Hurunui Water Project

Regional Economic Impacts and Cost Benefit Analysis of the Proposed Hurunui Irrigation Scheme

Report prepared by

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1. Executive Summary

The Scheme

- The proposed Hurunui Irrigation scheme will irrigate 35,000 Ha of dry land and provide increased reliability of irrigation on a further 7,000 Ha of currently irrigated land. It is currently estimated to cost $174 million for in-river storage structures (a weir at the Lake Sumner outlet, a dam on the South Branch of the Hurunui and an in-take from the river) and distribution to farm-gate[1].

- On-farm investment will depend on the land uses on the newly irrigated land, but base case estimates, assuming 54 % of land is used for dairying, are that the farmer investment will cost $376 million, including $271 million for physical investment on-farm and $105 million for dairy company shares.

Economic Benefits

- Ignoring the opportunity cost of in-river water and any net recreational, environmental and community costs and benefits of irrigation, the Net Present Value[2] of commercial benefits to farming are estimated to be $38 million. In broad terms this benefit is equivalent to farmers receiving a 30 year stream of benefits of $3.4 million / year.

- Reducing the discount rate to 5 % leads to a NPV of $230 million, equivalent to $15 million per year in net benefits to farmers.

- Faster uptake, with all land becoming irrigated within 5 years, increases the NPV to $62 million (8 % discount rate), while the base case uptake rate but with a less aggressive conversion to dairying (only 40 % of land going to dairying) reduces the NPV to $29 million.

- There is a clear net commercial benefit to farmers, and we anticipate that people in other sectors who experience an increase in economic activity will also perceive themselves to be receiving a benefit. The 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.

Affordability

- These figures suggest that conversion will be affordable from the farmers' perspective. For example, the estimated rate of return on <u>marginal</u> farm investment is likely to be 11 % for dairying and sheep finishing, 14 % for dairy support and 16 % for arable farming. Returns to viticulture and horticulture (represented by black currants) are likely to be much lower at around 5 %, although the former is heavily influenced by an expectation that the current comparatively low returns for grape growing will continue while the latter could vary enormously depending on what form of horticulture is undertaken.

- Notwithstanding the marginal returns to capital being somewhat lower for dairying than for arable farming, dairying is likely to be a much more attractive land use because its $1,780 / Ha operating profit (before interest) is much higher than the $500

[1] These are very provisional figures.

[2] At an 8 % discount rate, the currently recommended Treasury benchmark

/ ha for sheep finishing, $470 / ha for arable and the $310 / Ha for dairy support. Viticulture, even given the reduced returns which are expected to persist for some time, still generates returns estimated at $1,790 / Ha and will be attractive to those with low costs of capital or a more positive long term perspective on market prices.

- The benefit on farms 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 dry land:
  - 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

Economic Impacts

- The scheme will increase farm-gate output by $190 million / year. This increase will be accompanied by an increase in direct value added[3] on farm of $75 million / year. Multiplier effects increase the additional value added to $105 million per year in Hurunui District, while processing of meat and milk and still further multiplier effects mean that the total increase in Canterbury region's GDP will be $270 million / year.

- There will be an increase of 470 jobs on farm, 870 jobs in Hurunui District and 2,350 jobs in Canterbury region associated with the land use change to irrigation.

- Household income will increase throughout the district by $43 million per year, and through the region by $120 million per year as a result of the economic activity and employment associated with the scheme.

- Only 21 % of the regional employment impacts and 28 % of the total regional value added impacts occur on farm, with the majority of impacts occurring in industries affected by the flow-on effects. A further 18 % of employment and 26 % of value added occur in processing of meat and milk, and there are also significant effects on agricultural contracting, manufacturing, Wholesale and retail trade, transport and communications and services. At the district level a much higher proportion of the impacts is on farm (57 % of jobs and 71 % of value added), but there are also significant impacts on agricultural contracting, wholesale and retail trade and services (including local authorities).

- The changes in output and value added are heavily dependent on the 54% of irrigated land which is assumed to be used for dairying (see Table 1), and which is responsible for 77 % of value added (see Table 12). Arable is assumed to account for 11 % of the land use and 6 % of the value added, while grazing of sheep, beef cattle and dairy support uses 34 % of the land and accounts for only 12 % of the value added.

[3] 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).

- Much larger economic impacts could arise if there was more widespread conversion to either viticulture or horticulture, but this has been ignored for the purposes of this report on the grounds that current indications are that such land use will not be widespread under current market conditions.

- The increases in activity associated with the Hurunui scheme would represent increases of approximately 32 % in current[4] Hurunui District GDP and 23 % in employment. This is substantial and reflects the scale of the increase in production enabled by irrigation. At the regional level the increase is three times as high in physical terms, but represents a lower percentage increase (1.3 % and 1.0 % respectively) because of the size of the economic base in Canterbury.

- We do not define whether the project will have a net benefit from the perspective of society as a whole. We have not attempted to place economic values on wider community social, recreational and environmental outcomes associated with the change in water use and river state.

[4] Latest available data for 2005-06

2. Background

Hurunui Water Project has proposed a hydro generation and irrigation scheme which stores sufficient water to irrigate 35,00 Ha of currently unirrigated land, and to increase the reliability of irrigation on a further 7,000 Ha of which the majority is dairying irrigated by run-of-river water abstracted from the Hurunui by the Amuri Irrigation Company (AIC). For the purposes of this report, we have concentrated on the economic benefits of irrigation only, as hydro power is going to be analysed at a later stage as a separate contribution.

The scheme has two components. The first is a weir at the outlet of Lake Sumner, which will not increase the maximum lake level but will limit discharge during the months when irrigation is not required, hence retaining water for discharge down the river to a proposed off-take point at times when irrigation is required. One effect of this weir will be to raise the average lake level by retaining high levels for longer. The second component of the scheme is a dam in the South Branch of the Hurunui. The Lake Sumner scheme alone could irrigate an estimated 11,000 Ha, while the South Branch scheme alone could irrigate an estimated 33,000 Ha[5]. In this analysis the scheme is presumed to provide irrigation with reliability in excess of 95 %.

Capital costs of both storage and distribution structures have been estimated, but these are first estimates only and I understand are believed to be accurate to within 30 per cent. Sensitivity testing has considered costs 25 % and 50 % higher.

