Wairarapa Water Use Project

Regional Economic Impact Analysis of the Proposed Wairarapa Water Use project

Report prepared by

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KEY RESULTS

Scope of Analysis
The results reported here exclude the impacts of constructing and operating the off-farm infrastructure. This means that the economic impacts during construction are understated, and that increases in farm value added implicitly include value added associated with that off-farm infrastructure.

Combined Wairarapa Districts
Wairarapa GDP will have a one-off increase of $25 million as a result of on-farm investment to irrigate 10,000 Ha. Associated with that will be an extra $19 million of household income and 360 job-years[1] of work. The investment to irrigate 30,000 Ha would increase regional GDP by a one-off $76 million, with an associated extra $57 million of household income and 1,070 job-years[2] of work. These impacts will be spread over perhaps 15 years, but a large proportion will occur in the first five years of scheme implementation.

With 10,000 Ha irrigated, Wairarapa farm output could increase by around $65 million per year, with a resultant increase in farm value added (GDP) of $36 million per year[3]. Associated with this will be an increase in earned household income of $8 million per year and 200 on-farm jobs. Flow on effects to other industries will lead to a total increase in Wairarapa GDP (including farming) of $49 million per year, including earned household income of $17 million per year. Associated with this total GDP increase will be the generation of an additional 369 Full Time Equivalent[4] jobs (FTEs) in the district.

At full uptake of irrigation over 30,000 hectares (Ha), Wairarapa farm output could increase by around $196 million per year, with a resultant increase in farm value added (GDP) of $109 million per year[5]. Associated with this will be an increase in earned household income of $24 million per year and 600 on-farm jobs. Flow on effects to other industries will lead to a total increase in Wairarapa GDP (including farming) of $146 million per year, including earned household income of $51 million per year. Associated with this total GDP increase will be the generation of an additional 1,110 Full Time Equivalent[6] jobs (FTEs) in the district.

Wellington Region (including Wairarapa)
With the conversion of 10,000 Ha to irrigation, regional GDP will increase by a one-off $30 million as a result of on-farm investment. Associated with that will be an extra $21 million of household income and 390 job-years of work. With the conversion of 30,000 Ha to irrigation, regional GDP will increase by a one-off $89 million as a result of on-farm investment. Associated with that will be an extra $63 million of household income and 1,170 job-years of work.

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1 A job year is one person working for one year, or two people for half a year etc.
2 A job year is one person working for one year, or two people for half a year etc.
3 This includes the additional GDP in the water supply industry which at this stage has not been charged to farming.
4 A Full Time Equivalent job is one person working full time, or two people working half time, etc.
5 This includes the additional GDP in the water supply industry which at this stage has not been charged to farming.
6 A Full Time Equivalent job is one person working full time, or two people working half time, etc.

Regional GDP will increase as farms convert to irrigation and with 10,000 Ha converted, regional GDP on farms and in industries that directly or indirectly support farms will increase by $52 million per year. Associated with this increase will be an additional $18 million per year of household income and 403 Full-Time-Equivalent jobs. If 30,000 Ha are converted, regional GDP on farms and in industries that directly or indirectly support farms will increase by $157 million per year. Associated with this increase will be an additional $55 million per year of household income and 1,210 Full-Time-Equivalent jobs.

There is not predicted to be any significant processing of additional farm outputs, including horticultural products[7] and milk, in the Wellington region as there is no significant processing industry at present. Increased dairy production is likely to be processed in Manawatu and increased horticulture may be processed in Hawkes Bay. There could, however, be economic activity associated with wine-making if the postulated horticultural expansion takes the form of viticulture. There will be a decline in total net livestock production with the conversion of so much Sheep and Beef land to dairying, dairy support activities and horticulture, and with the shift in the livestock component of mixed farming away from sheep and beef and towards the more profitable dairy grazing The impact of this reduced livestock production on regional economic activity will depend on where meat is processed. Advice from local sources is that the reduced economic activity in meat processing will occur in other regions because in future a much greater percentage of remaining stock produced in the region will be fattened and slaughtered locally rather than being sent out of the region as stores and slaughtered in other regions as currently happens.

The wider non-farming community is expected to benefit from the off-farm increase in household income and employment discussed above, but the scale of this benefit depends on the ways in which labour and capital would have been employed in the absence of the irrigation project. If the proposed Wairarapa irrigation project and associated farming and support activity simply displaces other projects which have income and employment impacts similar to those arising from additional irrigation, then there is no particular benefit from the irrigation scheme because net employment and income will not have increased. It will simply have been switched between industries. However, the decline in Wairarapa agricultural employment during the last 13 years suggests that there may be surplus labour willing to work in agriculture[8], while the large number of people who reside in Wairarapa but commute out of Wairarapa to work suggests that there is a potential supply of labour to take up new employment opportunities within the district. Hence it seems likely that the proposed irrigation project will increase regional income and employment along the lines indicated in this report.

The growth in the economic base should lead to an increase in the range of goods and services available in Wairarapa as more industries are able to achieve critical mass. This will be to the benefit of all residents, even those who do not achieve any increase in income or employment opportunities as a result of irrigation.

This report does not demonstrate whether or not the project will have a net benefit from the widest societal perspective. Such a perspective takes into account environmental and other non-market values, such as recreation, which can be affected by water abstraction and

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[7] Packing and cool stores for apples are expected to occur in Wairarapa. Additional processing in this context refers to such things as juicing and freeze-drying.

[8] Although anecdotal evidence is that there is as shortage of labour for seasonal horticultural jobs. Growth in such employment is likely to be taken up by seasonal migrants to the region.

storage, and by increases in irrigation and agricultural production. That widest perspective is a matter beyond the scope of economics, and in particular beyond the scope of an economic impact analysis. What this report does is provide residents and decision makers with information to inform their consideration of the wider range of costs and benefits.

1. Executive Summary

The Scheme

1. Irrigation schemes proposed for the Wairarapa could potentially irrigate 10,000 of currently dry land initially, and eventually as much as 30,000 Ha could be irrigated. There are numerous variants of such schemes and this report makes no assumption as to which will proceed. While economic impacts are reported for both 10,000 and 30,000 Ha given a specific mix of land use assumptions, results are also provided on a per thousand Ha basis for each land use so that readers can test a wide range of assumptions about project size and land uses.

2. The impacts reported here are based on an assumption that water can be provided at a price which makes the project financially viable for farmers and other investors. However, at this early stage the lack of information about project costs mean that this assumption cannot be verified. Readers should note that the farm budgets include on-farm irrigation costs, but exclude any cost for providing water to the farm gate. The on-farm irrigation costs which are in the budgets assume that water is provided at pressure, and no allowance is made for additional electricity costs to increase pressure to the irrigators.

3. On-farm investment will depend on the land uses on the newly irrigated land, but a base case estimate by The Agribusiness Group is that farmer investment will cost $155 million for 10,000 Ha and $465 million for 30,000 Ha. The former figure includes $82 million for physical investment on-farm, $29 million for livestock, and $44 million for dairy company shares and working capital[9], and the latter includes $245 million for on-farm investment, $88 million for livestock and $132 million for dairy company shares and working capital.

4. The scheme will have to lead to a clear net commercial benefit to farmers or they will not undertake the required investment to change to different land uses. This report does not address the commercial viability of conversion to irrigation.

5. We anticipate that people in other sectors who experience an increase in economic activity will also perceive themselves to be receiving a benefit. Formal cost benefit analysis framework does not recognise this latter benefit because of the framework's restrictive assumptions regarding price equalling opportunity cost in these other sectors[10]. It is for this reason that we show in the following sections the increase in employment, regional GDP and regional household income. The community at large and decision makers can take these impacts into consideration when deciding whether the project has larger benefits than costs when viewed from the widest societal perspective.

Economic Impacts

6. The economic impacts arising from the project have two components, the first being the impact of on and off-farm construction. This is a one-off impact, and for this reason impacts are expressed as $million (rather than $million per year) and job-years (as

[9] This depends on the capital structure of the processing company. The purchase of dairy company shares has no economic impact, and so this assumption does not affect the economic impacts presented here.

[10] In simple terms, formal cost benefit analysis assumes that unless there is evidence to the contrary, price equals opportunity cost, which is the benefit foregone in the next best possible use.

opposed to on-going jobs). The second component of economic impact is the on-going effect of increased farm production. This generates impacts including:

a. on-farm,
b. off-farm in all the industries that support farming production, and that provide goods and services to households who work in affected farms and businesses (e.g. agricultural contractors, stock and station agents, rural transport, shops and service providers); and
c. off-farm in processing industries such as meat, dairy and vegetable processing, and in all the industries that support these processing industries and the household spending that flows from them.

Economic impacts are generally reported in terms of changes to output (sales), value added[11], which is sometimes referred to as regional income or regional GDP, earned household income, which is a component of value added, and employment. The impacts are split up into the direct effects, which in this case are the direct changes in output, employment and income on-farm, and the multiplier effects, sometimes referred to as the indirect and induced effects, or the industry-support effects.

One-Off On-farm Conversion Impacts

7. The investment of $155 million by farmers to convert 10,000 Ha to irrigated land uses will lead to economic impacts during land use conversion. The impacts include an increase in Wairarapa value added of $25 million and an associated increase in household income of $19 million, and 360 job-years of work. The impacts in the Wellington region[12] would be rather greater with value added increasing by $30 million, including household income of $21 million, and an additional 390 job-years of work. The figures for converting 30,000 Ha would be proportionately greater (see Summary Table 1 below).

8. These economic impacts would be spread over a number of years with the timing being dependent on the rate of conversion to irrigated land use. The project is likely to be financially viable only if a substantial number of farmers commit to paying for water from early on in the life of the project. These farmers are then likely to want complete conversion to happen quickly to ensure that they can make use of the water they are paying for. As a result, the impacts detailed above are likely to be centred on the period during, and for the first few years following, off-farm infrastructure conversion

Summary Table 1 Regional Economic Impacts of On-Farm Investment

	Output ($m)		Jobs (job-years)		Value-Added ($m)		House-Hold Income ($m)	
Ha	10,000	30,000	10,000	30,000	10,000	30,000	10,000	30,000
Direct Impacts	155	465	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Impacts in Wairarapa districts	180	550	360	1,070	25	76	19	57
Total Impacts in Wellington region	190	580	390	1,170	30	89	21	63

[11] In accounting terms this is equivalent to EBITDA.
[12] The region includes Wairarapa, and Wellington impacts include Wairarapa impacts.

