parcel. Given its relative diminutive size, flower 'farming' does not constitute a significant proportion in terms of irrigated land area.

The actual economics of this very small area of flower production is likely to be very dependent on the specific operation. Rather than postulate a general level of production and value, this requires specific information on the enterprise itself, obtained from a survey if the work is taken further.

2.4 Summary of estimated current economic production

Working from the economic parameters at the per hectare level for each of the three B&L NZ farm classes for 2013-24 we have estimated the total revenue and total gross margin from the area irrigated from Lindis water sources. We have included our estimate for the vineyard productivity, but deer production and flower production require more-specific information on their actual production types to give meaningful estimates. Also they comprise a very small component of production.

2.4.1 Total revenue and gross margin

The summary is that our current estimate of revenue (or gross output) from the main pastoral farming types using irrigation from Lindis water sources is approximately $3.7 million per year.

The total gross margin from this activity is approximately $1.76 million per year.

Table 5: Estimated revenue and gross margin from farm types with irrigation (Irrigation Only)

	Total area	Revenue	Farm working expenses	Gross margin	Total revenue	Total gross margin
Farm type	*Hectares*	*$ per hectare*	*$ per hectare*	*$ per hectare*	*$'000*	*$'000*
Sheep intensive finishing	1,250.8	1,850.00	980.00	870.00	2,314.1	1,088.2
Sheep and beef breeding and finishing	706.1	1,319.00	664.00	655.00	931.3	462.5
Beef intensive finishing	217.1	1,510.00	773.38	736.62	327.8	159.9
Deer intensive	14.8	n.a	n.a	n.a	n.a	n.a
Vineyard	12.4	9,000.00	5,350.00	3,650.00	111.6	45.3
Flowers	2.4	n.a	n.a	n.a	n.a	n.a
Total	**2,203.6**				**3,684.8**	**1,755.9**

2.4.2 Employment impact of current irrigated production

The direct employment impacts of irrigated production are limited.

Labour units per 100 hectares were sourced from the three B&L NZ farm classes for the key pastoral farm types while labour units for vineyards were sourced from 2006 Statistics NZ Census figures.

Using Statistics NZ Census figures, we approximated productivity per labour unit of a vineyard worker (i.e. grape grower/picker) to be 4 hectares per labour unit. This then would equate to an equivalent of 25 labour units per 100 hectares, making vineyards the most labour intensive of the various farm types in the Lindis catchment area, significantly more so than any of the other farm types. However given that there are only an approximate 12.4 hectares of vineyard in the catchment, the total number of labour units is relatively small at 3.11.

Beef Gross Income Per Hectare = $1672/Ha

Beef Gross Margin Per Hectare. = $797/Ha

When access to water for irrigation is restricted there is an almost infinite number of effects that could take place, depending upon which takes were affected, whether there was mitigating action taken by irrigators and so on.

For the purpose of this analysis we have taken a relatively simple approach of taking the land use with current irrigation as from Section 2 above, and reducing that production towards the production that would be achieved with no irrigation. The amount by which the production is reduced is the proportion of the current average 191 unrestricted irrigation days that are lost.

For example the 450L/s minimum flow would cause irrigation restriction to increase on an average of 20 days per season. The land use change assumed in our modelling is that which would reduce production by the 20 days over the current 191 days average irrigation per season. This is a reduction by about 10% of the difference in production between that currently produced, and what would be produced with no irrigation.

On the 49 days which currently have restricted access, there will be variety of patterns to the irrigation possible. We have no way of determining how the water is currently allocated on those days, nor how it will be allocated on the additional days with restrictions due to minimum flow requirements. The implication of taking the production as proportional to the number of unrestricted irrigation days is that the pattern of allocation on the current 49 restricted days will be reflected in the pattern of allocation in the increased number of restricted days under the minimum flow requirements.

In order to estimate the impact of the minimum flows, we therefore need to model the land use and production in the Lindis irrigation zone with no irrigation.

3.4 Land use and production no irrigation

(Dryland Only)

We use the above assumptions of the change in farming types on the land without access to irrigation. We then estimate economic production parameters using Beef&Lamb NZ estimates of revenues and farm working expenses for these land uses without irrigation.

Table 7: Estimated revenue and gross margin from farm types with no irrigation

	Total area	Revenue	Farm working expenses	Gross margin	Total revenue	Total gross margin
Farm type	*Hectares*	*$ per hectare*	*$ per hectare*	*$ per hectare*	*$'000*	*$'000*
Sheep intensive finishing	0.0	1,461.82	755.85	705.97	0.0	0.0
Sheep and beef breeding and finishing	2,174.0	1,017.00	490.00	527.00	2,211.0	1,145.7
Beef intensive finishing	0.0	1,161.94	594.91	567.03	0.0	0.0
Deer intensive	14.8	n.a	n.a	n.a	n.a	n.a
Vineyard	12.4	6,700.00	5,200.00	1,500.00	83.1	18.6
Flowers	2.4	n.a	n.a	n.a	n.a	n.a
Total (interim)	**2,203.6**				**2,294.0**	**1,164.3**

The summary is that our current estimate of revenue (or gross output) from the main pastoral farming types if they were unable to use irrigation is approximately $2.3 million per year.

The total gross margin from this activity is approximately $1.16 million per year.

Beef Gross Income per Hectare = $1040/Ha
Beef Gross Margin Per Hectare = $528/Ha.

Additional Information for Point 20
Reasons Berl Report Understates the Economic Impacts and Reduction in FTEs

1. The Berl report has identified the current irrigated land from the Lindis catchment as being 3,131 hectares

a) The Berl report uses only 2,204 hectares (Table 5 of the Berl report) which is defined as those dependent on the Lindis catchment for their irrigation needs areas exclusively
b) They have effectively carved out 927 hectres or 30% of the current land area irrigated from the Lindis River
This was because they were assumed to have two sources of water even though irrigators can use two soucres of water on the same land as long as it is efficient.

2. The report identifies (on page 2 of the executive summary) that producers in the Lindis dependent irrigation area can increase irrigation efficiency of their use of the Lindis water. This improved efficiency is however not modelled into their calculations even though it is encouraged and allowable under the current Otago Regional Council water plan.

3. Model for Berl overinflates Dryland returns and under estiamtes returns for Irrigated Land

	Dryland	Irrigated	Difference $/ Hectare	Difference %
Berl Income $/Ha	$1,040	$1,672	$632	61%
Porter Derived Income $/Ha	$712	$3,122	$2,410	338%
Berl Gross Margin $/Ha	$528	$797	$269	51%
Porter Derived Gross Margin $/ha	$305	$1,337	$1,032	338%
Berl Implied Productivity increase				61%
Porter Pastue Prodution Kg/Ha	2,889	12,721	9,832	340%

Note :
1. The Berl model only has a 61% increase in productivity by changing from dryland to irrigated in the Lindis catchment whereas the Porter model is based on a 338% increase in pasture production (3.4 times) grown and utised per hectare by changing from dryland to irrigated
If there was only a 61% increase in pasture productivity by devleoping irrigation there would be no irrigation in the Lindis catchment

2. Berl uses farm revenue and expenses from other regions of New Zealand for their irrigated model

3.The minimum flows are modelled on the difference in income of dryland compared to irrigated of $632/ha in the Berl Model compared to a difference of $2,410/ha for the Porter model
This means if the Lindis catchment had no irrigation in the Berl model income would drop by $632/ha whereas in the Porter model income would drop by $2,410/Ha . This is significant in that the impacts of minimum flows will be very small in the Berl model compared to the Porter model.