



**economics**

DRAFT Working Paper for:  
**Māori Economic Taskforce**

**MĀORI, SCIENCE AND INNOVATION –  
SCENARIOS OF  
POTENTIAL, OPPORTUNITY AND VALUE**

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## **Māori, Science and Innovation – Potential, Opportunity and Value**

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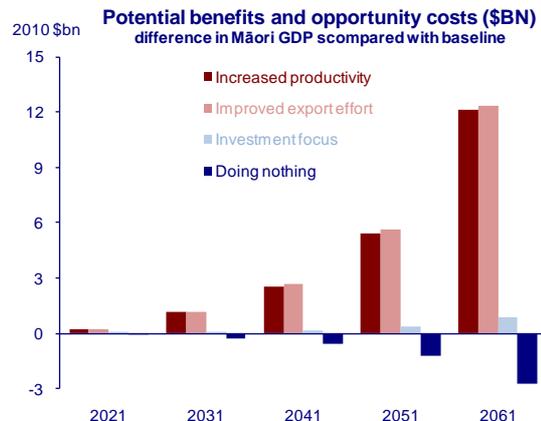
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## Executive Summary

There are potential benefits and opportunity costs for the Māori economy in relation to its effective or ineffective engagement and alignment with the nation's science and innovation effort. This paper summarises scenarios modelled to demonstrate potential benefits (or costs) to the Māori economy, as well as to the wider NZ economy over the period to 2061. The four scenarios are summarised below, but key points to be stated include:

- the 'doing nothing' scenario reveals high opportunity costs (in the economic as well as cultural and social sense) and few benefits.
- success in either productivity increases or improved export effort yield substantial benefits.
- a focus on investment in science and innovation that is not matched by the application and/or commercialisation of such effort results in only marginal gains.
- there is a need for a step change to lift both the Māori economy and the New Zealand economy. This requires extending our minds beyond the current thinking and situation.
- realising potential requires transcending the current political environment.
- scenarios showing gains to the Māori economy also show value to NZ Inc, through gains in national GDP, employment and wider economic benefits.



In the first scenario the level of productivity in the Māori economy is lifted to be the same as the national average across all industries by 2061. This scenario results in:

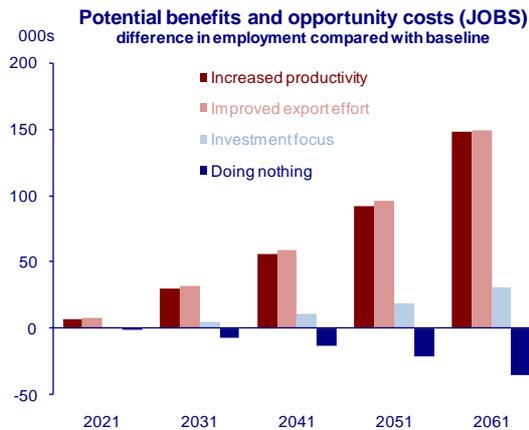
- GDP from the Māori economy in 2061 being \$12.1bn higher than that in the baseline
- an additional 148,000 job opportunities in 2061.

In the second scenario, an export-focused innovation of sales and marketing effort of the products and services from the Māori economy is modelled. This scenario can also be

viewed as encompassing the development of new/modified products and services and/or possible 'brand'. This scenario results in:

- GDP from the Māori economy in 2061 being \$12.3bn higher than that in the baseline
- an additional of 149,600 job opportunities in 2061.

In the third scenario more science and research investment is directed into the Māori economy, but this investment is not accompanied by the application to increasing productivity, or to commercialisation developing new products or new markets. Some



additional capital is accumulated, but productivity levels and the customer focus of businesses remains as in the baseline. The results of this scenario are:

- GDP from the Māori economy in 2061 is \$868m higher than that in the baseline
- an additional 31,000 job

opportunities in 2061.

In the fourth scenario, doing nothing sees the “running down” or devaluing of the Māori asset base, due to a lack of maintenance in the absence of sufficient investment funds arising from existing assets. The results from this scenario are:

- GDP from the Māori economy in 2061 is \$2.7bn lower than that in the baseline
- 35,000 fewer job opportunities in 2061.

**In summary**, increased productivity or improved export effort provides job opportunities for close to an additional 150,000 by 2061. In contrast, doing nothing sees job opportunities in 2061 total some 35,000 below the baseline. Thus, the difference between:

- a science and innovation effort with associated leadership and collaboration aimed at unlocking the potential residing in the Māori economy; and
- doing nothing

can be succinctly summarised as 185,000 job opportunities in 2061.

# 1 Introduction

## 1.1 Purpose of document

This draft working paper aims to further inform discussions on the issues, challenges, constraints and potential of the Māori economy given a closer alignment with the nation's science, innovation and R&D effort.

It combines information from our earlier [Discussion Document](#) with findings from an initial set of scenarios generated using a new model of the Māori economy and its links with the wider New Zealand economy.

These scenarios are a first attempt at compiling sufficient modelling evidence to generate stories informing the potential benefits and opportunity costs facing stakeholders in the science, and innovation effort and the Māori and wider New Zealand economies.

At this stage of our project – in conjunction with the topics raised in our previous discussion document and our calculations as to the Māori asset base – we have modelled four scenarios to quantify the returns to sectors in the Māori and New Zealand economy from a successful 'closer alignment', along with the costs of 'doing nothing'.

Following workshops, discussions and comments from stakeholders over coming weeks, these scenarios will be modified accordingly and finalised for the final report to the Taskforce. In particular, some assumptions may be combined (if appropriate), while the magnitude of the changes will also be tested for robustness. Additional scenarios, if necessary, may also be developed.

## 1.2 Next steps

Our calculations as to the Māori asset base are currently being peer reviewed, and this information will be released in early 2011.

Thereafter our overall final project report will be drafted and forwarded to the Taskforce in late February, with a view to finalisation in late March 2011. During this period we will discuss with the Māori Economic Taskforce(MET) options for additional communications methods to ensure our findings are widely distributed, understood and able to be interpreted and utilised by stakeholders.

## 2 Setting the scene

Towards 2061, a new way of thinking, doing and being is required to ensure a two-way relationship develops between players central to the science, R&D, and innovation effort. Science, R&D, and innovation are all part of an inter-linked system. However, this system is not currently operating as such - various compartments exist and players often operate within one compartment only. These players are unable to see their position or role within the system, and do not view science, R&D, and innovation as a system. As such, players do not engage with one another nor move through the system from science to innovation or from R&D to innovation.

This project has a forward focus and requires all parties to transcend the current policy environment, and the relationships that exist (or not) in that environment, and shift our mindset. We need to move beyond thinking that simply links science, R&D, and innovation investment to the Māori economy. This focus is too narrow; to make a step-change a multi-dimensional perspective is required that considers how lifting productivity in the Māori economy will lift the New Zealand economy and our economic, social and cultural well-being.

### 2.1 Linkages

Looking ahead, the importance of creating employment opportunities and owning assets will remain an important goal for Māori enterprises. Other goals include the ability to sustainably develop assets, build capital, and allow investment and further development.

More broadly, there is also the issues of small uneconomical land holdings and the potential for these holdings to be brought into production, and alternative uses for marginal land. There are significant areas of Māori land – predominantly comprised of small holdings – that are generally considered uneconomical due to a lack of access to water, roading, or other services. These holdings have often reverted to scrub; they may have some patches of grass for a few subsistence livestock or are leased to neighbouring farmers for nominal rent. Often this land has poor governance structures in place or no administration.

Māori are substantial players in the forest industry, and are considering moving into a more active role in the wood processing industry.

Māori are interested in getting involved in different parts of the fisheries value chain such as growing, marketing, processing, transport and logistics, and selling.

Aquaculture is a fast growing sector of the fishing industry. The Government has highlighted the aquaculture sector as a priority area for economic growth and has set a goal for this sector to be a sustainable \$1 billion sector by 2025. Currently, approximately 66 percent of

New Zealand aquaculture is exported. For this sector to grow, it has been argued, it is important that research and innovation is transferred into successful commercial enterprises that sell seafood products.

Māori are significant players in the aquaculture sector, and this is considered a growth area for many Māori entities. However, the challenge with aquaculture is the large capital investment required to invest in these ventures, and undertake science and innovation related to aquaculture.

Māori entities are passively and actively involved in the exploration and utilisation of natural resources. Passively, they are providing resource access to power generation, exploration and extraction companies, while actively they are involved in providing equity, and undertaking joint ventures and partnerships.

Māori entities are currently involved in this industry, particularly in ironsand mining and aggregates, and there is the potential for greater involvement in petroleum, oil and gas exploration offshore, and mining above and below ground.

Section 4 highlights some of the issues in realising some of this potential and links back to the [Discussion Document](#) prepared at an earlier stage of this project. This is woven into scenario discussions in Section 3.

### **2.1.1 Scenarios**

At the broadest level, the context for this project is prospects for the New Zealand economy and the influences arising from global developments. As such, there are a range of 'shocks' that we could consider. Arising from the information compiled in our discussion document we proposed the following scenarios options for modelling:

- business as usual – required not only as comparator, but also to signal opportunity costs of doing nothing.
- generic productivity improvements in sectors likely to apply innovation effort, or are capable of engaging in collaborative enterprises and obtaining economies of scale at the production end of the value chain.
- development of new products from existing sectors targeting specific markets abroad as a result of customer focussed innovation effort in particular sectors.
- improved returns from existing enterprises resulting from collaborative measures to capture value previously flowing to external players.

- the development and implementation of sector specific (e.g. forestry and alternative land-uses) Māori innovation strategies.
- improved returns in specific sectors through the development and implementation of a 'brand' for products, services and offerings from the Māori economy.
- additional revenue streams through the development of new innovation and science processes being licensed for application by external entrepreneurs.