The scheme has not yet proceeded to full feasibility study, but the resource consent process, and in particular the proposed water conservation order on the Hurunui river, has led to Hurunui Water Project (HWP) asking Butcher Partners Ltd to undertake a preliminary assessment of the economic impacts of the project as well as a farmer affordability analysis and a Cost Benefit Analysis (CBA) from a commercial perspective. This is not a full CBA since it does not take account of the opportunity cost of water (i.e. its value in other uses), nor any other social, recreational or environmental costs. In the absence of costs of these effects, it is up to 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. However, the economic impact analysis does provide information about the likely regional and district employment impacts, which are relevant in assessing social impacts.

[5] The two individual schemes can not be combined to irrigate 44,000 Ha because in each individual scheme some of the water comes from run-of-river, rather than storage, and although each stand-alone scheme could use this, the combined schemes could not use it twice.

3. Method

3.1 Cost Benefit Analysis

The CBA used a standard assessment framework using the best available estimates of on- and off-farm capital costs and benefits based on estimated increases in farm profits (after deducting all intermediate input costs, economic depreciation and an owner-operator salary). The assessment is done over a 30[6] year time frame, assumes no residual value for the on and off farm capital investments, assumes that it takes 8 years[7] from the start of water availability to achieve full land conversion and production, and uses a discount rate of 8 per cent[8].

Note that a financial Cost Benefit analysis generally assumes perfect markets and hence does not ascribe any benefit to generating additional income or jobs per se. There is an implicit assumption that the wage paid to people is equivalent to the opportunity cost of their labour (it is assumed that their labour would otherwise be used in leisure or in some other productive activity), and hence generating a job has no net benefit. Capital also has an opportunity cost (it could have been used productively somewhere else), and additional income earned by capital in the wider community as a result of multiplier effects is assumed to be equivalent to the opportunity cost of capital, and hence also has no net benefit. A net benefit is presumed to exist only in the project under investigation, and only to the extent that the returns to capital in this project exceed the opportunity costs of capital in the project. Given that markets are arguably not perfect and that in many cases additional employment or returns to capital do generate a net benefit, then a financial cost benefit analysis may be seen as a very conservative estimate of the financial benefits of a project.

3.2 Economic Impact Analysis

For the economic impact analysis the first step was development of a description of the Hurunui and Canterbury economies, 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 was created, using as a base a 2005-06 national input output model[9]. The district and regional input output models were supplemented using dryland and irrigated farm budgets prepared by The Agribusiness Group (TAG) for a range of different land uses. These budgets were translated into a standard analytical format, and the budget components assigned to industry category and location of purchases (in and out of district / region). The location was determined on the basis of a survey of farmer expenditure patterns (see Appendix 1). The model budgets for each land use were then incorporated into the generic Hurunui and Canterbury input output tables to produce land use specific regional models that are able to predict the likely regional impacts of land use changes in the irrigated area.

HWP provided TAG with 2008 survey data on intended irrigated land. TAG cleaned up this data to remove anomalies, and also assumed that farmers who specified "the most economic use", or farmers with over 250 Ha of irrigable land and who did not specify a land use would convert to dairying. On this basis, TAG estimated that about 54 % of the land to be irrigated would be used for dairying, 24 per cent for livestock (primarily sheep and beef finishing), 11

[6] A water right is assumed to be for 35 years, but construction is assumed to start 5 years into that period.
[7] Sensitivity testing also explores the impacts of full production after 5 years.
[8] The rate Treasury currently advises should be used for infrastructure of this type. The rate is arguably too high in terms of farmer investment predilections. Sensitivity testing considers 5 and 8 per cent.
[9] Stroombergen and Nana 2009.

per cent for cropping, 10 per cent for dairy support and about 1 per cent each for horticulture and viticulture. This land use mix was then fed into the model to provide estimates of the economic impact from the scheme.

3.3 Famer Affordability Analysis

Farm budgets for each farm type revealed operating cash surpluses. These surpluses were modified by deducting true economic depreciation, a salary for the farm owner-operator of the farm and, in the case of irrigated farms, an annual water charge to cover off-farm irrigation operating and capital costs. Capital budgets for each sort of irrigated farming were developed by TAG on the basis of experience elsewhere. The difference in adjusted annual cash returns / Ha for each farm type was divided by the additional capital cost / Ha for that farm type to estimate the marginal return on capital from conversion to irrigation from existing dryland sheep and beef.

4. Assumptions

4.1 Land Use and Farm budgets

A mix of current and future land uses were assumed on the basis of information contained in the HWP survey (see Table 1).

Table 1 Land Uses Before and After Irrigation (Ha)

	Arable	Live-stock	Dairy*	Dairy Support	Viti-culture	Horti-culture	Total**
Pre-Scheme	3,600 9 %	31,100 74 %	5,500 13 %	1,800 4 %	0 0 %	5 0 %	42,000 100 %
Post-Scheme	4,800 11 %	10,100 24 %	22,600 54 %	4,000 10 %	230 1 %	270 1 %	42,000 100 %

* Most is currently irrigated by water from Amuri Irrigation Co.
** Totals rounded
Source: HWP 2008 survey

Farm budgets for each land type were based on a range of MAF Farm Monitoring farm budgets which are appropriate to this region and to the current and expected land uses in the irrigation command area. TAG assumed irrigation reliability exceeding 95 %. Farm models use typical average input costs, and use product prices which are an average of actual prices for the last 3 years and the current year, and forecast prices for the next three years[10]. The budgets assume that newly irrigated farms will have an annual charge to cover off-farm irrigation capital and operating cost of $490 / per hectare per year. This cost was estimated on the basis of the expected capital costs financed entirely by a 30 year loan at 8 % interest, and annual operating costs of $2.5 million, including $1 million per year for electricity to pump water over a ridge to the South of the proposed in-take point.

4.2 Farm Conversion Capital Costs

Capital Costs were based on information available to TAG from previous work. Typical costs per Ha for conversion from dry land sheep farming are shown in Table 2, and range from $2,900 for arable farming to $37,000 for viticulture.

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

Table 2 Capital Costs / Ha and Total for each Land Use – Conversion from Dryland Sheep and Beef

	Dairy	Arable	Irrigated Sheep Finishing	Irrigated Dairy Support	Vineyard	Black Currants	**Total Cost**
Clean Up	50	50	50	50		3000	
Fonterra Shares	6,042	0	0	0		0	
Irrigation System	2,200	2200	2,200	2200		3000	
Cow Shed	3,000	0	0	-		0	
Electricity	100	0	0	-		50	
Housing	500	0	350	-		0	
Other Buildings	75	150	50	50		0	
Fencing and Lanes	200	200	200	200		0	
Stockwater	60	20	60	60		0	
Fertiliser	300	0	300	300		0	
Regrassing	500	0	500	500		0	
Machinery	250	600	150	-		16000	
Livestock	3,680	-300	530	-1120		0	
Water Access	0	0	0	0		0	
Total per ha (rounded)	**17,000**	**2,900**	**4,400**	**2,200**	**37,000**	**22,000**	
Irrigated Ha	**17,400***	**4,800**	**10,100**	**4,000**	**230**	**270**	
Total Capital Cost ($m)	**295**	**14**	**44**	**9**	**9**	**6**	**376**

* This is the increase in irrigated dairy. A further 5,200 Ha is already in irrigated dairying, but will have reliability improved.