On-Going Impacts Arising from Increased Farm Production

9. Irrigation of 10,000 Ha will increase farm-gate output by $65 million per year. This increase will be accompanied by an increase in direct value added[13] on-farm and in the supply of irrigation water[14] of $36 million per year, including $8 million per year of earned[15] household income. There will be an increase of 200 jobs on-farm, with 142 of those occurring in horticulture (see upper section of Summary Table 2). This increase in value added is equivalent to approximately 18 % of current value added in agricultures, and the additional employment is equivalent to 8 percent of jobs currently existing in agriculture. Irrigation of 30,000 will have proportionately greater impacts, and will increase value added in agriculture by $109 million per year and employment by 600 FTE jobs. These increases are equivalent to 53 % of current value added and 25 per cent of current employment in agriculture.

10. Multiplier effects arise as a result of the expansion of economic activity in supporting industries. The combination of direct impacts on-farm and multiplier[16] effects in the farm-support industries gives a total increase in Wairarapa's value-added (GDP) of $49 million per year, including earned household income of $17 million per year. The additional 169 jobs created off-farm give a total increase of 369 jobs in the Wairarapa (see middle section of Summary Table 2). These increases are equivalent to 2.9 % of current Wairarapa value added and 1.9 % of current Wairarapa employment. If 30,000 Ha is irrigated, the increase in Wairarapa Value added will be 8.8 % of current value added, and the increase in Wairarapa employment will be 6 – 7 % of current employment[17].

11. The total economic impacts in the Wellington region[18] of irrigating 10,000 Ha would be an increase of 403 jobs and $52 million per year in GDP, including $18 million per year in household income. The difference between Wairarapa and total Wellington (including Wairarapa) impacts is due to the higher multiplier effects of farming at the regional level, resulting from the regional economy being more diversified and self-sufficient than the district economy. Irrigation of 30,000 Ha would increase regional GDP by $157 million per year and regional employment by 1,210 FTE jobs.

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13 Value-added is the return to labour and capital. It is the equivalent concept to Gross Domestic Product. In accounting terms it can be seen as EBITDA + wages & salaries, or as gross output less purchases of inputs (other than capital and labour).

14 The off-farm costs of water supply will be almost entirely value-added in the irrigation company as a result of the expected high capital costs and minor operating costs. Once water supply costs are known, that cost will be deducted from value added currently shown as occurring in farming and will be re-allocated to the irrigation water supply industry.

15 Wages and salaries, plus self-employed income. Excludes any dividends from increased profits

16 Sometimes called indirect and induced effects.

17 Note that many working people who live in the region do not live in the region (see Table 14, Appendix II). The increase is equivalent to 6 % of the employed people who live in Wairarapa, and 7 % of the jobs located in the district.

18 Including Wairarapa

Summary Table 2 District and Regional Economic Impacts of Wairarapa Irrigation Scheme at Full Development of 10,000 and 30,000 Ha

	Output ($m / yr)		Jobs (FTEs)		Value-Added ($m / yr)		House-Hold Income ($m/yr)	
Ha	**10,000**	**30,000**	**10,000**	**30,000**	**10,000**	**30,000**	**10,000**	**30,000**
Dairy farming direct	38	114	90	270	21	63	4	12
Other pastoral and arable farming direct	10	29	-32	-95	7	21	-1	-2
Horticulture (or similar)	18	53	142	425	8	25	5	14
Sub-Total – Direct Farming (rounded)	**65**	**196**	**200**	**600**	**36**	**109**	**8**	**24**
Farm support effects in Wairarapa	23	68	169	510	13	37	9	27
Total Wairarapa impacts (rounded)	**88**	**264**	**369**	**1,110**	**49**	**146**	**17**	**51**
Farm support elsewhere in Wellington*	8	25	34	100	3	11	1	4
Total Wellington Impacts (rounded)	**96**	**289**	**403**	**1,210**	**52**	**157**	**18**	**55**

12. Over half of the total Wairarapa employment impacts, nearly half of the household income impacts, and three quarters of value-added impacts, occur on-farm. There are also significant effects on agricultural contracting, wholesale and retail trade, transport and communications, and services - particularly repair and maintenance services and packing and storage of fruit.

13. About 68 percent of direct net on-farm employment, 23 percent of direct value added and 56 percent of direct household income arises from the expansion of horticulture. If there is no expansion of horticulture, then economic impacts in Wairarapa and Wellington would increase by significantly less than is shown in this report[19].

On-going Impacts Arising from Increased Processing

14. The above analysis assumes that no processing of horticultural crops or milk will take place within the region. This reflects the current lack of such industries in the region. The conversion of sheep and beef farms and mixed cropping farms from livestock production to dairying, dairy support and horticulture also means that there will be a significant drop in total livestock production and hence meat processing. However, the drop in meat processing is not expected to be felt in Wellington because a much higher proportion of the remaining stock is expected to be kept in the region and fattened and slaughtered, as opposed to significant numbers being sold out of the region as stores and slaughtered elsewhere as now happens.

15. The impacts reported here should be seen as upper limits to the net impacts on the community[20]. The estimates are based on an implicit assumption that there will be labour available to take up these jobs, and that the people taking them up will be either unemployed or out of the labour force in the absence of the irrigation, or will be migrants into the region from elsewhere. To the extent that the jobs are filled by people leaving existing jobs in the region and those existing jobs are not filled, the impacts will be lower than is estimated here.

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[19] Horticulture generates much higher economic impacts per Ha. While the higher impacts may be associated with greater non-market benefits (e.g. through increasing employment opportunities), this does not imply that overall horticulture is a more efficient use of land since horticulture requires high capital investment and labour inputs, with corresponding high opportunity costs, to generate these impacts.

[20] For the assumed land uses. Different land use mixes will give different results.

2. Background

2.1 Farming and Irrigation Schemes in Wairarapa

Wairarapa is exposed to frequent dry conditions and drought. This both reduces production for any given farm type, while also limiting the land uses which farmers can adopt at an acceptable level of risk. Over the years, various irrigation projects have been proposed to increase production and enable a range of more profitable land uses to be undertaken. Butcher Partners Ltd (BPL) has been asked to review the economic impacts of the irrigation of 10,000 and 30,000 Ha on the Combined Wairarapa Districts (hereinafter referred to as Wairarapa and including Masterton, Carterton and Southern Wairarapa districts) and on the Wellington Region.

Economic impacts are expressed in terms of changes in employment, valued-added (which at an aggregate district, regional or national level is more commonly referred to as GDP), and earned household income. Results are also expressed per thousand Ha for existing unirrigated land uses, and for a range of expected irrigated land uses.

2.2 Economic Impacts Assessed

BPL has been asked to assess the one-off economic impacts of the capital costs of converting land to irrigated farming, as well as the on-going net economic impacts of farming the irrigated land. Net economic impacts of converting to irrigation are assessed by calculating the existing gross economic impacts of dryland farming and the expected gross economic impacts of irrigated farming, and then calculating the difference between the two.

BPL has NOT assessed the one-off economic impacts of constructing water storage and distribution systems. This is because no system has yet been selected.

2.3 Land Uses Selected

Economic impacts have been assessed for a particular mix of land uses, both existing and expected under irrigation. It has been assumed that irrigated land will be used for some mix of dairy, arable[21], Sheep and Beef, Dairy Support and Horticulture. Apples have been used as a representative horticultural crop. Had we used viticulture instead, then the on-farm impacts per Ha would have been considerably less[22], but if we assumed that the grapes were processed into wine within the district then the combination of on-farm and off-farm impacts would have been much closer to the impacts of orchards where fruit is assumed to be packed and stored within the region, but not to be processed into apple juice or some other apple-based product[23]. This study is intended to provide an indication of the likely impacts of irrigation, and the uncertainty about areas going into horticulture is far greater than the differences in impacts between orchards and viticulture. A more detailed analysis may be justified once land uses and processing options are known with greater certainty.

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[21] Experience in Canterbury suggests that irrigated arable farms will focus on cropping and a comparatively small proportion of income will come from providing silage and grazing to dairy farms.

[22] Work done for Ruataniwha suggested that viticulture had 30 % as much output per Ha, 40 % as much employment, and 69 % as much value added per Ha as apples.

[23] Work done for the Ruataniwha project indicated broadly similar employment figures for apples including packing and storing and grapes including production of wine.

In assessing the gross and net impacts over 10,000 and 30,000 Ha, a specific mix of existing[24] and irrigated land uses has been assumed on the basis of advice from those involved in developing the scheme proposal. Because there is considerable uncertainty about both the land-use mix and the irrigated area, impacts have also been expressed on a per thousand Ha basis for each of the proposed land-uses. This enables readers to readily adjust the figures in this report to reflect their own expectations about existing and future land-uses.

Table 1: Pre- and Post-Irrigation Land Uses

	Existing Dry Land			Irrigated		
	%	10,000 Ha	30,000 Ha	%	10,000 Ha	30,000 Ha
Dairy	22 %	2,200	6,600	45 %	4,500	13,500
Arable & Mixed	40 %	4,000	12,000	30 %	3,000	9,000
Sheep & Beef	24 %	2,400	7,200	12 %	1,200	3,600
Dairy Support	14 %	1,400	4,200	10 %	1,000	3,000
Horticulture	0.0 %	0	0	3 %	300	900
Total	100 %	10,000	30,000	100 %	10,000	30,000

2.4 Purpose of this Report

The irrigation scheme is still in its preliminary stages of design. Whether or not it proceeds will depend on support from local and central government, and from the Wairarapa community. The level of support, as well as the resource consent process, would benefit from an understanding of the likely regional economic impacts of irrigation.

An economic impact analysis is not a commercial analysis or a Cost Benefit Analysis. The farm budgets provided in this report give a preliminary indication of potential commercial benefits to farmers, but farmers will need to modify these to reflect their individual farm circumstance, while also weighing up the financial benefits against the costs of providing water to the farm-gate and the need for additional on-farm capital investment.

The commercial analysis is also not a Cost Benefit Analysis, as it does not take into account the opportunity costs of water (i.e. its value in other uses), nor any other social, recreational or environmental costs or benefits associated with the project.

In due course, once data on these other factors becomes available, it will be up to farmers to make a commercial decision as to whether they want to proceed with irrigation, and then up to the community and statutory decision-makers (e.g. commissioners or the Environment Court) to weigh up the commercial benefits against the non-market intangible costs and benefits associated with social, recreational and environmental values.

What this economic impact analysis does is to provide information about the likely regional and district employment impacts, which are relevant when assessing these social values.

[24] Note that the mix of land uses on land expected to be irrigated will not be the same as the mix of land uses over the entire Wairarapa districts.

