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Growing the Productive Base of Māori Land – Partial National Cost-Benefit Analysis

Ministry for Primary Industries

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Table of contents

Executive Summary

Purpose

The Ministry for Primary Industries (MPI) engaged PwC to further develop analysis around the potential economic impact of increasing the productivity of Māori land. Our previous work focussed on building a primary sector economic model to analyse the impact of increasing the productivity of Māori land at an aggregate national level, as well as at regional levels of analysis. These models were then used to assess the potential economic impact of several MPI prototype interventions designed to increase the productivity of Māori land.

The results of the national and regional economic models, as well as the outcomes of the prototype interventions are discussed in associated reports. This report extends the methodology used for the development of the prototype analysis and produces a partial national cost-benefit analysis of the potential for a whole programme of upgrading Māori freehold land. It also proposes an approach to closing information gaps that have been identified to date.

Results

Table 1 summarises the results from estimating a partial benefit-cost ratio (BCR). The BCR results incorporate:

- Estimated total net economic benefits from the whole programme
- A partial view of costs that includes only on-farm investment costs, as well as very indicative, generalised intervention costs estimated by MPI
- A breakdown of results for the four primary industries analysed in the national primary sector model and reports BCRs based on the range of intervention cost estimates provided by MPI. The baseline cost is the mid-point between the low-cost and high-cost ranges provided by MPI.

Table 1: Summary results of partial BCR analysis

	BCR for indicative average per-block intervention cost:		
Definition	Low Cost	Baseline	High cost
Dairy	2.1	2.0	2.0
Sheep and Beef	0.9	0.8	0.8
Horticulture	2.0	2.0	2.0
Forestry	1.7	1.6	1.6

Source: MPI analysis of prototype interventions.

Findings

Findings from our analysis suggest:

- At least on the basis of this partial analysis, it is worth MPI undertaking further work around developing a broader roll out of an intervention process to facilitate increased productivity of Māori land.
- The results of the national analysis conform to the findings obtained from our earlier analysis of the six prototype interventions, in terms of the size of benefits relative to costs.

- Sensitivity analysis across the range of intervention cost estimates supplied by MPI indicates no change in relative performance between industries and the magnitude of the BCRs remains approximately similar.
- An exceptional result is the under-performance of initiatives aimed at the sheep and beef farming industry:
  - The assumed investment costs for this pastoral use may be high relative to investment costs for other primary sector uses, in terms of upgrading the productivity on Māori land. This may require further review and analysis prior to any interventions being undertaken to facilitate the development of sheep and beef operations on Māori land.
  - One potential explanation is the likely lower quality classes of land that these farms either exist on or are to be established on may mean that investment costs are higher for this land.

Overall, the results remain a partial analysis of the benefits and costs of interventions. While overall benefits are well identified through the use of the primary sector model, there are still a number of cost factors that remain unspecified. These costs include off-farm investment costs and environmental mitigation costs, while the intervention costs used in this report remain at an indicative, generalised level and would benefit from further elaboration.

Next steps

To turn the analysis in this report into a more comprehensive analysis requires more detailed exploration of the costs associate with the intervention. More detailed analysis is beyond the scope of this project.

This includes consideration of the location and characteristics of the block, noting that environmental mitigation costs are likely to vary between regional council areas and the type of primary sector activity. Similarly, intervention costs need more work in terms of determining per block and per hectare costs and how these will change as the programme scales up – MPI should expect some reduced costs through obtaining some scale and network efficiencies through knowledge diffusion and demonstration effects.

Overview of programme to upgrade Māori freehold land

The Primary Sector Economic Model developed by PwC is an economic model that covers the primary sector and its major constituent industries in agriculture and forestry. It is intended to facilitate an economic analysis of the potential impact of bringing both un-utilised and under-utilised Māori land into agricultural production. The model forecasts outcomes to 2025 to ensure consistency with the Government's Business Growth Agenda targets.

This model has been developed to enable analysis of individual industries at both a national and a regional level. It focuses on four main primary sectors:

- dairy cattle farming
- sheep and beef cattle farming
- horticulture (focusing on four main crops: wine grapes, kiwifruit, apples, and potatoes)
- plantation forestry.

