ECONOMIC OUTLOOK REPORT 2

RIO regional investment opportunities

A PROJECT OF
THE MURRAYLANDS REGIONAL DEVELOPMENT BOARD INC

ECONOMIC OUTLOOK REPORT 2

Murraylands Economic Outlook Report 2: Headline Analysis

A report prepared for

MURRAY LANDS REGIONAL DEVELOPMENT BOARD INC

Prepared by

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Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
fte	full time equivalent
GRP	Gross Regional Product
PIRSA	Primary Industries and Resources South Australia
RIO	Regional Investment Opportunities
SAMDBNRMB	South Australian Murray Darling Basin Natural Resources Management Board

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1. Introduction

EconSearch Pty Ltd was contracted by the Murraylands Regional Development Board Inc to prepare a series of Economic Outlook Reports that provide investors, stakeholders and the community with an overview of the status of the Murraylands economy. Each Murraylands Economic Outlook Report consists of three key aspects, namely:

- Headline Analysis;
- Regional Investment Opportunities (RIO) Sector Analysis; and
- Standard Economic Analysis.

The aim of the Headline Analysis, the subject of this report, was to provide estimates of the regional economic impact in the Murraylands of a range of scenarios for manufacturing across the region, namely:

- impact of water industry growth
  - manufacturing to support water/irrigation industries
  - waste water reuse
  - Flinders University – Bedford project
- impact of energy industry growth
  - a grain based ethanol plant
  - other bio diesel opportunities
- impact of a zero allocation for River Murray irrigators
- impact of drought on food processing sectors
- impact of projected housing growth

The analysis presented in this report was undertaken by Lizzie Clark and Julian Morison (EconSearch Pty Ltd).

2. Method

The estimates of economic impact presented in this report were based on a *RISE* (Regional Industry Structure and Employment) model for the Murraylands region for 2002/03 prepared by the consultants for the Office of Regional Affairs (EconSearch 2005).

The method employed for estimation of economic impacts was input-output analysis. Input-output analysis provides a comprehensive economic framework that is extremely useful in the resource planning process. Broadly, there are two ways in which the input-output method can be used.

First, the input-output model provides a numerical picture of the size and shape of an economy and its essential features. The input-output transactions table can be used to describe some of the important features of an economy, the interrelationships between sectors and the relative importance of the individual sectors.

Second, input-output analysis provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various growth or decline scenarios.

For a technical description of the input-output modelling procedure refer to Appendix 1 and for a glossary of input-output terminology refer to Appendix 2.

Economic impacts in this report have been specified in terms of the following indicators:

- output;
- employment; and
- contribution to gross regional product (GRP).

Output is a measure of the gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies. This indicator needs to be used with care as it includes elements of double counting.

Employment is a measure of the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent (fte) jobs.

Contribution to GRP is a measure of the net contribution of an activity to the regional economy. Contribution to GRP is measured as value of output less the cost of goods and services (including imports) used in producing the output. It can also be measured as household income plus other value added (gross operating surplus and all taxes, less subsidies). It represents payments to the primary inputs of production (labour, capital and land). Using contribution to GRP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose.

Estimates of the economic impact are presented in terms of

- direct impacts;
- flow-on (or indirect) impacts; and
- total impacts.

Direct impacts are the initial round of output, employment and household income generated by an economic activity.

Flow-on (or indirect) impacts are the sum of production-induced effects and consumption-induced effects. Production-induced effects are additional output, employment and household income resulting from re-spending by firms (e.g. transport contractors) that receive payments from the sale of services to firms undertaking, for example, meat processing. Consumption-induced effects are additional output, employment and household income resulting from re-spending by households that receive income from employment in direct and indirect activities.

3. Data and Assumptions

The purpose of this section of the report is to summarise the data sources and assumptions that were used in imputing the regional economic impact of each scenario.

It should be noted that analysis of each of the scenarios assumed that the Murraylands economy has the capacity to meet any additional demands for goods, services and labour. In a relatively open economy which has the capacity to increase output in most of the key supply industries, this is a valid assumption. However, if local supply conditions are tight (for either material inputs or labour), costs may increase as a result of higher demand and inputs, including labour, may be sourced from outside the region.

3.1 The Economic Impact of Water Industry Growth

3.1.1 Manufacturing to support water/irrigation industries

The Water Industry Alliance was founded in 1998 with an aim to expand the water industry in South Australia. Reports from the industry group indicate that the water industry in South Australia has grown at about 30 per cent per year over the last decade. The group expects that growth in future years will average around 10 per cent per annum. Based on this expectation, three alternative industry growth scenarios were developed for the Murraylands region.

Low:	An increase in annual gross sales 50 per cent below the expected level (i.e. annual growth of 5 per cent).
Expected:	An increase in annual gross sales of 10 per cent.
High:	An increase in annual gross sales 50 per cent above the expected level (i.e. annual growth of 15 per cent).

Estimates of the overall size of the manufacturing sector in the Murraylands region was based on the final results from the ABS *2001/02 Manufacturing Survey for South Australia* (ABS 2005). In terms of annual sales income, it was estimated that the manufacturing sector in the Murraylands accounted for approximately 4 per cent of the South Australian total.

For the purpose of this analysis it was assumed that the average expenditure profile of irrigation/water industries manufacturing in the region was similar to that for general manufacturing in the region.

3.1.2 Waste water re-use

Significant volumes of contaminated water are currently produced and stored by food production and processing activities in the Murraylands region. A priority identified by the *RIO Regional Investment Prospectus* is to attract investment into water re-use projects that utilise contaminated water.

The South Australian Murray-Darling Basin Natural Resources Management Board (SAMDBNRMB) has recently undertaken a project to investigate opportunities for wastewater re-use within the Murray-Darling Basin in South Australia (SAMDBNRMB 2007). Two potential re-use projects are identified in the project report:

- Pumping of raw wastewater from Dairy Farmers to Big River Pork wastewater treatment plant and re-use wastewater at a new development site (Brinkley Precinct).
- Pumping of wastewater from National Foods to a new wastewater treatment plant to be constructed at T&R Pastoral and irrigation of treated wastewater (Northern Precinct).[1]

The re-use projects are estimated to generate approximate 1,400 ML of treated wastewater per year (SAMDBNRMB 2007). There are many potential uses for this wastewater resource including irrigation of new horticulture developments on adjacent and nearby land.

For the purpose of this analysis it has been assumed that all treated wastewater is used to irrigate new horticulture plantings. The types of new crops planted are based on current horticulture production in the region. Estimates of current (2005/06) production and value of production of horticulture crops in the Murraylands region were derived from the *Food Scorecard* for the region obtained from PIRSA (Carina Cartwright, pers. comm.).

Estimates of the regional economic impact in the Murraylands in 2005/06 of an increase in the quantity of wastewater reuse were based on the premise that irrigators would continue to irrigate their existing plantings with current water supply and treated wastewater would be used for irrigation of new plantings. The estimates of economic impact do not, however, take account of the impacts associated with the capital expenditure incurred in the adoption of wastewater re-use measures or the expansion of plantings.

3.2 The Economic Impact of Energy Industry Growth

Biofuels currently comprise a very small proportion of Australia's total liquid fuel supply. In 2005/06, Australia produced 57 ML of biofuel comprising 41 ML of ethanol and 16 ML of biodiesel. Production and sales of biofuels in Australia are rising (ABARE 2007).

3.2.1 Ethanol production

Ethanol can be produced from the fermentation of biomass feedstocks typically obtained from agricultural sources. Suitable feedstocks include:

- waste starch;
- molasses;
- corn;
- sorghum; and
- low quality wheat.

New technology could also allow crop waste, wood waste and grasses to be used as feedstocks (ABARE 2007).

The current ethanol production capacity in Australia and the feedstock used by each producer are detailed in Table 3.1.

[1] This project is likely to be an outcome of a partnership between the Murraylands Regional Development Board Inc and the Flinders University of South Australia.

Table 3.1 Estimated ethanol production capacity in Australia, 2005/06 [a]

Company Name	Capacity (ML/annum)	Feedstocks	Feedstock use at Full Capacity (Kt/annum)
Manildra Group	100	Waste wheat starch, low grade grain	n.a.
CSR Distilleries	32	Molasses	128
Rocky Point Sugar Mill	20 – 25	Molasses, sorghum	80 – 100
Primary Energy	120	Coarse grains (mostly sorghum), wheat	300
Primary Energy	160	Grain	400
Australian Ethanol	100	Wheat, corn, barley	245
Dalby Biorefinery	80	Sorghum	200
Primary Energy	160	Wheat	400
Australian Ethanol	200	Wheat	490
Australian Ethanol	200	Wheat	490

[a] Includes both actual and planned production capacity

Source: ABARE (2007)

Estimates of the economic impact of ethanol production in the Murraylands region were based on two hypothetical scenarios:

- Development of a plant with 100 ML annual production capacity; and
- Development of a plant with 200ML annual production capacity.

The key price, production, cost and employment assumptions are provided in Table 3.2. Estimates of economic impact were based on the assumption that, while the total volume of feedstock produced in the region would not increase significantly, the price received for these products would. For the purpose of this analysis it was assumed that feedstock prices would increase by 10 per cent in response to demand pressure from ethanol production. The impact of a more conservative 5 per cent price response was also estimated. The estimates do not take account of the impacts associated with the capital expenditure incurred in the development of the ethanol production technology or the construction of the ethanol production facility.

Table 3.2 Assumptions for economic analysis of ethanol production scenarios

	Plant Capacity 100ML per annum	Plant Capacity 200ML per annum
Ethanol Sale Price ($/l)	0.9	0.9
Annual Gross Sales ($m)	90.0	180.0
Feedstock Use (kt/annum)	245	490
Feedstock Cost ($m)	55.9	111.7
Other Operating Cost ($m)	23.9	47.7
Number of Employees (fte)	55	100

Source: ABARE (2007) and EconSearch analysis.

3.2.2 Biodiesel production

Biodiesel is produced from a reaction of vegetable oil or animal fat with an alcohol such as ethanol or methanol. Feedstocks in current or planned use in biodiesel production include:

- tallow;
- used cooking oil;
- canola oil;
- soy bean oil;
- palm oil; and
- vegetable oils.

The use of oilseeds, such as canola or mustard, are currently being investigated as feedstocks for biodiesel production (ABARE 2007).

The potential biodiesel production capacity in Australia and the feedstock used by each producer are detailed in Table 3.3.

Table 3.3 Estimated biodiesel production capacity in Australia, 2005/06 [a]

Company Name	Capacity (ML/annum)	Feedstocks	Feedstock use at Full Capacity (Kt/annum)
Biodiesel Industries Australia	15 – 20	Tallow, used cooking oil, canola oil	14–18
Australian Renewable Fuels	45	Canola oil, tallow, used cooking oil	41
Eco-Tech Biodiesel	30	Tall used cooking oil	28
Australian Biodiesel Group	160	tallow, soy bean oil	147
Australian Renewable Fuels	45	Canola oil, tallow, used cooking oil	41
Natural Fuels Australia	138	Palm oil, soybean oil	130
South Australian Farmer Fuel	15	Canola oil, tallow, used cooking oil	14
Biodiesel Producers Australia	60	Tallow, used cooking oil, vegetable oils	55
Axion Energy	150	Used cooking oil, tallow, palm oil	135
Riverina Biofuels	40	Tallow	36
Energetix Biodiesel	100	Tallow, canola oil, used cooking oil	90
Future Fuels	30	Canola oil	n.a.
BP Australia	110	tallow	100

[a] Includes both actual and planned production capacity.

Source: ABARE (2007)

Estimates of the economic impact have been based on two hypothetical scenarios:

- development of a plant with 15 ML annual production capacity; and
- development of a plant with 110ML annual production capacity.

The key price, production, cost and employment assumptions are provided in Table 3.3. Estimates of economic impact were based on the assumption that, while the total volume of feedstock produced would not increase significantly, the price received for these products would. For the purpose of this analysis it was assumed that feedstock prices would increase by 10 per cent in response to demand pressure from biodiesel production. The impact of a more conservative 5 per cent price response was also estimated The estimates do not take account of the impacts associated with the capital expenditure incurred in the development of the biodiesel production technology or the construction of the biodiesel production facility.

