

Economic Analysis of Prototype Interventions to lift Māori Agribusiness Productivity

*Ministry for Primary
Industries*

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Executive Summary

The Ministry for Primary Industries has engaged PwC to further develop a framework for analysing the potential economic impact of increasing the productivity of Māori land. Our report:

- builds upon earlier work on the sector – in particular, a February 2013 report by PwC that developed a preliminary analysis of the potential gains on Māori land.
- presents results from an economic model of four industries that comprise the primary sector and economic cost-benefit analyses of a set of prototype interventions in the sector
- is intended to assist MPI in understanding the potential value from Māori land and identifying opportunities to targeting their resources to achieving this value.

In our overall report, we describe the development of an economic model for analysing the potential economic gains from improving Māori land at a regional and national level. This model extends earlier work undertaken by PwC. We have developed a model that:

- is based on the National Accounting framework used by Statistics New Zealand and which uses a variety of historical and forward-looking data from MPI and industry sources to model expected future outcomes
- allows for the analysis of different scenarios for bringing Māori land into production, and which incorporates MPI assumptions and data on the sector
- produces outputs for four agricultural industries (dairy; sheep, beef and wool; forestry; horticulture) at a national and a detailed regional level.

The results of the national and regional economic models are reported in the associated report. This report contains the results of the prototype assessments that we have conducted using those models and additional information provided by MPI and the prototype group leads.

Prototype assessments

Outputs from the regional economic models have been used to conduct case studies of six prototype interventions currently being developed or implemented by MPI. The analysis suggests that these interventions could deliver national economic benefits in excess of their costs. Main findings include:

- A prototype intervention aimed at maintaining productivity and reducing working costs of an existing dairy farm results in a large economic returns relative to its economic costs, suggesting that interventions targeted at improving the productivity of existing agricultural activities are most likely to provide value for money.
- A prototype intervention aimed at raising the productivity of existing kiwifruit orchards also results in relatively large economic returns relative to costs.
- Two other prototype interventions aimed at establishing dairy farms on land currently used for other purposes also show good economic returns, albeit at a higher economic cost due to the need to undertake dairy conversions.
- Interventions targeted at raising the productivity of manuka / kanuka scrubland by introducing apiculture also result in economic benefits in excess of their costs, suggesting that there is likely to be more potential in this area given Māori ownership of a significant amount of native bush.

A summary table of the estimated benefits and costs associated with the prototype interventions, including MPI's costs as well as prototype group and co-funder contributions to each project is included in the Appendix A.

Economic analysis of prototype interventions

Outputs from the regional economic models, along with actual information on land, farm or orchard operations provided by MPI prototype leads, have been used to conduct economic cost-benefit analyses of six prototype interventions currently being developed or implemented by MPI. The analysis suggests that these interventions could deliver national economic benefits in excess of their costs. Main findings include

- **several prototype interventions associated with dairy farming result in large economic returns relative to their economic costs, reflecting the high productivity potential of dairy farming**
- **a prototype intervention in the horticultural sector also shows good economic returns**
- **interventions targeted at raising the productivity of manuka / kanuka scrubland by introducing apiculture also result in economic benefits in excess of their costs, suggesting that there is likely to be more potential in this area given Māori ownership of a significant amount of native bush.**

Overview of prototype interventions

We have completed an indicative analysis of six prototype interventions targeted at upgrading the productivity of Māori-owned land or enterprises. Table 1 describes these prototype interventions and summarises some key facts about the six prototypes that are included in the analysis.

Table 1: Six prototype interventions

Name	Description	Aspiration	MPI Intervention	Impact of MPI intervention
Prototype 1	> 2000 ha block in Northland used for dairy farming.	Successful transfer of land asset from Crown to Iwi as part of Treaty settlement along with establishment of partnership to ensure no loss in productivity.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • A formal partnership agreement between Iwi and amongst Iwi and a farm management partner. • Greater knowledge of the financial and operational performance of the land asset • Compare and consider alternative land use options. 	<ul style="list-style-type: none"> • No loss of productivity associated with the land through the asset transfer. • Establishment of a solid partnership between Iwi and farm management partner to progress further productivity gains.
Prototype 2	>500 ha Māori land in Northland administered by an Ahu whenua trust.	Convert from leasing to dairy farming to raise productivity of land.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • Dairy farm plan that considers the environmental, social and cultural needs of their shareholders. • Greater knowledge amongst governance of the technical and financial considerations for the dairy conversion and operating entity. 	Enabling and accelerating an increase in productivity in Māori land.
Prototype 3	Multiple Māori land blocks totalling >300 ha in the Bay of Plenty.	Shift from leasing to establishment of a collective management structure for the land blocks to enable a dairy farm conversion.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • Feasibility study on a dairy venture that considers the environmental and cultural needs of their owners. • Greater knowledge of the business structures to enable collective action while retaining original ownership. 	Enabling and accelerating an increase in productivity on Māori land.