2.5 Project Costs.

As noted earlier, off-farm project costs have been excluded in completing the farm budgets and the economic impacts. The one-off economic impacts of construction can be calculated in due course once capital costs are known. These may be significant in terms of calculating Net Present Value economic impacts of employment and household income over the project lifetime. However, the off-farm capital costs are unlikely to significantly affect estimates of total value added because, at present, the value-added associated with the construction cost is included as farm value-added. This is because the costs of providing water have not been deducted as a farm cost, and hence farm profit (which is part of value-added) is higher than it will be once the costs of water supplied to the farm gate are deducted. The charges for water will primarily represent a transfer of value-added from the farm sector to the water supply sector.

The off-farm operating costs of the project are not likely to materially affect the assessment of on-going economic impacts because whatever scheme is chosen is likely to have small operating costs, particularly if water is piped to supply water at pressure at the farm gate.

2.6 Farm Budgets

Farm budgets have been provided by Agribusiness Group, and are detailed in an Appendix to this report. The existing land use budgets are based on budgets produced by Baker and Associates[25], who are local farm consultants, and these budgets are presumed to be a fair analysis of the current productive and economic state of farming in the area. Agribusiness Group have chosen to use more aggressive models of post-irrigation farm systems than those adopted in the Baker report, and the Agribusiness budgets are based on their knowledge of the current state of irrigation development in Canterbury. In particular, Agribusiness has assumed that the livestock component of irrigated mixed cropping farms will be dairy grazing rather than breeding and fattening sheep and beef as is the case on dryland mixed cropping farms, because experience has been that dairy grazing provides the greatest returns to farmers.

The main factors to recognise are that product prices are based on a long term average (the last four years actual and the next three years forecast). Long term price assumptions (2013 prices) include $7.07 per kg for milk solids, $4.18 per kg for manufacturing beef, $5.68 per kg for lamb, and $26.58 per carton for apples.

[25] Wairarapa Water Use: Land Use Affordability under Irrigation" prepared by Baker & Associates in April 2014

3. Method

3.1 Economic Impact Analysis

Economic Impact Analysis is used to estimate the total economic impacts at the district and regional level. Impacts are reported in terms of employment, regional GDP or value-added[26], and earned household income, which is a component of value-added.

The first step of the impact analysis was to develop a description of the Wairarapa District and Wellington regional economies. This was based on Statistics NZ employment and population data, and supplemented with available data on agricultural production. Using this data, a generic regional input-output model for 2006-07 was created, using as a base a 2006-07 national input-output model[27].

Agribusiness Group developed dryland and irrigated farm budgets for a range of different land uses. These budgets were translated into a standard analytical format, and the budget components were assigned to industry category and location of purchases (in and out of district and region)[28]. The location was determined on the basis of previous surveys of farmer expenditure patterns in other projects (Hawkes Bay, Hurunui and Opuha), with these being modified to reflect BPL's understanding of the regional economy. A more sophisticated analysis of economic impacts could include a survey of where Wairarapa farmers spend their money. The model budgets for each land use were then incorporated into the generic Wairarapa and Wellington input output table to produce land-use-specific regional models that can be manipulated to predict the likely regional impacts of land-use changes in the irrigated area.

It has been assumed that the currently dry land that is likely to be irrigated is currently 22 percent dairy, 40 percent mixed-arable, 24 percent Sheep and Beef, and 14 percent dairy support. It has been assumed that under irrigation 45 percent of the land would be used for dairying, 30 percent for mixed-arable, 12 percent for Sheep and Beef finishing, 10 percent for dairy support, and 3 percent for orchards and viticulture. This land use mix was then fed into the model to provide estimates of the economic impact from irrigating 10,000 ha and 30,000 Ha. However, results were also produced on a per thousand Ha basis so that different assumptions about total irrigated area and land-use mixes can be readily calculated.

3.2 Farmer Affordability Analysis

Affordability analysis has not been undertaken, firstly because this was not part of the brief, secondly because water delivery costs are not known, and finally because individual farmers need to make assessments for their particular circumstances including existing rainfall, soil types, and farming interests.

Capital and operating budgets have been developed for each farm type, with the latter showing operating cash surpluses after deducting all operating costs, including costs of farm

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[26] Value-Added is the return to labour and capital. As such it includes interest payments and taxes, which are payments made to owners of capital and to government from the income earned. In accounting terms, value added is equivalent to EBITDA plus wages and salaries.

[27] Based on the 2006-07 released by Statistics New Zealand in 2012.

[28] The higher the proportion of expenditure which occurs out of the region, the lower the multiplier effects

management (drawings in the case of an owner-operator) and on-farm irrigator operating costs. The budgets do not include any allowance for the costs of water delivery by the new irrigation scheme. Hence the "profits" are returns to the capital invested in both the farm and the irrigation scheme.

In due course farmer affordability analysis will give some confidence as to whether or not farmers are likely to take up the water, and hence whether or not the benefits and economic impacts proposed in this report will be realised.

4. Economic Impact Assumptions

4.1 Land-Use and Farm budgets

A mix of current and future land uses (see Table 2) was assumed on the basis of advice from the project team. The process by which farm budgets were developed for each land type is described in Appendix 3. Farm models use predictions of long term average input costs and product prices[29].

The budgets show a surplus which is available to the newly irrigated farms to provide a return on the capital costs of conversion, and to cover their share of irrigation scheme water storage and distribution costs, although the latter are not yet known. The difference in cash operating surpluses prior to the irrigation scheme, and the cash operating surpluses after the establishment of the irrigation scheme *less* the costs of supplying water to the farm gate, will be the net financial benefits of the scheme. Detailed farm budgets and differences in total costs are shown below in Table 2 and Table 3.

Table 2: Land Uses Before and After Irrigation of 10,000 & 30,000 Ha

		Dairy	Mixed & Arable	Sheep & Beef	Dairy Support	Orchards	Total*
Pre-Scheme	10,000 Ha	2,200	4,000	2,400	1,400	0	10,000
Dry Land	30,000 Ha	6,600	12,000	7,200	4,200	0	30,000
	Share	22 %	40 %	24 %	14 %	0 %	100 %
Post-Scheme	10,000 Ha	4,500	3,000	1,200	1,000	300	10,000
Irrigated	30,000 Ha	13,500	9,000	3,600	3,000	900	30,000
	Share	45 %	30 %	12 %	10 %	3 %	100 %

4.2 Irrigation Scheme and Farm Conversion Capital Costs

Off-farm capital costs are not included in this analysis. On-farm capital costs are based on information from the Agribusiness Group. The costs of on-farm development of 30,000 Ha are estimated at $245 million[30], with a further $132 million required for dairy company shares and $88 million for livestock. The total capital cost for farmers is thus $465 million. Conversion of 10,000 Ha will involve costs of only one third as much. Typical costs per Ha for conversion to irrigation are shown in Table 4.

[29] The objective is to ensure that prices are not distorted by a current aberration from long term international price and exchange rate averages.

[30] These are the costs incurred by farmers, and do not reflect where the money is spent. The value added, household income and employment impacts do reflect where the expenditure occurs

Table 3: Pre-Irrigation Budgets per 000Ha

	Dairy	Mixed Arable	Sheep and Beef
Revenue			
Milk solids	6,311,384	-	-
Arable	-	308,200	-
Cattle	535,714	692,000	756,680
Sheep	-	604,000	666,000
Supplement Sales	-	-	27,000
Other	71,429	-	-
Total Revenue	**6,918,527**	**1,604,200**	**1,449,680**
Expenditure			
Labour	473,214	216,960	168,420
Animal Health	187,500	27,000	24,700
Breeding	107,143	8,000	10,000
Shed Expenses	53,571	-	-
Electricity	98,214	41,000	30,000
Feed	937,500	-	58,500
Shearing	-	37,800	30,600
Fertiliser	526,786	150,000	101,380
Lime	26,786	-	-
Freight	26,786	25,000	25,000
Regrassing	53,571	207,000	186,500
Weed and Pest	26,786	56,000	25,000
Fuel	107,143	28,000	26,000
Vehicle Costs	89,286	28,000	26,000
Repairs and Maintenance	357,143	65,000	65,000
Communication	17,857	6,000	6,000
Accountancy	26,786	6,000	6,000
Legal and Consultancy	35,714	10,000	10,000
Other Admin	26,786	10,000	10,000
Rates	89,286	30,500	30,500
Insurance	62,500	30,500	30,500
Other Expenditure	53,571	-	-
Total Farm Working Expenses	**3,383,929**	**982,760**	**870,100**
Cash Farm Surplus	**3,534,598**	**621,440**	**579,580**
Wages of Management	616,000	229,000	229,000

Table 4: Post-Irrigation Budgets per 000 Ha

	Dairy	Mixed Arable	Sheep & Beef	Dairy Support	Horticulture
Revenue					
Horticulture	-	-	-	-	58,807,159
Milk solids	11,381,589	-	-	-	-
Arable	-	3,148,000	-	-	-
Cattle	443,875	-	887,719	-	-
Sheep	-	-	4,101,994	-	-
Supplement Sales	-	598,000	-	1,122,000	-
Grazing	-	338,000	-	2,805,000	-
Other	-	120,000	-	-	-
Total Revenue	**11,825,464**	**4,204,000**	**4,989,713**	**3,927,000**	**58,807,159**
Expenditure					
Livestock Purchases	-	-	2,245,371	-	-
Labour	1,025,000	195,000	102,773	50,000	12,801,250
Contracting	-	80,000	-	-	444,341
Packing	-	-	-	-	8,569,432
Packaging	-	-	-	-	8,209,727
Cool Storage	-	-	-	-	3,808,636
Pollination	-	-	-	-	63,477
Animal Health	385,000	-	56,525	-	-
Breeding (75 % AI)	133,000	-	-	-	-
Shed Expenses	98,000	-	-	-	-
Electricity	91,000	82,000	41,623	40,000	148,114
Feed	2,935,478	45,000	59,094	400,000	-
Shearing	-	-	38,540	-	-
Fertiliser	712,500	446,000	353,538	350,000	84,636
Freight	26,088	90,000	57,039	13,000	677,091
Regrassing	45,000	103,000	90,183	250,000	-
Weed and Pest	27,500	321,000	73,996	62,000	4,824,273
Fuel	77,500	129,000	62,178	65,000	655,932
Vehicle Costs	75,000	77,000	56,525	65,000	444,341
Repairs and Maintenance	298,750	119,000	128,209	112,000	677,091
Communication	10,000	90,000	8,000	8,000	126,955
Accountancy	12,500	17,500	6,500	6,500	169,273
Legal and Consultancy	42,500	17,500	6,500	6,500	148,114
Other Admin	74,000	16,000	6,000	6,000	105,795
Irrigation Costs	120,000	120,000	120,000	120,000	250,000
Rates	37,500	48,000	22,000	22,000	253,909
Insurance	27,500	56,000	18,000	18,000	888,682
Other Expenditure	12,500	216,000	6,000	6,000	677,091
Total Farm Working Expenses	**6,266,316**	**2,268,000**	**1,313,223**	**1,600,000**	**44,028,159**
Cash Farm Surplus	**5,559,148**	**1,936,000**	**3,676,490**	**2,327,000**	**14,779,000**
Wages of Management	404,000	250,000	511,000	511,000	2,589,000