We have not modelled apiculture (beekeeping) on a national level due to the relative lack of reliable information on the sector, and its relatively small size compared to other agricultural industries. However, our analysis of six prototype interventions did include an analysis of outcomes on two apiculture blocks. These results suggested that apiculture investments are likely to have a BCR above one, indicating that economic returns exceed the costs of the intervention and investment. This result is likely to have some relevance across the sector.

Our main report contains a full discussion of the underlying assumptions, data, and methodologies used to create this model. One of the key inputs to the model is data breaking down total Māori freehold land by region, land use class (LUC), and block size, which we have combined with assumptions developed by MPI to estimate the total amount of land that is potentially available for upgrading or conversion to new uses.

Table 2 summarises the most recent assumptions about the total amount of Māori land that can be upgraded or converted between uses. We note that these figures are smaller than numbers previously presented due to a combination of (a) updated assumptions from MPI about the potential on land that is currently covered in (regenerating) native bush and (b) the fact that small blocks (1 hectares or less) have been excluded.

Table 2: National summary of potential change to land use on MĀORI LAND

	National total	
Land use change	**Hectares**	**% of MFL**
Retain as Natural forest	306,275	28.4%
Retain as Planted forest	86,071	8.0%
Retain as Dairy	14,483	1.3%
Retain as Grazing animals	21,505	2.0%
Retain as High-producing grassland with no known use	7,890	0.7%
Retain as Low-producing grassland with no known use	31,682	2.9%
Retain as Unused grassland with woody biomass	9,642	0.9%
Retain as Horticulture	4,304	0.4%
Total land retained in present use	*481,852*	*44.7%*
Upgrade productivity of Dairy	59,681	5.5%
Upgrade productivity of Grazing animals	358,504	33.3%
Upgrade productivity of Horticulture	4,684	0.4%
Total land with upgraded productivity	*422,868*	*39.2%*
Convert Natural forest to Dairy	1,569	0.1%
Convert Planted forest to Dairy	9,166	0.9%
Convert unused grassland to Dairy	16,021	1.5%
Convert Natural forest to Grazing	6,939	0.6%
Convert Planted forest to Grazing	6,455	0.6%
Convert unused grassland to Grazing	54,822	5.1%
Convert Natural forest to Planted Forest	1,648	0.2%
Convert Grazing animals to Planted Forest	17,393	1.6%
Convert unused grassland to Planted Forest	25,493	2.4%
Convert unused grassland to Horticulture	1,335	0.1%
Total land converted between uses	*140,841*	*13.1%*
Introduce apiculture on Natural forest	32,262	3.0%
TOTAL	**1,077,824**	

Source: MLC data, MPI estimates PwC calculations.

Partial national benefit-cost ratios

We have calculated a set of partial national benefit-cost ratios (BCRs) for a programme of upgrading Māori land. These results, which are reported in Table 3, are calculated on the baseline estimates provided by MPI for intervention costs. The numbers represent aggregate results reflecting the assumption that the absolute amount of Māori land available to each industry is utilised for that particular use. This may be a contributing factor to the high costs relative to benefits for the sheep and beef pastoral industry.

The baseline cost estimate is the mid-point in the range of cost estimates for interventions supplied by MPI. The range of cost estimates are reported in Table 4 and discussed further below. We report a sensitivity analysis of the impact on BCRs based around low cost and high cost estimates for interventions in Table 5 and Table 6 respectively.

The results of this partial cost-benefit analysis are largely consistent with previous work undertaken on six prototype interventions, which projected, based on detailed information about costs, land use, and potential for change, that the interventions would show positive BCRs. Broadly speaking, the prototype analysis suggested that BCRs for individual projects may vary considerably, with projects aimed at raising productivity on existing dairy and horticulture operations potentially showing better results due to the lower up-front investment costs. However, dairy conversions also appeared to perform strongly in the prototype analysis.