Name	Description	Aspiration	MPI Intervention	Impact of MPI intervention
Prototype 4	>5,000 ha of high country Māori land in Hawke's Bay with manuka honey potential.	Develop beekeeping / manuka honey production through a licence or lease arrangement with a beekeeping company.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • Feasibility study and financial analysis of a bee venture. 	Enabling and accelerating an increase in productivity on Māori land.
Prototype 5	>6,000 ha of Māori land with manuka honey potential in the Central North Island.	Consolidation of disparate beehives currently on land and further development of manuka honey production.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • Stock take of current land assets suitable for manuka honey. • Feasibility study of surrounding Māori land assets suitable for collaborative manuka honey venture. 	Enabling and accelerating an increase in productivity on Māori land.
Prototype 6	Approximately 100 ha of existing Māori owned kiwifruit orchards in the Bay of Plenty.	Invest in raising productivity through better orchard management and introduction of alternative kiwifruit species.	<p>Access to expert advice and information to enable informed decision making to achieve the following:</p> <ul style="list-style-type: none"> • Stock take of productivity of existing orchards. • Greater knowledge of the business structures to enable collective action while retaining original ownership. • Development of an orchard management plan that considers the environmental, social and cultural needs of their shareholders. 	Enabling and accelerating an increase in productivity of Māori enterprises.

PwC has conducted an indicative economic cost-benefit analysis of these prototype interventions. The headline results of this analysis are presented in Table 2, including:

- estimated present value costs and benefits of each intervention
- an indicative benefit-cost ratio that compares benefits to costs. This can be thought of as a measure of return on investment for society
- estimated present value of costs to Government associated with each intervention.

These results indicate that:

- The portfolio of interventions is likely to deliver net economic benefits in excess of the net economic costs, as indicated by indicative BCR ratios that are above one across the board.
- Existing farms and orchards with the potential to raise productivity appear to provide higher economic returns than enterprises that are seeking to introduce new activities.
- Further work may be needed to refine the underlying cost estimates, particularly in the case of Prototype 1 (see below).

Table 2: Headline results of prototype assessments

Name	Estimated economic outcomes			
	Total Costs (PV, \$m)	Costs to Govt (\$m)	Benefits (PV, \$m)	Indicative BCR
Prototype 1	0.3	0.09	5.2	16.9
Prototype 2	2.9	0.09	6.0	2.0
Prototype 3	3.0	0.06	5.5	1.8
Prototype 4	0.7	0.13	1.3	1.7
Prototype 5	2.7	0.06	5.8	2.2
Prototype 6	1.2	0.21	6.0	4.9

Notes: Prototype 1 is unique to the other prototypes as it is not Māori freehold land but is currently a Crown-owned farm that makes up part of a Treaty of Waitangi settlement offer.

Source: MPI data, PwC calculations

We note that the indicative analysis of Prototype 1's interventions show a high benefit-cost ratio (BCR) relative to other interventions. Prototype 1 is currently conducting a 360 degree review of its operations and developing a business plan. The significance of the scale involved in Prototype 1 and the fact that it is an existing working farm implies that further optimising farm operations renders marginal benefits that significantly outweigh the marginal investment costs. Preliminary work has identified an opportunity to significantly reduce working costs through better training of staff resulting in better delivery of feed to stock. The costs of training are reported as modest relative to the potential benefits. However, it is likely that some additional costs related to this overall aim will be identified in the business plan. As a result, we regard the cost estimates for Sweetwater to be conservative.

We employ a similar set of assumptions to those used in the regional analysis. This is an application of an economic model to each individual land block, plus supplementary assumptions as needed. It should not be used as a substitute for a more rigorous financial analysis, given the scope discussion at the front of this document.

As discussed in detail above, economic analyses treat some commercial and financial issues differently from financial analyses, such as the treatment of depreciation and the purchase of shares. The analysis contained here does not consider accounting depreciation and ignores the requirement for a dairy

development to purchase Fonterra shares before supply of milk can take place. This is because shares count as a financial transfer and therefore add nothing to economic activity. Such shares, however, would be counted in the amount of capital required to start the dairy farm and included within a financial analysis.

Methodology for assessing prototype interventions

Cost-benefit analysis

We have conducted a cost-benefit analysis that attempts to compare all **net economic costs** with all **net economic benefits** of each intervention. Our analysis is based on the following principles, which are consistent with Treasury guidance on cost-benefit analysis:

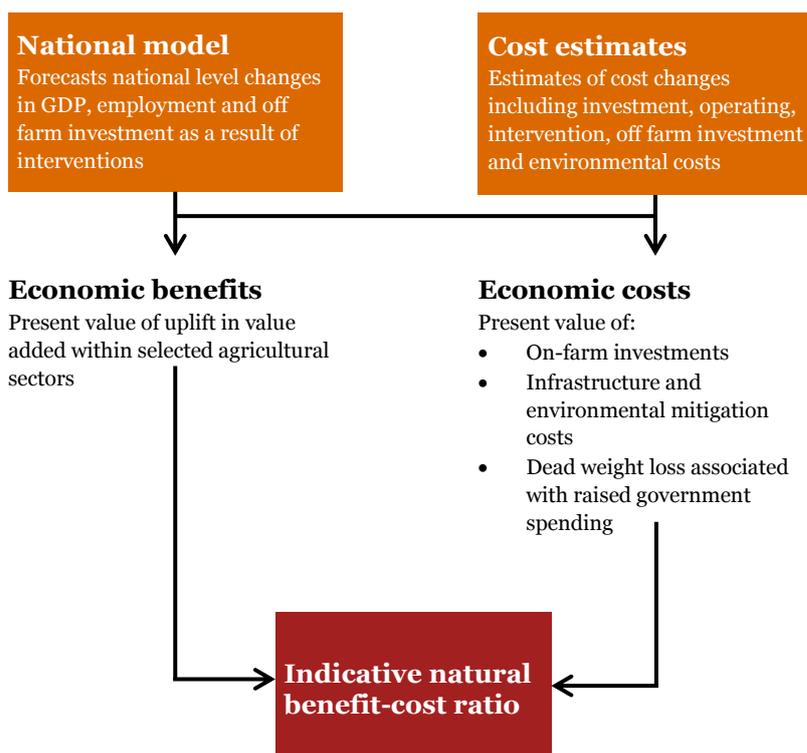
- Net economic costs include all costs to the Government and all net costs to the broader economy as a result of these interventions. Costs to Government account for the deadweight cost of taxation (estimated as 20% of the cost of any new Government spending) and the resource costs of MPI staff. Net costs to the broader economy include new gross fixed capital formation (investment) but exclude some costs that simply represent a transfer of income between parties with no net impact on overall production, such as purchases of Fonterra shares.
- Net economic benefits reflect the net change in value added resulting from these interventions. Value added can be described as a firm's contribution to gross domestic product (GDP). It is equivalent to the wages, salaries, profits, and taxes paid by a business. In order to estimate the net change in value added, we have compared outcomes under an "intervention scenario" with outcomes under a "baseline scenario" in which each land block stayed in its existing uses. For example, if a prototype intervention involved converting a beef cattle farm into a dairy farm, it would entail the loss of existing meat production. This represents an opportunity cost to the conversion, and we would therefore subtract it from the value of the new dairy activities in order to obtain an estimate of the net economic benefits that could not have been achieved without the intervention.
- We have used data and projections from the Regional and National Agriculture Sector models to estimate farms' and orchards' productivity, revenues, and the relationship between gross output and components of GDP. Where possible, we have supplemented these estimates with additional information provided by MPI on the productivity and activities of these farms and orchards. However, we note that there are likely to be some unobserved (or unobservable) variations between the results in the aggregate models and outcomes for any individual block of land.
- The present values of all costs and benefits over the evaluation period (2013-2025) have been discounted using the Treasury's standard discount rate and summed up. An indicative benefit-cost ratio (BCR) has been calculated for each option.

Underlying data and assumptions

The Appendix contains a detailed list of assumptions and inputs underlying the analysis of prototype interventions reported above. We note that in some cases the assumptions or inputs may be incomplete – particularly in the case of cost estimates. We further note that the Regional and National Agriculture Sector models described in this report have provided much of the underlying economic information required to undertake the assessments.

Figure 1 summarises, at a high level, the relationship between the prototype analysis, the regional agricultural models, and the data provided to us by MPI's.

Figure 1: Data underlying prototype analysis



Detailed analysis of prototype interventions

See Appendix A for a discussion of the assumptions underlying this analysis.

As the prototype interventions are expected to upgrade the productivity of the land or enterprise associated with the six prototypes, they can be expected to have effects on several economic variables, including:

- gross output, or the total revenue earned by the farm or orchard before expenses are deducted
- value added, or the net contribution that the farm or orchard makes to NZ's gross domestic product
- employment, measured in terms of full-time equivalent employees (FTEs)
- investment, or gross fixed capital formation associated with new activities.

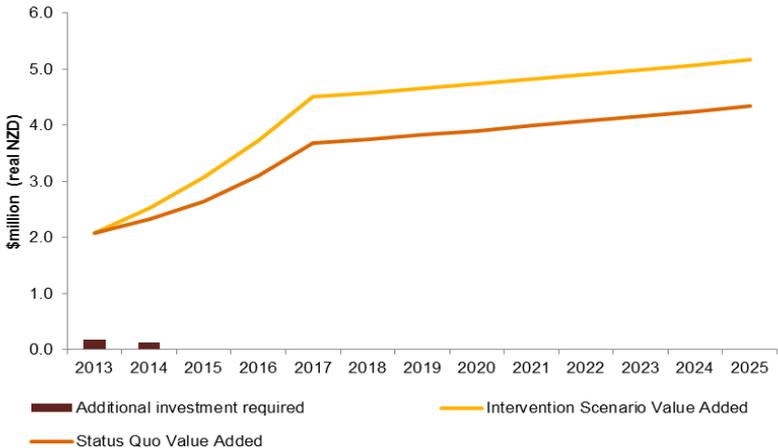
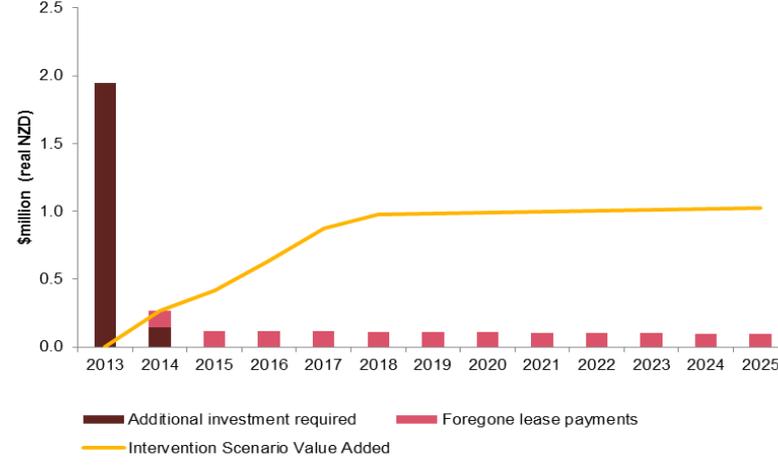
We have used Statistics New Zealand National Accounts data to estimate the relationship between these variables. However, we have not at this stage reported estimated impacts on employment at each farm. This is due to three factors that make it difficult to estimate reliably:

- First, the expected impact on employment at each farm or orchard is small – a change of ten or fewer FTEs – and consequently subject to a relatively high degree of uncertainty.
- Second, we lack information on current employment at these particular farms and orchards, and on factors that may cause them to deviate from regional average employment levels.
- Third, we do not have any information on farm managers' responses to changes. For example, some may be able to raise their productivity without hiring additional workers if some of their workers are not fully employed. Likewise, for the apiculture Prototypes (Prototypes 4 and 5), owners' choice to lease land to an outside beekeeping company as opposed to farming it themselves may affect the labour inputs.

Consequently, any estimates of employment impact are likely to be controversial and may distract from the rest of the analysis.

With those caveats in mind, Table 3 presents the expected annual impact on value added and required investment resulting from prototype interventions in chart format. (A data table that also accounts for changes in gross output is included at the end of this document.)

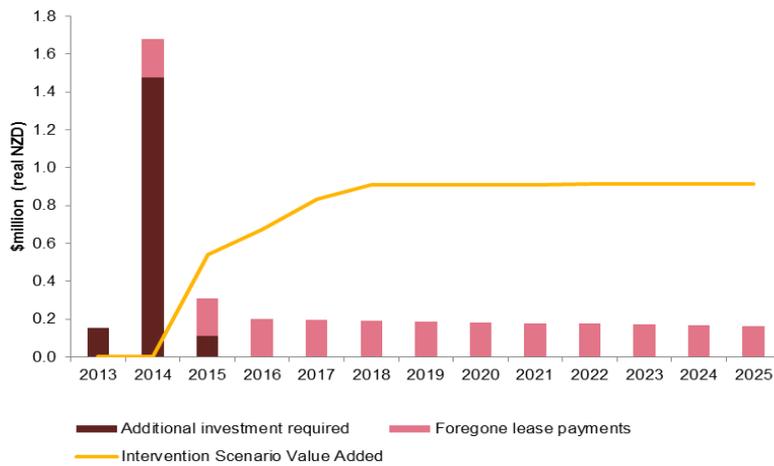
Table 3: Estimated annual impact of prototype interventions on investment and value added

Annual impacts	Notes
<p data-bbox="236 479 847 526">Value Added and Investment Costs, 2013-2025 Prototype 1: Improving farm management to raise productivity</p> 	<p data-bbox="1066 479 1461 613">Not all costs have been identified – investment required to reduce farm working costs may not have been fully quantified</p> <p data-bbox="1066 636 1417 770">Intervention scenario (yellow line) is expected to raise farm value added above status quo scenario (orange line)</p> <p data-bbox="1066 792 1469 994">Annual net economic benefits results from savings in farm working costs, which will result in reduced intermediate consumption and expenditure on wages and salaries.</p>
<p data-bbox="236 1032 820 1079">Value Added, Investment Costs and Other Costs, 2013-2025 Prototype 2: Dairy conversion to raise productivity</p> 	<p data-bbox="1066 1032 1442 1267">Net economic costs result from investment in dairy conversion. They do not include costs of purchasing Fonterra shares (a transfer rather than a net cost) and livestock (intermediate consumption)</p> <p data-bbox="1066 1290 1422 1391">Net economic benefits turn positive in later years as dairy farming ramps up.</p>

Annual impacts

Notes

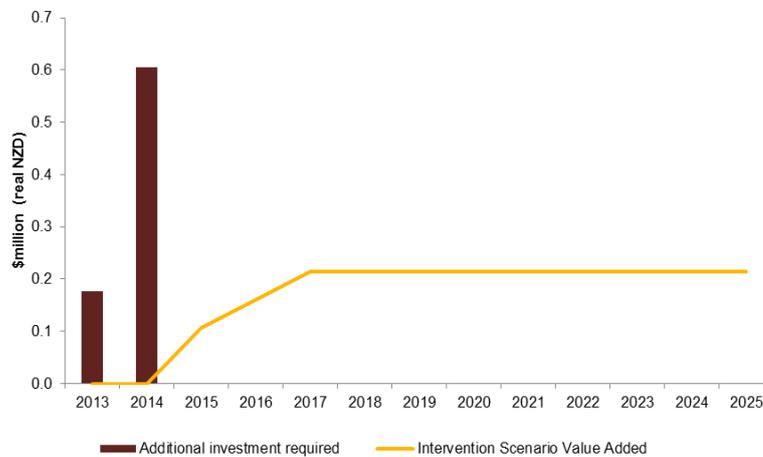
Value Added, Investment Costs, and Other Costs, 2013-2025
Prototype 3: Dairy conversion to increase productivity



Net economic costs result from investment in dairy conversion. They do not include costs of purchasing Fonterra shares (a transfer rather than a net cost) and livestock (intermediate consumption)

Net economic benefits turn positive in later years as dairy farming ramps up.