All totals are rounded

5. Summary of Evaluation and Impacts

5.1 Cost Benefit Analysis

The Cost Benefit Analysis suggests that development of the Hurunui Irrigation Project has a commercial Net Present Value of $38 million at an 8 % discount rate (see Table 3), assuming zero residual value of all assets after 30[11] years, and assuming that farms do not reach their new levels of productivity until 8 years after the scheme is completed. This NPV is equivalent to a 30 year stream of annual benefits of $3.4 million[12]. The benefits could continue if the water rights are renewed, and expressing benefits in this way enables an alternative comparison with any net environmental, social and recreational costs and benefits which damming and irrigation may lead to.

Table 3 Net Present Value of Project over 30 year life time

Year	Capital Off-farm	Capital on Farm	Annual Operating Costs	% of Full Irrigation Benefits	Net Increase in Farm Income	Net Annual Benefit ($m)
0	87	0				(87)
1	87	113				(200)
2		38	2.5	30%	19	(21)
3		38	2.5	40%	25	(15)
4		38	2.5	50%	32	(9)
5		38	2.5	60%	38	(2)
6		38	2.5	70%	44	4
7		38	2.5	80%	50	10
8		38	2.5	90%	57	17
9		0	2.5	100%	63	61
10 - 30		0	2.5	100%	63	61
NPV (8 % discount rate) – Base Case						**38**
NPV Sensitivities:						
NPV	(5 % discount rate)					230
NPV	(8 % discount rate – development in 5 years)					62
NPV	(8 % discount and 25 % capital cost over-run)					0
NPV	(8 % discount rate and only 40 % dairying)					29
NPV	(8 % discount and 50 % capital cost over-run)					(39)

* All cash flows assumed to be at end of year.

Sensitivity Testing

Using a discount rate of 5 % increases the NPV to $230 million, and the equivalent return per year to $15 million, demonstrating the sensitivity to discount rates of projects with long gestation periods and life-times. If capital costs were to increase by 25 %, then the project would have zero NPV at an 8 % discount rate. If capital costs were to increase by 50 %, then the project would have negative NPV at an 8 % discount rate, although it would still be

[11] A water right is assumed to be for 35 years, but actual construction is assumed to start 5 years into that period

[12] An alternative way of thinking about the figures, which may make it easier to put into context with any community social, recreational and environmental costs and benefits, is that the project generates an annual net benefit to farmers of $3.4 million per year. This benefit is after deducting the opportunity cost of the capital invested on and off-farm and after deducting all additional farm operating costs, and deducting the costs of additional owner-operator labour and economic depreciation of the farm assets.

positive at a 5 % discount rate. Increasing the rate at which irrigation is taken up significantly increases the NPV to $62 million, while reducing the proportion of land which is used in dairying reduces the NPV, although it is still +$29 million at an 8 % discount rate.

Alternative Development Combinations

Alternatives to the combined project (see Table 4) are a stand-alone Lake Sumner weir project, which has much cheaper storage per irrigable Ha than the combined project and has a NPV of $16 million; a South Branch dam alone, which has more expensive storage per irrigable Ha than the combined project and a NPV of $18 million, and the marginal project which adds the South Branch dam to the Lake Sumner weir and has a NPV of $22 million. The marginal project has less net benefit than the stand alone South Branch dam because although the additional capital costs are much the same, the increase in irrigable area is less than the increase which can be provided by the South Branch alone[13]. Notwithstanding this, the marginal project still has a positive NPV at an 8 % discount rate.

Table 4 Alternative Development Possibilities

	Lake Sumner Only	South Branch Only	Combined Project	Marginal: Lake Sumner to Combined
Ha	11,000	33,000	42,000	26,000
Capital off-farm ($m)	38	150	174	135
On-farm ($m	99	295	376	278
Annual operating cost ($m/yr)	0.7	2.0	2.5	1.8
Net Farm benefits at full development ($m/yr)	16	50	61	45
NPV (8 % discount rate) ($m)	16	18	38	22

5.2 Economic Impacts in Hurunui and Canterbury

5.2.1 Hurunui District

The irrigation of 35,000 Ha of dryland and improved irrigation of 7,000 Ha[14] will increase farm-gate income by an estimated $190 million / year[15]. Associated with this is a $75 million / year increase in value added[16] on-farm, including $24 million / year of household income, and 470 additional on-farm jobs (line 1, Table 5). The additional farm expenditure will drive further economic activity in Hurunui district and this is expected to increase non-farm output by $60 million / year. Associated with this is a $30 million / year increase in value added, including $19 million / year of household income, and 400 additional off-farm jobs (see line 2, Table 5). All told then, the proposed Hurunui irrigation project is expected to generate total additional output (gross sales revenue) in Hurunui District of $250 million per year.

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[13] This reflects the way in which water storage of the two sources combines, and the fact that the run-of-river component can be used in each case, but can not be used twice in the combined case.

[14] This includes some 5,200 Ha irrigated with water from the Amuri irrigation company and 1,800 Ha of land irrigated from other consented takes, all of which have lower reliability than could be achieved with supplementation from the proposed Hurunui irrigation scheme.

[15] For Total Production under each scenario, see Appendix 2.

[16] Value Added is the return to labour and capital, and is equivalent to business and household net income. At a farm level it is equivalent to farm-gate sales less purchases of inputs (other than capital and labour).

Associated with this is a $105 million per year increase in value added, including $43 million of household income, and 870 jobs (line 3, Table 5).

Table 5 Total Hurunui Net Economic Impacts from irrigating 42,000 Ha.

	Irrigated Impact *less* Dryland Impact			
	Output ($m / yr)	Jobs (FTEs)	Value Added** ($m / yr)	Household Income* ($m yr)
On Farm	190	470	75	24
Flow-on	60	400	30	19
Total	250	870	105	43

* 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, depreciation and profits (before tax).

