of activities, particularly those which relate to different industrial sectors, a shock in one industry the trust has invested in will have a comparatively smaller economic impact on the trust.

The 4IR brings technologies that allow for the potential uses of land to be expanded. Land that was once marginal or inappropriate for certain activities could be made viable through biotechnological changes, mechanical and digital changes to production, and changes to demand through accessing global markets with digital and transportation technologies.

For Ahu Whenua trusts, the demand side drivers of diversification are some of the most significant drivers of land diversification. Through the use of digital technologies and advances in transportation and production technologies, Ahu Whenua trusts are able to identify and access markets for a diverse range of products. 4IR technologies also facilitate, and at times necessitate, collaboration. These collaborative enterprises can be used to create sufficient supply; through coordinating production of several trusts, distant or high-value markets can be accessed. It also allows Māori trusts to play a larger part in the supply chain, increasingly difficult as 4IR technologies require significant capital deepening, most notably expensive plant and machinery investments.



HE TITIRO WHAKAMUA FUTURE RESEARCH

Opepe Farm

As discussed, we have only been able to scratch the surface on this burgeoning narrative and discourse for the Fourth Industrial Revolution and Māori Agribusiness models. However, the project has provided us with some interesting insights into the potential for the future use of farm lands, the governance models that our Māori Land Trusts are employing, and the role of technologies in contributing to a more sustainable environment with reduced impacts.

We also recognise that we have not been able to dive deep into the discourse of our Ahu Whenua Trusts, the diversity across Aotearoa New Zealand regions, and whether other regional Ahu Whenua face similar challenges. With the limited time and resources available to us, we have not been able to scope this project widely and have tended to focus on the technological aspect of the 4IR and the cultural aspect of the role of values.

In Phase 2 of this research, we would like to build on this first scoping project to consider the following:

- **Indigenous uses of farmlands and waterways** that are distinctly underpinned with an Indigenous knowledge system, values set and protocols;
- **Climate change from an Indigenous perspective**, through Indigenous practices and ways of knowing;
- **Indigenous frameworks and strategies** to reducing human impact on the environment, and the role of technologies in that.

Our team is meeting in November, 2019 to discuss Phase 2, potential partners and a brief research scope. This is therefore our invitation to the Ahu Whenua Trusts involved in this work to continue our journey together in deepening our understandings on Indigenous frameworks for land use, land protection and technologies of the 4IR.



HE KUPU WHAKAKAPI CONCLUSION

Pākira Marae

We have presented and discussed the key findings and implications of this research project specifically on how Māori Agricultural enterprises like Opepe Farm Trust navigate, thrive and survive in the Fourth Industrial Revolution (4IR), particularly with agriculture-based technologies in Aotearoa New Zealand.

We aimed to identify whether and how Māori Agribusinesses are engaging in technologies of the 4IR, in what ways and based on what reasons or decisions. We have heard perspectives on what drives Māori Agribusiness models, Trust board members, and land owners, to make the decisions they need to for the betterment of the whenua (land), wai (water) and iwi (people). 'Care for the land and the land will care for us' has been the kaupapa for all four of these Ahu Whenua Trusts.

This report and the findings herein contributes to the first Māori Agribusiness narrative for the Fourth Industrial Revolution. Mātauranga Māori, Applied Business and scientific knowledge has informed and identified opportunities for making the most out of the existing resources available and expansion into new areas of investment. In particular, we see that the 4IR has the potential to affect the following aspects of Māori Agribusiness;

- The importance of values for the Ahu Whenua Trust case studies indicate that decision-making at the board level is consistently guided by sets of values as they set both social and environmental goals and outcomes. While tensions were identified by Trust board members between balanced decision-making that upholds values that lead to the protection of the whenua and wai and the wellbeing of their beneficial owners on one hand, and improving financial returns on the other, these Trusts recognise that new pathways and considerations for the future of farming need to be carved out and pursued
- There was a strong indication that Ahu Whenua Trust would tend more toward the adoption of 4IR technologies that not only improve efficiencies but also enhance social and environmental objectives. On the contrary, they indicated aversion to technologies that would focus on economic gain at the expense of social and environmental benefits. In other words, ancestral cultural values have a significant influence on decisions and direction in regards to technology adaption and implementation.
- Efficient farm management systems indicate increasingly sophisticated on-farm technology such as milking systems, waste processing and environmental monitoring. These technologies carry potential benefits to production efficiency, regional government compliance and data that helps inform key decision-making (what type of 4IR knowledge or practice does this represent?);
- Communication, engagement and connectivity increase the ability for land owners and others to communicate and engage with each other on the land, supporting important social and cultural ties to people and the land as well as across/within Ahu Whenua trusts;
- Competitive pressure within the agriculture industry is likely as the agribusiness sector increasingly adopts technologies like those being utilised by our Ahu Whenua Trusts, and others. The relative competitive position of firms, including Māori firms, within the industry is likely to increase;
- Ahu Whenua Trusts, despite the competitive nature of the agricultural industry, have a strong desire to work together, with the aim to advance and honour whakapapa, connections, and mātauranga, as well as to share business expertise;
- Ahu Whenua Trusts stand to benefit from changes in the agribusiness landscape resulting from transformational technology which can yield both economic and environmental benefits. However, these benefits are not without risk, and the implications of 4IR biotechnologies and the destabilisation to employment and local communities have been identified as areas of concern for these trusts;
- Ahu Whenua Trusts aspire to land use diversification, including thinking differently about the future of farming and alternatives that consider the long term impact on the environment. Some trusts were actively exploring these alternatives during the development of this project such as Hemp farming and koura farming; and
- Climate change policies and practice are increasingly becoming more important as Māori agribusinesses have the opportunity to alleviate effects of climate change through land use diversification that promotes not only a sustainable future for the whenua and wai, but one that is thriving.

The future for land owners and trustees is an exciting one where technology will play a crucial role in the success and sustainability for these whenua and wai. Manaaki whenua, manaaki tangata, haere whakamua – care for the land, care for the people, anga whakamua. This inextricable connection between people and the land is represented in the values for each Trust, guiding their decisions and their engagement and employment of technological advances of the Fourth Industrial Revolution.

NGĀ KAIRANGAHAU RESEARCH TEAM

Tauhara Middle Lands



Dr Acushla Sciascia
Ngāruahine Rangī, Ngāti
Ruanui, Te Atiawa

Senior Māori researcher,
School of Agriculture &
Environment, Massey
University. Mātauranga Māori
Theme Leader, Resilience to
Natures Challenges, National
Science Challenge.



Dr Jason Mika
Tūhoe, Ngāti Awa,
Whakatōhea, Ngāti Kahungunu

Senior Lecturer & Co-director,
Te Au Rangahau, Māori
Business & Leadership
Research Centre, Massey
Business School.



Temuera Hall
Ngāti Tūwharetoa, Te Arawa

Director and Portfolio Manager
of TAHITO Ltd; Chairman –
Opepe Farm Trust, Deputy Chair
– CNI Iwi Holdings Limited,
Chairman Te Kakano Whakatipu
Partnership. Contracted
researcher for He Whenua Tipu



Dr Matt Roskrige
Te Ati Awa, Ngāti Tama

Senior Lecturer in the
School of Economics and
Finance, Codirector of
Te Au Rangahau