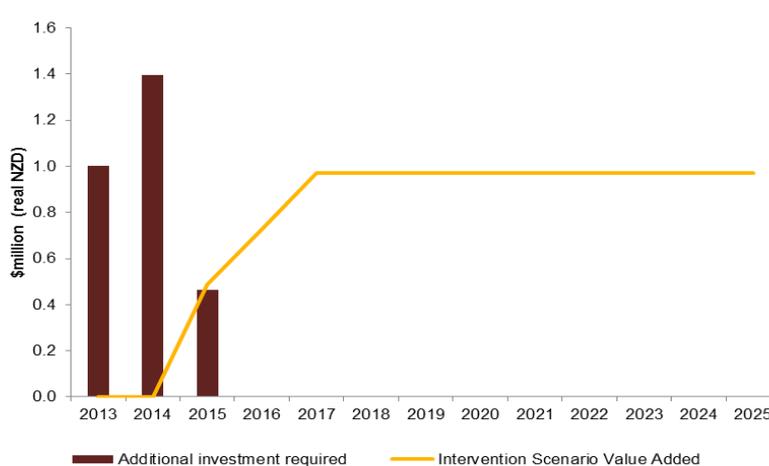
Value Added and Investment Requirements, 2013-2025
Prototype 4: Introducing apiculture to raise productivity



A range of net economic costs is reported, depending upon the intensity of beekeeping activities on the land. Costs are based on the midpoint of the range of costs reported in the MPI Apiculture Model. Some site-specific costs may not have been identified.

Net economic benefits turn positive in later years as apiculture production ramps up.

Value Added and Investment Requirements, 2013-2025
Prototype 5: Introducing apiculture to raise productivity



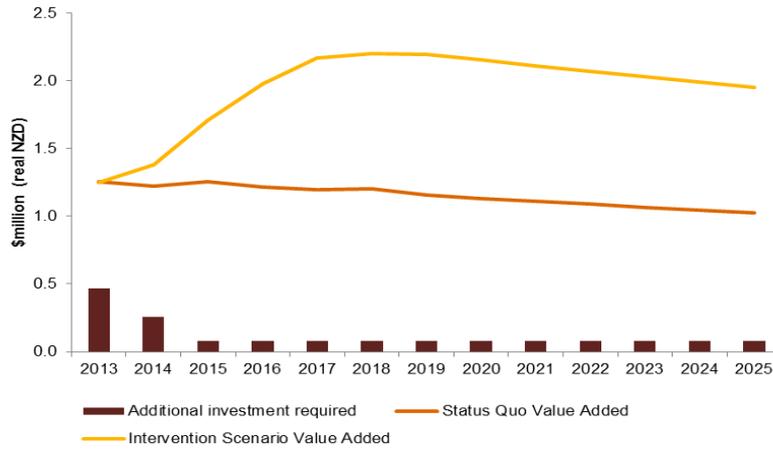
A range of net economic costs is reported, depending upon the intensity of beekeeping activities on the land. Costs are based on the midpoint of the range of costs reported in the MPI Apiculture Model. Some site-specific costs may not have been identified.

Net economic benefits turn positive in later years as apiculture production ramps up. No information on current farming activities on the land is included, although apiculture is not likely to be disruptive.

Annual impacts

Notes

Value Added and Investment Requirements, 2013-2025
Prototype 6: Improving orchard management to raise productivity



Some costs may not have been identified – initial investment in orchard management advice and ongoing increase in operating expenses are currently included.

Orchard's status quo productivity is at the regional industry average; intervention seeks to raise it to highly profitable levels of performance.

Annual net economic benefits result from growth in productivity from better orchard management, which will result in growth in orchard gate revenue.

Appendix A – Inputs and assumptions used in prototype assessment

Table 4: Inputs and assumptions underlying evaluations of prototype interventions

Name	Variable / input	Description / impact	Value / source data
Standard assumptions underlying all prototypes	Discount rate	In line with Treasury's current guidance an 8% real discount rate is used	8%
	Deadweight loss of taxation	Treasury guidance on p18 of their CBA Primer suggests that the deadweight loss of taxation be estimated as 20% of the value of Government spending	20%
	Estimate of MPI time and resources committed to project	This is an estimate of personnel time and other resources used as part of providing prototype funding	Unless other information has been provided by MPI, we have assumed that MPI's staff and overhead costs are equal to 1.5 times their financial contribution.
Prototype 1	Current land use scenario	>2,000 ha dairy farming blocks in Northland with above-average farm working costs per kilogram of milksolids produced.	Farm working costs greater than the national average of \$4.20 / kg.
	Potential future land use scenario(s)	Maintain existing farm management partner as a sharemilker and lower working costs per kilogram of milksolids produced to the national average.	Reduce working costs resulting in an increase in farm profitability and a reduction in intermediate consumption and employment.
	Timing of change	Governance and management arrangements successfully improved by 2014; Farm management partner agreement to remain as sharemilker.	Excess working costs progressively reduced in 2014-2017 as a result of new investment / decisions by Farm management partner and Iwi partners.