From these scenario options, the following four scenario options were chosen:

1. the level of productivity in the Māori economy is lifted to be the same as the national average across all industries by 2061.
2. world demand for export products from New Zealand grows across a range of industries such as agriculture – dairy and meat products; forestry – logs and wood products; fish – fish and aquaculture products; tourism; education; and other services.
3. more science and research investment is directed into the Māori economy, resulting in capital accumulation but not application to lifting productivity or commercialising into new products or new markets.
4. a 'doing nothing' assumption is applied and the model is used to simulate the changes in various economic measures due to "running down" or devaluing the Māori asset base.

## **2.2 Wider context for the scenarios**

There are many scenarios for economic development over the coming half-century, with energy, food and water supply and demand central to almost all issues. On these dimensions alone, New Zealand remains well placed given the resource-based production industries. Nevertheless, there remain challenges as to the sustainability of methods of production and means to mitigate environmental impacts. In addition, the changing tastes and aspirations of offshore consumer markets could increasingly reward producers focussed on the quality of their offerings, rather than the bulk volume or quantity of products sent to market.

Surrounding these factors is the geopolitical landscape, which is arguably even more dynamic, or at least uncertain. Much has been made of the likely growing influence of China and India in global picture of the coming decades. However, and of particular relevance to New Zealand, less seems to be made of the rise of other primary producers in central and southern America. The future of the Russian Federation is of relevance from the primary producer, energy supplier and consumer perspective. Amongst these factors lie the large and persistent imbalances in trading positions, which could potentially destabilise

international trading relationships. While a return to widespread protectionist policies is considered unlikely, such a scenario should not be dismissed entirely.

But, clearly, the world in which New Zealand enterprises do business over the coming decades will continue to evolve and change and, not to mention, challenge.

Of more certainty, however, is the need to ensure business growth from these enterprises. For it is these enterprises that will provide the jobs, income and opportunities that enable New Zealanders (individuals, communities and organisations) to contribute to this ever-changing world.

The innovation effort (whether it be targeted science investigations, or wider R&D activities) will be critical in attempts to efficiently use, as well as maintain and enhance, increasingly scarce and valued resources.

Within this ever-changing world Māori enterprises are uniquely positioned. Māori enterprises have a combination of assets held over a range of governance and management structures, with varying degrees of scale, capacity and capabilities. This suggests potentially greater returns may arise from a closer alignment between the science and innovation effort and the diverse needs of Māori enterprises. In addition to a closer alignment, the prospect of heightened collaboration between entities active in the Māori economy could enable scale to be reached whereby many more Māori enterprises had both the capacity and capability to engage in a truly two-way relationship with players central to the innovation effort.

In other words, it is not just gains from scale from collaboration that can be pursued. Nor is it just an increased commercial focus for our innovation effort that is in prospect. Rather, it is maximising the ability for Māori enterprises to contribute directly and indirectly with the innovation effort that is the goal. And in turn spur on additional opportunities that lie outside of the current asset base of the Māori economy.

Such a perspective adds even more to the potential income that undoubtedly resides in the Māori economy – as well as the wider New Zealand economy.

### 3 Scenarios

The BERL computable general equilibrium (CGE) model is a standard economic model of the New Zealand economy that has a structural framework similar to input-output relationships. The CGE model includes 75 industries, 40 types of labour and 25 types of exports. It is therefore able to illustrate the benefits, costs and opportunities that the development of a two-way relationship between players central to the science, R&D, and innovation effort could have on the New Zealand economy. Further, as part of this research the model has been enhanced to explicitly identify 16 industries that comprise the Māori economy and their links with the rest of the New Zealand economy.

The CGE model is used to simulate the effect of a range of comparative scenarios. The modelled outcomes are caused by different assumptions about the economic environment or influences such as productivity, world prices and demand. We term these modelled outcomes, scenarios.

#### 1. Increased productivity scenario

The level of productivity in the Māori economy is lifted to be the same as the national average across all industries by 2061.

#### 2. Improved export efforts scenario

World demand for export products from New Zealand grows across a range of industries such as agriculture – dairy and meat products; forestry – logs and wood products; fish – fish and aquaculture products; tourism; education; and other services.

#### 3. Investment focus scenario

More science and research investment is directed into the Māori economy, resulting in capital accumulation but not commercialisation or a large lift in productivity.

#### 4. Doing nothing scenario

A 'do nothing' assumption is implemented and the model is used to simulate the changes in various economic measures due to "running down" or devaluing the Māori asset base.

#### 3.1 Scenario summary results

In order to measure the effect of these scenarios a baseline or 'business as usual' benchmark needs to be set. This scenario is known as a comparator and is the outcome against which we compare the results of assumed changes in behaviour or economic activity.

**Table 1 Baseline economy under business as usual scenario**

	2010	2021	2031	2041	2051	2061
GDP (2010 \$m)	187,302	235,068	315,939	451,230	696,964	1,171,863
<i>%pa from 2010</i>		2.1	2.5	2.9	3.3	3.7
GDP per capita (2010 \$)	42,941	48,834	60,608	79,932	114,006	177,006
<i>%pa from 2010</i>		1.2	1.7	2.0	2.4	2.8
Consumption	109,491	139,848	188,594	268,757	412,322	683,218
Exports	52,425	66,958	91,646	133,705	209,302	356,734
<i>%pa from 2010</i>		2.2	2.7	3.1	3.4	3.8
Factor cost GDP	164,243	205,213	275,792	394,167	610,356	1,032,312
<i>%pa from 2010</i>		2.0	2.5	2.9	3.3	3.7
Māori economy GDP	9,739	12,194	16,291	23,019	34,881	56,696
<i>%pa from 2010</i>		2.1	2.5	2.8	3.2	3.5
Employment (000s)	1,810	2,020	2,209	2,416	2,643	2,890
<i>%pa from 2010</i>		1.0	1.0	0.9	0.9	0.9
Real wage rates	100.0	107.4	125.3	156.2	211.9	316.2
Trade balance (%GDP)	1.46	1.13	0.47	0.27	0.14	0.07
Govt balance (%GDP)	-2.59	-2.96	-3.35	-4.06	-5.12	-6.70

In the business as usual situation, national GDP steadily increases from \$187 billion in 2010 to \$1.1 trillion (measured in 2010 values) in 2061. GDP in the Māori economy increases at a slightly lower rate growing by 3.5 percent per annum from 2010 to 2061 to sit at \$56.7 billion. During this time, employment grows between 1.0 and 0.9 percent per annum resulting in a million more people in employment in 2061. This employment growth is fairly evenly distributed across the occupation groups examined.

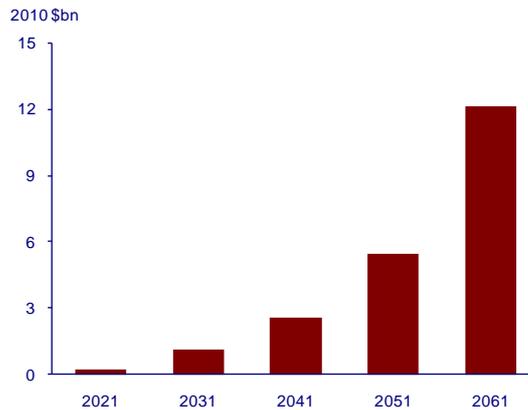
This growth is based on an assumption that world growth and the demand for New Zealand exports continues to expand at historic averages, along with productivity in sectors of the Māori and New Zealand economy.

### 3.2 Increased productivity scenario

Under this scenario, the level of productivity in the Māori economy is lifted to be the same as the national average across all industries by 2061. This lift in productivity results in productivity in the Māori economy growing faster than the rest of the economy due to noticeable productivity changes in industries such as agriculture and forestry. This is largely due to an increase in productivity of currently under utilised Māori land.

Under this scenario, the changes result in GDP in the Māori economy growing by \$12.1 billion. This is a 21 percent increase from the baseline figure of GDP in the Māori economy in 2061 of \$57 billion to \$69 billion. This is a significant increase in GDP, and is the second largest increase in GDP in the Māori economy in the scenarios examined.

**Figure 1 Increased productivity scenario – Māori GDP difference from baseline**



Household consumption and exports benefit from this lift in productivity. As shown in Table 2, consumption is 2.5 percent higher in 2061 under Scenario A compared to the baseline figures. This is primarily driven by a noticeable increase in the consumption (or purchase) by households of other services, which also positively impacts on employment in the services industries.

Under this scenario, there is an improvement in the trade balance, as earnings from exports rise faster than import payments. Compared to baseline figures, export volumes are 7.3 percent higher in 2061 in the increased productivity scenario, with a noticeable increase in exports from industries that Māori entities currently have significant interests. For example, under this scenario export volumes from the horticulture industry in 2061 are 9.2 percent higher, and export meat volumes are 2.6 percent higher. As mentioned in the next section, this has a positive impact on employment in the primary, manufacturing and services industries.

**Table 2 Increased productivity scenario – difference from baseline**

	2021	2031	2041	2051	2061
GDP (2010 \$m)	661	3,353	8,282	19,591	49,590
GDP per capita (2010 \$)	137	643	1,467	3,205	7,490
Consumption	226	1,111	2,768	6,716	17,312
Exports	387	1,949	4,701	10,701	26,061
Factor cost GDP	966	4,764	11,359	25,802	62,780
Māori GDP	238	1,132	2,563	5,431	12,135
Employment (000s)	7	30	56	92	148
Trade balance (%GDP)	0.03	0.14	0.25	0.37	0.54
Govt balance (%GDP)	0.07	0.26	0.43	0.64	0.96

### **3.2.1 The potential of increased productivity**

Under this scenario, some of the issues facing Māori entities and agribusinesses involved in the primary industry in 2010, such as sustainable land use and implementing best practice, have been addressed through investment in new processes and products, and market research into customer needs leading to New Zealand's entry into new markets as well as expansion in existing markets. Māori entities that were previously focused on lifting performance through investing in their farm or forest have completed these objectives and have turned to investment options beyond the farm or forest gate.