Table 3.4 Assumptions for economic analysis of biodiesel production scenarios

	Plant Capacity 15ML per annum	Plant Capacity 110ML per annum
Biodiesel Sale Price ($/l)	0.9	0.9
Annual Gross Sales ($m)	13.5	99.0
Feedstock Use (kt/annum)	14	100
Feedstock Cost ($m)	6.3	44.7
Other Operating Cost ($m)	2.7	19.0
Number of Employees (fte)	4	24

Source: ABARE (2007) and EconSearch analysis.

3.3 The Economic Impact of a Zero Allocation for River Murray Irrigators

Estimates of the regional economic impact in the Murraylands in 2005/06 of a 0 per cent water allocation for River Murray irrigators were based on previous assessments of the economic impact of drought conditions and reduced water allocations for River Murray irrigators in South Australia (EconSearch and SRHS 2004 and EconSearch 2007).

Given that the price of water is likely to be prohibitively high in a situation where supply is significantly restricted, it was assumed that no trade amongst irrigators would take place. This, in turn, implies that all irrigators would be subject to the significant yield declines.

Estimates of the farm-level and, by implication, regional-level yield response to the 0 per cent allocation scenario are summarised in Table 3.5 for the horticulture and viticulture sectors. In response to the 0 per cent water allocation scenario it was assumed that a proportion of dairy farmers would resort to full feedlot production (20 per cent), some would reduce feed inputs (with a consequent reduction in milk yield) (40 per cent) and the balance would cease production (40 per cent). These assumptions are consistent with those used in EconSearch (2007).

Table 3.5 Imputed yield response to a 0 per cent water allocation scenario

	Average On-Farm and Regional Yield reduction [a]
Winegrapes	-76%
Citrus	-100%
Stone and pome fruit	-100%
Almonds and other tree crops	-100%
Vegetables	-100%

[a] Based on assumptions made in EconSearch (2007).

3.4 The Economic Impact of Drought on Food Processing Sectors

Estimates of current[2] processing volumes and values in food manufacturing and processing sectors in the Murraylands region were derived from the *Food Scorecard* for the region obtained from PIRSA (Carina Cartwright, pers. comm.).

To highlight the potential effect of drought on food processing sectors, three hypothetical scenarios were developed:

- 10 per cent decrease in food processing;
- 25 per cent decrease in food processing; and
- 50 per cent decrease in food processing.

For the purpose of this analysis, it has been assumed that the effects of the drought are widespread. Consequently, primary products for processing cannot be sourced from outside the region to replace local production.

3.5 The Economic Impact of Projected Housing Growth

Estimates of residential population in the region were obtained from the Australian Bureau of Statistics (ABS) (*Regional Population Growth, Australia, 2005/06,* Cat. No. 3218.0). The estimated residential population of the Murraylands region for the period 2001/02 to 2005/06 is illustrated in Table 3.1.

Table 3.6 Estimated residential population in the Murraylands region

Year	Population (no of persons)					
	Karoonda East Murray	Mid-Murray	Murray Bridge	Southern Mallee	The Coorong	Total Murraylands
2001/02	1,253	8,428	17,265	2,240	5,901	35,087
2002/03	1,205	8,441	17,438	2,218	5,834	35,136
2003/04	1,198	8,435	17,636	2,206	5,798	35,273
2004/05	1,167	8,419	17,961	2,198	5,747	35,492
2005/06	1,154	8,420	18,194	2,187	5,724	35,679

Source: ABS 2007.

The *Murray Bridge Urban Growth Plan* (QED 2007) indicates that the population for the Murray Bridge Council area is forecast to increase by approximately 2.5 per cent per annum, reaching 30,000 by 2026. Estimates of residential population (Table 3.1) indicate that population in Murray Bridge has increased by an average of 1.3 per cent per annum over the last 5 years, while population in other council areas has remained stable or decreased slightly.

Estimates of regional economic impact were based on the assumption that growth in the Murray Bridge council area would be consistent with the *Urban Growth Plan* forecast estimates while population in other council areas would remain constant.

[2] The latest year for which data were available was 2005/06.

Data on the number and value of residential building approvals were obtained from the ABS (*Building Approvals, Australia,* Cat. No. 8731.0). The total number of building approvals in the Murraylands increased between 2001/02 and 2003/04, but has decreased in subsequent years (Table 3.7). The value of building approvals increased by over 50 per cent over the period 2001/02 to 2005/06.

Table 3.7 Number and value of new residential dwelling approvals in the Murraylands, 2001/02 to 2005/06

Year	Number of Approvals	Value of Approvals [a]	Value per Approval
	no	$'000	$'000
2001/02	233	23,864	102
2002/03	237	27,396	116
2003/04	278	33,586	121
2004/05	253	35,701	141
2005/06	241	36,130	150

[a] In 2006 dollars.

Source: ABS 2007.

Comparison of annual growth in residential population and in the number of residential building approvals was used to estimate the expected number of residential approvals given the population forecasts for the region. The value of approvals were calculated based on the estimated number of approvals and the average value per approval in 2005/06 ($150,000).

Based on the population and building approvals data, it was estimated that for every 1 per cent increase in population, there would be a 3.1 per cent increase in the number of residential dwelling approvals, i.e. if the population were to increase by 357 persons (an increase of 1 per cent) between 2005/06 and 2006/07, the number of residential dwelling approvals would increase by 8, from 241 to 249 (an increase of 3.1 per cent).

4. The Regional Economic Impact of Water Industry Growth

4.1 Manufacturing to Support Water/Irrigation Industries

Estimates of the regional economic impact of the three growth scenarios for water industry manufacturing are presented below. Estimates of the cumulative impact of the growth (over a 5 year planning horizon) have also been calculated. These cumulative estimates are based on the assumption that a 1 per cent productivity improvement would be achieved each year.

4.1.1 Low growth scenario

Estimates of the regional economic impact of low growth (5 per cent per annum) in water industry manufacturing in the Murraylands in 2005/06 are provided in Table 4.1

Table 4.1 Estimated regional economic impact of water industry manufacturing: low growth scenario

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Water Industry Manufacturing	0.9	8	0.3
Flow-on impacts			
Trade		*1*	*0.0*
Transport & Storage		*0*	*0.0*
Property & Business Services		*0*	*0.0*
Other Manufacturing		*1*	*0.0*
Other Service Sectors		*1*	*0.0*
Other Flow-ons		*1*	*0.1*
Total Flow-on [b]		4	0.3
Total [b]		12	0.6
Proportion of regional total		0.1%	0.1%

[a] To avoid double counting only direct output impacts have been reported.

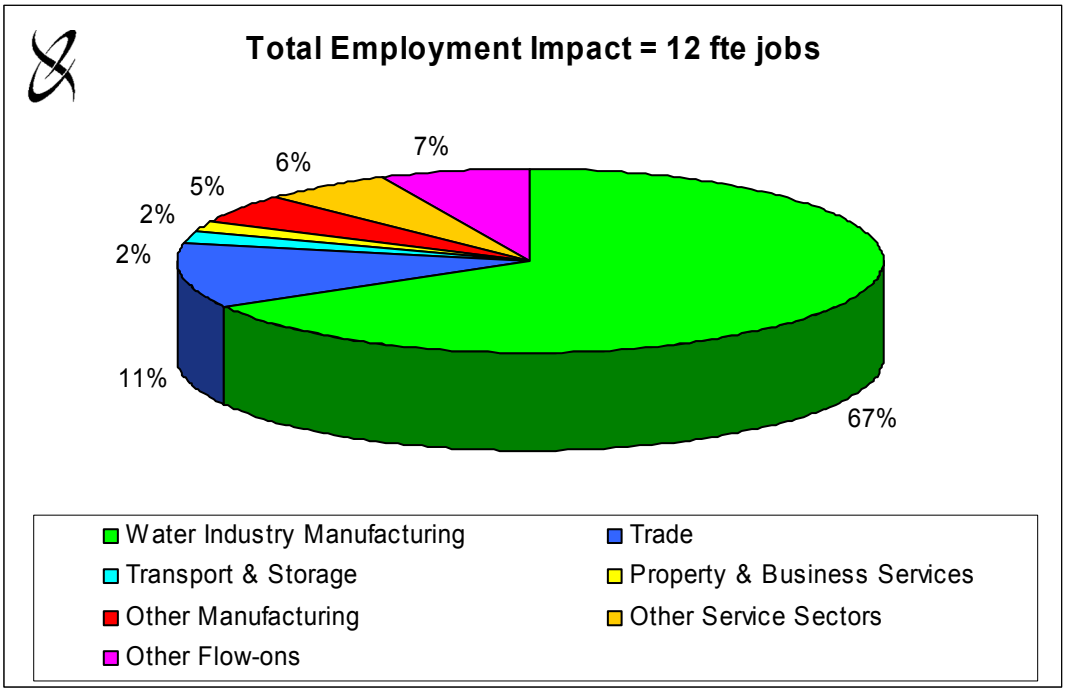
[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

It was estimated that 12 fte new jobs would be generated in the Murraylands regional economy each year in response to annual growth of 5 per cent in water industry manufacturing. Approximately 8 of these jobs would be generated directly in the manufacturing sector and the remaining 4 in flow-on jobs in other sectors of the regional economy.

Jobs in water industry manufacturing accounted for 67 per cent of the total employment impact (Figure 4.1). Flow-on employment was concentrated in trade, transport and storage, property and business services, other manufacturing sectors and other service sectors.

Figure 4.1 Distribution of employment impacts for growth in water industry manufacturing



Source: EconSearch Analysis.

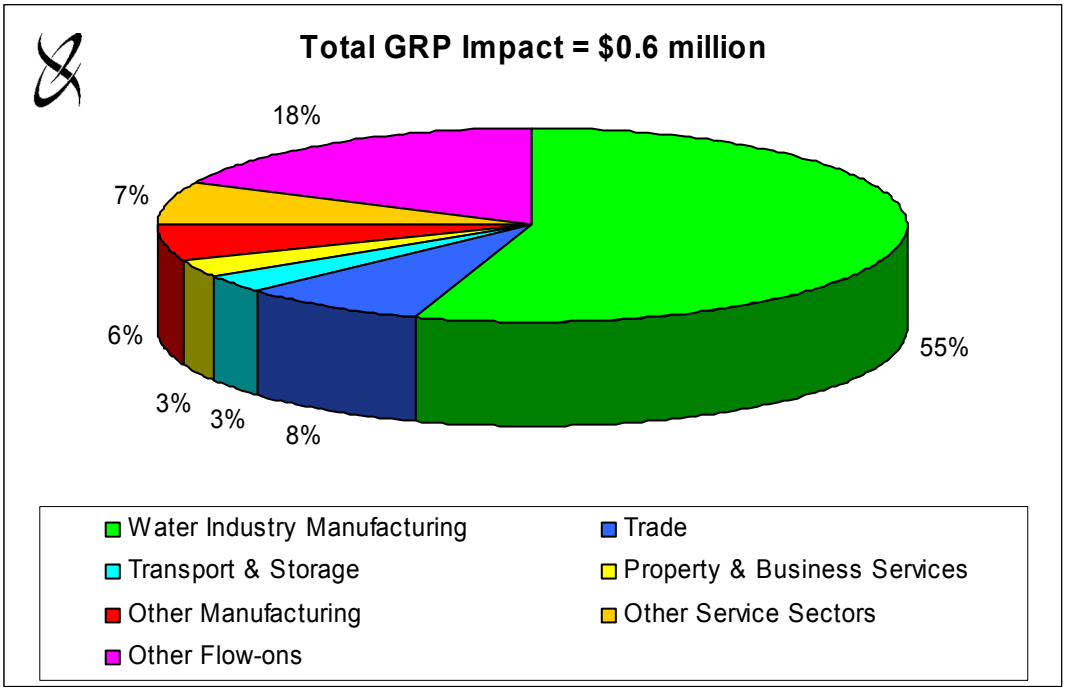
The total employment impact represents approximately 0.1 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.4 per cent increase in regional employment above 2005/06 levels, i.e. an increase of approximately 59 fte jobs.

It was estimated that $0.6m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy each year in response to 5 per cent annual growth in water industry manufacturing. Approximately $0.3m in GRP would be generated directly in the manufacturing sector and $0.3m in flow-on GRP would be generated in other sectors of the regional economy.

GRP in the water industry manufacturing sector accounted for 55 per cent of the total GRP impact (Figure 4.2). The remaining GRP was generated in the trade, transport and storage, property and business services, other manufacturing sectors and other service sectors.