Table 3: Baseline results of partial national BCR (in real terms)

Industry sector	Dairy 2013-2025	Sheep and beef 2013-2025	Horticulture 2013-2025	Forestry 2013-2025
Net benefits relative to baseline scenario ($m)				
PV of increase in GDP	$806	$272	$143	$106
Net costs ($m)				
PV of on-farm investment costs	$360	$185	$67	$57
PV of costs to facilitate intervention	$42	$135	$4	$8
PV of added infrastructure / mitigation costs	Unknown	Unknown	Unknown	Unknown
PV of deadweight loss of taxation	Unknown	Unknown	Unknown	Unknown
PV of known costs	**$402**	**$320**	**$70**	**$65**
Partial BCR (including only known costs)	**2.0**	**0.8**	**2.0**	**1.6**

Notes: Discount rate is 8%

Source: PwC analysis

We note that BCRs for individual industries fall within the same general range – with the exception of the sheep and beef sector. Sheep and beef farms tend to have lower returns per hectare than either dairy farms or horticulture (but are assumed to have similar intervention costs to raise productivity). However, it is possible that the low partial BCR reported here is due to an overestimate of the per-hectare investment costs required to convert a block of land for pastoral farming or to raise productivity on an existing sheep and beef farm.

Based on recent analysis of the cost of prototype interventions aimed at raising the productivity of existing dairy farms and horticulture operations, which suggested that per-hectare costs were low for those interventions, we believe that our model may incorporate too high an estimate of per-hectare costs to raise the productivity of sheep and beef farms. Given the sheep and beef farm conversions or improvements are

expected to exist on the lower quality classes of land, this may be a relevant issue that warrants further investigation as part of any programme expansion. This would be one area of investment costs that would warrant further analysis in the future.

The approach used accounts for all economic benefits – defined as net uplift in gross domestic product (GDP) following the intervention. But it does not account for all economic costs – only on-farm investment, defined as gross fixed capital formation, and indicative intervention cost estimates are included. The absence of analysis on the costs of further off-farm investment required, plus any associated environmental mitigation costs means the analysis in this report can only be considered as producing a partial BCR.

Differences in land block characteristics and variations in regional council policies toward development across the country make these costs difficult to calculate in the first instance. We discuss the missing categories of costs in more depth in the following section. In a similar vein, previous work that focused on applying an economic cost-benefit analysis methodology to a set of individual prototype interventions successfully identified additional costs, including costs to facilitate the intervention. The indicative costs to facilitate interventions were developed having regard to the prototypes, and other productivity raising interventions supported by MPI. The information from these examples was insufficient, however, to calculate an average intervention cost applicable to all land blocks.

As with our previous economic analysis, there are important distinguishing features between economic and financial analysis. We disclaim that we have conducted this analysis by applying a high-level economic model to a set of new land inputs. It should not be used as a substitute for a more rigorous financial analysis of individual blocks of land, given the scope discussion at the front of this document.

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.

Assumptions around costs of interventions

In order to quantify the cost of interventions, we have used information on the costs of different types of prototype interventions. We have considered costs for small blocks and large blocks separately, as well as separately considering costs for interventions aimed at raising productivity on existing farms versus costs for interventions aimed at converting to new uses.

We note, importantly, that these cost estimates do not distinguish between:

- The share of costs that will be borne by government, either through financial contributions to prototypes or through in-kind contributions of time and resources (which will have a budgetary impact for government).
- The share of costs that will be borne by landowners and other private parties, either through financial contributions or through in-kind contributions of time and resources (which may carry opportunity costs but not financial costs).

It is important to note this, as we would expect that an increasing share of costs would shift from government to the private sector over time, as network effects and knowledge sharing encourage landowners to adopt successful practices. In addition, the potentially important role of in-kind contributions from landowners may mean that the required contributions from government are considerably less.

These estimates are presented in Table 4. Appendix A contains a full description of the underlying analysis and assumptions – it is a copy of a technical note provided by MPI on 9 May 2014 and updated through e-mail correspondence with MPI on 20 May 2014.

Table 4: Estimated average cost of interventions to raise productivity

		Indicative average per-block intervention cost:		
Category	Definition	Low Cost	Baseline	High cost
Large blocks	10+ ha on LUC 3 and 4, 100+ha on LUC 5+	$15,000	$22,500	$30,000
Small blocks	1-9 ha on LUC 3 and 4, 1-99 ha on LUC 5+	$6,000	$6,000	$6,000

Source: MPI analysis of prototype interventions.

We have applied these estimates to the total area of land that has been identified, at a national level, as having the potential to raise productivity or convert to a better use. In doing so, we have considered costs separately for different block sizes and different land use classes, assuming that Māori land that has the potential for productivity improvements largely matches the overall distribution of block sizes, but with a slight skew away from blocks in the range of 1-9 ha.