Entities in the Māori economy have improved their capability to access and apply science and associated information under this scenario. In addition, their capacity to perceive and manage risk has also improved. As mentioned in Section 3, attitudes to risk are important as this has a direct impact on the ability of an entity to extract the potential returns from an asset or to consider investment proposals aimed at generating improved returns from an asset. Finally, collaboration and economies of scale have also helped to overcome some of these challenges, allowing entities to be assisted by the benefits of scale.

Under this scenario, the Māori economy will also grow through the parallel investment in people – their skills, knowledge, training and experience. Without this parallel investment in building the skills and education base, employment needs will not be met and the sustainable development of the asset base will not meet intergenerational aspirations. Under this scenario, there is the potential for sustainable returns at a whānau, hapu, iwi and national level through growing human and material capital

### 3.2.2 *Employment under increased productivity scenario*

This scenario also results in significant additional employment growth. Employment in 2061 is 5.1 percent higher than the baseline figure. In 2061, employment in the baseline is 2,890,000, while in the improved productivity scenario employment totals 3,039,000. This is an increase of 148,000 people in employment.

Focusing on employment at an occupation level in 2061, under this scenario there is employment growth across a wide range of occupations. Substantial growth is recorded in occupations such as forestry and related workers, machinery and trades workers, transport drivers, and professionals such as physical scientists and engineers. People employed in occupations within the other services industries also benefit from higher average wages as a result of higher consumption of these goods and services. The other services industry includes people involved in repairs, maintenance and cleaning such as mechanics and drycleaners, as well as personal care services such as hairdressers and beauticians.

### 3.3 *Improved export effort scenario*

In this scenario the world demand for export products from New Zealand expands beyond the baseline rates of growth across a range of industries such as agriculture – dairy and meat products; forestry – logs and wood products; fish – fish and aquaculture products; horticulture; tourism; education; and other services.

**Table 3 Improved export effort scenario – difference from baseline**

	2021	2031	2041	2051	2061
GDP (2010 \$m)	379	2,148	5,532	13,069	31,738
GDP per capita (2010 \$)	79	412	980	2,138	4,794
Consumption	227	1,139	2,824	6,670	16,455
Exports	180	1,061	2,626	5,692	12,342
Factor cost GDP	827	4,239	10,161	22,556	52,116
Māori GDP	246	1,182	2,681	5,632	12,344
Employment (000s)	7	32	59	96	150
Trade balance (%GDP)	-0.03	-0.06	-0.09	-0.15	-0.28
Govt balance (%GDP)	0.06	0.23	0.38	0.56	0.79

This expansion is further concentrated in demand for outputs from the Māori economy as a result of new products and markets being developed, following a renewed focus on overseas

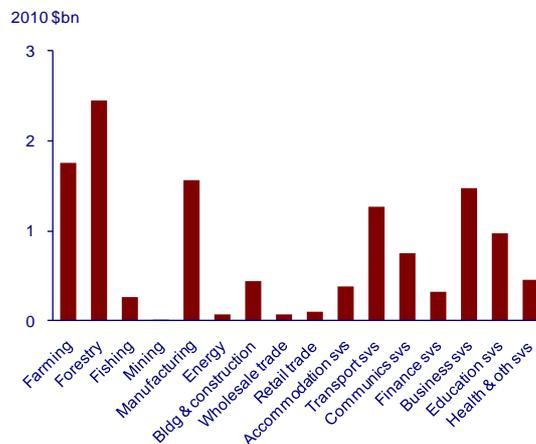
customers for Māori businesses. Consequently, the growth in world demand for New Zealand exports is proportionally skewed in favour of the Māori economy.

This scenario sees GDP from the Māori economy growing by \$12.3 billion. This is a 21.8 percent increase from the baseline figure of the 2061 GDP in the Māori economy – from \$57 billion to \$69 billion. This is a significant increase in GDP, and the largest increase in GDP in the Māori economy in the scenarios examined.

This growth in GDP is also substantially higher than that occurring at a national level, where GDP in 2061 grows 2.7 percent.

Under this scenario, export volumes are 3.5 percent higher in 2061 than in the baseline. While this increase in export volumes is not as high in total as in the increased productivity scenario, there are noticeably different impacts across the commodities. For example, fish exports in 2061 in the improved export scenario are 9.3 percent higher than the baseline. In contrast, the increased productivity scenario sees fish exports in 2061 at only 4.6 percent higher than the baseline. Similarly, other food and beverage exports are 23.3 percent higher in the improved export effort scenario, along with 7.7 percent more meat, 9.2 percent more horticulture, and 6.5 percent more log and wood product exports.

**Figure 2 Improved export effort – difference from baseline in 2061 Māori sector GDP**



There is also substantially higher investment across all industries in the improved export effort. In percentage terms, real investment in 2061 is 5.8 percent higher in this scenario. For example, real investment in 2061 in the Māori fishing industry grows by an additional \$118,000 in this scenario, while investment in the Māori forestry industry grows by an additional \$517,000.

### **3.3.1 *The potential of improved export effort***

Under this scenario, collaboration at a management and governance level has resulted in opportunities being maximised, particularly in the primary sectors, and the potential of some Māori entities has been realised. This collaboration has also resulted in several industries combining marketing expertise and this could include focusing on a 'brand'.

Entities with good leadership have had good results, as this type of leadership has a clear understanding of risk which has resulted in the investigation and development of new ideas. Further, under this scenario Māori entities have got a head start with new and emerging industries through working with research organisations. An increase in export earnings has allowed Māori entities to invest in other areas of the value chain, including a focus on niche high-value products.

This growth in real investment is largely due to an increase in export earnings. This in turn, has been assisted by the export-focused innovation effort of the sales and marketing of products and services from the Māori economy. Under this scenario, new and modified products and services have been developed, and new 'brands' have been developed and successfully marketed domestically and internationally. This has also led to further investment in sectors of the Māori economy such as business and education services.

As a result, there are noticeable employment increases in this scenario. This employment growth out to 2061 is led by the primary sector.

### **3.3.2 *Employment under improved export effort***

Employment in 2061 is 5.2 percent higher than the baseline figure, rising from 2.89 million in the baseline to 3.04 million in the improved export effort scenario. This is an extra 150,000 people in employment. This employment growth is slightly higher than that recorded in the increased productivity scenario, where employment in 2061 is 5.1 percent higher than in the baseline.

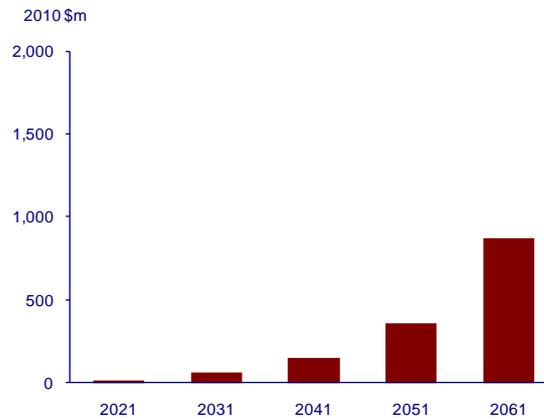
Looking at employment growth by industry, and focusing on the 16 industries we have identified within the Māori economy, employment growth under the 'shock' in 2061 is strong in the primary industries of Māori forestry, fishing, and farming. There is also substantial growth in employment in manufacturing and transport.

Service industries – education, business services, and health and other social services – benefit from the flow-on effects of employment growth in the other export-focused sectors. Scientific research and computer services, and other business services also benefits from a lift in the world demand for exports from New Zealand.

### 3.4 Investment focus scenario

Under this scenario, more science, research and innovation investment and effort is directed into the Māori economy. However, this investment is not as successful in lifting productivity. Nor is there recorded success in developing new markets or new products. This scenario can be viewed as one where investment spending is the focus, but there is a failure to apply or commercialise such efforts either by lift the productivity of existing assets or by engaging in new ventures. Some capital is accumulated under this scenario in the Māori economy, which is positive, but the productivity and profitability of existing assets remains at their baseline levels. Consequently, the gain to GDP over the period to 2061 is minimal.

**Table 4 Investment focus scenario – Māori GDP difference from baseline**



Under this scenario, GDP from the Māori economy in 2061 is \$870 million (measured in 2010 values) higher than in the baseline. This represents a 1.5 percent gain from the baseline figure of GDP in the Māori economy in 2061 of \$57 billion. This is a relatively small increase in GDP and, further, is only slightly higher than the increase in national GDP of 1.3 percent. The household consumption spending component of GDP grows by less than one percent under this scenario and investment is slightly less than two percent.

By sector, the difference in GDP generated by this scenario (compared to the baseline) is very small. Across the sectors, the difference between the gross outputs of the primary, manufacturing and services sector under this scenario is less than two percent.

Under this scenario, export volumes are 2.3 percent higher in 2061 than in the baseline. Exports of fish under the improved export effort scenario were 9.3 percent higher in 2061 compared to the baseline, while they were 4.6 percent higher in the increased productivity scenario. However, in the investment focus scenario fish exports in 2061 are only lifted by 2.5 percent above the baseline.

Export volumes of other food and beverage products in 2061 are 23.3 percent higher under the improved export effort scenario, along with 7.7 percent more meat export volumes and 9.2 percent more horticulture, and 6.5 percent more log and wood product exports. In comparison, this investment focus scenario sees export volumes of other food and beverage products in 2061 up only 3.3 percent, with 0.8 percent more meat, and 2.2 percent more horticulture export volumes.