5.2.2 Canterbury Region

At a provincial level the impacts will be more significant because significant farm spending takes place outside the district. Hence the off-farm impacts dependent directly on farming will increase regional (including Hurunui) value added by $66 million / year, including $38 million per year of household income, and there will be 800 off-farm jobs (line 2, Table 6).

There will also be significant activity associated with processing, with approximately half of all the additional meat production and all of the additional dairy production expected to be processed within the province. Increased meat and dairy processing will generate additional direct value added of $65 million / year, including $21 million of household income, and 380 jobs (line 3, Table 6). Multiplier effects in other industries in Canterbury are expected to generate a further $62 million per year of value added, including $37 million / year of additional household income, and 700 jobs (line 4, Table 6).

Hence for Canterbury region as a whole (including Hurunui district) there is a $270 million[17] per year increase in value added, including $120 million of household income, and 2,350 jobs (line 5, Table 6).

Table 6 Total Canterbury Net Economic Impacts from irrigating an additional 42,000 Ha.

	Irrigated *less* Dryland			
	Sales ($m / yr)	Jobs (FTEs)	Value Added** ($m / yr)	Household Income* ($m yr)
On Farm	190	470	75	24
Flow-on	150	800	66	38
Processing	310	380	65	21
Flow-on	350	700	62	37
Total	1,000	2,350	270	120

* 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, depreciation and profits (before tax).

[17] $75 million on farm and $65 million of associated multiplier effects plus $65 million in processing and $60 million of associated multiplier effects.

5.2.3 Impacts in Context

The increases in activity associated with the Hurunui scheme would represent increases of approximately 32 % in current Hurunui District GDP and 23 % in district employment (see Table 7). At the regional level the increases are 1.3 % and 1.0 % respectively (see Table 8).

The jobs that are derived through irrigation and processing are effectively embedded in the regional economy – they cannot be outsourced overseas or moved to other parts of New Zealand. In the context of Canterbury region, and of Hurunui district in particular, the scheme therefore provides a significant return on the use of regional resources if increased employment and economic activity is a policy goal.

Table 7 Scheme Increase as % of Hurunui Economic activity (2005/06 year)

	Value added			Employment (FTEs)		
	District ($m / yr)	Scheme Change ($m/yr)	Change compared to base (%)	District FTEs)	Scheme Change (FTEs)	Change compared to base (%)
All agriculture	120	75	64 %	1,800	470	26 %
All other sectors	210	30	14 %	2,000	400	20 %
Total economy	330	105	32 %	3,800	870	23 %

Table 8 Scheme Increase as % of Canterbury Economic activity (2005/06 year)

	Value added ($m)			Employment (FTEs)		
	District ($m / yr)	Scheme Change ($m/yr)	Change compared to base (%)	District FTEs)	Scheme Change (FTEs)	Change compared to base (%)
All agriculture	800	75	9.4 %	12,000	470	3.9 %
Meat and Dairy processing	450	65	14.4 %	5,000	380	7.6 %
All other sectors	18,750	127	0.7 %	221,000	1,500	0.7 %
Total economy	20,000	267	1.3	238,000	2,360	1.0 %

5.3 Distribution of Income and Employment across Sectors

The effects outside farming and processing are spread widely through the district and regional economies. Only 21 % of the regional employment impacts and 28 % of the total regional value added impacts occur on farm (see Table 10), with the majority of impacts occurring in industries affected by the flow-on effects. A further 18 % of employment and 26 % of value added occur in processing of meat and milk, and there are also significant effects on agricultural contracting, manufacturing, wholesale & retail trade, transport and communications and services.

At the district level a much higher proportion of the impacts is on-farm (57 % of jobs and 71 % of value added), but there are also significant impacts on agricultural contracting, wholesale & retail trade and services, including local authorities (see Table 9).

The implication is that economic impacts are widely dispersed, and people in many industries get a benefit[18] from irrigation and the resultant increase in farming activity.

Table 9 Distribution of Net Total* Economic Impacts among Sectors in Hurunui

Sector	Employment		Household Income		Value Added	
	FTEs	%	$m/yr	%	$m/yr	%
Agriculture *	490	57	24	56	75	71
Rural Contracting	157	18	7	16	6	6
Other Primary Industry	6	1	0	1	1	1
All other Manufacturing	6	1	1	1	1	1
Utilities & Construction	13	2	2	5	10	9
Wholesale and Retail Trade	87	10	4	9	4	4
Transport & Communications	24	3	1	3	2	2
Other Services	83	10	4	9	7	7
Total Net Impacts	870	100	43	100	105	100

Numbers may not add due to rounding
Source: Calculations of disaggregated multipliers from district input output model
* Total impacts on agriculture and processing exceed the direct impacts shown in tables 5 and 6 because of additional feedback effects as other businesses expand and household spend increases.

Table 10 Distribution of Net Economic Impacts among Sectors in Canterbury

Sector	Employment		Household Income		Value Added	
	FTEs	%	$m/yr	%	$m/yr	%
Agriculture*	500	21	25	20	77	28
Rural Contracting	180	8	7	6	7	2
Other Primary Industry	10	0	1	0	1	0
Meat Processing*	110	5	6	5	6	2
Dairy Processing*	300	13	17	14	64	24
All other Manufacturing	160	7	9	8	16	6
Utilities & Construction	70	3	5	4	16	6
Wholesale and Retail Trade	370	16	16	13	19	7
Transport & Communications	160	7	9	8	16	6
Other Services	510	21	25	22	47	17
Total Net Impacts	2,350	100	120	100	270	100

Numbers may not add due to rounding
Source: Calculations of disaggregated multipliers from region input output model
* Total impacts on agriculture and processing exceed the direct impacts shown in table 6 because of additional feedback effects as other businesses expand.

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

5.4 Farmer Affordability

Economic impacts and commercial benefits will only occur if irrigation is profitable for farmers, and seen to be so. The Hurunui schemes had an estimated capital cost of storage and distribution to the farm gate of $4,100 / Ha. The farm budgets assume that this is funded either by outside investors or by farmers who are treating the off-farm capital costs as a separate exercise. In this section we consider how farmers might see the on-farm affordability of the scheme. To do this we calculate the change in net[19] returns per Ha of going from dryland sheep & beef farming to irrigated land uses. We then compare this to capital costs of conversion and calculate the returns on additional capital for each irrigated land use.