The total GRP impact represents approximately 0.1 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.3 per cent increase in GRP above 2005/06 levels, i.e. an increase of approximately $3m.

Figure 4.2 Distribution of GRP impacts for growth in water industry manufacturing



Source: EconSearch Analysis.

4.1.2 Expected growth scenario

Estimates of the regional economic impact of expected growth (10 per cent) in water industry manufacturing in the Murraylands in 2005/06 are provided in Table 4.2. The distribution of these impacts is similar to those presented in Figures 4.1 and 4.2.

It was estimated that 24 fte new jobs would be generated in the Murraylands regional economy each year in response to annual growth of 10 per cent in water industry manufacturing. Approximately 16 of these jobs would be in generated directly in the manufacturing sector and the remaining 8 in flow-on jobs in other sectors of the regional economy.

The total employment impact represents approximately 0.1 per cent of the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.7 per cent increase in regional employment above 2005/06 levels, i.e. an increase of approximately 117 fte jobs.

It was estimated that $1.2m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy each year in response to 10 per cent annual growth in water industry manufacturing. Approximately $0.6m in GRP would be generated directly in the manufacturing sector and $0.5m in flow-on GRP would be generated in other sectors of the regional economy.

Table 4.2 Estimated regional economic impact of water industry manufacturing: expected growth scenario

Sector	Output	Employment	Contribution to GRP
	$m	fte	$m
Water Industry Manufacturing	1.8	16	0.6
Flow-on impacts			
Trade		*3*	*0.1*
Transport & Storage		*1*	*0.0*
Property & Business Services		*0*	*0.0*
Other Manufacturing		*1*	*0.1*
Other Service Sectors		*1*	*0.1*
Other Flow-ons		*2*	*0.2*
Total Flow-on [b]		8	0.5
Total [b]		24	1.2
Proportion of regional total		0.1%	0.1%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

The total GRP impact represents approximately 0.1 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.6 per cent increase in GRP above 2005/06 levels, i.e. an increase of approximately $6m.

4.1.3 High growth scenario

Estimates of the regional economic impact of high growth (15 per cent per annum) in water industry manufacturing in the Murraylands in 2005/06 are provided in Table 4.3. The distribution of these impacts is similar to those presented in Figures 4.1 and 4.2.

It was estimated that 36 fte new jobs would be generated in the Murraylands regional economy each year in response to annual growth of 15 per cent in water industry manufacturing. Approximately 24 of these jobs would be in generated directly in the manufacturing sector and the remaining 12 in flow-on jobs in other sectors of the regional economy.

The total employment impact represents approximately 0.2 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 1.1 per cent increase in regional employment above 2005/06 levels, i.e. an increase of approximately 176 fte jobs.

It was estimated that $1.7m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy each year in response to 15 per cent annual growth in water industry manufacturing. Approximately $1.0m in GRP would be generated directly in the manufacturing sector and $0.8m in flow-on GRP would be generated in other sectors of the regional economy.

Table 4.3 Estimated regional economic impact of water industry manufacturing: high growth scenario

Sector	Output	Employment	Contribution to GRP
	$m	fte	$m
Water Industry Manufacturing	2.7	24	1.0
Flow-on impacts			
Trade		*4*	*0.1*
Transport & Storage		*1*	*0.1*
Property & Business Services		*1*	*0.0*
Other Manufacturing		*2*	*0.1*
Other Service Sectors		*2*	*0.1*
Other Flow-ons		*3*	*0.3*
Total Flow-on [b]		12	0.8
Total [b]		36	1.7
Proportion of regional total		0.2%	0.2%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

The total GRP impact represents approximately 0.2 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.9 per cent increase in GRP above 2005/06 levels, i.e. an increase of approximately $9m.

4.2 Wastewater Re-use

4.2.1 Horticulture production

Estimates of the regional economic impact of a horticulture wastewater re-use scenario in the Murraylands in 2005/06 are provided in Table 4.4.

Table 4.4 Estimated regional economic impact of wastewater re-use for horticulture development

Sector	Output [a] $m	Employment fte	Contribution to GRP $m
Direct effects			
Vegetables	*3.29*	*12*	*1.87*
Winegrapes	*0.03*	0	*0.02*
Other horticulture	*0.00*	0	*0.00*
Total Direct [b]	3.32	13	1.90
Flow-on effects			
Trade		*5*	*0.16*
Transport		*1*	*0.08*
Other service sectors		*4*	*0.24*
Other flow-ons		*4*	*0.31*
Total Flow-on [b]		13	0.79
Total [b]		26	2.69
Proportion of regional total		0.2%	0.3%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

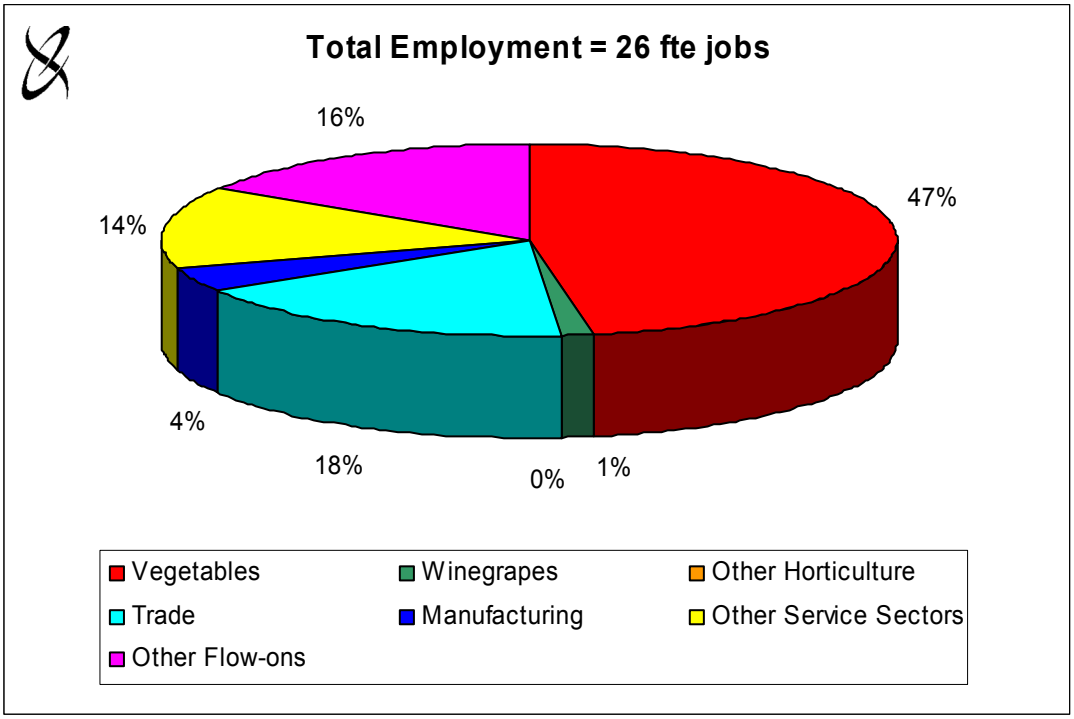
Source: EconSearch Analysis.

The re-use water would, once perennial crops were mature, produce $3.3m (in 2006 dollars) of output annually. The majority of the additional horticulture output would be as a result of additional vegetable production.

It was estimated that 26 fte new jobs would be generated in the Murraylands regional economy in response to the increase in wastewater irrigated horticulture production, 132 jobs directly in horticulture sectors and 13 flow-on jobs in other sectors of the regional economy. The total employment impact represents approximately 0.2 per cent of the regional total in 2005/06.

Jobs generated in horticulture sectors would account for almost 50 per cent of the total employment impact (Figure 4.3). Flow-on jobs would be concentrated in the trade, manufacturing and other service sectors.

Figure 4.3 Distribution of employment impacts for an increase in horticulture production

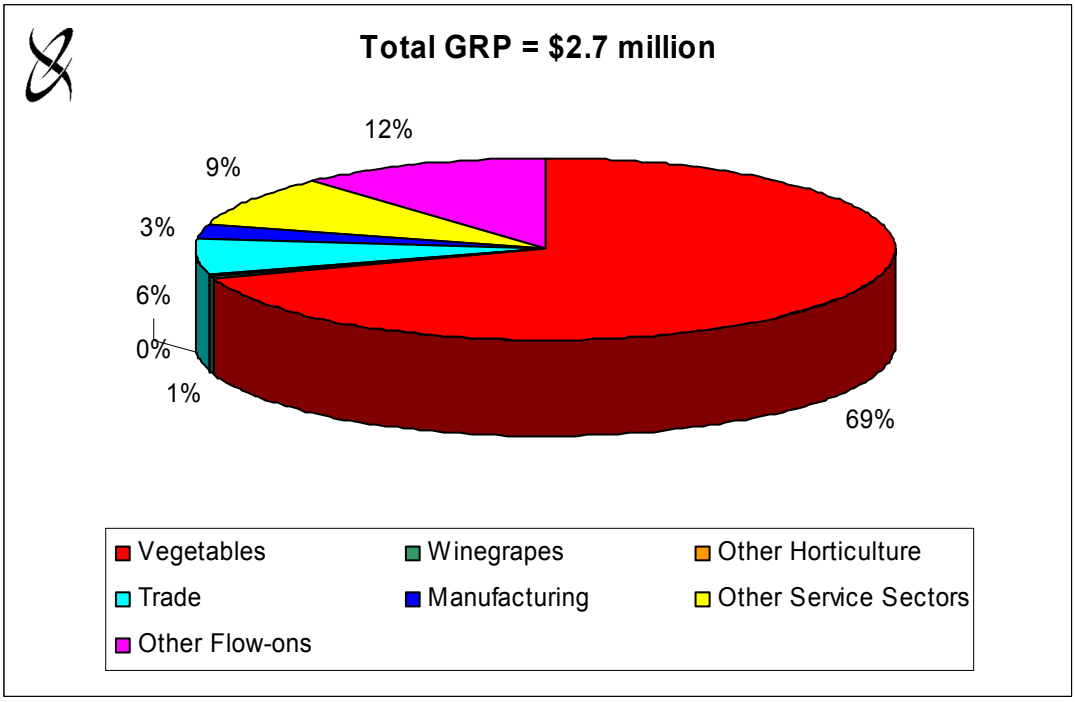


Source: EconSearch Analysis.

It was estimated that almost $2.7m (in 2006 dollars) in GRP would be generated in the Murraylands regional economy in response to an increase in horticulture production, $1.9m directly in horticulture sectors and approximately $0.8m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents almost 0.3 per cent of the regional total in 2005/06.

GRP generated in horticulture sectors would account for approximately 70 per cent of the total impact (Figure 4.4). Flow-on impacts would occur mainly in the trade, manufacturing and other service sectors.

Figure 4.4 Distribution of GRP impacts for an increase in horticulture production



Source: EconSearch Analysis.

4.2.2 Food manufacturing and processing

The regional economic impacts of the additional horticulture production have the potential to be greater if processing of these products occurs locally. Based on the assumption that all additional production is processed in the Murraylands, estimates of regional economic impact of an increase in food processing in the Murraylands have been calculated. The estimated net regional economic impacts of an increase in local food processing (that is, excluding the impact of horticulture production) are provided in Table 4.5.

It was estimated that 43 fte new jobs would be generated in the Murraylands regional economy in response to the increase in food manufacturing and processing, 23 jobs directly in food processing and manufacturing and 20 flow-on jobs in other sectors of the regional economy. The total employment impact represents approximately 0.3 per cent of the regional total in 2005/06.

Jobs generated in food processing would account for 53 per cent of the total employment impact (Figure 4.5). Flow-on jobs would be concentrated in the trade, transport and other service sectors.

It was estimated that almost $2.8m (in 2006 dollars) in GRP would be generated in the Murraylands regional economy in response to an increase in food processing and manufacturing in 2005/06, $1.5m directly in food processing and manufacturing and approximately $1.3m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents almost 0.3 per cent of the regional total in 2005/06.

GRP generated in food processing and manufacturing would account for approximately 54 per cent of the total impact (Figure 4.6). Flow-on impacts would occur mainly in the trade, manufacturing and other service sectors.