Table 5: Capital Costs of Conversion on-Farm ($m) for 10,000 & 30,000 Ha

	Dairy		Mixed Arable		Sheep and Beef		Dairy Support		Horti-culture		Total	
Area (Ha)	4,500	13,500	3,000	9,000	1,200	3,600	1,000	3,000	300	900	10,000	30,000
Clean Up	0.2	0.7	0.2	0.5	0.1	0.2	0.1	0.2	0.6	1.8	1	3
Irrigation System	15.7	47.3	10.5	31.5	4.2	12.6	3.5	10.5	3.0	9.0	37	111
Cow Shed	15.8	47.3	-	-	-	-	-	-	-	-	16	47
Electricity	0.5	1.4	-	-	-	-	-	-	1.5	1.4	1	3
Housing	2.3	6.8	-	-	0.4	1.3	-	-	2.3	6.8	5	15
Other Buildings	0.6	1.7	0.5	1.4	0.1	0.2	0.1	0.2	0.6	1.8	2	5
Fencing and Lanes	0.5	1.4	-	-	0.2	0.7	0.2	0.6	-	-	1	3
Stock water	0.2	0.7	-	-	0.1	0.2	0.1	0.2	-	-	0	1
Fertiliser	1.4	4.1	-	-	0.4	1.1	0.3	0.9	0.6	1.8	3	8
Regrassing	2.3	6.8	-	-	0.6	1.8	0.5	1.5	-	-	3	10
Machinery	1.1	3.4	1.8	5.4	0.2	0.5	-	-	2.4	7.2	6	17
Livestock	35.1	105.3	(3.0)	(9.0)	(1.4)	(4.3)	(1.2)	(3.6)	-	-	29	88
Supply Shares	43.8	131.5	-	-	-	-	-	-	-	-	43	132
Trees planted	-	-	-	-	-	-	-	-	7.5	22.5	8	23
Total (rounded)	**119**	**358**	**10**	**30**	**5**	**14**	**3**	**10**	**18**	**52**	**155**	**465**

5. Summary of Economic Impacts

5.1 Direct Net Economic Impacts of Increased Irrigation

If the mix of land-uses is as shown in Table 6, the irrigation of 10,000 Ha of currently unirrigated land will eventually increase farm-gate income by an estimated $65 million per year while expenses, including wages & salaries of $8 million / year, will increase by $37 million per year. Hence profits (before interest and tax, and before deducting charges for water delivery to the farm gate) will increase by $28 million per year, and 200 jobs will be created. Value-added, which includes wages and salaries, will increase by $36 million per year.

The irrigation of 30,000 Ha will increase the value of farm gate output by $196 million per year, will increase value added by $109 million per year including $24 million per year of wages and salaries, and will create 600 on-farm jobs.

It must be recognised that because water charges have not been included as a cost, a significant part of this increase in value-added will accrue to the water supply "industry".

Table 6: Net On-Farm Impacts from converting 10,000 & 30,000 Ha from Dryland to Irrigation.

	Land-use			**Impacts**							
	Area (in Ha)			**Sales ($m / yr)**		**Jobs (FTEs)**		**Value-Added ($m / yr)**		**Household Income ($m / yr)**	
	10,00 Ha	30,000 Ha	% of total	10,000 Ha	30,000 Ha	10,000 Ha	30,000 Ha	10,000 Ha	30,000 Ha	10,000 Ha	30,00 0 Ha
Dryland *											
Dairy	3,300	6,600	22	15.3	46.0	34	101	8.8	26.5	2.4	7.3
Mixed & Arable	6,000	12,000	40	6.4	19.3	38	115	3.3	10.0	1.8	5.4
Sheep and Beef	2,400	7,200	24	3.5	10.4	29	86	1.8	5.4	1.0	2.9
Dairy Support	1,400	4,200	14	2.9	8.6	12	36	1.1	3.4	0.4	1.2
Gross Loss	**10,000**	**30,000**	100	**28**	**84**	**113**	**340**	**15**	**45**	**5.6**	**17**
Irrigated											
Dairy	4,500	13,500	45	53.2	159.6	124	371	29.8	89.4	6.4	19.2
Mixed &Arable	3,000	9,000	30	12.6	37.8	27	80	6.4	19.3	1.3	4.0
Sheep and Beef	1,200	3,600	12	6.0	18.0	12	36	4.6	13.7	0.7	2.2
Dairy Support	1,000	3,000	10	3.9	11.8	9	26	2.4	7.2	0.6	1.7
Orchards	300	900	3	17.6	52.9	142	425	8.3	24.9	4.7	14.1
Gross Gain	**10,000**	**30,000**	100	**93**	**280**	**313**	**940**	**51**	**154**	**13.7**	**41**
Net Change	**0**	**0**		**65**	**196**	**200**	**600**	**36**	**109**	**8.0**	**24**

The scale of the economic impacts is highly dependent on the assumptions regarding land being converted to orchards[31], with 27 percent of the additional net output, 23 percent of the additional net value added, 56 percent of the additional net household income and 68 percent of the additional employment depending on the conversion to orchards in spite of this being only 3 percent of the irrigated land use. The huge increases in household income and employment arise from the very high labour demands for pruning, thinning and picking.

[31] Had we chosen to use viticulture rather than horticulture the on-farm impacts would have been less, but the inclusion of processing wine into grapes would have led to broadly similar total district and regional economic impacts.

Table 7: Direct On-farm Impacts per thousand Ha for various land uses

	Impact			
	Sales ($m / yr)	**Jobs (FTEs)**	**Value-Added ($m / yr)**	**Household Income ($m / yr)**
Unirrigated				
Dairy	6.9	15	4.0	1.1
Mixed and Arable	1.6	10	0.8	0.4
Sheep and Beef	1.4	12	0.8	0.4
Dairy Support	2.1	8.6	0.8	0.3
Irrigated			(before water charges)	
Dairy	11.8	27	6.6	1.4
Mixed and Arable	4.2	8.9	2.1	0.4
Sheep and Beef	5.0	10	3.8	0.6
Dairy Support	3.9	8.6	2.4	0.6
Orchards	58.8	473	27.6	15.7

** Value-added is the return to labour and capital. Hence it includes household income as shown, as well as interest, depreciation and profits (before tax).

5.2 Total Impacts

5.2.1 Wairarapa

There are significant multiplier effects arising from the provision of goods and services to support increased farm production and household spending. These impacts raise the total impacts in Wairarapa for an irrigated area of 10,000 Ha to 369 jobs and $49 million per year of value-added (GDP), including $17 million per year of household income (see Table 8). If 30,000 Ha are converted to irrigation, then the increase in regional GDP will be $146 million per year, including $51 million per year of earned household income, and 1,110 jobs will be created.

The above estimates exclude any effects arising from the further processing[32] of output, primarily because of the current lack of such processing capacity in the district. There will be a decline in livestock production (net of stock purchases) as land is converted from livestock farming to dairy, dairy support and orcharding, and as the livestock component of mixed farming shifts from sheep and beef production to dairy grazing. However, the decline in production is expected to be offset by a larger proportion of the remaining production being fattened and slaughtered in the district rather than being sold as stores for fattening and slaughter outside the district.

5.2.2 Wellington

Total economic impacts in Wellington region, including the Wairarapa, are greater than for Wairarapa alone because regional multipliers are higher. If 10,000 Ha are irrigated, then Wellington regional GDP is expected to increase by $52 million per year, including $18 million per year of earned income. This increase is expected to be accompanied by the

[32] Apples are presumed to be packed and stored within the district and region.

creation of 403 additional jobs. Should 30,000 Ha be irrigated, then the increase in regional GDP is expected to be $157 million per year, including an increase in household income of $55 million per year, and an additional 1,210 jobs are expected to be created (see Table 9).

Table 8: Total Wairarapa Economic Impacts (including multiplier effects) per thousand Ha of land use, and over 10,000 Ha & 30,000 Ha.

		Output ($m / yr)	Jobs (FTEs)	Value-Added ($m / yr)	H-Hold Income ($m / yr)
Dryland per 000 Ha					
Dairy		9.0	29	5.1	1.8
Mixed and Arable		2.3	14	1.2	0.7
Sheep and Beef		2.1	17	1.1	0.6
Dairy Support		3.3	17	1.4	0.7
Gross Loss (rounded)	10,000 Ha	**39**	**190**	**21**	**9**
	30,000 Ha	**116**	**560**	**62**	**27**
Irrigated					
Dairy		14.4	46	8.0	2.4
Mixed and Arable		6.0	22	3.1	1.1
Sheep and Beef		6.3	19	4.4	1.1
Dairy Support		5.6	21	3.2	1.2
Orchards		102	790	51	32
Gross Gain (rounded)	10,000 Ha	**127**	**560**	**69**	**26**
	30,000 Ha	**380**	**1,670**	**208**	**78**
Net Gain	10,000 Ha	**88**	**369**	**49**	**17**
	30,000 Ha	**264**	**1,110**	**146**	**51**

* Output (or sales) less non-wage operating costs = Value-added.

** Value-added is the return to labour and capital. Hence it includes household income as shown, as well as interest, non-economic depreciation and profits (before tax).

Table 9: Total Wellington Economic Impacts (including multiplier effects) per thousand Ha of land use, and over 10,000 Ha & 30,000 Ha.

		Output ($m / yr)	Jobs (FTEs)	Value-Added ($m / yr)	H-Hold Income ($m / yr)
Dryland per 000 Ha					
Dairy		9.8	34	5.5	2.0
Mixed and Arable		2.6	16	1.3	0.7
Sheep and Beef		2.4	18	1.2	0.7
Dairy Support		3.6	19	1.6	0.8
Gross Loss (rounded)	10,000 Ha	**43**	**206**	**23**	**10**
	30,000 Ha	**129**	**620**	**68**	**31**
Irrigated					
Dairy		15.5	51	8.5	2.5
Mixed and Arable		6.9	26	3.5	1.3
Sheep and Beef		6.7	21	4.6	1.1
Dairy Support		6.0	22	3.5	1.3
Orchards		116	856	58	36
Gross Gain (rounded)	10,000 Ha	**139**	**609**	**75**	**29**
	30,000 Ha	**418**	**1,827**	**226**	**86**
Net Gain (rounded)	10,000 Ha	**96**	**403**	**52**	**18**
	30,000 Ha	**289**	**1,210**	**157**	**55**

* Output (or sales) less non-wage operating costs = Value-added.