Finally, we may expect these BCRs to change as a more complete picture of costs emerges. The degree to which they are reduced is likely to depend upon the cost of infrastructure and environmental mitigation. The experience with the prototype analysis suggests that costs of facilitating intervention are likely to be substantially smaller than the cost of new on-farm investments required to raise productivity.

Sensitivity analysis

We conducted a sensitivity analysis based around the range of estimates provided by MPI and illustrated in Table 4. We have already highlighted the baseline BCRs based on the mid-point of the cost range, so Table 5 and Table 6 report the results from the low-cost and high-cost estimates for interventions. The outcome of the analysis does not change the overall outcome of the partial BCR results in terms of order of magnitude or overall ranking of potential interventions across industries.

Table 5: Low-cost estimate for partial national BCR (in real terms)

Industry sector	Dairy 2013-2025	Sheep and beef 2013-2025	Horticulture 2013-2025	Forestry 2013-2025
Net benefits relative to baseline scenario ($m)				
PV of increase in GDP	$806	$272	$143	$106
Net costs ($m)				
PV of on-farm investment costs	$360	$185	$67	$57
PV of costs to facilitate intervention	$33	$115	$3	$8
PV of added infrastructure / mitigation costs	Unknown	Unknown	Unknown	Unknown
PV of deadweight loss of taxation	Unknown	Unknown	Unknown	Unknown
PV of known costs	**$393**	**$301**	**$70**	**$64**
Partial BCR (including only known costs)	**2.1**	**0.9**	**2.0**	**1.7**

Notes: Discount rate is 8%
Source: PwC analysis

Table 6: High-cost estimate for partial national BCR (in real terms)

Industry sector	Dairy 2013-2025	Sheep and beef 2013-2025	Horticulture 2013-2025	Forestry 2013-2025
Net benefits relative to baseline scenario ($m)				
PV of increase in GDP	$806	$272	$143	$106
Net costs ($m)				
PV of on-farm investment costs	$360	$185	$67	$57
PV of costs to facilitate intervention	$51	$154	$5	$9
PV of added infrastructure / mitigation costs	Unknown	Unknown	Unknown	Unknown
PV of deadweight loss of taxation	Unknown	Unknown	Unknown	Unknown
PV of known costs	**$411**	**$339**	**$71**	**$65**
Partial BCR (including only known costs)	**2.0**	**0.8**	**2.0**	**1.6**

Notes: Discount rate is 8%
Source: PwC analysis

Methodology for estimating national BCRs

Cost-benefit analysis

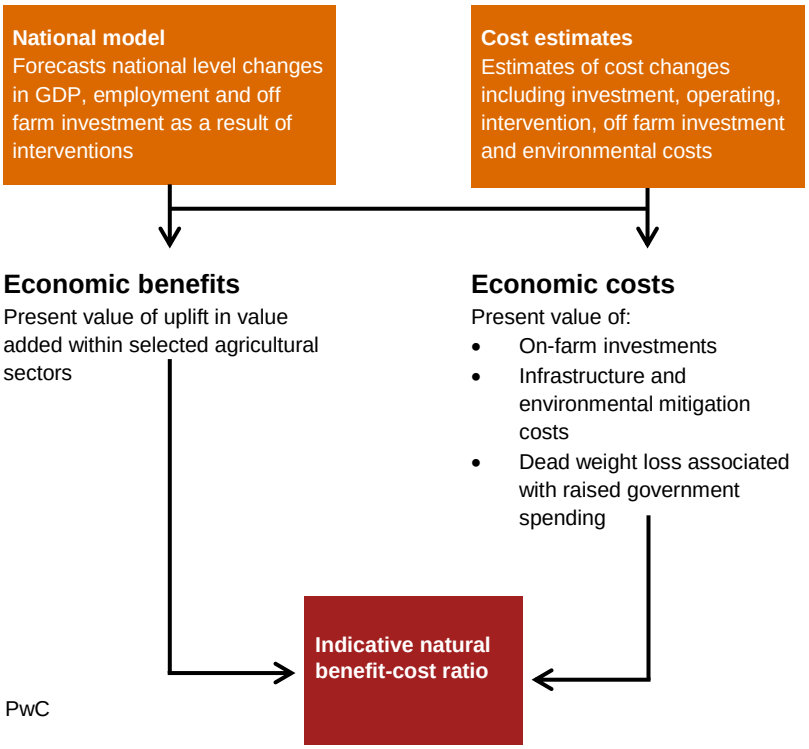
We have conducted a cost-benefit analysis that attempts to compare all **net economic costs** with all **net economic benefits** of each intervention. Our analysis is based on the following principles, which are consistent with Treasury guidance on cost-benefit analysis:

- Net economic costs include all costs to the government and the broader economy. This includes any infrastructure or environmental mitigation costs, as well as the deadweight cost of taxation (estimated as 20% of the cost of any new government spending). It also accounts for new gross fixed capital formation (investment) on farms, but excludes 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 projected net change in value added resulting from bringing Māori land into cultivation. Value added 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.
- The present values of all costs and benefits over the evaluation period (2013-2025) have been discounted using the Treasury's standard discount rate (8% real) and summed up. A partial benefit-cost ratio (BCR) has been calculated for each option.

Approach to estimating costs and benefits

Figure 1 summarises the process for calculating a partial national BCR. These calculations draw primarily upon the benefits and investment costs information from the national agriculture model developed in a previous stage of this work.

Figure 1: Data underlying cost-benefit analysis



To round out the cost analysis requires further work on the wider set of costs potentially associated with facilitating extensive investment in the primary sector. These include elaboration on intervention costs and where they fall (ie the mix of public and private sector involvement), as well as the mix of off-farm investment costs required and any costs associated with environmental mitigation. Table 7 summarises the information that was available. Because some costs could not be estimated with sufficient accuracy, the decision was made to estimate a partial BCR.

Table 7: Data required for calculate costs and benefits

Component	Current information	Proposed approach
Economic benefits		
Additional value added in four sectors	Projections available from national agriculture models	Use model projections of net economic benefits
Economic costs		
Additional on-farm investment (gross fixed capital formation)	Estimates available from national models based on assumptions about per-hectare development costs	Use model projections of additional investment required; review inputs and assumptions to test validity (eg for sheep and beef farming)
Added infrastructure costs (eg irrigation)	No estimates of infrastructure costs are included in the national models	Due to absence of reliable estimates of these costs across all regions, exclude these and indicate this through estimation of a partial BCR.
Costs of environmental mitigation	No estimates of mitigation costs are currently included in the models	
Costs to facilitate intervention, including costs to MPI, other public sector organisations, and landowners	Data on cost of MPI support for prototype assessments, and other MPI supported interventions aimed at raising primary sector on-farm productivity	Use prototype and other data to develop an indicative cost, noting that the information does not allow an average to be calculated that can be applied to across all land. Do not allocate these costs to MPI, other public sector organisations and landowners, as no broad funding agreement is in place for a wider programme. So, a generalised, indicative cost estimate is included at this stage. See Table 4 and Appendix A.
Deadweight loss of additional taxation	Treasury guidelines state that deadweight loss is equal to 20% of the value of added government spending (if any)	As there is no cost allocated to the public sector it is not possible to estimate this cost. Indicate this exclusion through estimation of a partial BCR.

Estimating net national economic benefits

Analysis in the national agricultural model suggests that a programme to systematically upgrade the productivity of Māori land will have effects on several economic variables, including:

- gross output, or the total revenue earned by a farm, forest, or orchard before expenses are deducted

- value added, or the net contribution that the farm, forest, 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.

The national agricultural model developed in a previous stage of this project models economic outcomes for four sectors:

- dairy (model period 2013-2025)
- sheep, beef and wool (model period 2013-2025)
- horticulture (model period 2013-2025)
- forestry (model period 2013-2055, to reflect longer time lag between forest plantings and harvests).

For the purpose of conducting an economic cost-benefit analysis at the national level, we focus on two particular modelled economic outcomes:

- projected net economic benefits from bringing additional Māori land into cultivation and raising productivity on existing farms
- projected on-farm investment (gross fixed capital formation) costs, which comprise some (but not all) of the costs of the programme.