Table 11 Increase in Net returns ($/Ha) from Change in Land Use, Additional investment Required, and Returns on Capital

From Dryland Sheep/Beef	Additional net Return ($/Ha/yr)	Additional Investment ($ / Ha)	Return on Additional Investment % / yr	Return with 25 % increase in off-farm capital costs*	
TO				Net return	Return on capital
Irrigated Dairy	1,780	17,000	11 %	1,670	10 %
Irrigated Arable	470	2,900	16 %	360	12 %
Irrigated Sheep Finishing	500	4,400	11 %	400	9 %
Irrigated Dairy Support	310	2,200	14 %	210	9 %
Irrigated Viticulture	1,790	37,500	4.8 %	1,690	4.5 %
Irrigated Black Currants	1,190	22,100	5.4 %	1,090	4.9 %

* Implies $105 / Ha / year increase in off-farm irrigation costs

As is shown in Table 11, the estimated rate of return on marginal farm investment is likely to be 11 % for dairying and sheep finishing, 14 % for dairy support and 16 % for arable farming. Returns to viticulture and horticulture (represented by black currants) are likely to be much lower at around 5 %, although the former is heavily influenced by an expectation that the current comparatively low returns for viticulture, will continue while the latter could vary enormously depending on what form of horticulture is undertaken.

These figures suggest that conversion to most land uses will be affordable from the farmers' perspective, and will probably remain so even if off-farm capital costs increase by 25 % (column 4, Table 11). Notwithstanding the marginal returns to capital being somewhat lower for dairying than for arable farming in percentage terms, dairying is likely to be a much more attractive land use because its cash return of $1,780 / Ha operating profit (before interest) is much higher than the $470 ha for arable farming, $500 for sheep finishing and the $310 / Ha for dairy support (column 3, Table 11). Viticulture, even given the reduced returns which are expected to persist for some time, still generates returns estimated at $1,790 / Ha and may be attractive to those with low costs of capital or a more positive long term perspective on market prices for grapes.

Even if the off-farm capital costs are increased by 25 % (column 5 & 6, Table 11), the returns will still be moderately attractive to farmers in all cases except possibly viticulture and horticulture.

[19] After deducting additional owner-operator inputs and additional economic depreciation on-farm, but before deducting any change in interest payments.

6. Interpreting the Results

6.1 Expected Outcomes

The results show that a change to irrigation results in an increase in turnover, net returns, and economic impact in the region.

There is a clear net commercial benefit to farmers, and we would anticipate that people in other sectors who experience an increase in economic activity will also perceive themselves to be receiving a benefit. The 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.

The benefit on farms 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 dry land:

- 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

We do not define whether the project will have a net benefit from the perspective of society as a whole. We have not attempted to place economic values on wider community social, recreational and environmental outcomes associated with the change in water use and river state.

6.2 Uncertainty of Outcomes

At this stage of analysis there is considerable uncertainty as to the capital costs of construction, the scale of environmental effects after mitigation measures, and the economic impacts, which depend heavily on the actual land uses which come to pass. Nonetheless, these results present a realistic picture of likely economic impacts, and are consistent with the impacts have been observed in previous studies which compare irrigated land with adjacent unirrigated land.

Appendix I Survey of Farmer Expenditure Patterns

For the purposes of this work we undertook a survey of all farmers in the irrigable area, asking them about where they purchased various inputs from and what their current and intended land uses were on whatever irrigable land that they had. This appendix contains the survey letter and form sent out to 203 households. We received 83 usable responses and 3 which were unusable[20]. The response rate of more than 40 per cent is generally regarded as good for a postal survey. Nonetheless there is a significant margin of error as regards intended land use because some of the largest land owners did not respond.

The average responses have been inserted into the survey form on the next pages.

23 February 2010
Dear Landowner,
As you will be aware there have been some quite encouraging signs coming from the government that they support water storage and irrigation as a means of improving the New Zealand economy. While we view this as verbal at the moment, we feel it will be translated into action as the year progresses.

Our most pressing need at the moment is to present a case that will resolve the conservation order appeal in our favour. The new hearings are likely to begin in mid-April.

Enclosed is a short survey on land use and where you buy various farm inputs from. Please take the time to complete, and return it to the Consultants as soon as possible. The information received will be used to support our case at the conservation order appeal hearings by demonstrating where the various flow-on economic impacts will take place.

I know it isn't easy to predict exactly the answers to all questions. Please give your best estimate. If you have any problems, ring me.

Kind regards
Mike Hodgen
Chairman Hurunui Water Project.
Phone: 03 3144063

[20] One objected to an invasion of privacy, even though the respondents were not identified on the response forms. Two others had filled out only a few of the questions.

Survey of Where you Spend your Money.

1. For each expenditure category, please estimate approximately what proportion of the expenditure takes place within Hurunui District (which includes Hanmer and Amberley but not Rangiora), Elsewhere in Canterbury and Outside Canterbury, and fill in the table below. Obviously the total will be 100 % of that category. If you do not undertake expenditure in that category please put n.a. (not applicable),

	% in Hurunui District	% else-where in Canterbury	% outside Canterbury	**Total**
Livestock Purchases (including stud stock)	53	25	22	100 %
Wages	89	8	3	100 %
Animal health and vet				
- chemicals	93	5	2	100 %
- vet	97	2	1	100 %
Feed				
- Contractors	98	2	0	100 %
- Purchased off-farm	81	18	1	100 %
- Grazing	82	15	3	100 %
- Other	91	9	0	100 %
Fertiliser				
- Materials	82	16	2	100 %
- Freight	97	3	0	100 %
- Application	98	2	0	100 %
Lime				
- Materials	100	0	0	100 %
- Freight	100	0	0	100 %
- Application	100	0	0	100 %
Freight	94	5	1	100 %
Seeds	55	44	1	100 %
Shearing				
- Contract Shearers	91	8	1	100 %
- Shed	93	7	0	100 %
- Groceries & materials	68	32	0	100 %
Weed & Pest				
- Materials	86	13	1	100 %
- Application	96	4	0	100 %
Dairy Breeding				
- herd testing	67	2	31	100 %
- A.I.	50	18	32	100 %
- Materials	67	15	18	100 %
- Other	50	9	41	100 %
	% in Hurunui District	% else-where in Canterbury	% outside Canterbury	**Total**
Dairy Shed Expenses				
- Chemicals	50	0	50	100 %
- Rubberware	50	50	0	100 %

- Other	50	50	0	100 %
Fuel	36	61	3	100 %
Vehicle R & M	75	25	0	100 %
General Farm R & M	84	14	2	100 %
Insurance agent	5	87	8	100 %
Accounting, legal, consultants	9	79	12	100 %
Drawings				
- Groceries	38	62	0	100 %
- Clothes	13	84	3	100 %
- Furnishings	5	94	1	100 %
- Schooling	49	48	3	100 %
- Entertainment	37	57	6	100 %
- Other (Please specify)				
- Other (Please specify)				
- Other (Please specify)				
Purchases of major plant items	27	69	4	100 %

2. Changes to Where you Buy things from

Briefly describe any changes to the above percentages which you think might happen if the proposed irrigation project goes ahead.