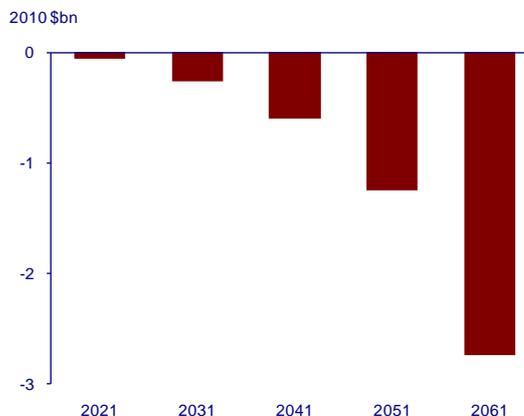
This difference between the scenarios further illustrates the need for a truly two-way relationship between players central to the science, R&D, and innovation effort. It builds on our argument that there is a need for Māori enterprises to contribute directly and indirectly with the innovation effort, and for such collaboration to spur additional opportunities beyond the current enterprises in the Māori economy. Simply investing in science and R&D is not enough – a step change needs to occur whereby that investment leads to innovation and the commercialisation and application of this effort.

Under this scenario, the unemployment rate drops, but not as noticeably as under the two scenarios examined earlier. Consequently, employment growth is substantially lower in this investment focus scenario. Employment is just over one percent higher than the baseline in 2061, while this difference is more than five percent in each of the increased productivity and improved export effort scenarios.

### 3.5 Doing nothing scenario

In this do nothing scenario there is no maintenance of existing assets due to the lack of investment flows. This arises from the low profitability of existing assets due to their currently below-average levels of productivity. Consequently, the Māori asset base over time progressively degrades.

**Figure 3 Doing nothing scenario – Māori GDP difference from baseline**



In this scenario, less productive assets are 'run down' resulting in a decrease in profitability and therefore a decrease in investment and re-investment. Note that this scenario differs from the business as usual scenario.

Under this scenario, the GDP from the Māori economy in 2061 is \$2.7 billion below the baseline. This is a 4.8 percent decrease from the baseline figure of Māori GDP in 2061 of \$57 billion, to \$54 billion in 2061 under the doing nothing scenario. This is a significant decrease in GDP. This decline in GDP also impacts on outcomes at the national level, where GDP in 2061 is 1.0 percent (or \$12 billion, measured in 2010 values) below the baseline.

Household consumption and exports suffer in this scenario. As shown in Table 5, consumption in 2061 is 0.6 percent lower than the baseline in the doing nothing scenario. This decline in household consumption is primarily driven by a noticeable increase in the unemployment rate (to 7.8 percent compared to 6.7 percent in the baseline).

Exports are 1.7 percent lower in 2061 in the doing nothing scenario compared to the baseline figures. Across all of the sectors export volumes are below the baseline figures. However, there are noticeably lower export volumes from key industries relevant to the Māori economy such as logs and wood products, horticulture, other food and beverages, and tourism.

**Table 5 Doing nothing scenario – difference from baseline**

	2021	2031	2041	2051	2061
GDP (2010 \$m)	-143	-765	-1,947	-4,691	-12,015
GDP per capita (2010 \$)	-30	-147	-345	-767	-1,815
Consumption	-54	-272	-687	-1,678	-4,333
Exports	-79	-427	-1,070	-2,494	-6,182
Factor cost GDP	-216	-1,094	-2,643	-6,045	-14,749
Māori GDP	-56	-265	-595	-1,247	-2,741
Employment (000s)	-2	-7	-13	-22	-35
Trade balance (%GDP)	0.00	-0.03	-0.05	-0.09	-0.13
Govt balance (%GDP)	-0.02	-0.06	-0.10	-0.16	-0.24

### **3.5.1 *The opportunity costs of the do nothing scenario***

Under this scenario, some of the issues facing Māori entities and agribusinesses involved in the primary industry in 2010, such as sustainable land use and implementing best practice, have not been addressed. Capability and leadership issues remain and these have created a barrier to Māori enterprises contributing directly and indirectly with the innovation effort, and engaging with additional opportunities outside of the current enterprises in the Māori economy.

The asset base has devalued as assets have been run down, leading to a decline in productivity and profit, and less investment by Māori enterprises in areas such as machinery and equipment, improvements, capital funds, and human capital.

Under this scenario, the Māori economy has not grown through the parallel investment in people – their skills, knowledge, training and experience. Without this parallel investment in building the skills and education base, employment needs have not been met and the sustainable development of the asset base has not met intergenerational aspirations.

Economic, social and cultural well-beings suffer under this scenario. People have moved away to seek employment and opportunities for their whānau. Under this scenario, whānau and connections with people, community and 'home' have deteriorated. Identity and belonging has suffered and cultural capital such as language, worldview and Mātauranga Māori has been lost.

### **3.5.2 *Employment under the do nothing scenario***

Doing nothing results in lower employment. Employment in 2061 is 1.2 percent (or 35,000) lower than in the baseline scenario. In 2061, employment in the baseline is 2.89 million while doing nothing results in employment of 2.86 million.

Focusing at an occupation level in 2061, in the doing nothing scenario employment is lower than baseline across a wide range of occupations. However, there are substantially more losses in occupations such as forestry and related workers, machinery and trades workers, and transport drivers. There are also noticeable losses in the professional categories such as physical scientists and engineers. Employment losses under a do nothing scenario are in stark contrast to the employment growth seen in the improved productivity and improved export effort scenarios, where employment levels were more than five percent above baseline.

### 3.6 Comparison of the scenario results

The following table illustrates the differences in key economic measures. The table shows for each of the snapshot years the difference from the baseline generated by the scenarios in terms of additional employment or GDP.

In terms of people, the increased productivity or the improved export effort scenarios provides job opportunities for close to an additional 150,000. This is in stark contrast to the doing nothing scenario where job opportunities number some 35,200 below the baseline. Thus, the difference between

- a science and innovation effort with associated leadership and collaboration aimed at unlocking the potential residing in the Māori economy; and
- doing nothing

can be succinctly summarised as: 185,000 job opportunities in 2061.

**Table 6 Scenario summary**

Scenario		2021	2031	2041	2051	2061
Employment (000s)	Increased productivity	7.1	29.6	55.5	91.6	148.5
	Improved export effort	7.4	31.6	59.2	95.5	149.6
	Investment focus	1.1	5.1	10.5	18.5	31.3
	Doing nothing	-1.6	-6.8	-13.0	-21.7	-35.2
Māori GDP (2010 \$m)	Increased productivity	238	1,132	2,563	5,431	12,135
	Improved export effort	246	1,182	2,681	5,632	12,344
	Investment focus	11	60	151	356	868
	Doing nothing	-56	-265	-595	-1,247	-2,741
Māori GDP per capita (2010 \$)	Increased productivity	137	137	137	137	137
	Improved export effort	79	79	79	79	79
	Investment focus	39	39	39	39	39
	Doing nothing	-30	-147	-345	-767	-1,815
NZ GDP (2010 \$m)	Increased productivity	661	661	661	661	661
	Improved export effort	379	379	379	379	379
	Investment focus	186	186	186	186	186
	Doing nothing	-143	-765	-1,947	-4,691	-12,015

The greatest effect on GDP from the Māori economy is recorded in the improved export effort scenario. GDP in the Māori economy in 2061 in this scenario is 21.8 percent higher than in the baseline. At the other end of the spectrum, the doing nothing scenario results in GDP from the Māori economy being 4.8 percent lower than the baseline in 2061.

The scenarios examined indicate the importance of aligning science policy levers to the needs of the Māori economy now and towards 2061. They indicate the potential that exists to further grow and develop the value of the asset base, and highlight the importance of not just investing money into research, science, and innovation but the need to invest in commercialising and developing this potential. Putting resources into this effort will only do so much, as indicated by the relatively small gains from the investment focus scenario. It is critical that the next step of application and/or the commercialisation of such effort is taken.

## 4 Appendix 1: Themes identified

Science and innovation could play a significant role in this development, but a number of factors influence the extent of the involvement of Māori entities and these have been highlighted from an industry perspective in the previous section. But, there is a need to understand the circumstances that are preventing Māori entities from participating in order to improve engagement.

Currently, Māori entities do not always lend themselves to science and innovation. There a limited number of researchers in leadership positions in Māori communities to prompt entities to get involved in this space. As such, many entities are reluctant to put in funding into science and innovation without seeing a return and a fairly immediate return.

This section summarises the themes identified through our discussions with a range of stakeholders active in both the Māori economy and the science sector. The following matrix illustrates the cross-section of stakeholders interviewed:

**Table 7 Cross-section of stakeholders interviewed**

Industries	Agriculture, Horticulture, Forestry, Fisheries, Mining , Services, Tourism, Energy
Size	Small, Medium, Large
Types	Holding companies, MIOs (Mandated Iwi Organisations), trusts, incorporations, Māori Trust Boards, PSGEs (Post Settlement Governance Entity), SMEs (small to medium enterprises) – whānau, individual Māori entities – either as whānau or Māori individuals and JVs (joint ventures), CRIs, Government Departments
Methods	1-2-1 interviews, desktop analysis, workshops, small group interviews

We note that some of these themes may be relevant to wider New Zealand economy, as opposed to being specific to the Māori economy. We argue, however, that the characteristics and growing contribution, of the Māori economy mean it is increasingly important that these themes are explored from this perspective.

### 4.1 Meaning of science and innovation

Discussions highlighted that activities are often not understood by Māori entities as being science and innovation. What Māori entities often consider as general development and often part of 'business as usual', the science sector in some cases would consider science and innovation.

A wider scope and/or definition of what this includes will increase clarity for Māori entities and foster interest in engagement. It was evident that certain industries had a better understanding; in particular entities with activities in agriculture were more aware of the definition of science and innovation and also had higher level of engagement. Conversely those involved in geothermal had less understanding and engagement, though this may also have been due to the fact that Māori entities involvement in this industry is in its infancy compared to agriculture and/or a number of the geothermal projects are joint ventures (JV) and the JV partner is responsible for science and innovation.

It was also evident that this was even less understanding of term 'science' and some traditional perspectives of what science means and involves. Dispelling some of the traditional perspectives could result in a better understanding within Māori entities and possibly encourage more engagement.