Table 4.5 Estimated net regional economic impact of additional local food processing

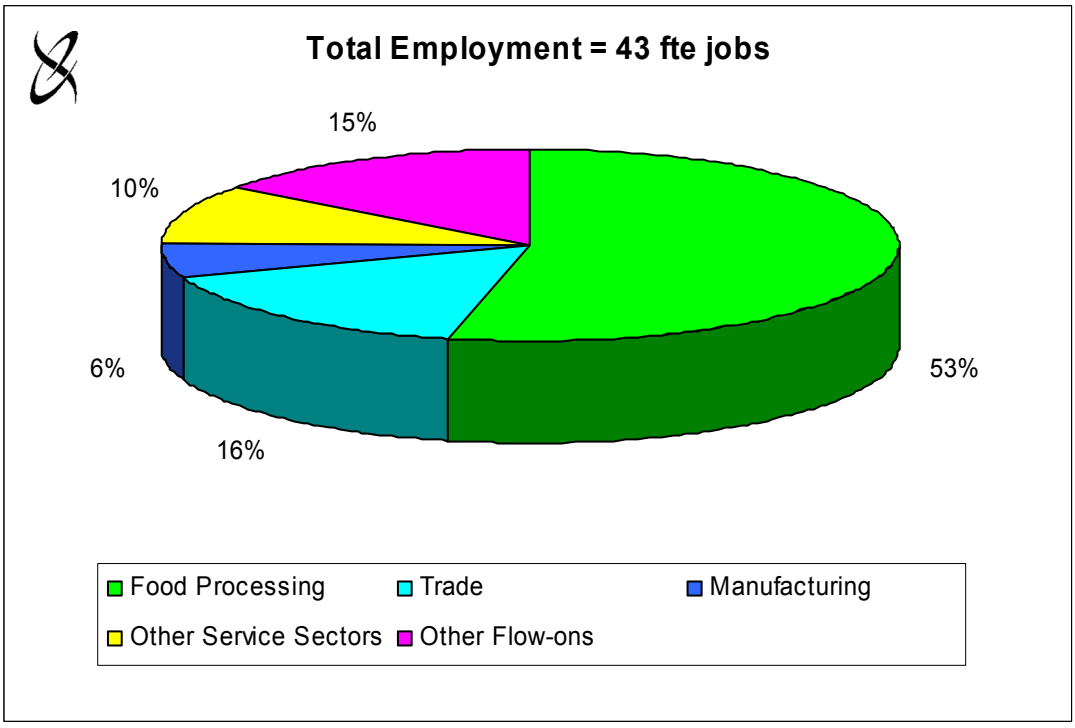
Sector	Output [a] $m	Employment fte	Contribution to GRP $m
Direct effects			
Food processing	*6.08*	*23*	*1.48*
Total Direct [b]	6.08	23	1.48
Flow-on effects			
Trade		*7*	*0.25*
Transport		*2*	*0.18*
Other service sectors		*4*	*0.29*
Other flow-ons		*6*	*0.59*
Total Flow-on [b]		20	1.31
Total [b]		43	2.79
Proportion of regional total		0.3%	0.3%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

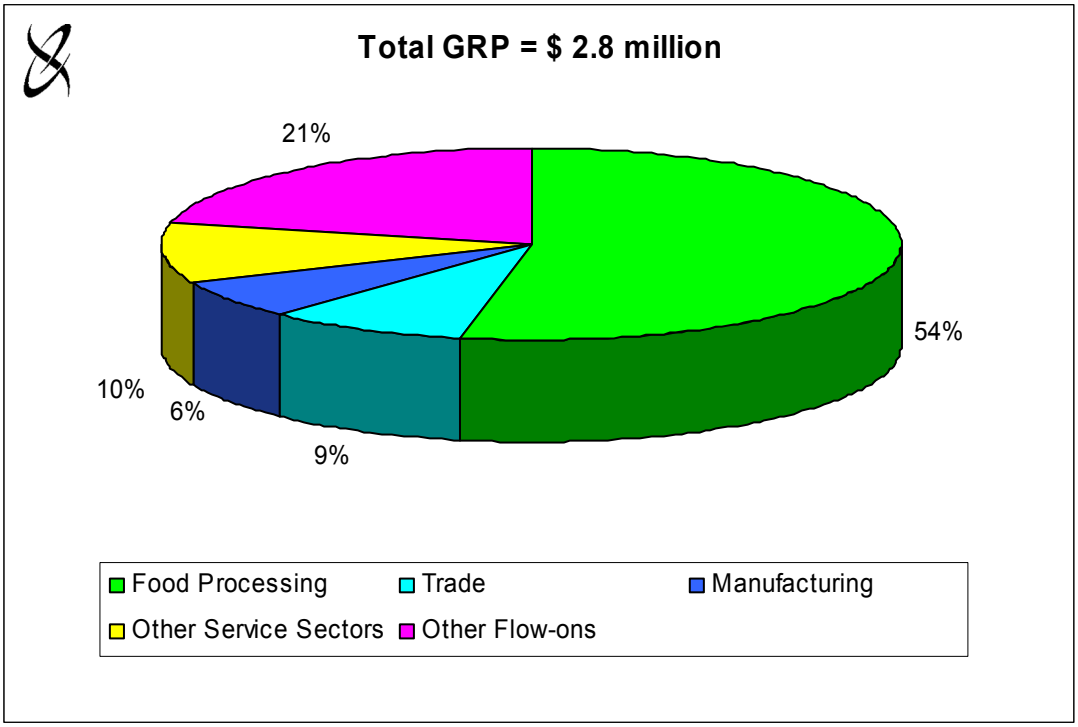
Source: EconSearch Analysis.

Figure 4.5 Distribution of employment impacts of additional local food processing



Source: EconSearch Analysis.

Figure 4.6 Distribution of GRP impacts of additional local food processing



Source: EconSearch Analysis.

4.2.3 Total potential impact of wastewater re-use

The estimated regional economic impacts of an increase in horticulture production and local food processing in response to wastewater re-use of 1,400ML are provided in Table 4.6.

The total potential employment impact of wastewater re-use of 1,400ML for horticulture production and processing would be 36 fte jobs in on-farm and in food processing sectors. Combined flow-ons of 33 fte jobs would be generated, these flow-on jobs would be concentrated in trade, transport and other service sectors.

The total potential GRP impact of wastewater re-use for horticulture production and processing would be $3.4m in on-farm and food processing sectors. Combined flow-ons of $2.1m would be generated. This flow-on GRP would be concentrated in trade, transport and other service sectors.

Table 4.6 Estimated regional economic impact of additional horticulture production and local food processing

Sector	Output [a] $m	Employment fte	Contribution to GRP $m
Direct effects			
Vegetables	*3.29*	*12*	*1.88*
Winegrapes	*0.03*	*0*	*0.02*
Other horticulture	*0.01*	*0*	*0.00*
Food processing	*6.08*	*23*	*1.48*
Total Direct	9.41	36	3.38
Flow-on effects			
Trade		*11*	*0.41*
Transport		*4*	*0.26*
Other service sectors		*8*	*0.53*
Other flow-ons		*10*	*0.91*
Total Flow-on		33	2.11
Total		69	5.49
Proportion of regional total		0.43%	0.57%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

4.3 Flinders University – Bedford Project

Flinders University has signed a memorandum of understanding with the Murraylands Regional Development Board Inc. via the Flinders Research Centre for Coastal and Catchment Environments.

Likely projects that will results from this partnership will be relating to wastewater treatment and reuse, and application of saline groundwater, such as for inland aquaculture. Potential outcomes of the projects may result in significant economic benefits to the Murraylands region.

5. The Regional Economic Impact of Energy Industry Growth

Estimates of the economic impact of energy industry growth in ethanol production and biodiesel production are presented in the following sections.

5.1 Ethanol Production

Estimates of the economic impact were conducted for two alternative ethanol production scenarios. The assumptions for each scenario are detailed in Section 3 of this report. Estimate of the economic impact of ethanol production scenarios are detailed in Table 5.1.

Table 5.1 Estimated regional economic impact of growth in ethanol production

Sector	Annual Production - 100ML			Annual Production 200ML		
	Output [a]	Employment	Contribution to GRP	Output [a]	Employment	Contribution to GRP
	$m	fte	$m	$m	fte	$m
Ethanol Production	90	55	20.8	180	100	41.8
Flow-on impacts						
Trade		*26*	*0.8*		*51*	*1.6*
Transport & Storage		*4*	*0.3*		*9*	*0.6*
Other Service Sectors		*16*	*1.0*		*32*	*2.0*
Manufacturing		*5*	*0.3*		*10*	*0.6*
Other Flow-on		*15*	*2.1*		*30*	*4.2*
Total Flow-on [b]		66	4.5		132	9.1
Total [b]		121	25.4		232	50.8
% of regional total		0.7%	2.6%		1.4%	5.3%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis

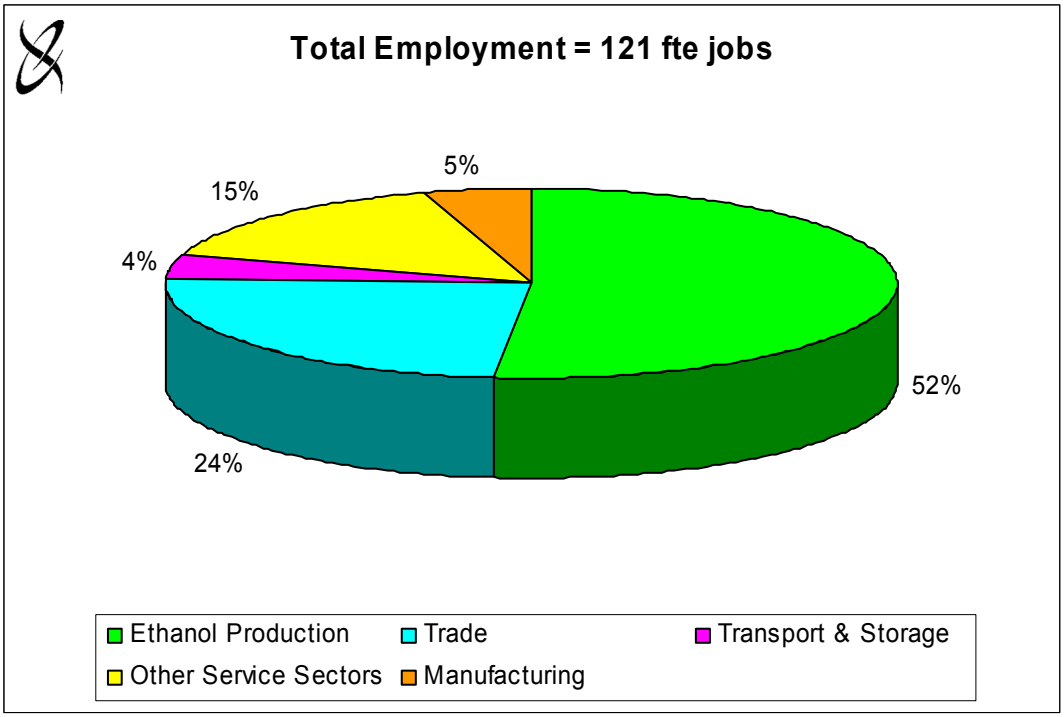
Estimates were based on the assumption that the increase in demand for feedstock for ethanol production would lead to an increase in feedstock prices of 10 per cent. To highlight the sensitivity of this assumption, impact estimates have also been calculated to show the effect of a 5 per cent price increase. These estimates are presented in Appendix 3 of this report.

A plant producing 100ML of ethanol per annum would have an estimated output of $90m per annum.

It was estimated that over 120 fte new jobs would be generated in the Murraylands regional economy in response to ethanol production of 100ML. Approximately 55 of these jobs would be generated directly in ethanol production and almost 70 flow-on jobs would be generated in other sectors of the regional economy. The total annual employment represents approximately 0.7 per cent of the regional total in 2005/06.

Jobs generated in ethanol production would account for approximately 52 per cent of the total employment impact (Figure 5.1). Flow-on jobs would account for the balance of the total employment impact and would be concentrated in the trade, manufacturing, transport and storage and other service sectors.