** Value-added is the return to labour and capital. Hence it includes household income as shown, as well as interest, non-economic depreciation and profits (before tax).

The above figures exclude any impacts on primary product processing within the region. The conversion of sheep and beef farms and mixed cropping farms from livestock production to dairying, dairy support and horticulture means that there will be a significant drop in total livestock production and hence meat processing. However, the drop in meat processing is not expected to be felt in Wellington because a much higher proportion of the remaining stock is expected to be kept in the region and fattened and slaughtered, as opposed to significant numbers being sold out of the region as stores and slaughtered elsewhere as now happens. There may be an increase in processing of vegetables and fruit in the region, though none occurs at present[33] and it is possible that future additional processing would take place in Hawkes Bay, which has a history of such processing[34]. Milk will most likely be processed at Pahiatua, which is in Manawatu-Wanganui and is reasonably close to areas expected to be irrigated. Should additional processing facilities be established in the region, very significant additional household income and employment could be generated in the area.

5.3 Impacts in Context

The increases in activity associated with 10,000 Ha of irrigation in the Wairarapa scheme would be equivalent to approximately 2.9 percent of Wairarapa's 2013 GDP and 1.9 percent of the district's employment (see Table 10). If 30,000 Ha are irrigated, the impacts are 8.8 % of Wairarapa's GDP and 5.8 % of the district's employment.

Table 10: Scheme-dependent impacts as percentage of Wairarapa's Economic Activity.

	Employment (FTEs)				**Value-Added***			
	Wairarapa 2013 census	Scheme Change (FTEs)	Change compared to base (%)		Wairarapa ($m / yr) 2012-13	Scheme Change ($m/yr)	Change compared to base (%)	
	A	B	C	D	E	F	G	H
Ha		10,000	10,000	30,000		10,000	10,000	30,000
All agriculture	2,376	200	8%	25%	207	36	18%	53%
All other sectors	16,536	169	1.0%	3.0%	1,432	125	1.1%	3.2%
Total economy	18,912	369	1.9%	5.8%	1,639	49	2.9%	8.8%

* Includes value added (GDP) in supplying water to the farm gate.

Sources: Column A. Statistics New Zealand
Column B Agriculture figure from Table 6 - final row: Jobs for 10,000 Ha
Total economy from Table 8- final row: Jobs for 10,000 Ha
All other sectors – Total economy less agriculture
Column C B ÷ A
Column D A x 30,000 Ha ÷ 10,000 Ha
Column E Statistics New Zealand – regional GDP data and Study estimates converting this to Wairarapa share of this
Column F Agriculture figure from Table 6 - final row for 10,000 Ha
Total economy from Table 8- final row: Value added for 10,000 Ha
All other sectors – Total economy less agriculture
Column G F ÷ E
Column H G x 30,000 Ha ÷ 10,000 Ha

[33] Employment in fruit and vegetable processing in Wairarapa in 2013 was 3 people, and in Wellington region was 30 people. This excludes employment in fruit pack houses and in cool stores, which are not considered to be part of the processing industry. It is expected that fruit will be packed and stored in Wairarapa.

[34] Employment in fruit and vegetable processing in Hawkes Bay in 2013 is 1,860 people.

The jobs that are created through irrigation are effectively embedded in the regional economy and cannot be outsourced overseas or moved to other parts of New Zealand. The scheme therefore provides a significant social benefit if increased employment and economic activity in Wairarapa is a policy goal.

5.4 Distribution of Income and Employment across Sectors

More than half of the on-going net economic impacts in Wairarapa occur within agriculture (see Table 11), with other significant impacts occurring in rural contracting, wholesale and retail trade, transport and storage (including cool stores), and services. The latter includes vet services, local government and, in particular, repairs and maintenance services and fruit packhouses.

The implication is that off-farm economic impacts are widely dispersed, and people in many industries get a benefit[35] from irrigation and the resultant increase in farming activity. If more processing were to occur in the district then off-farm impacts, and hence total impacts, would be greater, and the total impacts would be spread even more widely across the community.

Table 11: Distribution of Net Total Farm and Farm Support Economic Impacts among sectors in Wairarapa

Sector	Employment			Value Added			Household Income		
Ha		10,000	30,000		10,000	30,000		10,000	30,000
	%	FTEs		%	$m/yr		%	$m/yr	
Agriculture	54	201	603	75	36	109	48	24	24
Rural Contracting	3	9	28	1	0.5	1.6	3	1	1
All other manufacturing	2	7	21	1	0.6	1.7	2	1	1
Utilities* and Construction	1	4	13	1	0.4	1.1	1	1	1
Wholesale and Retail Trade	13	47	142	5	2.5	7.5	12	6	6
Transport** and Communications	3	12	36	2	0.9	2.6	4	2	2
Finance and Business Services	4	14	41	6	3.0	9.0	5	3	3
Vet, Health and Education	3	13	39	1	0.7	2.1	4	2	2
Local and Central Government	1	3	10	0	0.2	0.5	1	0	0
Repairs and Maintenance	6	20	61	2	1.0	3.0	5	3	3
Packing and Storage	10	38	113	5	2.5	7.4	15	7	7
Total Net Impacts	100	370	1,100	100	48	145	100	51	51

Source: Calculations of disaggregated multipliers from district input output model
Notes: Excludes impacts on processing industries.
* Includes all returns to the off-farm investment in irrigation.
** Includes coolstores.

[35] Assuming they are not capacity constrained, and do not have to turn down other work in order to meet the needs of irrigated farming.

5.4 Economic Impacts of Increased On-Farm Investment

Changes in land use to irrigated farming will require on-farm investment in land preparation, fencing, housing for dairy farm workers, dairy shed construction, on-farm irrigation systems, additional stock, and dairy company shares. A significant part of the direct spend will have no economic impacts within the region. For example:

- An increase in stock numbers will lead to a mix of stock being imported into the region and fewer stock going to slaughter, as local livestock farmers change production towards dairy breeds to increase herd sizes;
- Irrigators are imported into the region and the local content is limited to assembly and some site works;
- Dairy company shares may lead to additional construction of dairy processing plants in other regions, depending on whether additional processing capacity is required

The costs and impacts presented in this section exclude those associated with off-farm construction. While the off-farm component could well generate an economic impact of similar magnitude to the on-farm investment, there is at present considerable uncertainty as to exactly how and where the water will be stored and distributed, and hence what the costs and impacts will be.

Development of 10,000 Ha of irrigation is expected to lead to on-farm investment of $155[36] million (see Table 5 for details) which is expected to increase value added in Wairarapa by $25 million, including household income of $19 million, and an additional 360 job-years of work. The regional impacts will be somewhat greater with an estimated $30 million increase in GDP, an associated $21m increase in household income and 390 job-years of work. Development of 30,000 Ha will have impacts which are three times as great (see Table 12).

These economic impacts would be spread over a number of years with the timing dependent on the rate of conversion to irrigated land use. The project is likely to be financially viable only if a substantial number of farmers commit to paying for water from early on in the life of the project. These farmers are then likely to want complete conversion to happen quickly to ensure that they can make use of the water they are paying for. As a result, the impacts detailed above are likely to be centred on the period during, and for the first few years following, off-farm infrastructure conversion

Table 12: District and Regional Economic Impacts of 10,000 and 30,000 Ha Wairarapa Irrigation Scheme – On-Farm Investment only

	Output ($m)		Jobs (job-years)		Value-Added ($m)		H-Hold Income ($m)	
Ha	**10,000**	**30,000**	**10,000**	**30,000**	**10,000**	**30,000**	**10,000**	**30,000**
Direct Spend	155	465	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Impacts – Wairarapa	180	550	360	1,070	25	76	19	57
Total Impacts - Wellington	190	580	390	1,170	30	89	21	63

One-off effects will be spread over 10 - 15 years, with the most intensive activity occurring in the first five years

[36] For the purposes of this exercise, spending on dairy company shares and working capital is included as a change in output but has no effect on value-added or employment.

6. Interpreting the Results

6.1 Expected Outcomes

Wairarapa GDP will increase by a one-off $25 million as a result of on-farm investment associated with conversion of 10,000 Ha. Associated with that will be an extra one-off $19 million of household income and 360 job-years of work. Wellington region (including Wairarapa) GDP will increase by $30 million, with an associated $21 million of household income and 390 job-years of work. These impacts will be spread over several years, and exclude the impacts associated with off-farm construction. Development of irrigation on 30,000 Ha will have one-off impacts which are three times as great (see Table 12).

Wairarapa district GDP will increase as farms convert to irrigation and, once 10,000 Ha is being fully irrigated, regional GDP on farms and in industries that directly or indirectly support farms will increase by $49 million per year. Associated with this increase will be an additional $17 million per year of household income and 369 Full-Time-Equivalent jobs. Impacts of irrigation of 30,000 Ha will be three times as great (see Table 8).

Regional economic impacts will be greater, both because of greater self-sufficiency in some inputs at the regional level than the district level, and because multipliers at the regional level are greater. Taking all these factors into account, regional GDP will increase by $52 million per year. Associated with this increase will be an additional $18 million per year of household income, and 403 Full-Time-Equivalent jobs. Impacts of irrigation of 30,000 Ha will be three times as great (see Table 9).

Benefit

These estimates of economic impacts assume that there will be some financial benefit to farmers from the potential increases in GDP, but this will obviously depend on the financial feasibility of the projects. Whether irrigation is commercially feasible is as yet unknown because costs of storage and delivery of water are not yet known. The project will only proceed if the additional farm income is sufficient to cover the scheme capital and operating costs, as well as providing sufficient returns to cover the on-farm costs of conversion and also compensate investors for the risks they will be taking.

The wider community is expected to benefit from the increase in household income and employment discussed above, but the scale of this benefit depends on the ways in which labour and capital would have been otherwise employed in the absence of the Wairarapa irrigation project. If the project displaces other projects in the region which would have had a similar economic impact, then there is no particular economic impact and hence no particular community benefit from irrigation. This is because net employment and income will not have increased but will simply have been switched between industries. This seems unlikely, with the comparatively slow growth in the region over the last 10 years (see Appendix II) suggesting that a major irrigation project in Wairarapa would significantly increase regional income and employment above what it would otherwise be.