#### **4.2 Communication**

It is evident that this is room for improved communication, amongst Māori entities, amongst entities in the science sector and between Māori entities and the science sector.

Discussions highlighted that poor communication resulted in the dilution of opportunities and failure to seize opportunities to gain cost efficiencies.

Amongst Māori entities there appears to be duplication of information and ideas, with different entities undertaking similar developments and/or initiatives. In particular the investigation of new initiatives has sometimes resulted in a repeat of market research. More collaboration and communication within Māori entities could provide an opportunity to share costs of investigation and also possibly encourage collaborative investment from inception. The major prohibitor to this, of course, is the commercial sensitivity of information and the competitive nature of business; as well as entities being at different stages of development.

Amongst science there appears to be duplication of information and information being held within different entities that would progress initiatives for other entities and their stakeholders. Though a detailed stock-take of work undertaken was not completed, there were situations where it was evident that similar projects had been undertaken by different entities; much like the repeat of market research within Māori entities. This appeared to be apparent for two major reasons

1. the competitive nature of the science sector, renders CRIs (in particularly) vulnerable as businesses, creates uncertainty, and undermines their ability to act strategically and
2. the organisations are often busy with doing the work and have limited opportunity to communicate with each other.

The proposed change to science funding may change to this in the future and minimise the competitive nature of the sector, but the issue of lack of information due to time available might not be overcome.

The biggest opportunity for improved communication is between the science Sector and Māori entities. Discussion with key stakeholders re-iterated concerns raised in the report prepared by BERL titled Māori Science and Innovation – Potential, Opportunity and Value, April 2010.

Key prohibitors to communication between Māori entities and the science sector include:

- the scope of science and innovation is unclear for Māori entities
- Māori entities lack of understanding of the science sector and value that it can add
- science sector lack of appreciation of the initiatives being undertaken by Māori entities and the consequent potential that the science sector have to advance this
- key networks and/or contacts not known by both parties
- communication and engagement methods often not suitable and/or effective.

#### **4.3 Information**

There were reoccurring themes about information that raised the following key questions:

1. What information do I need, what information is available?
2. How do I access the information?
3. How do I interpret the information?

##### **4.3.1 *What do I need to know?***

As signalled in the previous section, Māori entities often do not know have a clear understanding of the scope of science and innovation. Furthermore Māori entities need to know about

- the process of science and innovation
- the questions to ask and/or
- what is possible.

A number of key stakeholders did not know what questions to ask in order to progress an idea or to advance an activity.

#### **4.3.2    *How do I access the information?***

During discussions key stakeholders signalled that they did not know how to access the information and in a number of cases, who to talk to. This highlighted the fact that key information is often dispersed in different entities and even more so, in different forms. Key stakeholders signalled that clearer guidelines about how they can access this information, including information on who to talk to and what questions would be of great assistance.

#### **4.3.3    *How do I interpret the information?***

Once information was in hand, it was often difficult to interpret the information and apply in a meaningful and useful manner. The information could have been presented in a simpler, more usable format.

### **4.4        *Māori entities***

A range of entities were engaged as part of the fieldwork. Findings indicated that they were homogenous in some senses and not in others.

#### **4.4.1    *Not homogenous***

They were not homogeneous when it came to:

- size - this ranged from small whānau entities to large corporations. In addition, the size of the asset base, owners, beneficiaries<sup>1</sup> and capital varied. The point to be made is that Māori entities vary in size on all accounts.
- stages of development - this ranged from start up to well-established and diverse investments. In addition, some Iwi were in the process of Treaty settlements and others completed their settlement process.
- internal expertise – this range included no expertise through to considerable internal knowledge. The extent to which entities had access to external resources varied and this largely depended on the cash position of the entity and/or their ability to access funding to support projects. In the case where there were JVs in place, science and innovation this was often funded by the JV partner.

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<sup>1</sup> For the purpose of this discussion, beneficiaries are defined as those that benefit from the Trust and include owners

- governance – governance and management arrangements varied. In the smaller entities, some were managed and governed by the same individuals. For the medium-large entities and those established by legislative and policy requirements they had clearer separation between governance and management. The skills and capability at both governance and management level varied from case to case.
- foci – the focus of governance and management often influenced their decision about what direction to take and what level of risk they were prepared to take. If the individuals and or governance groups were open to risk, than the organisation in general was open to risk. Some of the entities were focused purely on commercial gain and this was less common than entities having a holistic and sustainable approach to development.
- different industries – the present strength of these Māori entities remains in their asset base, concentrated in the primary industry and driven by land ownership. Māori entities are involved in a range of industries. Those discussed as part of the fieldwork include farming, forestry fishing, horticulture, property, geothermal, mining and tourism. This ranged from start up to well-established. In the case where entities were well established, they tended to be more diverse in their investments. In addition there was differing degrees of investment(s) in different industries. One exception is those involved in forestry – in the case where harvesting had yet begun, the investments were consolidated in forestry and interested in add-value to the forestry industry, rather than diversifying into other industries. Further discussion on these industries and their potential is discussed in section 0.
- structures – entities differed in structure and this is discussed further in sub-section 4.4.3.
- capacity and capability<sup>2</sup> - discussions highlighted that some entities had the capability, but not the capacity, whilst other organisations that had the capacity, but not the capability. In some instances some entities had neither the capacity nor capability. The issue of capacity and capability was often overcome by engaging external consultants to assist. In the case where entities had capacity and capability, engagement in science and innovation was medium to high.

#### **4.4.2 Common to Māori entities**

Most Māori entities concurred when it came to:

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<sup>2</sup> For the purpose of this discussion, capacity is defined as resources and time to spend accessing the information. Capability is defined as the ability to ask the questions, access, interpret the information and apply for funding to assist with science and innovation

- vision – most entities were committed to realising the potential of the assets and opportunity for the benefit of whānau, hapu and iwi. However, in some instance, there were some entities to manage the assets at the current level rather than develop further.
- desire to reach potential – coupled with the vision, all entities were committed to achieving their potential. However the definition of what the potential was varied from entity to entity and in large, though the qualitative commitment was apparent, there were no clear measures of what the quantitative potential was. As mentioned about most took a holistic and sustainable approach; a minority took a pure commercial focus, with the financial gain of the commercial entities enabling investment in other dimensions of development (i.e. social, cultural, and environmental).
- creation of opportunities for whānau – all entities were committed to creating opportunities for their whānau, hapu and Iwi. Entities were focused on employment, business opportunities and skills/career development. Entities often linked their investment in skills and career development to areas that would contribute to the achievement of their potential.

#### **4.4.3 Structures important**

We made contact with a range of Māori entities such as Māori authorities, Māori Trust Boards, rūnanga, and Treaty of Waitangi settlement entities. It should also be noted that a number of the entities were formed due to Legislative requirements, in particular MIOs, PSGEs and Trust Boards. To some degree Trusts and Incorporations were established due to Legislative and/or policy influences/requirements. The two entities that had formed on their own accord were Holding Companies (outside those established for Fisheries) and SMEs.

Key stakeholders were part of the following range of structures

- holding companies\*
- MIOs (Mandated Iwi Organisations)
- trusts\*
- incorporations\*
- Māori Trust Boards
- PSGEs (Post Settlement Governance Entity)

- SMEs\* (small to medium enterprises) – whānau, individual Māori entities – either as whānau or Māori individuals
- JVs (joint ventures)\*

\* These entities primarily have commercial focus, though often to foster more holistic development

Though entities varied in structure, it was clear that structure was important. Main reasons for this included:

1. assurance of good governance and delineation of governance vs. management
2. separation of commercial activity from other aspects of development (i.e. social, cultural, environmental)
3. management of Treaty Settlements and/or return of assets
4. management of specific assets (e.g. fisheries)
5. compliance.

**Error! Reference source not found.** summarises the relationship between the type of structure and their engagement in science and innovation. In addition the table signals whether the entity has a commercial focus and what significances (in terms of \$\$ figures) that it has in relation to the Māori entities asset base.

#### 4.5 Attitude to risk

Individual entities attitude to risk varied also. This often correlated to one of more of the following factors:

- stage of development – generally, the more further on, the more risk willing to be taken. However there were some instances where entities considered risk up front. Geothermal industry tended to foster high risk upfront, but these may have been influenced by the fact that the majority of geothermal investments were JVs.
- size of the entity and/or asset base it managed – generally the bigger entities had more scope to take risk, but there were cases where small and medium entities (both in size and in asset base) that were willing to take risk to accelerate the progress for their whānau, hapu, iwi.

**Table 8 Links between Māori entities and engagement in science and innovation**

Type of Entity	Level of Engagement in science and innovation	Significance in terms of Māori entities Asset Base	Commercial Focus
Holding Company	High	High	High
MIO	Low	Low	Low
Trusts	Med	High	High
Incorporation	Med	High	High
Māori Trust Boards	Low	Low	Low
PSGEs	Low	Low	Low
SMEs	Med	High	High
JVs	High	High	High

- foci of governance/management – risk was often led from the top, either from governance and/or governance and management. An organisation that had a ‘risk champion’ whether at governance and/or management levels, took more risk(s).
- internal expertise – further to the appetite for risk, it was common that entities were more accepting of risk when they had the expertise (either internally or externally) to manage risk.
- willingness of owners – in cases where decision about risk had to be communicated with owners; where good quality information and solid communication lines were in place, owners supported risk taking on the condition that it was for the long term benefit of the entity. Risk was never supported for short term gain.
- previous examples – risk was more often taken when there were other examples of same and/or similar activities being undertaken. It was more likely to be favoured if there were other Māori entities engaged in a similar activity. JVs with other indigenous parties also show favour.