Name	Variable / input	Description / impact	Value / source data
	Farmgate revenue	Existing farm productivity greater than the regional average.	Existing farm productivity greater than the regional average.
		Future productivity forecast to grow in line with regional dairy productivity growth.	Regional Dairy Sector model results for Northland used to forecast productivity growth rates 2013-2025.
		Milksolids prices obtained by the farm grow in line with milk prices projected in national dairy model.	National Dairy Sector model forecasts of milksolids prices for 2013-2025.
	Relationship between farmgate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between farm revenue and components of GDP.	National Dairy Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025.
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	\$207,300 Other costs may emerge through the process of business planning.
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$91,750
		Deadweight loss from taxation	MPI funding and in-kind contribution multiplied by 20% (see above).
		Other development costs	Presently unknown.
Prototype 2	Current land use scenario	>500 ha farm in Northland administered by an Ahuwhenua trust and currently leased out for dairy farming activities.	Trust receives an annual lease payment for dairy farming activities by a third party. This represents a cost incurred in the conversion.
	Potential future land use scenario(s)	Convert to a dairy farm with an effective area of half of the total area to raise productivity of land.	Potential future land use modelled as being equivalent to the average productivity of a dairy farm in the Northland region.
	Timing of change	Intervention to take place in 2013-2014; milking to start in 2014	Conversion to dairy farm underway; ramp-up in cow numbers and milk production over a four to five year period.
	Farmgate revenue	Existing lease payments result in a financial gain for owners but no net economic benefit	

Name	Variable / input	Description / impact	Value / source data
		Potential milk solid production and revenue equal to the regional average.	Regional Dairy Sector model results for Northland used to forecast farm revenue for 2013-2025 after a successful intervention.
	Relationship between farmgate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between farm revenue and components of GDP.	National Dairy Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025.
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	\$48,960
		Economic costs of dairy conversion to land-owner	\$1,945,600 in dairy conversion investment over two years. This figure excludes costs of Fonterra share purchases (an estimated \$1.65m), as they are a transfer rather than a net cost to the economy, and livestock purchases (an estimated \$1m), which are counted in farms' intermediate consumption rather than fixed capital formation.
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$86,400
		Deadweight loss from taxation	MPI funding and in-kind contribution multiplied by 20% (see above)
		Other development costs	Presently unknown.
Prototype 3	Current land use scenario	Multiple Māori land blocks totalling >300 ha in the Bay of Plenty.	The land blocks receive an annual lease payment for dairy farming activities by a third party. This represents a cost incurred in the conversion.
	Potential future land use scenario(s)	Shift from passive leasing arrangement to establishment of a management structure for the land blocks that will enable a conversion to a dairy farm.	Potential future land use modelled as being equivalent to the average productivity of a dairy farm in the Bay of Plenty region.
	Timing of change	Intervention to take place in 2013-2015 with milking starting in 2015.	Conversion to dairy farm in 2015; ramp-up in productivity over following five years.

Name	Variable / input	Description / impact	Value / source data
	Farmgate revenue	Existing lease payments result in a financial gain for owners but no net economic benefit.	
		Potential dairy farm productivity and revenue equal to the regional average.	Regional Dairy Sector model results for Bay of Plenty used to forecast farm revenue for 2013-2025 after a successful intervention.
	Relationship between farmgate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between farm revenue and components of GDP.	National Dairy Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	\$20,000
		MPI estimate of co-funder contributions to prototype intervention	\$65,000
		Economic costs of dairy conversion to land-owner	Based on actual conversion costs from Prototype 2. This estimate excludes costs of Fonterra share purchases, as they are a transfer rather than a net cost to the economy, and livestock purchases, which are counted in farms' intermediate consumption rather than fixed capital formation.
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$55,000
		Deadweight loss from taxation	MPI funding and in-kind contribution multiplied by 20% (see above)
		Other development costs	Presently unknown.
Prototype 4	Current land use scenario	>5,000 ha of high country Māori land in Hawke's Bay with manuka honey potential.	No revenues or economic benefits associated with land.