The national agricultural model projections are fit for purpose for quantifying these elements and do not require any supplementary analysis (although the caveats around the sheep and beef per-hectare investment cost estimates are noted above.) Data from the national agriculture model is summarised in Table 8. These figures are based on modelling that incorporates the land inputs summarised in

Table 2. Note that rapid development refers to a scenario developed in our main report[1] that assumes interventions undertaken by MPI to facilitate improving the utilisation and productivity of Māori land result in strong programme participation and quick uptake of the land development opportunities.

Table 8: Summary of potential for change under a rapid development scenario

Sector	Land area (ha)		Total investment required (real $m, 2013-2025)	Stabilised year* economic outcomes		
	Raised farm productivity	Net conversions		Gross output (real $m)	Value added (real $m)	Employment (FTEs)
Dairy	61,286	26,272	$480.4	$386.9	$189.9	1,046
Sheep and beef	392,228	55,110	$247.6	$155.4	$62.4	602
Horticulture	4,415	1,264	$89.0	$100.3	$34.2	567
Agriculture subtotal	*457,929*	*101,653*	*$817.0*	*$642.6*	*$286.5*	*2,216*
Forestry	-	34,291	$79.2	$371.4	$124.5	348

Notes: *Dairy, sheep and beef, and horticulture stabilised year is based on 2021 - 2025 average; forestry is based on outcomes forecast for the projected harvest window in 2044 – 2052.

As discussed above, the analysis in this report contains a partial benefit-cost assessment rather than an indicative assessment due to some cost information not being available at the time of analysis. These costs are known to exist, but have been excluded from this analysis because within the time frames for the preparation of this report it was not possible to include cost estimates with any reasonable degree of accuracy.

Realising the productivity improvements to Māori freehold land are likely to encounter additional costs for mitigating environmental impacts, securing adequate water, or building additional off-farm infrastructure (e.g. processing facilities, roading etc.) These costs are likely to vary between regions and between different agricultural sectors. For example:

- New dairy farms will often require riparian planting, fencing around streams, dairy pads, and effluent ponds to prevent effluent and nitrate leaching. This will manifest itself as an increase in on-farm investment costs.
- In regions where water is at or near full allocation (e.g. Marlborough wine country, Canterbury Plains), investment in new water storage and distribution infrastructure may be needed to enable further farm development.
- New sheep and beef farms in hill country, especially on the East Coast, will often require investment in reticulated water supply and potentially also in feed pads and improved grass species, as a result of arid conditions.

In addition, development rules vary considerably between regional councils, with some considering limits on dairy conversions to protect water quality. At present, Environment Waikato is the only council to have implemented nitrate leaching rules that put a cap on overall dairy farming in the Taupo catchment. Rules implemented by regional councils will affect on-farm investment costs, and also potentially impact on the cost of preparing a feasibility study for a conversion.

Calculating these costs, given the extent of data collection and analysis required, was beyond the resources of this report. This means that for the purposes of this report these cost factors remained unidentified. The BCR in this report is partial.

[1] See pages 56 and 57, including Figure 19 of the PwC report 'Growing the Productive Base of Māori Freehold Land – further evidence and analysis'; May 2014.

Cost of facilitating interventions - characteristics of Māori freehold land

Data on the total area proposed for intervention can be used to inform an analysis of expected costs from intervention.

Table 9 summarises total Māori land by block size and land use class. It suggests that:

- There are a total of 1.2 million hectares of land spread across 168,200 blocks
- Extremely small blocks of less than one hectare apiece account for 95,800 land titles but only 22,700 hectares of land – in other words, 57% of land titles but less than 2% of total land area
- Small blocks of one to nine hectares account for 52,200 land titles and 177,500 hectares of land – 31% of total land titles but less than 15% of total land area.

Excluding small blocks from analysis could therefore significantly improve the practicality of the programme, as it would drastically reduce the amount of engagement with landowners, without having an equally large effect on the amount of land available for productivity increases.

Conversely, a policy focus on large blocks and/or large projects could have positive spin-offs throughout the sector, as the owners of small blocks decide to emulate changes seen on large blocks. In this case, MPI may see a 'virtuous cycle' of lower pre-engagement costs after some high-profile successes. The extent to which this will occur may depend upon a number of factors, including the degree to which access to information and specialised services is currently serving as an impediment to landowners' own efforts to raise productivity. We discuss these issues, in a general sense, below.