Figure 5.1 Distribution of employment impacts for growth in ethanol production (100ML annual production)

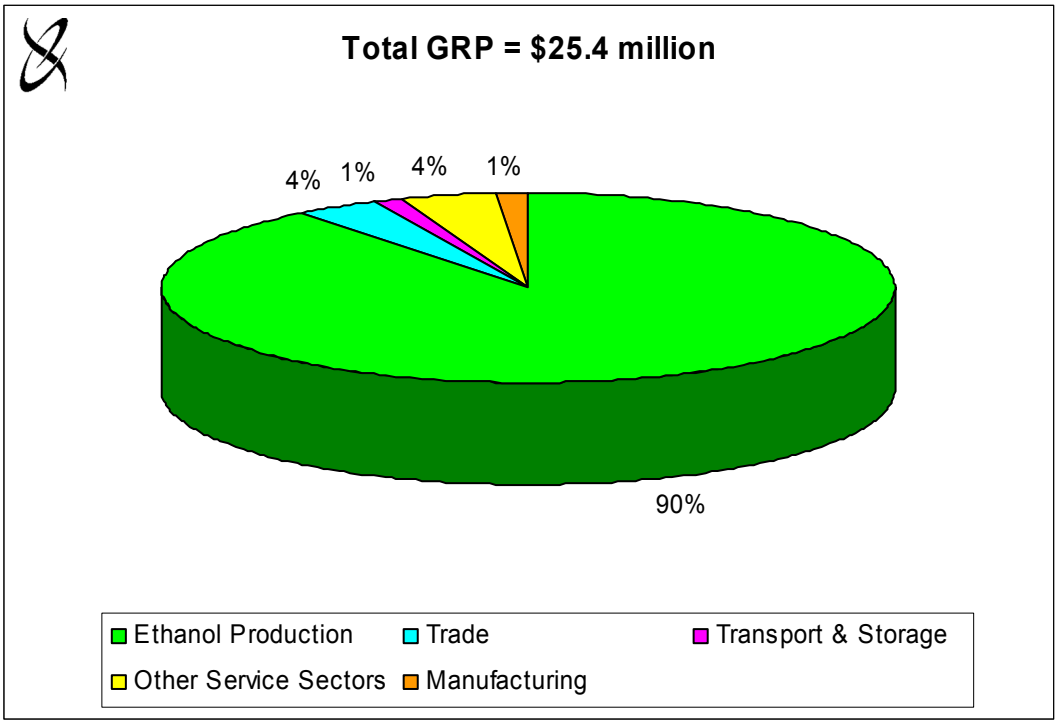


Source: EconSearch analysis

It was estimated that just over $25m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy in response to production of 100ML of ethanol. Almost $21m in GRP would be generated directly in ethanol production and approximately $5m in flow-on GRP would be generated in other sectors of the regional economy. The total GRP impact represents approximately 1.4 per cent of the regional total in 2005/06.

GRP generated in ethanol production would account for approximately 90 per cent of the total impact, with the balance being attributable to flow-ons in other sectors of the regional economy (Figure 5.2).

Figure 5.2 Distribution of GRP impacts for growth in ethanol production (100ML annual production)



Source: EconSearch analysis

Interpretation of the results of the impact assessment for the 200ML annual production scenario (Table 5.1) are similar to those for the 100ML annual production scenario.

5.2 Bio-Diesel Production

Estimates of the economic impact were conducted for two alternative bio-diesel production scenarios. The assumptions for each scenario are detailed in Section 3 of this report. Estimate of the economic impact of bio-diesel production scenarios are detailed in Table 5.2.

Estimates were based on the assumption that the increase in demand for feedstock for bio-diesel production would increase feedstock prices by 10 per cent. To highlight the sensitivity of this assumption, impact estimates have also been calculated to show the effect of a 5 per cent price increase. These estimates are presented in Appendix 3 of this report.

Table 5.2 Estimated regional economic impact of growth in bio-diesel production

Sector	Annual Production - 15ML			Annual Production 110ML		
	Output [a]	Employment	Contribution to GRP	Output [a]	Employment	Contribution to GRP
	$m	fte	$m	$m	fte	$m
Biodiesel production	14	4	5.8	99	24	43.8
Flow-on impacts						
Trade		*3*	*0.1*		*20*	*0.7*
Transport & Storage		*0*	*0.0*		*4*	*0.3*
Other Service Sectors		*2*	*0.1*		*13*	*0.8*
Manufacturing		*1*	*0.0*		*4*	*0.2*
Other Flow-on		*2*	*0.2*		*12*	*1.7*
Total Flow-on [b]		7	0.5		53	3.6
Total [b]		11	6.3		77	47.4
% of regional total		0.1%	0.6%		0.5%	4.9%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

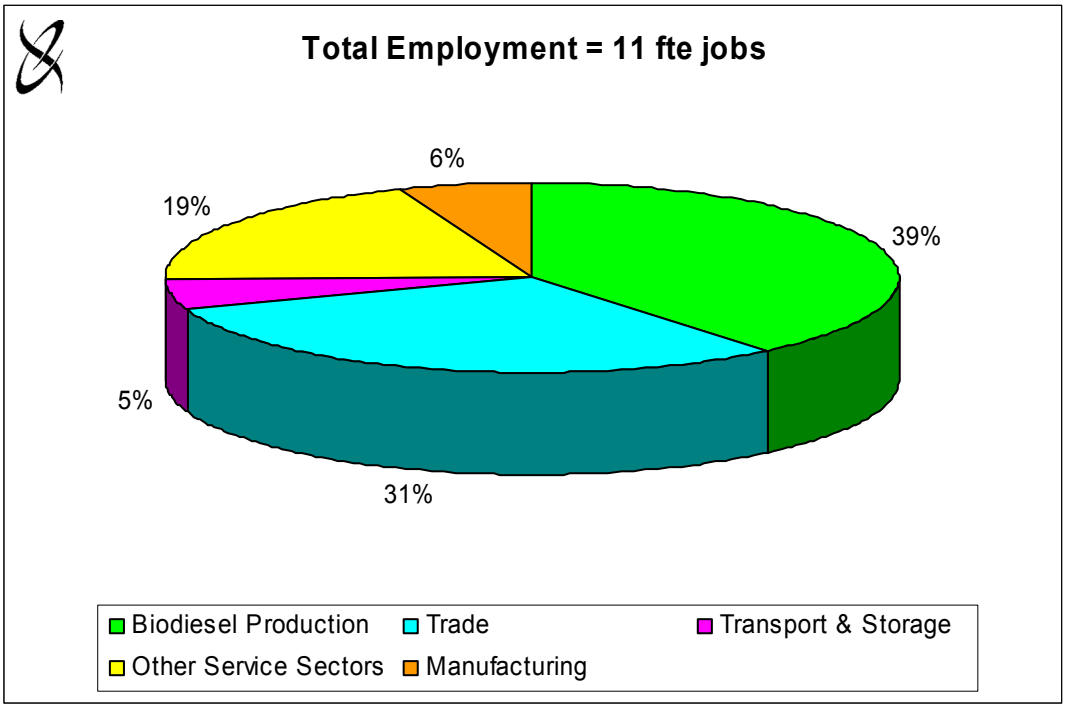
Source: EconSearch analysis

A plant producing 15ML of bio-diesel per annum would have an estimated output of approximately $14m per annum.

It was estimated that over 10 fte new jobs would be generated in the Murraylands regional economy in response to bio-diesel production of 15ML per annum. Approximately 4 of these jobs would be generated directly in bio-diesel production and 7 flow-on jobs would be generated in other sectors of the regional economy. The total annual employment impact represents approximately 0.1 per cent of the regional total in 2005/06.

Jobs generated in bio-diesel production would account for almost 40 per cent of the total employment impact (Figure 5.3). Flow-on jobs would account for the balance of the total employment impact and would be concentrated in the trade, manufacturing, transport and storage and other service sectors.

Figure 5.3 Distribution of employment impacts for growth in bio-diesel production (15ML annual production)

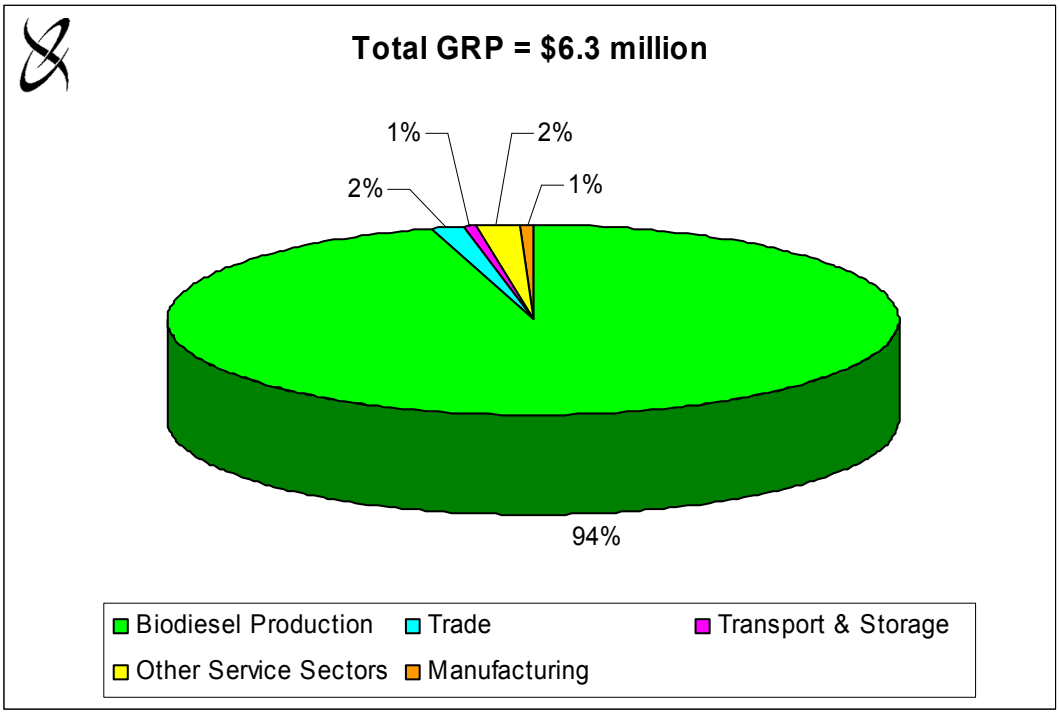


Source: EconSearch analysis

It was estimated that almost $6.5m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy in response to bio-diesel production of 15ML per annum. Almost $6.0m in GRP would be generated directly in bio-diesel production and approximately $0.5m in flow-on GRP would be generated in other sectors of the regional economy. The total GRP impact represents approximately 0.6 per cent of the regional total in 2005/06.

GRP generated in bio-diesel production would account for approximately 94 per cent of the total impact, with the balance being attributable to flow-ons in other sectors of the regional economy (Figure 5.4).

Figure 5.4 Distribution of GRP impacts for growth in biodiesel production (15ML annual production)



Source: EconSearch analysis

Interpretation of the results of the impact assessment for the 110ML annual production scenario (Table 5.2) is similar to those for the 15ML annual production scenario.

6. The Regional Economic Impact of a Zero Allocation for River Murray Irrigators

Estimates of regional economic impact of a 0 per cent water allocation scenario for irrigated agriculture in the Murraylands region are provided in Table 6.1. The estimates represent a change from current levels of irrigated agriculture in the region.

Table 6.1 Estimated net regional economic impact of a 0 per cent water allocation scenario on irrigated agriculture

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Irrigated agriculture [b]	-92.4	-347	-74.8
Flow-on impacts			
Trade		*-162*	*-5.2*
Other service sectors		*-135*	*-7.8*
Transport		*-20*	*-1.5*
Other flow-ons		*-81*	*-12.7*
Total flow-on impacts [c]		-398	-27.1
Total [c]		-745	-101.9
Proportion of regional total		-5%	-11%

[a] To avoid double counting only direct output impacts have been reported.

[b] Irrigated agriculture includes winegrapes, citrus, other tree crops, vegetables and dairy production.

[c] Totals may not sum due to rounding.

Source: EconSearch Analysis.