Majority said no change. Of those expecting change, most thought there would be an increase in range of services available locally.

3. Irrigated Areas

Total Area of Farm	**27,800**
Area that can be irrigated.	**13,800**
Area that you wish to irrigate.	**11,200**

4. Irrigation Intentions

Land use on irrigable area prior to irrigation.				
Land use on irrigable area post irrigation[1]		Survey		Adjusted
		No.	% of area	Total*
	Arable	15	17 %	13 %
	Livestock finishing	35	39 %	28 %
	Dairy	7	11 %	43 %
	Dairy Support	13	12 %	9 %
	Viticulture	3	0.5%	0.2 %
	Horticulture	2	2.2%	1.6 %
	Most economic	4	14 %	
	Not sure	9	5 %	
Or:			100 %	100 %
No intention to irrigate.	(tick if appropriate)		2 responses	
Not sure.	(tick if appropriate)		9 responses	
Sell and leave it up to the new owner.	(tick if appropriate)		2 responses	

* Assumes all AIC land and Balmoral Forest land (who are not included in survey results) and those answering "best economic use" will be dairying.

Appendix II Farm Budgets

Aggregated Farm budgets and Production by Farm Type under each land use scenario are shown in Table 12. Budgets per ha for each farm type, and details of the underlying assumptions, are in the attached report by the agribusiness group (see Appenix III). The area of irrigated land in the Agribusiness report was corrected to be consistent with the 42,000 Ha currently anticipated to be irrigated, and the irrigated models were adjusted to reflect current best estimates of off-farm irrigation costs. Detailed expenditure patterns of the farms are shown in Appendix 3.

Table 12 Direct Economic Impacts by Farm Type, and Net Direct Impacts

	Dryland				Irrigated				
	Sales ($m / yr)	Jobs (FTEs)	Household Income* ($m yr)	Value Added** ($m / yr)	Sales ($m / yr)	Jobs (FTEs)	Household Income* ($m yr)	Value Added** ($m / yr)	
Dairy	35.8	99	4.9	15.3	186.0	524	26.3	78.2	77 %
Arable	3.1	16	0.9	0.3	18.6	40	2.3	6.2	6 %
Sheep & Beef	24.0	84	4.3	9.7	31.0	42	2.1	9.2	1 %
Dairy Support	1.9	5	0.3	0.8	9.0	15	0.8	2.9	3 %
Horticulture	0.03	0	0	0.01	2.1	12	0.6	1.1	1 %
Viticulture	0	1	0	0.0	4.6	46	2.3	3.4	3 %
Total	65	200	11	26	250	680	34	101	100 %
Net Impacts of Converting Dry land to Irrigated land					**190**	**470**	**24**	**75**	

Numbers may not add due to rounding

* Household income includes wages and drawings

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

Appendix III. Hurunui Model Land Use Parameters

1.1 Price Series

The price series used have been taken from the MAF Situation and Outlook[21] document. The figure used is an average of the previous seasons (5 years) and the period of outlook (4 years). The sheep breeding revenue has been taken from a stock unit calculation utilising the appropriate price series information. The arable results are an average of the last 5 years production taken for the farm monitoring report[22]. The vineyard results are taken from the 2009 monitoring report. The blackcurrants results are used as an approximation of the likely horticultural results achieved and have been taken from a study in 2007 of the approximate area of this study. The results are shown in Table 13.

Table 13 : Price Series for irrigated land

Milksolids Price	5.63 / Kg milksolids
Lamb Price	3.91 / Kg
Wool Price	3.49 / Kg
Beef Price	3.30 / Kg
Sheep Breeding Revenue	84.80 / stock unit
Arable - Crop	2,975 / ha
Sheep	667 / ha
Grazing	119 / ha
Other	124 / ha
Stock Purchases	356 / ha
Dairy Support	0.16 $/ Kg DM
Vineyard Revenue	$ 20,415 / ha
Horticultural Revenue – Black currants	$8,000 / ha

1.2 Models

The models that have been used have been developed to reflect the current land use in the area now (using long term average price series) and the likely land uses in the future. They have been set up to reflect the MAF Farm Monitoring [23] models that have been adjusted to reflect local conditions or higher performance under irrigation, where appropriate.

1.3 Dryland

Dairy Model

This model is designed to reflect the performance in the Balmoral scheme under its current level of reliability and the small area of partially irrigated dairy farming in the area at present. Productions assumed at 1,055 Kg of milksolids / ha.

[21] MAF (2009): Situation and Outlook for New Zealand Agriculture and Forestry.
[22] MAF (2009): Horticulture and Arable Monitoring Report.
[23] MAF (2009): Pastoral Monitoring.

Arable
The arable model is set up to reflect the current practice of approximately half of the area in wheat and barley production with yields of 7.5 and 6.0 t/ ha respectively and the remainder of the farm in livestock at 9 stock units / ha.

Sheep and Beef
The sheep and beef model is set up to reflect the current situation of 9 stock units / ha with a mix of 85% of sheep and 15% of beef finishing. This is based on growing 6,200 Kg DM with a utilisation of 80% to give a consumed amount of feed of 4,960 Kg DM which works out at 9 stock units /ha.

Dairy Support
The current area of dryland dairy support has been modelled at the annual production of 6,200 Kg DM with an average return of $ 0.16 / Kg DM.

Horticulture
The blackcurrant model is used to reflect the small amount of dryland horticulture at present. This has been used at a lower yield of 6 t/ha to reflect a dryland yield.

1.4 Irrigated
All irrigated models, where appropriate are based on producing 16,500 Kg DM / ha with a utilisation of 85% to give a yield of 14,025 per ha.

Dairy
This calculates to a yield of 1,337 kg of milksolids with all other expenditure based on the model results but rated up, where appropriate, for the increased production.

Arable
The arable model is set up to reflect the crop mix of the Farm Monitoring model. This includes a mix of cereals, small seeds, other crops and an element of process / fresh vegetable production. This is combined with an element of owned and traded sheep and the sale of grazing to the dairy industry.