Name	Variable / input	Description / impact	Value / source data
	Potential future land use scenario(s)	Develop beekeeping / manuka honey production through a licence or lease arrangement with a beekeeping company.	Potential future land use modelled based on MPI's Apiculture Model, which provides information on manuka honey production, pricing, and beehive working costs.
	Timing of change	Intervention to take place in 2013-2014	Introduction of beehives in 2014; ramp-up in hive production over following three years.
	Farmgate revenue	No current revenue associated with land.	
		Two scenarios for area required for beekeeping.	MPI provided scenarios for area required per hive: 1.5 ha per hive and 2.5 ha per hive. However only the 1.5 ha scenario is presented in Table 3.
		Beehive productivity (kg honey produced per hive)	Assumed to be equal to the average productivity over the last six years in the MPI Apiculture Model (30.6 kg / hive)
		Manuka honey prices (\$ / kg)	Assumed to be equal to the simple average of high and low prices for active and non-active manuka honey over last 5 years in the MPI Apiculture Model (approx. \$22/kg). This may represent a conservative assumption given growth in prices and the considerable range between high and low prices. As this is an unweighted average of prices for different grades of honey, it may underestimate revenue if, for example, beehives on this land produce more active manuka honey (or vice versa).
	Relationship between farmgate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between farm revenue and components of GDP.	National Other Livestock Farming Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	\$21,000
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$135,000

Name	Variable / input	Description / impact	Value / source data
		Deadweight loss from taxation	MPI funding and in-kind contribution multiplied by 20% (see above)
		Costs of apiculture development	Based on MPI Apiculture Model data on apiculture expenditures. Approximately \$460 / hive in variable costs plus some fixed costs associated with developments. Does not account for roads or other infrastructure at this point. (Excludes livestock purchases, which are counted in farms' intermediate consumption rather than fixed capital formation.) We note that this estimate is likely to exclude some costs associated with, eg, developing access roads to beehives. It is difficult to make an estimate of this without more detailed information on, eg, the planned placement of hives on the land.
		Other development costs	Presently unknown.
Prototype 5	Current land use scenario	>6,000 ha of Māori land with manuka honey potential in the Central North Island.	No significant revenues or economic benefits associated with land. Prototype group are investigating options for commercialising manuka foliage.
	Potential future land use scenario(s)	Consolidation of disparate beehives currently on land and further development of manuka honey production. There is the further potential for engagement with adjoining landowners and the expansion of apiculture onto their blocks; however, this is not currently planned for.	Potential future land use modelled based on MPI's Apiculture Model, which provides information on manuka honey production, pricing, and beehive working costs.
	Timing of change	Intervention taking place in 2013	Prototype group is targeting a 3-fold increase in beehives by the end of 2013 following intervention. Ramp-up in hive production over following three years.
	Farmgate revenue	No significant revenue currently identified.	See above – there are a few minor sources of revenue. However, no information on the

Name	Variable / input	Description / impact	Value / source data
			magnitude of this revenue is presently available. Furthermore, apiculture will not displace these revenues.
		Scenario for introduction of beehives	MPI inform us that beehive introduction has already begun.
		Beehive productivity (kg honey produced per hive)	Assumed to be equal to the average productivity over the last six years in the MPI Apiculture Model (30.6 kg / hive)
		Manuka honey prices (\$ / kg)	Assumed to be equal to the simple average of high and low prices for active and non-active manuka honey over last 5 years in the MPI Apiculture Model (approx. \$22/kg). This may represent a conservative assumption given growth in prices and the considerable range between high and low prices.
	Relationship between farmgate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between farm revenue and components of GDP.	National Other Livestock Farming Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	No current estimate of land owners' contribution.
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$59,580
		Deadweight loss from taxation	MPI funding and in-kind contribution multiplied by 20% (see above)
		Costs of apiculture development	Based on MPI Apiculture Model data on apiculture expenditures. Approximately \$460 / hive in variable costs plus some fixed costs associated with developments. Does not account for roads or other infrastructure at this point. (Excludes livestock purchases, which are counted in farms' intermediate consumption rather than fixed capital formation.) We note that this estimate is likely to exclude some costs associated with, eg, developing access roads to

Name	Variable / input	Description / impact	Value / source data
			beehives. It is difficult to make an estimate of this without more detailed information on, eg, the planned placement of hives on the land.
		Other development costs	Presently unknown.
Prototype 6	Current land use scenario	Approximately 100 ha of existing Māori owned kiwifruit orchards in the Bay of Plenty. Currently underperforming relative to its potential. Land is currently under a variety of ownership and management arrangements.	Current land use modelled as green kiwifruit orchard with the average productivity and revenue of a kiwifruit orchard in the Bay of Plenty region. We note that orchardists do not typically make money by producing at the regional (Bay of Plenty) average.
	Potential future land use scenario(s)	Invest in raising productivity through better orchard management and introduction of alternative kiwifruit species.	Potential future scenario modelled as a green kiwifruit orchard with productivity performance that rises to above the regional average.
	Timing of change	Intervention to take place in 2013-2014	Productivity upgrade to begin in 2014 and ramp up over the following 3 years. New orchards planted 2014.
	Orchard gate revenue	Existing orchard productivity and revenue equal to the regional (Bay of Plenty) industry average. This level is unprofitable or marginally profitable for growers. Typically, only the top quartile of most productive growers are highly profitable.	Data on regional productivity and revenue per hectare for green and gold kiwifruit provided by MPI prototype lead, along with forecasts of increased orchard gate revenues from accompanying data provided. Checked against National Horticulture Sector model results for kiwifruit orchards (which are weighted heavily towards production in the Bay of Plenty due to the fact that almost 4/5 of kiwifruit orchards, by land area, are in the Bay of Plenty).