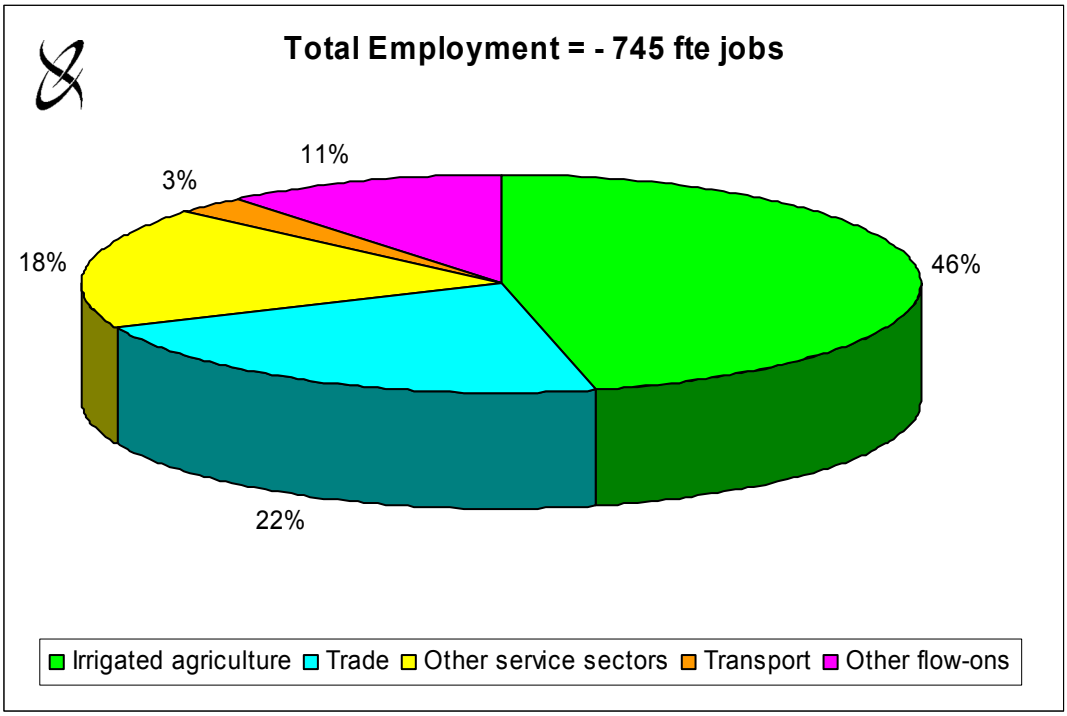
A 0 per cent water allocation would reduce direct irrigated agriculture output by approximately $92m (in 2006 dollars).

It was estimated that 745 fte jobs would be lost from the Murraylands regional economy in response to a 0 per cent water allocation, almost 350 jobs directly and almost 400 flow-on job losses in other sectors of the regional economy. The total employment impact represents approximately 5 per cent of the regional total in 2005/06.

Job losses in irrigated agriculture would account for 46 per cent of the total employment impact (Figure 6.1). Flow-on job losses would account for the balance of the total employment impact and would be in the trade, transport and other service sectors.

It was estimated that almost $102m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 0 per cent water allocation scenario, almost $75m directly and $27m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately 11 per cent of the regional total in 2005/06.

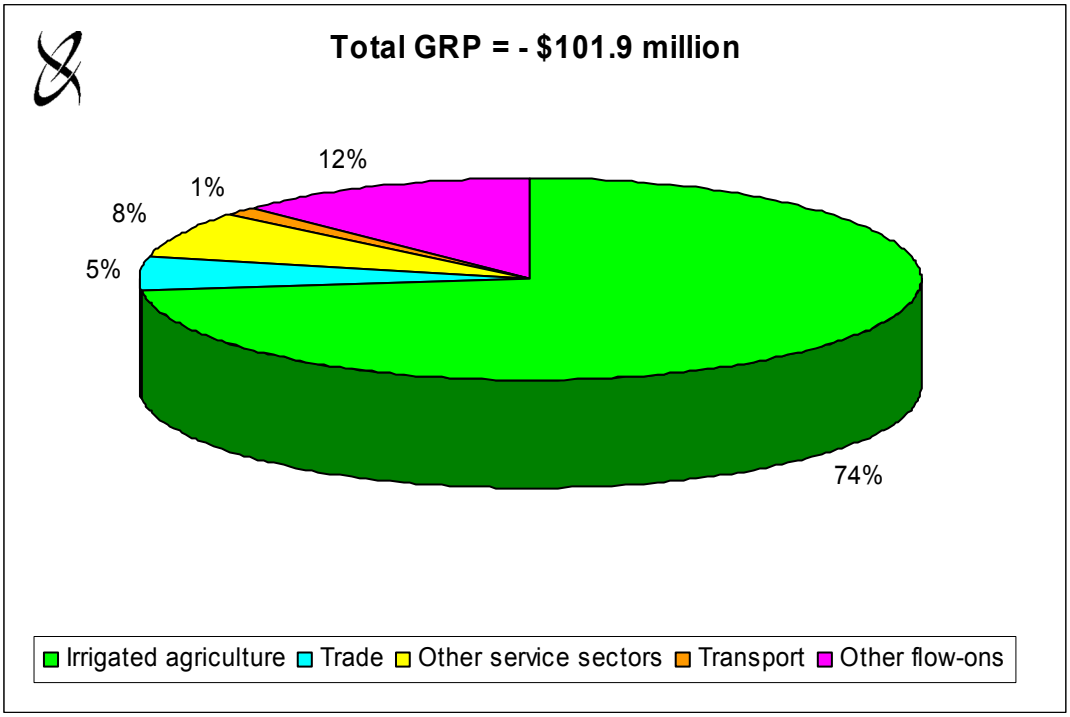
Figure 6.1 Distribution of employment impacts for a 0 per cent water allocation scenario



Source: EconSearch Analysis.

Reduced GRP in irrigated agriculture would account for 74 per cent of the total GRP impact (Figure 6.2). Flow-on losses of GRP would account for the balance of the total GRP loss and would be concentrated in trade, transport and other service sectors.

Figure 6.2 Distribution of GRP impacts for a 0 per cent water allocation scenario



Source: EconSearch Analysis.

7. The Regional Economic Impact of Drought on Food Manufacturing and Processing

This section of the report provides estimates of regional economic impact of three alternative scenarios for food manufacturing and processing in the Murraylands region.

7.1 Economic Impact of a 10 per cent Decline in Food Processing

Estimates of regional economic impact of a 10 per cent decline in food processing in response to widespread drought conditions are provided in Table 7.1. The estimates represent a change from current levels of food processing in the region.

Table 7.1 Estimated net regional economic impact of a 10 per cent decline in food processing

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Food Manufacturing and Processing	-59	-223	-14.3
Flow-on impacts			
Trade		*-65*	*-2.4*
Property & Business Services		-11	-0.8
Transport & Storage		*-24*	*-1.7*
Other Service Sectors		*-30*	*-1.9*
Manufacturing		*-19*	*-1.1*
Other Flow-ons		*-38*	*-4.2*
Total Flow-on [b]		-186	-12.1
Total [b]		-408	-26.4
Proportion of regional total		-2.5%	-2.7%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

A 10 per cent decline in food processing would reduce direct output by approximately $59m (in 2006 dollars).

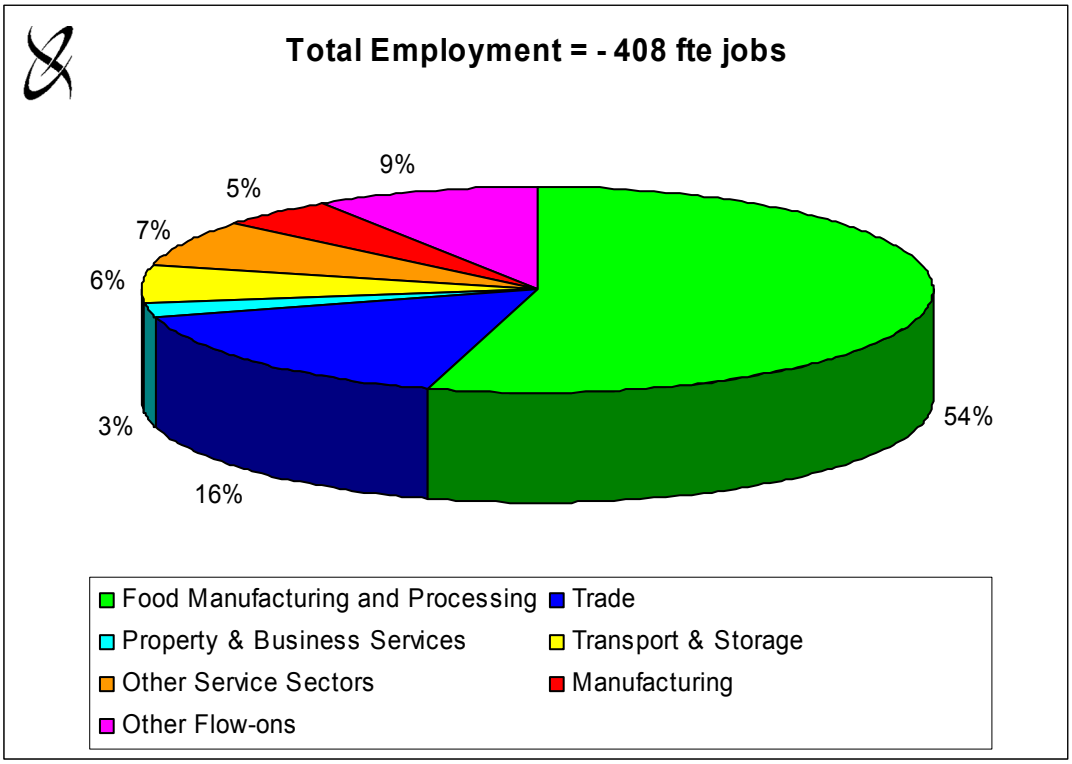
It is expected that almost 410 fte jobs would be lost from the Murraylands regional economy in response to a 10 per cent decline in food processing, just over 220 jobs directly and almost 190 flow-on job losses in other sectors of the regional economy. The total employment impact represents approximately 2.5 per cent of the regional total in 2005/06.

Job losses in food processing would account for 54 per cent of the total employment impact (Figure 7.1). Flow-on job losses would account for the balance of the total employment impact and would be concentrated in the trade, property and business services, transport and other service sectors.

It was estimated that over $26m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 10 per cent decline in food manufacturing and processing, over $14m directly and $12m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately 1 per cent of the regional total in 2005/06.

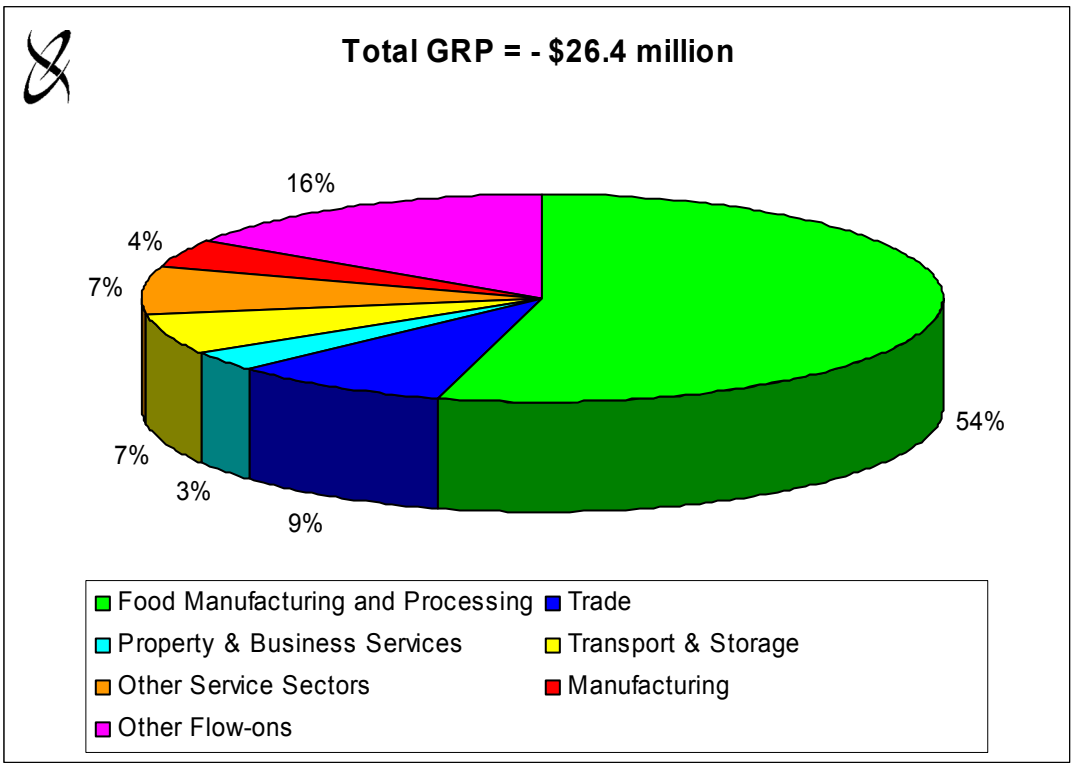
Reduced GRP in food processing would account for 54 per cent of the total GRP impact (Figure 7.2). Flow-on losses of GRP would account for the balance of the total GRP loss and would be concentrated in trade, property and business services, transport and other service sectors.