Councils will benefit from additional rates associated with the changes in land-use and higher land values. However, this is not a pure benefit as they will also have to pay for an increased range of services as a result of the increase in population and general economic activity.

Councils may use their net increase in income to either increase the range of services they provide to the community, or to reduce the average rate burden for all ratepayers.

The on-farm benefit will be derived from a number of sources:
On the irrigated area:

- An increase in production associated with irrigation of existing systems;
- A change in systems to higher intensity land uses such as dairying and cropping which are possible with more reliable irrigation;
- Reduced farming risk, which increases returns by enabling famers to move towards more risk-neutral behaviour, which generally has a higher average return than does a risk-averse management style.

On associated dryland:

- Ability to manage associated dryland areas better, given the increased flexibility which irrigation usually generates. This latter benefit has not been estimated for this project

An economic impact study of the sort reported here does not demonstrate whether or not the project will have a net benefit from the widest societal perspective, which takes into account environmental and other non-market values such as recreation. These factors would all be affected by the state of the river and levels of water abstraction. That widest perspective is a matter beyond the scope of economics. What this study does is provide decision makers, and the community, with information to inform their consideration of the wide range of costs and benefits.

6.2 Uncertainty of Outcomes

As is to be expected at this stage of project development, there remains considerable uncertainty as to the scale of the economic impacts. These depend heavily on the actual land-uses which come to pass, and on the degree and location of the processing of farm outputs. These caveats notwithstanding, the economic impacts shown in this report present a realistic picture of potential economic impacts of irrigation. This is particularly true of those figures, which are expressed on a per thousand Ha of land in a particular use basis. The farm-related impacts are consistent with the impacts which have been observed in previous studies which compare irrigated land with adjacent un-irrigated land.

The greatest uncertainty with respect to economic impacts relates to the proportion of land which goes into horticulture, and the level of processing of vegetables, dairy and grapes which takes place in the region. Even though the analysis assumes that only 3 percent of the irrigated land (300 Ha of 10,000 Ha and 900Ha of 30,000 Ha) goes into horticulture[37], this accounts for 71 percent of the direct on-farm employment increase, 59 percent of the direct household income increase and 23 percent of the direct value-added increase. While parts of Wairarapa have proven suitable for orchards and viticulture, there is no certainty that the proposed irrigation project will lead to any significant growth in these industries. The 2013 employment statistics show only 280 people being employed in the region in viticulture and 55 in fruit growing, and the 2006 census shows 270 employed in all forms of fruit growing. This is considerably less than the 425 jobs in horticulture which we have projected could potentially arise from the proposed Wairarapa Irrigation scheme. Employment in these

[37] Orchards were chosen as a representative horticultural crop, but viticulture processed into wine in the district would give broadly similar impacts.

industries is highly seasonal, and it is likely that many seasonal workers are not picked up in the official figures which are understated to this degree. Nonetheless, the postulated growth in horticultural employment is likely to be at least double current levels.

7. Comparison of the Wairarapa results with other irrigation schemes

Economic Impact assessments have been carried out for a number of proposed irrigation schemes[38] in recent years. In addition, an *ex post* assessment was conducted for the Opuha Irrigation scheme[39]. It would seem that there are plenty of examples with which to compare the results for the proposed Wairarapa scheme. However, comparisons between schemes are hindered by a number of variations in assessment methods, significantly limiting the value of any conclusions that are drawn.

One such difference is in the expression of results for a scheme. These are often expressed on a total scheme basis, rather than per thousand Ha for each separate land use type. There are substantial differences in the economic impacts for different land use types. This variability is coupled with disparities in the mix of land use types existing prior to irrigation, and in the mix that is presumed to exist post-irrigation. Given this level of variation, comparisons between the schemes have limited value. Comparisons with results in the Opuha case are further complicated because many of the farms were only partially irrigated. Results were presented on a "per effective Ha" and a "per irrigated ha" basis.

The difficulties in comparing financial impacts such as output, value added, and Household Income per thousand Ha, even for comparable land uses, are exacerbated by significant variations in commodity prices in the last decade. Most of the studies in question have tried to control for this by using long-term average prices. The exception to this is Opuha, which was based on actual farm accounts over the analysis period (2003-2005). The analysis carried out in this report for Wairarapa uses a long term average for dairying of $7.07 / kg, whereas comparable studies conducted in around 2005 used long-term averages of around $4.50 / kg. Even allowing for general price inflation, these figures are vastly different.

Significant changes in apparent labour productivity, particularly on dairy farms, in recent times also complicate any comparison. These changes in part represent a genuine increase in labour productivity on farms, but are also due to a change in farming systems e.g. dairy farmers buying in more feed, and grazing off-farm.

Finally, variation in the reliability of water-supplies in the schemes in question further limits the value of any comparison. This is demonstrated in the results from the Hunter Downs scheme. In that instance, lower scheme reliability, arising from having to leave a higher residual flow in the river, reduced the expected gross economic impacts per thousand irrigated Ha by almost one third, and the bet economic impacts by about half

Therefore, while BPL has provided some comparisons of economic impacts per thousand Ha for the sake of completeness, we must caution readers that, for the reasons outlined above, using this comparison with other schemes as a basis for assessing the accuracy of results for the Wairarapa scheme is of limited value.

[38] Ruataniwha, Hurunui, Central Plains, Hunter Downs.

[39] Harris Consulting *et al* 2006. *The Opuha Dam: An ex-Post Study of its Impacts on The Local Economy and Community*

7.1 Opuha

We were unable to establish the land use mix for the Opuha project. However, we were able to abstract estimates of net economic impacts per thousand irrigated Ha. These estimates are presented in tables 12 and 13.

It is not meaningful to compare the per thousand Ha results for Opuha with those for Wairarapa, because so much of the Opuha "irrigated farms" were only partially irrigated. As is shown in Table 13, the total area of farms with irrigation was 32,000 Ha, but the total irrigated area on those farms was only 15,000 Ha. If we divide the net results for the entire project (right hand column) by the 15,000 Ha irrigated area, then we get the results per thousand irrigated Ha shown at the bottom of each section (e.g. $2.8 million increase in output on-farm per irrigated Ha). From these, we can conclude that on-farm economic impacts per thousand Ha were 9.7 jobs and $1.0m per year value added, including $0.45 million per year of earned household income. This is comparable with Wairarapa figures of 20 jobs and $3.9m / year of value added.

However, if orchards were excluded from the land use types considered in the Wairarapa scheme, with that land changed to dairying, the scheme would only result in 7 jobs per thousand Ha and $3.4m per year of value added per thousand Ha. All that this demonstrates is that the results of the two schemes are not necessarily inconsistent.

Table 12: Opuha - Economic impacts per thousand Ha of land on farms with some irrigation

	Dry Land	Irrigated Land
Output ($m / year)		
Direct on Farm	$0.86m	$2.07m
Direct in Processing	$0.67m	$2.04m
Indirect and Induced	$0.76m	$1.94m
Total	$2.29m	$6.05m
Employment (FTEs)		
Direct on Farm	5.1	9.6
Direct in Processing	1.8	4.8
Indirect and Induced	5.4	12.6
Total	12.3	26.9
Value Added ($m / year)		
Direct on Farm	$0.25m	$0.75m
Direct in Processing	$0.14m	$0.38m
Indirect and Induced	$0.32m	$0.83m
Total	$0.71m	$1.96m
Household Income ($m / year)		
Direct on Farm	$0.10m	$0.30m
Direct in Processing	$0.08m	$0.20m
Indirect and Induced	$0.20m	$0.49m
Total	$0.38m	$1.0m

Source: Table 15. Harris et al. 2006

Table 13: Opuha- Economic impacts per thousand Ha of land, and per thousand Ha of irrigated land – all land uses.

	Per 000 Ha		Net Effect Scheme 32,000 Ha total and 15,000 Ha irrigated	
	On-farm	Region	On-farm	Region
Output ($m/yr)				
Dryland	0.86	2.29		
Part Irrigated	2.07	6.05		
Ratio	2.4	2.6		
Net Change	1.21	3.76	40	124
Net per Irrigated 000 Ha	2.8	7.7		
Employment (FTEs)				
Dryland	5.1	12.3		
Part Irrigated	9.6	26.9		
Ratio	1.8	2.2		
Net Change	4.5	14.6	145	480
Net per Irrigated 000 Ha	9.7	30		
Value Added ($m/yr)				
Dryland	0.25	0.71		
Part Irrigated	0.75	1.96		
Ratio	3.0	2.8		
Net Change	0.50	1.25	16.3	41
Net per Irrigated 000 Ha	1.0	2.5		
Household Income ($m/yr)				
Dryland	0.10	0.38		
Part Irrigated	0.30	1.00		
Ratio	3.0	2.7		
Net Change	0.20	0.62	7	20
Net per Irrigated 000 Ha	0.45	1.2		

7.2 Hunter Downs

The Hunter Downs irrigation scheme proposed to take water from the Waitaki river, but there was a debate as to what the minimum residual flows in the Waitaki should be. The minimum residual flow affects the number of days on which water can be extracted, which affects the reliability of water supply for irrigation. This reliability, or lack of it, affects viable land uses and average yields.

In the Hunter Downs impact assessment, two scenarios were modelled which were essentially Scenario I reliable supply and Scenario II – less reliable supply. The economic impacts for both are shown in the following tables. In essence, the net on-farm impacts of converting dryland to reliably irrigated land were around 11 jobs and $1.1 million per year of value added per thousand Ha (Table 13). Conversely, conversion from dryland to less reliably irrigated land generated net farm impacts of only 6 jobs and $0.5 million per year of value added.

On the face of it the figures of 11 jobs and $1.1 million per year can be compared to the expected Wairarapa figures of 20 jobs and $3.9 million / year. However, unpublished data reveals that the economic impacts for Hunter Downs assumed that none of the existing land

use was dairying, and the irrigated land use would be quite different to that assumed in Wairarapa. In particular no irrigated land would be used for horticulture. If similar assumptions were applied to the Wairarapa project, the net economic impacts per thousand Ha would be hugely reduced. However, using the Hunter Downs land use mixes for the Wairarapa project would be inappropriate given the known current land uses in Wairarapa.

Table 14: Hunter Downs - Economic impacts of conversion from Dryland to Irrigated Land – reliable irrigation

Impacts per 000 Ha of land		
	On-farm	Region
Output ($m/yr)		
Dryland	1.1	2.6
Scenario I – high reliability	3.9	12.1
Ratio Reliable Irrigation : Dryland	3.4	4.6
Net Impacts	2.8	9.4
Employment (FTEs)		
Dryland	6.8	15.6
Scenario I – high reliability	18.2	46.3
Ratio Reliable Irrigation : Dryland	2.7	3.0
Net Impacts	11.4	30.7
Value Added ($m/yr)		
Dryland	0.6	1.2
Scenario I – high reliability	1.8	4.2
Ratio Reliable Irrigation : Dryland	2.8	3.6
Net Impacts	1.1	3.0

Table 15: Hunter Downs - Impacts of Conversion from Dryland to Irrigated Land – less reliable irrigation.