Name	Variable / input	Description / impact	Value / source data
		Orchard productivity and revenue rises to above the regional average for a kiwifruit orchard after intervention. This change will move the participants from being unprofitable or marginally profitable orchards to very profitable orchards.	Data on regional productivity and revenue per hectare provided by MPI prototype lead.
	Relationship between orchard gate revenue and economic benefits (additional value added, employment, etc)	Forecasts based on National Accounts industry tables used to model relationship between orchard revenue and components of GDP.	National Horticulture Sector model forecasts of value added / gross output ratios (and FTEs/GO) for 2013-2025.
	Costs of development / intervention	MPI estimate of prototype group's contributions to intervention	\$13,125
		Additional ongoing operating costs	\$750/ha annual costs related to orchard management consultant's services. This is likely to be a high estimate as some orchards will see reductions in working costs while others will see minor increases. No capital expenditure is expected to be required.
		Total MPI funding for prototype intervention (including an estimate of MPI's in-kind contribution)	\$208,750
		MPI estimate of co-funder contributions to prototype intervention	\$115,000
		Deadweight loss from taxation	MPI, co-funder and in-kind contribution multiplied by 20% (see above)
		Other development costs	Presently unknown.

Full summary of cash-flows associated with prototype interventions

Table 5: Inputs and assumptions underlying evaluations of prototype interventions

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Prototype 1													
Change in gross output	\$0.0m												
Change in value added	\$0.0m	\$0.2m	\$0.4m	\$0.6m	\$0.8m								
Additional investment required	-\$0.2m	-\$0.1m	\$0.0m										
Prototype 2													
Change in gross output	\$0.0m	\$0.5m	\$0.9m	\$1.3m	\$1.8m	\$2.0m	\$2.0m	\$2.0m	\$2.0m	\$2.0m	\$2.1m	\$2.1m	\$2.1m
Change in value added	\$0.0m	\$0.3m	\$0.4m	\$0.6m	\$0.9m	\$1.0m							
Additional investment required	-\$1.9m	-\$0.1m	\$0.0m										
Opportunity cost of conversion	\$0.0m	-\$0.1m											
Prototype 3													
Change in gross output	\$0.0m	-\$0.2m	\$0.9m	\$1.2m	\$1.5m	\$1.7m							
Change in value added	\$0.0m	\$0.0m	\$0.5m	\$0.7m	\$0.8m	\$0.9m							
Additional investment required	-\$0.2m	-\$1.5m	-\$0.1m	\$0.0m									
Opportunity cost of conversion	\$0.0m	-\$0.2m											
Prototype 4													
Change in gross output	\$0.0m	\$0.0m	\$0.4m	\$0.7m	\$0.9m								
Change in value added	\$0.0m	\$0.0m	\$0.1m	\$0.2m									
Additional investment required	-\$0.2m	-\$0.6m	\$0.0m										
Prototype 5													
Change in gross output	\$0.0m	\$0.0m	\$2.0m	\$3.0m	\$4.0m								
Change in value added	\$0.0m	\$0.0m	\$0.5m	\$0.7m	\$1.0m								
Additional investment required	-\$1.0m	-\$1.4m	-\$0.5m	\$0.0m									
Prototype 6													
Change in gross output	-\$0.0m	\$0.5m	\$1.3m	\$2.2m	\$2.8m	\$2.9m	\$3.0m	\$3.0m	\$2.9m	\$2.9m	\$2.8m	\$2.8m	\$2.7m
Change in value added	-\$0.0m	\$0.2m	\$0.5m	\$0.8m	\$1.0m	\$0.9m	\$0.9m						

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Additional investment required	\$0.5m	\$0.3m	\$0.1m										

Source: MPI data, PwC calculations

Appendix B - Restrictions

Restrictions

This report into the development and application of an economic framework for assessing the impact of bringing Māori land into production was prepared for the Ministry for Primary Industries. This report has been prepared solely for this purpose and should not be relied upon for any other purpose.

To the fullest extent permitted by law, PwC accepts no duty of care to any third party in connection with the provision of this report and/or any related information or explanation (together, the “Information”). Accordingly, regardless of the form of action, whether in contract, tort (including without limitation, negligence) or otherwise, and to the extent permitted by applicable law, PwC accepts no liability of any kind to any third party and disclaims all responsibility for the consequences of any third party acting or refraining to act in reliance on the Information.

Our report has been prepared with care and diligence and the statements and opinions in the report are given in good faith and in the belief on reasonable grounds that such statements and opinions are not false or misleading. In preparing our report, we have relied on the data and information provided by MPI as being complete and accurate at the time it was given. The views expressed in this report represent our independent consideration and assessment of the information provided.

No responsibility arising in any way for errors or omissions (including responsibility to any person for negligence) is assumed by us or any of our partners or employees for the preparation of the report to the extent that such errors or omissions result from our reasonable reliance on information provided by others or assumptions disclosed in the report or assumptions reasonably taken as implicit.

We reserve the right, but are under no obligation, to revise or amend our report if any additional information (particularly as regards the assumptions we have relied upon) which exists at the date of our report, but was not drawn to our attention during its preparation, subsequently comes to light.

This report is issued pursuant to the terms and conditions set out in the Contract for Services agreed on 2 October 2013.

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