Figure 7.1 Distribution of employment impacts for a 10 per cent decline in food processing



Source: EconSearch analysis.

Figure 7.2 Distribution of GRP impacts for a 10 per cent decline in food processing



Source: EconSearch analysis.

7.2 Economic Impact of a 25 per cent Decline in Food Processing

Estimates of regional economic impact of a 25 per cent decline in food processing in response to widespread drought conditions are provided in Table 7.2. The distribution of employment impacts and GRP impacts for a 25 per cent decrease are similar to that for a 10 per cent decrease (Figures 7.1 and 7.2).

A 25 per cent decline in food processing would reduce direct output by approximately $147m (in 2006 dollars).

It was estimated that just over 1,020 fte jobs would be lost from the Murraylands regional economy in response to a 25 per cent decrease in food processing, almost 560 jobs directly and approximately 470 flow-on jobs. The total employment impact represents 6.3 per cent of the regional total in 2005/06.

It was estimated that $66m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 25 per cent decrease in food processing, almost $36m directly in food processing and approximately $30m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately 6.9 per cent of the regional total in 2005/06.

Table 7.2 Estimated net regional economic impact of a 25 per cent decline in food processing

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Food Manufacturing and Processing	-147	-557	-35.7
Flow-on impacts			
Trade		*-164*	*-5.9*
Property & Business Services		-26	-2.0
Transport & Storage		*-60*	*-4.3*
Other Service Sectors		*-74*	*-4.8*
Manufacturing		*-47*	*-2.8*
Other Flow-ons		*-94*	*-10.4*
Total Flow-on [b]		-465	-30.3
Total [b]		-1,021	-66.0
Proportion of regional total		-6.3%	-6.9%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch Analysis.

7.3 Economic Impact of a 50 per cent Decline in Food Processing

Estimates of regional economic impact of a 50 per cent decline in food processing in response to widespread drought conditions are provided in Table 6.3. The distribution of employment impacts and GRP impacts for a 50 per cent decrease are similar to that for a 10 per cent decrease (Figures 7.1 and 7.2).

A 50 per cent decline in food processing would reduce direct output by approximately $290m (in 2006 dollars).

It was estimated that just over 2,040 fte jobs would be lost from the Murraylands regional economy in response to a 50 per cent decrease in food processing, approximately 1,110 jobs directly and almost 930 flow-on jobs. The total employment impact represents 12.6 per cent of the regional total in 2005/06.

It was estimated that just over $132m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 50 per cent decrease in food processing, approximately $71m directly in food processing and almost $61m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately 13.7 per cent of the regional total in 2005/06.

Table 7.3 Estimated net regional economic impact of a 50 per cent decline in food processing

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Food Manufacturing and Processing	-293	-1,113	-71.4
Flow-on impacts			
Trade		*-327*	*-11.8*
Property & Business Services		-53	-4.1
Transport & Storage		*-120*	*-8.6*
Other Service Sectors		*-148*	*-9.7*
Manufacturing		*-93*	*-5.7*
Other Flow-ons		*-188*	*-20.8*
Total Flow-on [b]		-929	-60.7
Total [b]		-2,042	-132.1
Proportion of regional total		-12.6%	-13.7%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis.

8. The Regional Economic Impact of Projected Housing Growth

8.1 The Regional Economic Impact of Residential Construction

Estimates of the regional economic impact of residential construction in the Murraylands in 2005/06 are provided in Table 8.1.

Table 8.1 Estimated regional economic impact of residential construction

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Residential Building	36	110	17.2
Flow-on impacts			
Trade		*37*	*1.2*
Property & Business Services		*10*	*0.8*
Transport & Storage		*6*	*0.4*
Accom, Restaurants & Cafes		*6*	*0.2*
Other Service Sectors		*16*	*1.1*
Machinery & Equipment		*5*	*0.3*
Other Manufacturing Sectors		*14*	*1.0*
Other Flow-ons		*15*	*2.3*
Total flow-on impacts [b]		109	7.3
Total [b]		218	24.5
Proportion of regional total		1.3%	2.5%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis.

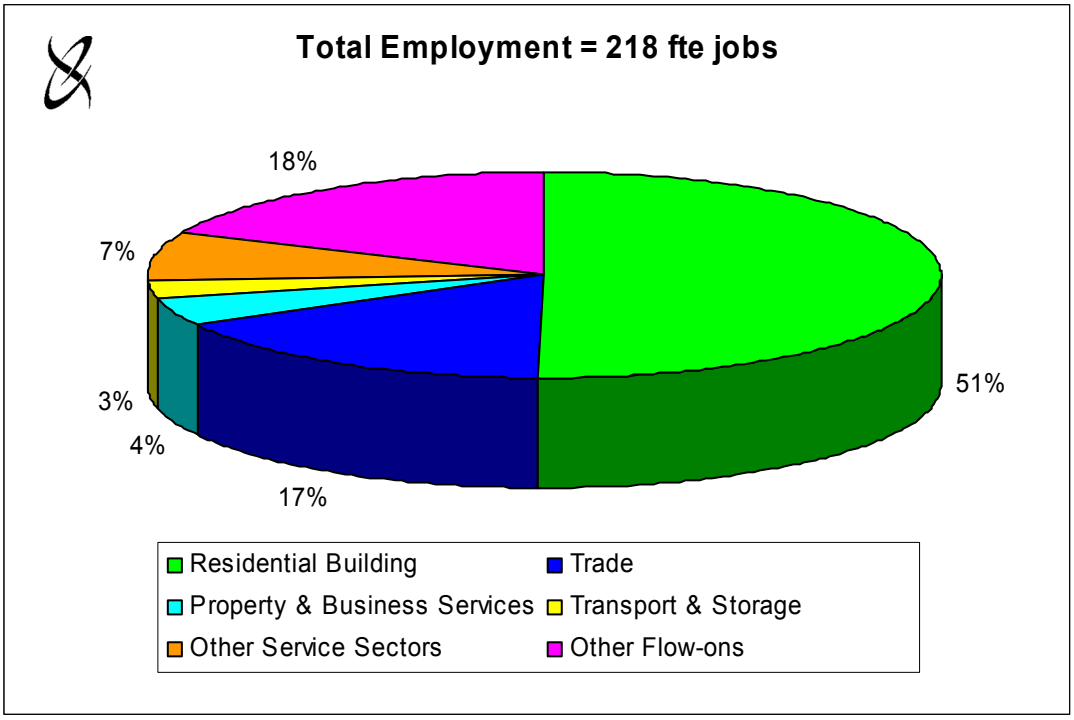
It was estimated that 218 fte jobs were generated in the Murraylands regional economy in 2005/06 by residential construction activity. Approximately 110 of these jobs were generated directly in the residential building sector and 109 flow-on jobs in other sectors of the regional economy. The total employment impact was 1.3 per cent of the regional total in 2005/06.

Jobs in residential building accounted for 51 per cent of the total employment impact (Figure 8.1). Flow-on employment was concentrated in the trade, property and business services and transport and storage sectors.

It was estimated that almost $25m (in 2006 dollars) in GRP was generated in the Murraylands regional economy in 2005/06 by residential construction activity, $17m directly and $7m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately 2.5 per cent of the regional total in 2005/06.

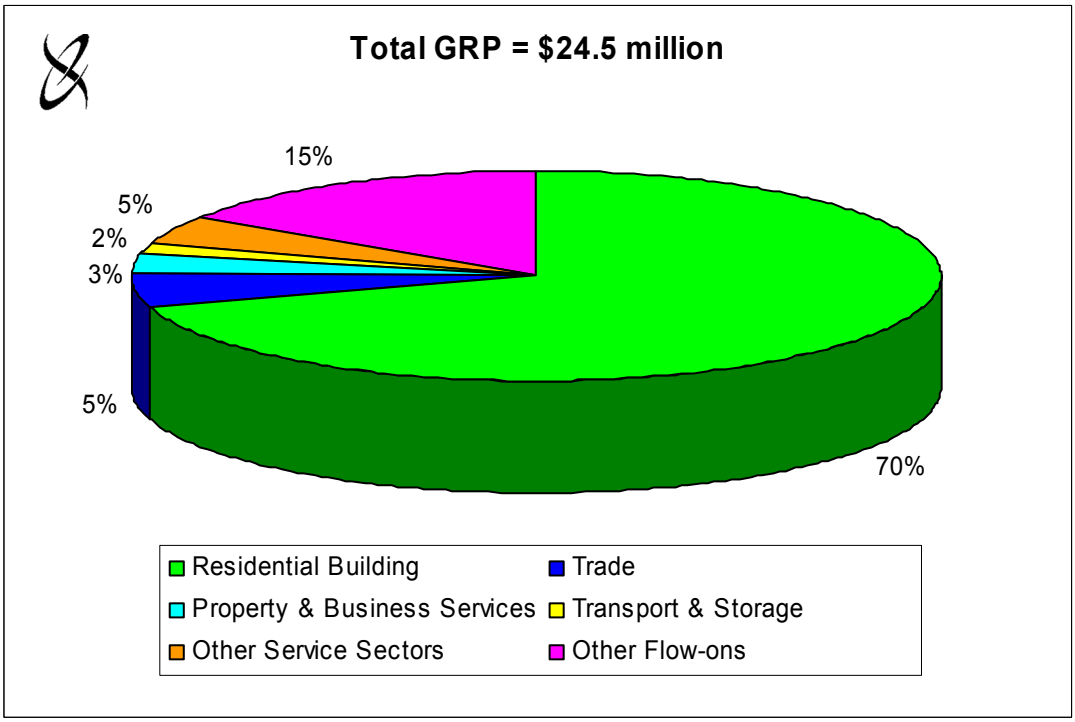
GRP in the residential building sector accounted for 70 per cent of the total GRP impact (Figure 8.2). The remaining GRP was generated in the trade, property and business services and transport and storage sectors of the regional economy.

Figure 8.1 Distribution of employment impacts for residential construction



Source: EconSearch analysis

Figure 8.2 Distribution of GRP impacts for residential construction



Source: EconSearch analysis

8.2 The Regional Economic Impact of Annual Growth in Residential Construction

Estimates of the regional economic impact of annual growth in regional construction in the Murraylands are provided in Table 8.2. The distribution of these impacts is similar to those illustrated in Figures 8.1 and 8.2.

Table 8.2 Estimated regional economic impact of annual growth in residential construction

Sector	Output [a]	Employment	Contribution to GRP
	$m	fte	$m
Residential Building	1.9	6	0.90
Flow-on impacts			
Trade		*2*	*0.06*
Property & Business Services		*1*	*0.04*
Transport & Storage		*0*	*0.02*
Accom, Restaurants & Cafes		*0*	*0.01*
Other Service Sectors		*1*	*0.06*
Machinery & Equipment		*0*	*0.01*
Other Manufacturing Sectors		*1*	*0.05*
Other Flow-ons		*1*	*0.12*
Total flow-on impacts [b]		6	0.38
Total [b]		11	1.28
Proportion of regional total		0.1%	0.1%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis.

It was estimated that 11 fte new jobs would be generated in the Murraylands regional economy each year in response to annual growth in residential construction of the magnitude outlined above. Approximately 6 of these jobs would be in generated directly in the residential building sector and the remaining 6 in flow-on jobs in other sectors of the regional economy.