#### 4.6 Collaboration

It is evident that more will be gained by working together rather than working apart. This includes both Māori entities and the science sector. The issue of communication and information has been signalled in previous sections. Collaboration at management and governance level will also maximise opportunities and assist in realising potential for Māori

entities. Several industries indicated interest and signalled value in combined marketing and these are discussed in section 0. Collaboration also fosters an increase in size and scale and this is a factor that anecdotally supports future development and should be considered when developing scenarios for modelling.

#### **4.6.1 Need for scale**

An opportunity for improved productivity/profitability exists in the increasing scale. This can be achieved through collaboration. Some of the more traditional activities, such as farming have taken a collaborative approach to increase scale and see positive results and increase return for shareholders. Other niche industries would benefit also and some have begun investigating options, but have yet to take the leap. A closer inspection may indicate that particular industries will benefit more but in general those industries that are land based will be key benefactors of this approach.

Quantitative modelling as part of the next phase of the project will better illustrate the impact that scale can have on return and give clear indication of the opportunity that increasing scale provides.

#### **4.7 Leadership**

It was evident that good leadership within entities and between entities is a key factor to success. Leadership is important at both a management and governance level. As indicated in the previous section, leadership that has an appetite for risk results in investigation and development of new ideas. In general, entities with good leadership had good results.

#### **4.8 What does this mean for Māori and the science sector?**

It is clear that information needs to be available and disseminated in a more understandable and useable format. These improvements will enable both Māori entities and research organisations to understand and appreciate the value of working relationships.

It is evident that Māori entities are not homogeneous. Knowing this, a more tailored approach regarding the engagement of Māori entities in science and innovation is more likely to succeed than a one size fits all approach.

**Error! Reference source not found.** gives clear indicators of where there is a high level of engagement in science and innovation and identifies areas of low uptake. This can be used by the science sector to formulate a more tailored approach.

There is a correlation between appetite for risk and engagement in science and innovation. This knowledge provides an opportunity for science and innovation to inform decisions by providing information to mitigate risk from new initiatives.

A more collaborative approach will foster communication and the sharing of information. Collaboration could reduce the entities that research organisations need to liaise with and reduce duplication, increasing cost efficiencies and ultimately increase productivity/profitability. Findings illustrate key factors that influence engagement in science and innovation enable the science sector to undertake a more focused approach to engagement.

Good leadership is imperative in developing pathways for Māori entities.

There is the potential for Māori entities to get a head start within new and emerging industries through working with research organisations. These investors may wish to minimise their outputs and drive niche high-value products. These investors may also be looking at their position in the value chain and are interested in value-add propositions. This will create a need for an integrated approach by research organisations and Māori entities across the value chain.

Looking ahead, Māori need to take the step up to engage and invest in the types of technology that research organisations are working with and in. This could include their involvement in higher risk technology, and some of this involvement could be as simple as investing in technology companies. Māori entities need to think more in this space and focus more on the whole value chain and process rather than just simply being at one point in the chain. Evidence also illustrates that a more collaborative approach in this engagement would be more fruitful than a more singular approach.

It is therefore important for research organisations to work with Māori entities to see the big picture and achieve desired outcomes for Māori. The role of science is to identify what the opportunities for Māori entities are and foster working relationships that produce usable outcomes. The role of Māori entities is to build capacity and capability, and engage with the science sector for the benefit of the Māori economy as a whole.

## 5 Appendix 2: Industry issues

In this section we discuss issues of particular relevance to specific industries in the Māori economy. This discussion highlights that towards 2061 all land-based sectors will face the on-going need for research and scientific knowledge and innovative effort to ensure the development of commercial and environmentally sustainable businesses.

### 5.1 Agriculture

There are two main issues currently facing Māori entities involved in agriculture. These are the long-term decline of the sheep and beef industry, and the sustainability of dairy farming. As such, the focus of Māori agribusinesses in the short to medium-term is on sustainable land use and implementing best farm practices.

More broadly, there are also the issues of small uneconomical land holdings and the potential for these holdings to be bought into production, and alternative uses for marginal land.

#### 5.1.1 *Current issues facing the industry*

There has been, and continues to be, a long-term decline in the sheep and beef industry. Estimated returns on investment for sheep and beef farming have suffered due to the volatile exchange rate, and dairy farming continues to remain attractive in the eyes of most farmers.

Meat export volumes and values remain low, due to weak slaughtering volumes caused by weather and a decrease in market demand. However, sheep numbers are up, increasing 2.5 percent to 33.2 million in June 2010, due to farmers continuing to rebuild stock by retaining hoggets. This though, still represents a large decline in the size of the sheep farming sector – from 39.5 million in 2002 and over 57 million in 1990. We further note that export revenue from meat has grown at only 3.9 percent per annum over the past two decades, whereas overall export receipts have expanded by an average 5.2 percent per annum. Average returns to sheep farming remain low and reflects an industry unable to grapple with its seemingly long-term decline.

Beef cattle numbers fell in the same period, down 1.3 percent to 3.9 million, partly due to poor profitability forcing farmers to change to different land uses. Markets in the Middle East, China and Russia continue to strongly demand our meat, which may hold up prices over the 2010/11 season, but volumes will remain muted due to limited supply.

Wool production profitable is low. And farmers in this industry currently lack an alternative positive income stream to support the meat side of their business.

In contrast to wool production, dairy tonnage reached record export highs for the July 2010 year, reaching 2.1 million tonnes of product. Dairy farming continues to expand in New Zealand, with dairy volumes up 11.7 percent in the July 2010 year and prices up 0.6 percent. With these expansions are concerns about farm intensification.

Environmental concerns about the sustainability of dairy farming and its expansion continues to worry Māori entities, particularly issues around the leaching of nitrogen into waterways and the atmosphere. Increased nitrate leaching from surrounding farms is the possible cause of a change in water quality in our lakes and rivers. And an increase in farm intensification is expected to continue to impact on water quality unless more sustainable farming practices are put in place.

Some Māori agribusinesses have put in place riparian planting of harakeke around and along streams as one step towards dealing with water quality issues, while others are reticulating their water.

### **5.1.2 Broader issues**

There are significant areas of Māori land – predominantly comprised of small holdings – that are generally considered uneconomical due to a lack access to water, roading, or other services. These holdings have often reverted to scrub; they may have some patches of grass for a few subsistence livestock or are leased to neighbouring farmers for nominal rent. Often this land has poor governance structures in place or no administration.

### **5.1.3 Land use information - unlocking constraints, improving productivity**

Land use information could enable Māori entities to work together to resolve these issues. It could also provide direction on how to utilise the land to its greatest potential and take advantage of future opportunities. Land use information may be able to highlight the potential use of marginal land for wind farming, carbon farming, biofuels, or apiculture to produce high-activity manuka honey on regenerating scrubland. It may also enable informed decision-making about partnerships and collaborations with other groups that are involved in strategies such as carbon farming, geothermal, eco-tourism or horticulture ventures.

Many Māori entities already consider land use information important to their future development, particularly if their asset base is currently concentrated in the primary industry and land ownership. The focus here is on yield and ensuring the productive use of land, and alternative land uses for less productive land rather than the retirement of land.

The land use information Māori entities are interested in includes:

- soil profiles including nitrogen and phosphate levels, and fertiliser rates, as soil quality and potential is a vital input into the farm, and information on soil resources can help to improve land use management and decision-making
- how properties can either be joined to work together or should be worked as separate farms
- stock units each parcel of land can hold, and what breed of animals should be farmed on this land
- feasibility studies to determine what the land is suitable for (in addition to the soil profiles).

This type of information is needed to ensure the land is used to its full potential in an integrated way.

Māori entities who are interested in this type of information want to concentrate on lifting performance through investing in their farm rather than looking at investment options beyond the farmgate, and use their own land to make and grow their income rather than diversify their interests into another area.

Māori entities with farm and forest interests are also considering the incentives to farm carbon, for themselves and on behalf of others. There are potential opportunities for Māori entities to get involved in carbon farming. Carbon farming allows land owners to acquire carbon credits (NZUs) through growing trees. The carbon credits can then be traded, and are bought by organisations that need to offset their carbon emissions. Land used for carbon farming can also be used to produce non-timber products like honey. This provides a viable opportunity to gain returns from marginal land and could potentially provide a revenue stream and incentive for preserving indigenous forests.

## **5.2 Horticulture**

Māori entities are currently involved in citrus fruit, tree vines such as avocados, kiwifruit, pipfruit such as apples and pears, and grapes. These products are sold locally and exported. Similar to farming, climate and weather conditions can impact on volume and prices, along with world prices. Consumer preferences for varieties can also change and this impacts on the demand for produce and prices. In the future, water supply and irrigation may become an issue for some horticulture ventures.

### **5.2.1 Current issues facing the industry**

Issues that are impacting on this industry are focused on export prices, volumes, and varieties. The Government has stopped investing in biodiscovery (flora and fauna, including enzymes, bacteria and viruses) while they await the outcome of WAI 262. It is unsure what impact this will have, if any, on the horticulture industry.

Demand in our key apple markets, the United States and the United Kingdom, fluctuate in terms of prices and volumes. Key export varieties are expected to remain the same, Royal Gala, Braeburn and Jazz apples, but the introduction of new varieties will continue, with new apple and pear varieties currently being trialled in orchards in the top of the South Island.

For those entities involved in pipfruit, the World Trade Organisation ruling that declared Australia's boycott of New Zealand apples illegal will be closely followed; particularly as the Australian Government looks set to appeal the judgment, and it may take – even without this bump in the road - until 2012 to get the Australian export market operational.

Kiwifruit volumes are expected to continue to grow, and with it the price per tray. However, prices in key export markets can be impacted by the weather, pollination, and fruit size. While drier weather can positively impact on the taste of the fruit, it can also impact on the size of the fruit, which in turn impacts on price. Some Māori entities involved in kiwifruit orchards are considering changing from green to gold kiwifruit due to the higher prices these fruit reach per tray.