Table 9: Summary of Māori land by block size and LUC class

		Number of blocks, by block size						Total area of blocks, by block size				
LUC	Total	1000+ ha	100-999 ha	10-99 ha	1-9 ha	<1 ha	Total	1000+ ha	100-999 ha	10-99 ha	1-9 ha	<1 ha
1	**2,884**		1	160	831	1,892	**7,078**		107	3,798	2,739	434
2	**14,997**		2	712	4,103	10,180	**30,468**		263	14,150	13,638	2,417
3	**24,904**		37	1,561	6,669	16,637	**70,011**		5,482	38,837	21,944	3,749
4	**25,068**	1	165	2,151	7,554	15,197	**115,883**	1,035	29,068	56,967	25,308	3,505
5	**1,196**		4	138	396	658	**5,991**		830	3,534	1,476	151
6	**57,221**	2	771	7,332	18,086	31,030	**427,432**	2,787	136,351	218,434	62,567	7,294
7	**29,893**	11	819	4,678	10,460	13,925	**390,130**	17,450	183,938	148,849	36,290	3,603
8	**12,064**	13	262	1,394	4,106	6,289	**152,262**	28,175	64,728	44,216	13,540	1,603
Total	**168,227**	**27**	**2,061**	**18,126**	**52,205**	**95,808**	**1,199,256**	**49,447**	**420,766**	**528,786**	**177,501**	**22,756**

Source: Māori Land Court data

Cost of facilitating interventions - nature of intervention

MPI has developed a generalised intervention model that aims to guide landowners through the process to where they can make investments or upgrade productivity on their land. This intervention model, and the indicative costs used in the analysis, are summarised in

Table 10. The model distinguishes between:

1 Productivity improvement of existing use on large blocks – which might include enterprise productivity assessment, enterprise productivity improvement plan, and mentored implementation of plan (eg, through on-farm field days, off-farm training, benchmarking).

2 Productivity improvement from conversion on large blocks – which might include land use options study, full feasibility study of preferred option, and development and implementation of conversion plan, and governance and management training.

3 Productivity improvement on small blocks (from existing use or conversion) – assumed that small blocks will collaborate with a larger block as part of the larger blocks plan to raise productivity. Costs are those to negotiate appropriate arrangements with larger block.

The distinction between large and small blocks recognises that many Māori freehold land blocks are too small to be viable for primary sector production on their own, or at all.

The analysis excludes all blocks less than 1ha in size, on the basis that they are unlikely to be viable for primary sector production (although they may be suitable to other purposes – eg, whanau housing).

The analysis also assumes small blocks most likely route to productive use will be to collaborate with a larger block (or blocks), and play a role in the larger block/s plan to raise productivity. (Small blocks are defined for estimating purposes as 1-9 ha on land use classes 3 and 4, and 1-99ha on classes 5,6 and 7)

Recognising that many of these 'large' blocks are still relatively small in productive scale, the model assumes most will collaborate to raise productivity. (The analysis assumes groups of 10 blocks, while realising the desirable number will vary depending on size, proximity, productive features etc.)

MPI's experience is that there are extensive costs involved in engaging groups and their beneficiaries prior to decisions being made to undertake productivity improvement. How far this engagement occurs prior to land owner engagement with potential partners (including MPI) varies considerably.

Table 10: Estimated cost of interventions to improve productivity

Type of intervention package	Indicative Cost Range
Productivity improvement of existing use on large blocks	$150-300,000/10 blocks
Productivity improvement from conversion on large blocks	$150-300,000/10 blocks
Productivity improvement (from existing use or conversion) on small blocks	$60,000 / 10 blocks

Source: MPI

Thinking about causes of underperformance and how to address them

In order to achieve the potential economic benefits related to upgraded primary sector production on Māori land, it will be necessary to scale up prototype interventions and extend them more broadly throughout the sector.

As discussed in our main report, there are both opportunities and constraints in this area. On the one hand, Māori land is concentrated in six regions that together account for nine-tenths of the total Māori land area[2]. This means that MPI may be able to initially target its resources relatively effectively in a smaller number of regions rather than dispersing them throughout the whole country.

[2] These regions are: Bay of Plenty (19% of national total), Gisborne (16%), Hawke's Bay (14%), Manawatu-Wanganui (15%), Northland (10%), Waikato (19%).