Impacts per 000 Ha of land		
	On-farm	Region
Output ($m/yr)		
Dryland	1.1	2.6
Scenario II – lower reliability	2.7	8.3
Net Impacts	1.6	5.7
Employment (FTEs)		
Dryland	6.8	15.6
Scenario II – lower reliability	12.6	33.5
Net Impacts	5.8	17.9
Value Added ($m/yr)		
Dryland	0.6	1.2
Scenario II – lower reliability	1.2	2.9
Net Impacts	0.5	1.8

Source: Butcher October 2007. *Evidence to Hearing for an Application by South Canterbury Irrigation Trust and Meridian Energy to Take and Use Water from the Waitaki River*

Table 16: Hunter Downs - Comparison of gross output on Irrigated Land with varying reliability of irrigation

Impacts per 000 Ha of land		
	On-farm	Region
Output ($m/yr)		
Scenario I – high reliability	3.9	12.1
Scenario II – low reliability	2.7	8.3
Ratio	70%	70%
Employment (FTEs		
Scenario I – high reliability	18.2	46.3
Scenario II – low reliability	12.6	33.5
Ratio	69%	72%
Value Added ($m/yr		
Scenario I – high reliability	1.8	4.2
Scenario II – low reliability	1.2	2.9
Ratio	66%	71%

7.3 Ruataniwha Irrigation Scheme

The Ruataniwha Irrigation scheme constituted an application to take water and irrigate 19,000 additional Ha, and to more reliably irrigate a further 6,000 Ha. The economic impact analysis for this scheme assessed an area of over 42,000 Ha, because it was assumed that farming practices on adjacent dryland areas would be modified as a result of the scheme. There was considerable debate about the magnitude of the changes that were likely to occur on this dryland.

The economic impacts for the entire Ruataniwha scheme were not estimated for the irrigated land alone. Consequently the total scheme results are not directly comparable with the results for the Wairarapa project. The Ruataniwha farm budgets were calculated taking into account existing rainfall and soil types on the land which was proposed to be irrigated. The land use post-irrigation on irrigated land was expected to be 37 percent dairy, 5 percent orchards and 7 percent viticulture, however, different reports on the project may have varied these assumptions.

As is shown in Table 17, the report estimates that that there were 630 jobs created on-farm, which is 26 jobs per thousand Ha irrigated. This result was heavily affected by the assumption that 12 percent of the land went into orchards and vineyards compared to the 3 percent assumed for the Wairarapa study. The Ruataniwha figures are converted to net impacts per thousand Ha irrigated in Table 18, which indicate that for conversion to Pastoral and Arable farming there is only an additional 5.9 jobs and $1.8 million / year value added per year per thousand Ha of irrigated land. This can be compared to the figure estimated for Wairarapa of 6.2 jobs and $3.3 million / year value added, although the $3.3 million includes the returns to the irrigation infrastructure in Wairarapa as well as to the farming sector.

For orcharding and viticulture the figure for the Ruataniwha scheme is 170 jobs and $10m/year per thousand Ha irrigated. However, these latter figures are complicated by the fact that prior to irrigation about a third of this land was already in orchards, which considerably reduces the net employment impacts compared to what they would have been if the land had all previously been in pastoral farming. Also, half of the additional horticultural area was in vineyards, which have direct on-farm employment which is less than half that of

orcharding. Hence any comparison of Wairarapa and Hawkes Bay horticultural impacts on a per thousand Ha basis is effectively meaningless.

Table 17: Ruataniwha - Total (Net) Hawke's Bay Economic Impacts from irrigating 25,000 Ha.

	Output ($m / yr)	Jobs (FTEs)	Value Added ($m / yr)
Pastoral and arable farming direct	107	130	40
Orchards and vineyards (or similar)	53	500	30
Farm support effects (multiplier effects)	120	530	56
Sub-Total (farming-dependent)	280	1,160	127
Processing (including multiplier effects)	145	525	52
Vegetables	129	480	46
Wine	-10	-30	-4
Meat	76	110	14
Dairy	340	1,090	108
Sub-total (high uncertainty)			
Potential Total Impacts***	620	2,250	235

Table 18: Ruataniwha - Farm-related (Net) Hawke's Bay Economic Impacts per thousand Ha

	Ha Irrigated	Output ($m / yr)	Jobs (FTEs)	Value Added ($m / yr)
Pastoral and arable farming direct	22,000	4.9	5.9	1.8
Orchards and vineyards (or similar)	3,000	17.7	170	10
Farm support effects (multiplier effects)	25,000	4.8	21	2.2
Sub-Total (farming-dependent)	25,000	11	46	5.1

N.B: The farm support effects exclude any processing of products (other than packing and coolstores for fruit).

7.4 Summary

What the above comparisons have effectively illustrated is that to make meaningful comparisons of summary figures for different projects in different regions is almost impossible. The variations in land use both pre-irrigation and post-irrigation are simply too great.

What can be said about the Wairarapa estimates of economic impacts is that they have been estimated using the analytical framework recommended in the MAF publication (Ford et al. 2003). This is the same framework that has been used for most of the other assessments discussed here.

The evidence from the only *ex-post* analysis of an irrigation scheme, the Opuha scheme, is that economic impacts off irrigation in terms of output, value added and employment on farm are significant, and of the order of magnitude indicated for pastoral farming in the Wairarapa project. The analysis of other projects supports this conclusion.

The regional flow-on effects of irrigation in Wairarapa is significantly less than has been the case in some other regions. This is in part because the Wellington economy is less diversified than some other regions (for example Canterbury), but primarily because it is not expected at this stage that there will be significant processing of milk or horticultural products within the region. As is obvious from the estimated impacts for other projects, the processing impacts can constitute a significant part of total economic impacts.

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Appendix I. Glossary of Economic Terms

Direct Economic Impacts
The direct impact is the output and employment of the business itself (in this case the farm). The direct employment is of people who work on the farm. The direct output is the value of farm gate sales. The direct value added is the value added on the farm. It is equivalent to operating surplus, before interest or tax, plus wages, salaries and drawings.

Down Stream Impacts
Impacts which are not driven by an activity's demand for extra inputs, but which might arise as a result of a particular activity, are sometimes called the "downstream impacts". The obvious example in the farming industry is the processing sector, where there is whole new set of direct and flow-on effects. These effects are not included in the initial farm impacts, which focus only on the supply of inputs.

Employment
Employment is work done by employees and self-employed persons, and is measured in Full-Time-Equivalent jobs (FTEs). A person working part time all year is deemed to be equivalent to 0.5 FTEs. Where work is seasonal, the conversion to FTEs is based on 12 months work per year. So a seasonal worker working full time for six months per year is 0.5 FTEs, and a part time seasonal worker working ten hours per week for 4 months is 0.1 FTEs.

Flow on Effects
The sum of indirect and induced effects is sometimes termed the flow-on effects, or upstream impacts.

Household Income
Household income is the gross earned income of households. It includes the income of self-employed persons. There is sometimes considerable uncertainty as to the proportion of business income which goes to households, especially for small businesses. In assessing this proportion, dividends and interest payments have been excluded. When estimating indirect economic impacts, one needs to know the increase in household income, which occurs in the region.

Indirect Economic Impacts
The indirect impact arises from increased spending by farms as they buy additional inputs so that they can increase production to meet plant demands. This indirect effect can be envisaged as an expanding ripple effect. For example, the farm buys fertiliser, the fertiliser factory has to employ more staff and buy more electricity, so the electricity industry expands. The electricity industry has to employ more staff and buy more fuel, so the fuel company increases its output. And so on. All the increased employment, output and value added (apart from that at the farm) are the indirect effect.

Note that indirect effects only include "upstream" effects (via buying more inputs), but do not include any stimulated development downstream, such as processing vegetables.

Induced Economic Impact
The induced impact is the result of increased household income being spent, and leading to a further ripple effect of increased employment, output and income.

Multipliers
A Type I multiplier is the ratio of (direct + indirect) impacts to direct impacts, and a Type II multiplier is the ratio of (direct + indirect + induced) impacts to direct impacts. The Type II multipliers include the impact of household spending and hence will always be greater than a Type I multiplier. Both multipliers will always be greater than 1. Note that downstream effects (whether positive or negative) are not included in the multiplier, and must be calculated separately.

Output
Output is the value of sales by a business. In the case of wholesale and retail trade it is the total value of turnover (and not simply gross margins)[40].

Total Economic Impacts
The total Type I impact is the sum of the direct and indirect impacts, and a Type II impact is the sum of direct, indirect and induced impacts.

Value-Added
Value-added includes household income (wages and salaries and self-employed income), and returns to capital (including interest, depreciation and profits). It also includes all taxes. Put another way, value-added is equal to output, less costs other than wages, salaries, depreciation and interest. From an accounting perspective it is equivalent to EBITDA plus wages & salaries.

[40] Care has to be taken in combining retail sales figures with employment per $ million of output from input-output tables. In these tables, output is generally defined as gross margin. By contrast, business statistics usually refer to employment per $ million of turnover.

Appendix II. Structure of the District & Regional Economy

Wellington Economy

As is shown in Table 10, the Wellington region as a whole has little dependence on agriculture with less than 2 percent of employment occurring in the primary production sectors.

Table 13: Wellington Region - Employment by Sector

	Wellington Region			
	2006	% Change 2006-13	2013	% of total 2013
Agriculture, Forestry and Fishing	4,656	-9%	4,251	1.8%
Mining	255	-2%	249	0.1%
Manufacturing	15,690	-24%	11,916	5.1%
Electricity, Gas, Water and Waste Services	1,041	81%	1,887	0.8%
Construction	15,873	-4%	15,204	6.5%
Wholesale Trade	8,931	-10%	8,016	3.4%
Retail Trade	21,930	-7%	20,406	8.7%
Accommodation and Food Services	12,321	7%	13,239	5.6%
Transport, Postal and Warehousing	8,442	0%	8,466	3.6%
Information Media and Telecommunications	6,561	4%	6,831	2.9%
Financial and Insurance Services	12,195	2%	12,420	5.3%
Rental, Hiring and Real Estate Services	5,973	-24%	4,554	1.9%
Professional, Scientific and Technical Services	27,219	6%	28,884	12.3%
Administrative and Support Services	8,748	-7%	8,151	3.5%
Public Administration and Safety	22,920	18%	27,102	11.5%
Education and Training	17,511	16%	20,226	8.6%
Health Care and Social Assistance	18,627	17%	21,885	9.3%
Arts and Recreation Services	4,590	18%	5,439	2.3%
Other Services	9,585	-3%	9,252	3.9%
Not Elsewhere Included	10,554	-32%	7,227	3.1%
Total Employed – by place of residence	233,616	1%	235,605	100.0%
Total Employed by place of work				
Agriculture	3,039			
Total	204,111		n.a.	