### **5.3 Forestry**

Māori are substantial players in the forest industry, and are considering moving into a more active role in the wood processing industry. Current major players in the industry include entities such as Ngāti Hine Forestry Trust, Lake Taupo Forest Trust, Lake Rotoaira Forest Trust, Ngāti Porou Whanui Forests, and of increasing importance and scope, the Central North Island (CNI) Iwi Collective.

Exotic plantation forestry is often harvested at a level that can be sustained indefinitely. The logs are sold to a variety of mills for further processing and exported as logs. Some Māori entities also have indigenous forestry interests, and parts of these forests are suitable for sustainable harvesting. Often privately-owned forest management companies undertake contract management of the forest.

Key issues that Māori entities face in this industry include fluctuating log, timber and pulp prices, the tyranny of distance to market and associated transport costs, the impact of the

Emissions Trading Scheme, and the employment and retention of skilled silviculture and harvesting crews.

### **5.3.1 *Current issues facing the industry***

Some Māori entities have substantial forest leases and are beginning to see a return on these leases through the harvesting of the forest. These returns can include a return on the value of the land and stumpage. Depending on the age of the trees, the commercial harvest of the first rotation of trees may only now be happening. Harvesting may continue for a long period, in some cases up to 10 years, and the same harvesting contracting company may be involved throughout this time and then move on to harvest other forests in the same area. This is important as it creates employment opportunities for people who live locally and these jobs are permanent. This ensures the Māori entity fulfils what is often part of their trust deed – to create employment opportunities within the forest for shareholders.

Other Māori entities are involved in forestry with the Crown. In these situations the Māori entity provided the land while the Crown provided the funding and expertise to establish and manage the forest. Over time the land is then returned to the Māori entity and the fully-owned land is gradually increased. In these situations the Māori entity may use their share of the profits from the first rotation of harvesting to fund the planting of the second rotation and the harvesting of this rotation.

### **5.3.2 *Land use information - unlocking constraints, improving productivity***

Forestry is a long-term investment. Some Māori entities with substantial forest leases are beginning to focus on alternative investments due to concerns that they are over-exposed to forestry. Questions are also being posed about how to use income acquired through stumpage and rental from forestry leases to further grow the asset base and provide employment.

Forestry may be the best option for their land, but Māori entities may want to use the profits from harvesting to invest in other opportunities such as horticulture or commercial property. There is also the opportunity to look at forestry in terms of wood, carbon, nutrients, and biofuels.

## **5.4 Fisheries**

Māori involvement in fisheries has grown substantially following the Māori Fisheries Act 2004. The Act implements the agreements reached in the deed of settlement in September 1992 and provides for the development of the interests of iwi in fisheries, fishing and fisheries related activities. The Act does this via a framework for the allocation and

management of settlement assets. Some of the settlement assets are allocated and transferred to iwi while others are managed by Te Ohu Kaimoana.

The key, but not sole, requirement for receiving fisheries settlement assets is the recognition of a representative iwi organisation as a mandated iwi organisation (MIO). Recognised iwi organisations are those organisations recognised by Te Ohu Kai Moana Trustee Limited (TOKMTL). Once a MIO has been established, each iwi receives a minimum asset package of \$1 million. Iwi also receive a mixture of quota; income shares in Aotearoa Fisheries Limited; and cash. This allocation is based on the length of their coastline, and the size of their population relative to the total Māori population as per the Māori Fisheries Act 2004.

#### **5.4.1 Broader issues**

Māori are interested in getting involved in different parts of the fisheries value chain such as growing, marketing, processing, transport and logistics, and selling. All MIOs want to strategically manage and grow their assets through sustainable fisheries. Strategic management includes how this asset base can provide long-term social and economic benefits, particularly employment, and the steps necessary to move into business operations. Despite this goal, each MIO is at a different stage of development.

Some MIOs have their governance structures and organisational capabilities in place. Others are still in the settlement phase, or have strategies in place and are looking to the future.

Some MIOs are collaborating to grow their asset through economies of scale. Tuhoe, Te Rarawa, Ngāi Te Rangi, Ngāti Awa, Te Whakatōhea, Ngāti Tai, Ngāti Whare, Ngāti Manawa, Ngāti Tūwharetoa, Te Arawa, Ngāti Porou, and Ngāti Ruanui have a multi-year ACE leasing agreement (MYAA) with Aotearoa Fisheries Limited. This agreement has been in place since 2006-07, while Taranaki became a partner in 2007-08, followed by Rangitaane in 2008-09. The current MYAA partnerships are due for renewal in the 2009-10 year.

Māori entities actively involved in fisheries are aware that they need to diversify their interests in this area but it is difficult as their allocation includes fish stocks and shares in Aotearoa Fisheries Limited. Diversifying cash flows and managing risk is important but overall the issue with fish stocks has to be dealt with. Constraints include capital and business expertise in the fisheries area. While many will not necessarily look to buy boats and fish for themselves, they will consider investing in aquaculture and the marketing of their product domestically and offshore.

Aquaculture is a fast growing sector of the fishing industry. The Government has highlighted the aquaculture sector as a priority area for economic growth and has set a goal for this

sector to be a sustainable \$1 billion sector by 2025. Currently, approximately 66 percent of New Zealand aquaculture is exported. For this sector to grow, it has been argued, it is important that research and innovation is transferred into successful commercial enterprises that sell seafood products.

Māori are significant players in the aquaculture sector, and this is considered a growth area for many Māori entities. However, the challenge with aquaculture is the large capital investment required to invest in these ventures, and undertake science and innovation related to aquaculture.

#### **5.4.2 *Fish stocks and new species the current focus***

Several fisheries development projects are being undertaken by Aotearoa Fisheries. These projects are looking to develop new products for the domestic and export market, and to maximise value from quota. Two new species being examined are surf clams and deep-water crabs.

Māori could become key players in the eel aquaculture industry. Eels are a taonga species, and some iwi have obtained access to glass eel seed stock as a result of Treaty of Waitangi claims. Others have developed an interest in this area through fishing company and quota interests.

Aotearoa Fisheries is not directly involved in eel fishing or processing but is looking into options in terms of eel quota. This includes potential pilot projects with iwi that look at the capture and identification of eel species, and using juveniles to enhance the availability and sustainability of the species.

### **5.5 Natural resources**

Māori entities are passively and actively involved in the exploration and utilisation of natural resources. Passively, they are providing resource access to power generation, exploration and extraction companies, while actively they are involved in providing equity, and undertaking joint ventures and partnerships.

#### **5.5.1 *Geothermal electricity generation***

The conversion of geothermal heat to electricity is the most optimal use of a geothermal resource. New Zealand has the capacity to generate 435 thermal megawatts (MWt) of geothermal electricity. This is the seventh largest in the world. However, we only use 310 MWt of that geothermal electricity for direct heat utilisation.

Presently, the main uses for direct heat are industrial processes heat (67 percent), agricultural drying (nine percent), bathing, swimming and balneology (nine percent), space heating (eight percent), fishing and animal farming (six percent), and greenhouse heating (one percent). More than 90 percent of the annual energy from direct heat uses in New Zealand is derived from wastewater from geothermal power stations and little use is made of other sources such as hot spring systems.

### **5.5.2 Current issues**

In terms of future potential, geothermal power generation is limited as this is a finite resource. One of the barriers for Māori is therefore understanding the capacity of this resource, particularly as 100 Megawatts (MWt) or greater is needed to generate power.

However, there is the potential to explore low temperature geothermal resources. These resources are increasingly being utilised globally. In New Zealand, warm to hot springs (just above ambient to 100 degrees Celsius) that can be used for direct heat applications are found in more than 150 locations in the North and South Islands, outlying small islands of the North Island and the Kermadecs. However, less than 20 percent of these warm to hot springs are being exploited.

### **5.5.3 Broader issues**

Māori entities are currently involved in this industry, particularly in ironsand mining and aggregates, and there is the potential for greater involvement in petroleum, oil and gas exploration offshore, and mining above and below ground. However, questions are being posed around resources such as, how does exploration and exploitation fit with our business values and sustainable business practices?

There is also the opportunity to get involved in electricity generation. Māori entities may be approached by power generation companies to partnership with them. For example, there may be the potential for a Māori entity to operate a mini-hydro plant on their land. The power generation company may approach them to get involved in this type of project. In this case, the Māori entity provides the land for the project, and receives an income from the rent of this property and a share of the profits. The power generation company will undertake feasibility studies such as water flow tests to determine water flow consistency.

Māori entities are also considering other forms of energy development such as wind. However, Māori entities can be located in places that are removed from the national grid, which can limit their opportunities to provide national power generation. In most cases, Māori entities have very limited capital available to them to invest in energy development such as power generation, they also have very limited experience of working on projects of

this size, and some Māori entities may also be suspicious of dealing with large companies. There may also be impediments due to the RMA, and slow decision-making internally due to working as a multiply-owned entity.

## **5.6 Commercial and residential property development**

Some Māori entities have embarked on substantial urban development projects, building new retail developments, malls, farmers markets, local government buildings, and hotels. Others have bought existing commercial properties and become landlords. These properties can be in New Zealand and/or overseas.

At a more local level, some Māori entities have got involved in the provision of community services such as landfills, worm farms, composting and recycling to process a diverse range of local waste products such as paper fibre waste, human effluent, and animal effluent. While light industrial or commercial development in smaller settlements and towns are beginning to involve Māori entities working in collaboration with local government or other Māori entities in joint venture operations. Landcare Research, for example, is involved in research that links urban planning with Māori values to ensure developments are sustainable and meet cultural values.

Entering the commercial property and commercial property development market is seen as a long-term income base for some Māori entities. However, there are some potential tensions with this type of investment, and some entities have made a conscious decision not to invest in properties related to gambling, alcohol or tobacco, and are cautious about the tenants they lease to.