Sheep and Beef
The model is set up to reflect a system with 21.7 stock units made up of 40% in breeding ewes, 40% in traded lamb finishing and 20% in beef finishing.

Dairy Support
The system is set up to sell 14,025 Kg DM at a rate of $0.16 Kg DM /ha to the dairy industry. This reflects the average return to dairy grazing from a mix of heifer grazing, cow wintering and the sale of standing feed to dairy farmers.

Vineyard
The vineyard model is based on the Marlborough model which includes a mix of grape varieties. The model sells all of its grapes direct to a winemaker so does not include any revenues from wine making or its associated tourist activities.

Horticulture
The horticulture model is based on a black currant property producing 8 tonnes / ha and selling that for $1,000 a tonne.

Dryland Models

			Dairy		$ / Ha	Total	Balmoral			ARABLE		$ / Ha	Total
	REVENUE			per kgMS				REVENUE						
	Milksolids	1,055	Price	5.63	5,934		5,934	0.25	Wheat	7.5	350	656	
	Cattle net of Purchases			0.41	432		432	0.25	Barley	6.00	320	480	
	Other			0.11	116		116	0.50	Livestock	9.0	84.8	382	
												-	
	GROSS FARM REVENUE				**6,482**	**1,296,388**	6,482	**GROSS FARM REVENUE**				**1,519**	**303,726**
	FARM WORKING EXPENSES							**FARM WORKING EXPENSES**					
	Livestock Purchases			0.07	74		74	Livestock Purchases			45	45	
	Wages			0.66	696		696	Wages			54	54	
	Animal Health			0.21	221		221	Animal Health			18	18	
	Breeding			0.11	116		116	Breeding				-	
	Shed Expenses			0.05	53		53	Shed Expenses				-	
	Electricity			0.21	221		221	Electricity			7	7	
2000	Feed			1.40	1,476		1,476	Feed			15	15	
	Fertiliser			0.54	569		569	Fertiliser			250	250	
	Freight			0.03	32		32	Freight			18	18	
	Seeds			0.06	63		63	Seeds			50	50	
	Shearing				-		-	Shearing			26	26	
	Weed and Pest			0.02	21		21	Weed and Pest			150	150	
	Fuel			0.07	74		74	Fuel			54	54	
	Vehicle			0.09	95		95	Vehicle			40	40	
	Repairs & Maint			0.29	306		306	Repairs & Maint			50	50	
	Rates				64		64	Rates				15	
	Communication				27		27	Communication				7	
	Insurance				50		50	Insurance				12	
	Acct, Legal,Cons				37		37	Acct, Legal,Cons				9	
	Administration				57		57	Administration				5	
	Other				-		-	Other				3	
	Irrigation	Off Farm					55	Irrigation	Off Farm				
		On Farm					120		On Farm				
					-		-						
	CASH FARM EXPENDITURE				**4,253**	**850,524**	**4,428**	**CASH FARM EXPENDITURE**				**828**	**165,600**
	CASH FARM SURPLUS				**2,229**	**445,864**	**2,054**	**CASH FARM SURPLUS**				**691**	**138,126**

			SHEEP FINISHING		$ / Ha	Total			Dairy Support					
	REVENUE									REVENUE				
									Price	0.16		992.00		
0.85	Ewe Breeding		7.67	84.80	650									
0.15	Cattle		36.47	3.30	120									
	GROSS FARM REVENUE				770	154,088			TOTAL REVENUE			992	198,400	
	FARM WORKING EXPENSES								FARM WORKING EXPENSES					
	9.02	SU/Ha		per SU										
	Livestock Purchases			9.43	85				Livestock Purchases					
	Wages			4.00	36				Wages		50			
	Animal Health			3.92	35				Animal Health		45			
	Breeding			-	-				Breeding					
	Shed Expenses				-				Shed Expenses					
	Electricity			0.57	5				Electricity		5			
	Feed			2.52	23				Feed		200			
	Fertiliser			8.40	76				Fertiliser		85			
	Freight			1.00	9				Freight		11			
	Seeds			2.11	19				Seeds		31			
	Shearing			5.70	51				Shearing					
	Weed and Pest			1.72	16				Weed and Pest		16			
	Fuel			4.50	41				Fuel		41			
	Vehicle			3.28	30				Vehicle		30			
	Repairs & Maint			3.20	29				Repairs & Maint		29			
	Rates				11				Rates		11			
	Communication				5				Communication		5			
	Insurance				9				Insurance		9			
	Acct, Legal,Cons				10				Acct, Legal,Cons		10			
	Administration				4				Administration		4			
	Other				2				Other		2			
	Irrigation	Off Farm							Irrigation	Off Farm	-			
		On Farm								On Farm	-			
	CASH FARM EXPENDITURE				495	99,013			CASH FARM EXPENDITURE			583	116,534	
	CASH FARM SURPLUS				275	55,075			CASH FARM SURPLUS			409	81,866	