Source: Statistics New Zealand. Censuses 2006 & 2013

Wairarapa Economy

Wairarapa is much more dependent than Wellington on agriculture, with about 16 percent of employment in the region being in agriculture and services to agriculture (see bottom of Table 11). However, employment in all primary industry in Wairarapa appears to have declined by

around 4 percent in the inter-censal period from 2006 – 2013 (see top of table 11). While more detailed employment data from the census is not yet available, the business demography data produced by Statistics NZ (not shown here) suggests that employment in agriculture and agricultural support services combined has declined by around 10 percent in the inter-censal period. This follows a decline of approximately 7 percent in the 2001-2006 period.

The census data is also notable in that a comparison of place of work and place of residence shows that in 2006 there were far fewer employed people working within the region (15,288) than there were employed people living within the region. Comparable figures for 2013 are not yet available. However, it is apparent that many people are travelling out of the region to work. Whether this reflects insufficient job opportunities in Wairarapa, higher housing costs in Wellington and Hutt cities, or other motivating factors is not known.

Table 14: Combined Wairarapa Districts - Employment by Sector

	2006	% Change 2006-13	2013	% of total
Agriculture, Forestry and Fishing	3,186	-4%	3,051	15.5%
Mining	45	-27%	33	0.2%
Manufacturing	1,845	-12%	1,629	8.3%
Electricity, Gas, Water and Waste Services	51	94%	99	0.5%
Construction	1,512	4%	1,572	8.0%
Wholesale Trade	573	9%	624	3.2%
Retail Trade	1,935	1%	1,959	10.0%
Accommodation and Food Services	1,050	8%	1,131	5.7%
Transport, Postal and Warehousing	477	18%	561	2.9%
Information Media and Telecommunications	249	-5%	237	1.2%
Financial and Insurance Services	387	12%	432	2.2%
Rental, Hiring and Real Estate Services	480	-26%	354	1.8%
Professional, Scientific and Technical Services	999	12%	1,116	5.7%
Administrative and Support Services	543	-4%	519	2.6%
Public Administration and Safety	789	27%	1,005	5.1%
Education and Training	1,332	15%	1,527	7.8%
Health Care and Social Assistance	1,665	20%	1,995	10.1%
Arts and Recreation Services	228	26%	288	1.5%
Other Services	699	12%	780	4.0%
Not Elsewhere Included	1,035	-26%	771	3.9%
Total Employment – (by place of residence)	19,101	3%	19,680	100.0%

Total Employment – (place of work)	**2001**	**% change**	**2006**	**% of 2006**	**2013 Study est**
Agriculture	2445	} – 7 %	2,217	14.5%	}2,380
Services to Agriculture	222	}	267	1.7%	}
Total	14,433		15,288	100%	n.a.

Source: Statistics New Zealand. Censuses 2001, 2006 & 2013

Appendix III. On-Farm Modelling carried out for Wairarapa Economic Impact Report

(Prepared by Stuart Ford of Agribusiness Group)

1. Prices used.

Where ever possible we have adopted prices for products which are sourced from the Ministry For Primary Industries "Situation and Outlook for Primary Industries 2014" report. This report is published in June so the prices in the current season are still estimates, where ever the actual product price has changed this is put into the analysis. For example the current milk pay-out and the estimate of the pay-out in the next season have both changed significantly since publication of the report; these current changes have been incorporated into the analysis.

For each entity we have calculated the average return for the last four years actual data and the next four years estimates. In that way the average is a reflection of an eight year spread of prices which attempts to incorporate some view of the likely returns from the industry into the future.

For the Arable model the prices used are an average of the prices used in the Arable Farm Monitoring report over the last 8 seasons.

For Dairy Support it uses what is being paid at present in an average season.

	Prices Used
Milk solids ($ / kg)	7.07
Beef ($ / kg)	4.18
Lamb ($ / kg)	5.68
Pipfruit ($ / TCE export)	26.58
Silage ($ / kg DM)	0.20
Grazing Heifers ($ / kg DM)	0.24
Grazing Cows ($ / kg DM)	0.26
Arable Crops average (4 / ha)	3,148

2. Land-Use Mix

It is somewhat difficult to determine the current land use mix partly because the intended area covers part of two different Local Body Authorities and partly because the available statistics are very out of date, with 2006 being the latest available statistics. Therefore we have put together the current land use mix based on our interpretation of what is there at present.

The post irrigation land use is made up of an estimate supplied to us by WWUP which was put together after consultation with local land users and their advisors.

Table 15: Pre and Post Irrigation Development Land-Use 30,000* Ha

	Current Land Use	Post Irrigation Land Use
Dairy	6,600	13,500
Arable	12,000	9,000
Sheep and Beef	7,200	3,600
Dairy Support	4,170	3,000
Horticulture (Pipfruit)	30	900
TOTAL	30,000	30,000

* For 10,000 Ha divide the above numbers by 3

3. Individual Models Used.

The analysis of the on-farm financial performance of the scheme started by reviewing the report; "Wairarapa Water Use: Land Use Affordability under Irrigation" prepared by Baker & Associates in April 2014. This report showed a range of land uses pre and post irrigation development and also gave some detail on the costs of conversion.

We have used the reports dryland land-uses for Sheep and Beef and Mixed Arable as the starting point of our analysis for the pre irrigation land uses. We presume that they are a fair analysis of the current productive and economic state of farming in the area. We have chosen to use more aggressive models of farm systems into our analysis of post irrigation development than those adopted in the Baker report. This is based on our knowledge of the current state of irrigation development in Canterbury.

The models have all been set up in the form of farm models adopted in the Ministry for Primary Industries Farm Monitoring series of reports.

Table 16: Pre Irrigation Development Financial Models ($/ha).

	Dairy	Mixed Arable	Sheep and Beef
Revenue	6,919	1,604	1,450
Farm Working Expenses	3,384	983	870
Cash Farm Surplus	3,535	621	580

Dairy

The pre irrigation Dairy model is set up to represent the same level of performance (physical and financial) as that reported in the Lower North Island Dairy Model of MPI's Farm Monitoring report.

Mixed Arable

The mixed arable model is an adaption of the Baker farm model in terms of its physical output which has been adapted to represent all of the expenditure items which are detailed in the MPI reports.

Sheep and Beef

The Sheep and Beef model is an adaption of the Baker farm model in terms of its physical output which has been adapted to represent all of the expenditure items which are detailed in the MPI reports.

Table 17: Post Irrigation Development Financial Models ($/ha).

	Dairy	Arable	Sheep and Beef	Dairy Support	Horticulture
Revenue	11,825	4,204	4,990	3,927	58,807
Farm Working Expenses	6,266	2,268	3,559	1,600	44,028
Cash Farm Surplus	5,559	1,936	1,431	2,327	14,779

Dairy

The Dairy model has been set up to conform with the way that modern irrigation models are structured which means that they conform with lower levels of N leaching which are now being required. This means that the per-cow production is relatively high and relatively large amounts of supplement are introduced onto the farm with the majority of it being in the form of grain. All young stock are grazed off the farm for the whole period and the cows are wintered off the farm.

Arable

The arable model is set up to be aligned with the Canterbury arable model with the same crop mix apart from the exclusion of process crops. The arable model also has the inclusion of dairy support activities in the form of the sale of silage and the wintering of dairy cows in its mix.

Sheep and Beef

The Sheep and Beef model is set up with an entirely purchasing and finishing operation with 70 percent of the pasture grown being utilised by Sheep and 30 percent by beef.

Dairy Support

The dairy support model sells one third of the feed produced to each of; the sale of silage, the grazing of young stock and the wintering of dairy cows.

Horticulture

The horticultural model is set up to represent an allowance for the potential development of horticultural production in the region. We have used the MPI's Pipfruit model to represent the degree of financial performance that can be achieved from horticultural development. We are not claiming that the horticultural development will all, or even part, be made up of pipfruit development. In terms of economic impacts, orcharding has broadly similar impacts to viticulture where the grapes are converted to wine in the region.

On-Farm Conversion Costs

The on-farm conversion costs used in this analysis have been gained through our experience with the development of irrigation schemes in the South Island. The only exception is the cost of conversion to pipfruit which has been taken from the Macfarlane Rural Business report into the returns from conversion carried out for the Ruataniwha dam project.

Table 18: Conversion Costs ($/ha)

Item	Dairy	Arable	Sheep & Beef	Dairy Support	Horticulture
Clean Up	50	50	50	50	2,000
Irrigation System	3,500	3,500	3,500	3,500	10,000
Cow Shed	3,500	-	-	-	-
Electricity	100	-	-	-	1,500
Housing	500	-	350	-	7,500
Other Buildings	125	150	50	50	2,000
Fencing and Lanes	100	-	200	200	-
Stock water	50	-	60	60	-
Fertiliser	300	-	300	300	2,000
Regrassing	500	-	500	500	-
Machinery	250	600	150	-	8,000
Livestock	7,800	-1,000	-1,200	-1,200	
Supply Shares	9,741				
Trees planted					25,000
Total	**26,516**	**3,300**	**3,960**	**3,460**	**58,000**

In the case of the existing dairy farms it has been assumed that the conversion has taken the form of a greenfields development.

4. Rating Up

The $ per ha figures per land use have been multiplied by the area in each land use to give the on-farm financial performance of the area pre and post irrigation development.

5. Wages of Management

Wages of Management (W of M) have been calculated in the same way as MPI calculates them in their Farm Monitoring Reports; $31,000 for labour input plus 1 percent of Total Assets up to a maximum of $85,000.

Table 19 Wages of Management by Farm Type and per Ha

	Pre Dairy	Pre S & B Arable	Post Dairy	Post Arable	Post Sheep & Beef	Post Dairy Support	Horticulture
Area (ha)	140	200	210	300	140	140	22
W of M Total	85,000	45,870	85,000	75,000	71,600	71,600	56,960
W of M / ha	616	229	404	250	511	511	2,589
Management jobs / Ha	0.0071	0.005	0.0048	0.0033	0.0071	0.0071	0.045