Another area of the property market that some Māori entities are entering is the provision of affordable housing. In many parts of New Zealand, there is a need to increase the supply and quality of housing in an area, and in some cases help Māori into home ownership. As a result, some Māori entities are actively working with Housing New Zealand (HNZ). With HNZ there are opportunities to purchase houses and then lease the property back to HNZ. These houses are 100 percent financed and have 10 years interest free to help assist the group who are trying to purchase the houses. HNZ deals with the tenants and the maintenance of the properties.

Other entities have looked at multiple-owned Māori freehold land within their area and explored the potential for housing development based on a growing Māori population with housing needs. These entities are working to access loan funds to build housing on multiple owned Māori land and include funding for infrastructure costs. Working with HNZ, owners of Māori land, and members of their entity to provide a flexible home lending package that will allow Māori to build and own homes on multiple owned Māori land.

## 5.7 Other

Tourism is a sector that has attracted the interest of some Māori entities, both small and large. The New Zealand tourism experience indicates that in general a minimum of six to eight activities or attractions are needed to initially attract people to an area. This number is then likely to grow to about 12 to 15 activities or attractions in a mature tourist node.

This highlights benefits to collaborative efforts in such an industry, with structures within the industry well established through the network of Regional Tourism Organisations (RTOs).

Environmental-based attractions or experiences (including 'eco-tourism') continue to grow in popularity as business ventures. However, the risk for the tourism industry, both in general and particular for Māori, is its current high-volume, low-value model for development. This potentially drives the industry outcome into a sector offering predominantly low-wage, low-skilled jobs. This risk reinforces the imperative for the development of innovative, high value, offerings.

Health, education, social services activities are dependent on central government funding and associated policies. Consequently, activities in these areas have a short-term focus based on their funding or contractual arrangements and their longer-term development is likely to be restricted.

## 6 Appendix 2: Current engagement in science and innovation

In this section we discuss specific industries within the Māori economy that are currently engaging with the science sector and the research, development and innovation effort. This discussion highlights the significant potential role science and innovation could play in adding value to the Māori economy, and the opportunities that exist given the characteristics and growing contribution of the Māori economy to the wider New Zealand economy.

### 6.1 Agriculture

Current engagement with science and innovation centres on the integration of farming systems to improve yields, increase farm productivity, and provide a quality end product to customers. Current investment in science and innovation is therefore geared towards the land and improvements to the farming business. These improvements include:

- infrastructure such as irrigation and water reticulation
- increasing the health and well-being of their animals including genetics and animal husbandry
- water quality research including research on nitrate leaching
- increasing sustainable farm practices through alternative forage sources such as lucerne, maize, and different grass species to reduce leaching
- pasture development including regrassing of old pasture
- subdivision or joining of properties together
- repairs and maintenance on the property such as fencing, as well as farm property development
- professional development of farm staff.

Farm consultants can, and have, played a key role in this process. Improvements to farms are occurring through the implementation of analytical models that consider the whole farm and its systems and practices. These models can lead to new farm systems and practices, and in turn improved production and financial performance.

This occurs as an integrated system of farm management allows Māori entities to control the various parts of their farm, and have all the information and data about their farm in one

place. This allows them to look at ways to improve their business and to consider science and innovation as a key part of their business operations. Further down the track, it may also allow Māori entities to better understand the needs of their wholesale and retail customers.

Māori entities could also begin to actively work in the areas of sustainability and biological farming systems through this integrated system, and the farming strategies that may result from this. These systems could potentially look at the inter-relationships between valley and land development, and the different aspects of land development. If Māori are farming on the hill country, flats and by the sea, then what one group is doing with their land impacts on the land being farmed by others in the same valley.

Farm monitor programmes are also run through research organisations such as AgResearch or regional councils such as Horizons. These programmes can employ consultants to help increase the production of the farm, provide advice on farming practices or farm management to lift the performance of the property, or help the Māori entity to make prudent investments in their farm.

Examples of research organisations currently working in this space include Landcare Research and AgResearch. Examples of projects include Iwi Futures, a project that examines individual Māori land blocks as case studies. It does this by examining the decision-making processes of Māori land trusts and incorporations to determine what these trusts and incorporations “need to know” and the quality of this information. It considers models and guidelines, good governance structures, and how these structures can be used when new technology, research or innovation activities are brought to the table.

Projects such as this allow science organisations to understand what is important when it comes to decision-making, and how to target those Māori entities that have a high ability to engage, and embrace these activities and ideas. It also means in the case of Māori entities, research organisations and the business are getting down to individual blocks of land and paddocks – this is when the focus is on lifting productivity and optimising the land-use potential of the land, as well as benchmarking.

## **6.2 Horticulture**

For large Māori entities involved in horticulture, getting involved in research and innovation is a natural part of being part of an industry. The options therefore centre on whether to work with an entity such as Turners and Growers to investigate various research and innovation options or to develop a strategic partnership with a local player such as a local horticulture or viticulture consultant. This research and innovation could involve looking at:

- new varieties, new flavours, or niche high-value products
- soil profiles
- planting programmes including the viability of alternative crops
- soil management programmes
- decreasing the use of sprays and considering more sustainable methods of production
- the utilisation of new technologies to improve productivity.

This type of research is focused on optimal land use to drive the optimal performance, or at least to open the entity up and provide them with access to, the drivers to optimal performance.

Looking ahead there is the opportunity to complete more research in the areas of value chain relationships and marketing. There are opportunities for further customer and market research to be undertaken, along with research that investigates whether an entity enters the wholesale and/or retail markets rather than just being a supplier.

Māori entities are currently involved in citrus fruit, tree vines such as avocados, kiwifruit, pipfruit such as apples and pears, and grapes. These products are sold locally and exported. Similar to farming, climate and weather conditions can impact on volume and prices, along with world prices. Consumer preferences for varieties can also change and this impacts on the demand for produce and prices. In the future, water supply and irrigation may become an issue for some horticulture ventures.

### **6.3 Forestry**

Māori entities are also considering the use of the land beneath the canopy of their trees for alternative crops such as wild ginseng and manuka honey. This is where current engagement with science and innovation is focused.

Under the canopy of plantation forestry ginseng can be grown. There are two variants of forest grown ginseng, woods grown and semi-wild. Again, it is important to consider the soil and climate of the area, as well as pests to determine if the land is suitable for this type of alternative crop. Plant and Food Research are currently working with Māori entities with forestry interests to grow semi-wild forest grown ginseng.

Harakeke growing can also be complementary with forestry and farming interests. Harakeke has many uses including the use of the base of the harakeke for gel in lotions and naturaceuticals; different grade fibre for clothing as well as within building materials such as

earth bricks or natural fibreglass; and as flax seeds that can be used for food and food flavouring. The flax seeds can also be used as a wax for waterproofing. Harakeke research is also being carried out by IRL and Plant and Food Research in association with Māori entities.

An area of growing interest is manuka honey and the harvesting of manuka honey with a UMF 20+. UMF is an antibacterial property that is naturally present in some strains of manuka honey. Manuka honey with a high UMF is highly sought after due to its health and healing properties, particularly in wound care. The higher the number following the UMF logo, the greater the strength of the antibacterial properties present in the honey.

Land used for carbon farming can also be used to produce non-timber products like honey. This means there is the potential opportunity to align forestry interests with developing areas of Māori interest. Beekeeping and apiculture is also complementary with successful horticultural production and these hives could be domiciled within or beyond the entities area of interest.

There can also be the opportunity for Māori entities to offset the carbon footprint of another large commercial entity. For example, a Māori land trust could grow a forest on their land to offset the carbon footprint of a large power generation company. The advantages of carbon farming has been discussed in the section on farming, as some marginal land on farms can also be used to grow trees for carbon farming.

Māori are substantial players in the forest industry, and are considering moving into a more active role in the wood processing industry. Current major players in the industry include entities such as Ngāti Hine Forestry Trust, Lake Taupo Forest Trust, Lake Rotoaira Forest Trust, Ngāti Porou Whanui Forests, and of increasing importance and scope, the Central North Island (CNI) Iwi Collective.

Exotic plantation forestry is often harvested at a level that can be sustained indefinitely. The logs are sold to a variety of mills for further processing or are exported as logs. Some Māori entities also have indigenous forestry interests, and parts of these forests are suitable for sustainable harvesting. Often privately-owned forest management companies undertake contract management of the forest.

#### **6.4 Fisheries**

One of the major players in this area of research is NIWA. This CRI has 88 partnerships with Māori throughout New Zealand including memorandums of understanding, letters of agreements and contracts to establish and maintain these partnerships and relationships.

Research that has been completed by NIWA in the past, or is currently being undertaken, involves the taking, growing, culturing, and restoration of species such as eels or freshwater koura, or cultures such as seaweed culture.

Māori entities may take a conservation or restoration approach to this area of research or approach it from the point of view of growing their business and using the research for business purposes. A business approach may focus on hatcheries or brood stock, or it may look at waste streams from inshore fisheries, and how to use the leftovers from one part of their company to make other products such as bioactive compounds.

## **6.5 Natural resources**

GNS Science is currently completing a variety of research projects with Māori entities in the areas of natural resources and geothermal power generation. The role of this research organisation in these projects is to act as an advisor and assist Māori entities to find JV partners.

GNS Science is working with Māori entities in emerging areas such as petroleum exploration and minerals. Māori entities want to understand the potential of their land, and this can include geothermal and mineral resources. Minerals are very much at the forefront of issues due to the current political environment, particularly around the foreshore and seabed. However, understanding geothermal and mineral resources can also involve understanding hazard risks such as flooding, erosion, and landslides. This information is important as it potentially limits the future development opportunities and potential of the land.

GNS Science argues that natural resources have the potential to provide a range of commercial and non-commercial benefits, but this resource utilisation must be consistent with long-term Māori custodial responsibilities. Scientific investigation can therefore provide the starting point, but Māori entities need to develop realistic and sustainable development options that have community support and appeal to commercial partners.

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