Irrigated Models

						Balmoral													
		Dairy		$ / Ha	Total				ARABLE		$ / Ha	Total			SHEEP FINISHING		$ / Ha	Total
REVENUE			per kgMS				**REVENUE**							**REVENUE**					
Milksolids	1,337	Price	5.63	7,522		7,522	Crop			2,975	2,975		0.40	Lamb Finishing		401	3.91	1,707	
Cattle net of Purchases			0.41	548		548	Sheep			667	667		0.40	Ewe Breeding		10.20	84.80	935	
Other			0.11	147		147	Grazing			119	119		0.20	Beef Finishing		137.50	3.30	454	
				-		-	Other			124	124								
GROSS FARM REVENUE				8,217	**1,643,395**	8,217	**GROSS FARM REVENUE**				**3,886**	**777,120**		**GROSS FARM REVENUE**				**3,096**	**619,207**
FARM WORKING EXPENSES							**FARM WORKING EXPENSES**							**FARM WORKING EXPENSES**					
														21.68	SU/Ha		per SU		
Livestock Purchases			0.07	94		94	Livestock Purchases			356	356			Livestock Purchases			950.00	950	
Wages			0.66	882		882	Wages			158	158			Wages			65.00	65	
Animal Health			0.21	281		281	Animal Health			12	12			Animal Health			31.00	31	
Breeding			0.11	147		147	Breeding			-	-			Breeding			-	-	
Shed Expenses			0.05	67		67	Shed Expenses				-			Shed Expenses				-	
Electricity			0.21	281		281	Electricity			86	86			Electricity			10.00	10	
Feed			1.40	1,872		1,872	Feed			29	29			Feed			64.00	64	
Fertiliser			0.54	722		722	Fertiliser			515	515			Fertiliser			164.00	164	
Freight			0.03	40		40	Freight			55	55			Freight			13.00	13	
Seeds			0.06	80		80	Seeds			109	109			Seeds			35.00	35	
Shearing				-		-	Shearing			11	11			Shearing			45.00	45	
Weed and Pest			0.02	27		27	Weed and Pest			311	311			Weed and Pest			31.00	31	
Fuel			0.07	94		94	Fuel			109	109			Fuel			45.00	45	
Vehicle			0.09	120		120	Vehicle			73	73			Vehicle			38.00	38	
Repairs & Maint			0.29	388		388	Repairs & Maint			114	114			Repairs & Maint			54.00	54	
Rates				64		64	Rates			37	37			Rates			21.00	21	
Communication				27		27	Communication			13	13			Communication			7.00	7	
Insurance				50		50	Insurance			43	43			Insurance			24.00	24	
Acct, Legal,Cons				37		37	Acct, Legal,Cons			32	32			Acct, Legal,Cons			14.00	14	
Administration				57		57	Administration			17	17			Administration			10.00	10	
Other							Other			67	67			Other			14.00	14	
Irrigation	Off Farm			490		110	Irrigation				490			Irrigation	Off Farm			490	
	On Farm			120		120	Other				120				On Farm			120	
				-															
CASH FARM EXPENDITURE				5,938	**1,187,615**	**5,558**	**CASH FARM EXPENDITURE**				**2,757**	**551,440**		**CASH FARM EXPENDITURE**				**2,245**	**449,000**
CASH FARM SURPLUS				**2,279**	**455,780**	**2,659**	**CASH FARM SURPLUS**				**1,128**	**225,680**		**CASH FARM SURPLUS**				**851**	**170,207**

Irrigated Models

Irrigated Dairy Support								Vineyard							$	
	REVENUE					21.7	S U / ha	REVENUE						Revenue		
														Black currants	8.00	1,000.00	8,000.00
Price	0.16		2,244.00								20,415			Other			
TOTAL REVENUE			2,244	448,800				TOTAL REVENUE			20,415			Gross Revenue			8,000.00
FARM WORKING EXPENSES								FARM WORKING EXPENSES						Working Expenditure			
Livestock Purchases																	
Wages		50						Wages		4698				Wages		955.00	
Animal Health		45															
Breeding		-															
Shed Expenses		-															
Electricity		10						Electricity		142				Electricity		130.00	
Feed		400															
Fertiliser		175						Fertiliser		298				Fertiliser		175.00	
Freight		13															
Seeds		35															
Shearing		-															
Weed and Pest		31						Weed and Pest		951				Weed and Pest		1,371.00	
Fuel		45						Fuel		294							
Vehicle		38						Vehicle		1123				Vehicle		850.00	
Repairs & Maint		54						Repairs & Maint		388				Repairs & Maint		120.00	
Rates		21						Rates		362				Rates		180.00	
Communication		7						Communication		126				Communication		50.00	
Insurance		12						Insurance						Insurance		215.00	
Acct, Legal,Cons		14						Acct, Legal,Cons		366				Acct, Legal,Cons		80.00	
Administration		10						Administration		311				Administration			
Other		14						Other		329				Other		175.00	
Irrigation	Off Farm	490						Irrigation	Off Farm	490				Irrigation	Off Farm	490	
	On Farm	120							On Farm	50					On Farm	50	
CASH FARM EXPENDITURE			1,584	316,800				CASH FARM EXPENDITURE			9,928			Total Expenditure			4,841.00
CASH FARM SURPLUS			660	132,000				CASH FARM SURPLUS			10,487			Cash Surplus			3,159.00

1.5 Conversion costs

The costs of conversion of land from its current land use to its irrigated land use is listed for each land use as follows. These figures were used to rate up to the total conversion costs by multiplying them by the total area of each type.

Table 14: Land Conversion Costs

Item	Dairy	Arable	Sheep and Beef	Dairy Conversion	Viticulture	Horticulture
Clean Up	50	50	50	50		3,000
Fonterra Shares	6,042					
Irrigation System	2,200	2,200	2,200	2,200		3,000
Cow Shed	3,000			-		
Electricity	100			-		50
Housing	500		350	-		0
Other Buildings	75	150	50	50		0
Fencing and Lanes	200	200	200	200		
Stockwater	60	20	60	60		
Fertiliser	300		300	300		
Regrassing	500		500	500		
Machinery	250	600	150	-		16,000
Livestock	3,680	-300	530	-1,120		
					37500	
Total	**16,957**	**2,920**	**4,390**	**2,240**	**37,500**	**22,050**

1.6 Land use Mix

We were provided with a spreadsheet of the answers to a series of questions about land use mix that were completed in 2008. There was a very high response rate to this questionnaire so we have been able to use it to determine the possible land use mixes to be adopted in the study area.

Farmers were asked to fill out questions on (amongst others);

Total area of the farm
Area in use.
Current Irrigable Area.
Land use currently.
Irrigable area.
Eventual use of land with irrigation.
Support of the scheme.

There were some inconsistencies in the information provided caused by failure to fill out the form completely and a misinterpretation of some of the questions.

The first major problem that we have rectified was that a proportion of the farms had a larger area than that able to be irrigated in the section on eventual use of land with irrigation. These were sorted out by a reduction in the area under irrigation to match the Irrigable area as stated. Where there was confusion over the possible land use it was sorted out by reference to the land use currently.

A second problem was for farms that had not filled out the section on eventual use of the land with irrigation. They had however indicated support of the scheme in that section of the report. For these farms the eventual use of the land under irrigation was filled out to reflect the best possible use of the land depending on their responses to the earlier land use question.

The area under the Balmoral irrigation scheme is included in the area to be irrigated with 5240 ha. However the area is attributed with one sixth of the cost of the scheme. This is to reflect the fact that the Balmoral scheme is only taking one sixth of the amount of water that the rest of the area is taking. This will ensure that the Balmoral area has complete reliability for its water allocation.

The area of land that is owned by Ngai Tahu Forest Estates Limited has 7,320 ha as irrigable which is currently in forestry. This has been included in the dryland analysis as livestock. It is unlikely that the land will be returned to forest when it has been felled. The land will return to either dryland agriculture or to irrigated agriculture if it is available. This land has all been included as dairy land use in the assumptions of the eventual use of the land under irrigation.