On the other hand, ownership of Māori land may be widely dispersed, and Māori land is often split up into many smaller blocks. An analysis of block size suggests that there is likely to be a "long tail" of small blocks that are currently sub-economic to farm but also too numerous to be targeted effectively for intervention.

It would be possible to upgrade the productivity of 42% of overall Māori land by targeting roughly 2,000 blocks of 100 hectares or more, and upgrade the productivity of an additional 42% by targeting approximately 18,000 additional blocks of between 10 and 100 hectares. MPI could in theory begin by targeting its efforts in these areas. However, reaching the last 16% of Māori land could be considerably more difficult – it would entail targeting 50,000 to 150,000 individual blocks of land.

There are several factors that may result in landowners not taking advantage of opportunities that are both financially and economically beneficial:

- First, capital market imperfections may mean that landowners are unable to access the investment capital or working capital required to invest in new stock, plant or machinery, hire farm advisors to recommend governance and farm management improvements, or agglomerate multiple small blocks into a workable farm.

- Second, landowners may be unable to access the inputs or product markets required to make improvements to their farms or orchards. For example, some may be unable to obtain the services of professional farm advisors required to make improvements to governance and farm management. This is more likely to be an issue in more underdeveloped regions, and for Māori landowners, who may require specialised skills to assist in, say, negotiating an agreement with multiple other Māori landowners.

- Third, landowners may have insufficient information on the options available to them to make productivity improvements. They may also be unwilling for other reasons to take them up. Investments that are financially viable and commercially feasible may not be taken up.

- Fourth, transaction costs may arise in the process of organising land into a form that lends itself for higher economic value uses. For example, large land parcel may have several owners, or land parcels may be small, and land from different may would need to be consolidated. The process to reach agreement among land users may be costly.

MPI's programme of prototype interventions is most likely to succeed in raising productivity across the whole Māori land resource if it is successful in "making a market" for investments in management and governance capability, including the agglomeration of multiple small blocks under a single manager. It is most likely to scale up at a relatively low cost to government if the primary barrier facing Māori land at present is either a lack of access to specialised inputs (the second problem) or a lack of information about opportunities (the third problem), rather than a lack of access to capital (the first problem).

If the second problem – a lack of specialised inputs in regions with Māori land – is the underlying issue, MPI's prototype interventions could be used to support the development of the appropriate capability in specific markets. For example, it could fund the development of specialist farm advisors serving the Māori land market by providing support for further prototype interventions. Other landowners would then be able to take advantage of the presence of local expertise to help them solve similar problems.

However, if the infrastructure required to support specialised high value agriculture (eg, dairy) is less developed in regions with Māori land, interventions may require infrastructure investments. This would be more expensive and take longer than developing capability.

If the third problem – a lack of information and awareness – is the underlying issue, MPI's prototype interventions could play an important role in raising awareness among Māori landowners of the availability of options for improving the productivity of their land. Supporting and promoting some "demonstration projects" in local markets could increase the appetite of other landowners to invest in governance and management capability.

In either case, a relatively modest programme of prototype interventions could be a sufficient condition for prompting wider uptake of productivity improvements and land use changes. If, however, capital market

issues, a lack of infrastructure or other, unidentified factors play an important role in creating barriers to change, it is likely to be much more challenging to expand this programme more widely.

Appendix A – Intervention costs

Correspondence received from MPI for the update of costs in Table 10 above, dated 20 May 2014:

Table 11: Estimated cost of interventions to improve productivity

Type of intervention package	Indicative Cost Range
Productivity improvement of existing use on large blocks - might include enterprise productivity assessment, enterprise productivity improvement plan, and mentored implementation of plan (e.g. through on-farm field days, off-farm training, benchmarking).	$150-300,000/10 blocks
Productivity improvement from conversion on large blocks – might include land use options study, full feasibility study of preferred option, and development and implementation of conversion plan, and governance and management training,	$150-300,000/10 blocks
Productivity improvement (from existing use or conversion) on small blocks – assumed that small blocks will collaborate with a larger block as part of the larger blocks plan to raise productivity. Costs are those to negotiate appropriate arrangements with larger block.	$60,000 / 10 blocks

Source: MPI

Appendix B - 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 variation to our Contract for Services agreed on 21 March 2014.

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