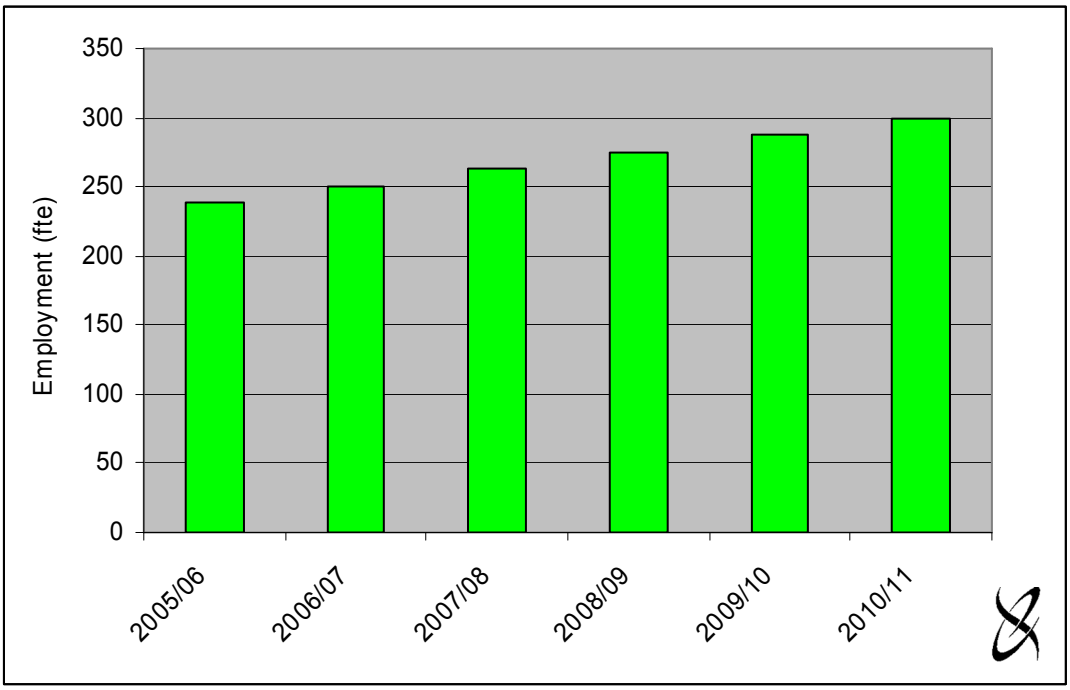
The total employment impact represents approximately 0.1 per cent on the regional total in 2005/06. Over a 5 year planning horizon, the cumulative impact of this growth would be a 0.3 per cent increase in regional employment above 2005/06 levels[3], i.e. an increase on approximately 55 jobs.

It was estimated that $1.3m (in 2006 dollars) in additional GRP would be generated in the Murraylands regional economy each year in response to annual growth in residential construction of the magnitude outlined above. Approximately $0.9m in GRP would be generated directly in the residential building sector and $0.4m in flow-on GRP would be generated in other sectors of the regional economy.

The cumulative effect of this growth on regional employment and GRP is illustrated in Figures 8.3 and 8.4, respectively.

[3] Based on the assumption that a 1 per cent productivity improvement would be achieved each year.

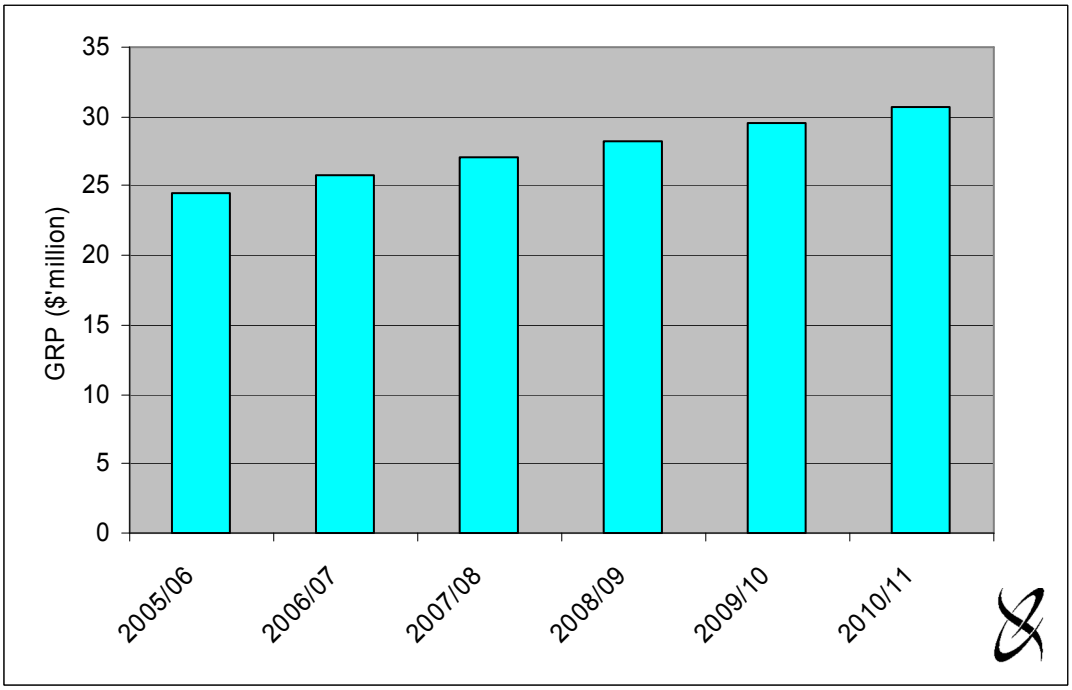
Figure 8.3 Cumulative employment impact of annual growth in residential construction [a]



[a] The impacts for 2005/06 reflect the current value of residential construction in the Murraylands region. The impacts for 2006/07 and subsequent years highlight the effects of annual growth in residential construction.

Source: Tables 8.1 and 8.2.

Figure 8.4 Cumulative GRP impact of annual growth in residential construction [a]



[a] See Figure 8.3.

Source: Tables 8.1 and 8.2.

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We have prepared the above report exclusively for the use and benefit of our client. Neither the firm nor any employee of the firm undertakes responsibility in any way whatsoever to any person (other than to the above mentioned client) in respect of the report including any errors or omissions therein however caused.

Appendix 1 Input-Output Methodology

Overview of Input-Output Analysis

Input-output analysis provides a comprehensive economic framework that is extremely useful in the resource planning process. Broadly, there are two ways in which the input-output method can be used.

First, the input-output model provides a numerical picture of the size and shape of an economy and its essential features. The input-output transactions model can be used to describe some of the important features of an economy, the interrelationships between sectors and the relative importance of the individual sectors.

Second, input-output analysis provides a standard approach for the estimation of the economic impact of a particular activity. The input-output model is used to calculate industry multipliers that can then be applied to various development scenarios.

Linkages between sectors

The standard approach for the estimation of the regional economic impact of a particular activity, such as pig production, is to employ *input-output analysis*. The input-output model conceives the economy of the region as being divided up into a number of sectors, and this allows the analyst to trace expenditure flows.

To illustrate this, consider the example of a piggery that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include feed, power, and, of course, labour. The direct employment created is regarded in the model as an expenditure flow into the household sector, which is one of several non-industrial sectors recognised in the input-output model.

Upon receiving expenditure by the piggery, the other sectors in the regional economy engage in their own expenditures. For example, as a consequence of winning a contract for work with a piggery, a feedstuff producer buys materials from its suppliers and labour from its own employees. Suppliers and employees in turn engage in further expenditure, and so on. These *indirect effects*, as they are called, are part of the impact of the piggery on the regional economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the piggery itself) in order to arrive at a measure of the total impact of the piggery.

It may be thought that these indirect effects go on indefinitely, and that their amount adds up without limit, the presence of *leakages*, however, prevents this from occurring. In the context of the impact on a *regional* economy, an important leakage is expenditure on imports, that is, products or services that originate from *outside the region, state or country* (e.g. machinery).

Thus some of the expenditure on imports to the region is lost to the local economy. Consequently, the indirect effects get smaller and smaller in successive expenditure rounds, due to this and other leakages. Hence the total expenditure created in the local economy is limited in amount, and so (in principle) it can be measured.

The performance of the input-output analysis calculations require a great deal of information. The analyst needs to know the magnitude of various expenditures and where they occur. Also needed is information on how the sectors receiving this expenditure share *their* expenditures among the various sectors from whom they buy, and so on, for the further expenditure rounds.

In applying the input-output model, the standard procedure is to determine the direct or first-round expenditures only. No attempt is made to pursue such inquiries on expenditure in subsequent rounds, not even (for example) to trace the effects in the local economy on household expenditures by piggery employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the piggery.

The input-output model is instead based on a set of assumptions about constant and uniform proportions of expenditure. If households in general in the local economy spend (say) 13.3 per cent of their income on food and non-alcoholic beverages, it is assumed that those working in piggeries do likewise. Indeed, the effects of all expenditure rounds after the first are calculated by using such standard proportions (*multiplier* calculations).

Multipliers

Multipliers are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. As well, they can be used to estimate the impact of a change in that particular sector on the rest of the economy. As noted above, detailed explanations on calculating input-output multipliers (and the underlying assumptions) are provided in any regional economics or input-output analysis textbook (see for example Jensen and West (1986)). Suffice to note that they are calculated through a routine set of mathematical operations based on coefficients derived from the input-output transactions model.

Input-output transactions model

The structure and linkages of a local economy can be described with the aid of input-output analysis. Input-output analysis, as an accounting system of inter-industry transactions, is based on the notion that no industry exists in isolation.

This assumes, within any economy, each firm depends on the existence of other firms to purchase inputs from, or sell products to, for further processing. The firms also depend on final consumers of the product and labour inputs to production. An input-output transactions model is a convenient way to illustrate the purchases and sales of goods and services taking place in an economy at a given time.

Input-output models provide a numerical picture of the size and shape of the economy and its essential features. Products produced in the economy are aggregated into a number of groups of industries and the transactions between them recorded in the transactions model. The rows and columns of the input-output model can be interpreted in the following way:

- The rows of the input-output model illustrate sales for intermediate usage (to other firms) and for final demand (consumers, exports, capital formation).
- The columns show the origin of the inputs and hence the purchases made at that time (labour, capital and intermediate inputs).

- Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

In summary, the input-output transactions model can be used to describe some of the important features of a regional economy, the interrelationships between sectors, and the relative importance of the individual sectors. The model is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.

Appendix 2 Glossary of Input-Output Terminology

Basic value is the price received for a good or service by the producer. It is also known as *producers' price*. It excludes indirect taxes and transport, trade and other margins.

Consumption-induced effects are additional output, employment and income resulting from re-spending by households that receive income from employment in direct and indirect activities. Consumption-induced effects are sometimes referred to as "induced effects".

Contribution to gross state/regional product is calculated as the value of output less the cost of goods and services (including imports) used in producing the output. It represents payments to the primary inputs of production (labour, capital and land). Contribution to GSP/GRP is consistent with standard measures of economic activity, such as gross domestic, State or regional product and it provides an assessment of the net contribution to regional economic growth of a particular enterprise or activity.

Direct effects are the initial round of output, employment and income generated by an economic activity.

Employment is the number of working proprietors, managers, directors and other employees, in terms of the number of full-time equivalent jobs.

Exports refers to the sale of goods and services to final consumers outside the region of interest. In a state input-output model, exports refers to the sale of goods and services interstate and overseas. In a regional input-output model exports refers to the sale of goods and services interstate, overseas and to other regions within the state.

Flow-on effects are the sum of the production-induced effects and the consumption-induced effects.

Household income is wages and salaries, drawings by owner operators and other payments to labour including overtime payments and income tax, but excluding payroll tax.

Input-output analysis is an accounting system of inter-industry transactions based on the notion that no industry exists in isolation.

Input-output model is a transactions model that illustrates and quantifies the purchases and sales of goods and services taking place in an economy at a given point in time. It provides a numerical picture of the size and shape of the economy and its essential features. Each item is shown as a purchase by one sector and a sale by another, thus constructing two sides of a double accounting schedule.

Multiplier is an index (ratio) indicating the overall change in the level of activity that results from an initial change in economic activity. They are an indication of the strength of the linkages between a particular sector and the rest of the regional economy. They can be used to estimate the impact of a change in that particular sector on the rest of the economy.

Other Final Demand includes government expenditure, private and public sector investment (gross fixed capital formation) and change in stocks (inventories).

Other Value Added includes gross operating surplus and all taxes, less subsidies.

Output is gross revenue of goods and services produced by commercial organisations plus gross expenditure by government agencies.

Purchasers' price is the price paid for a good or service paid by the purchaser. It includes indirect taxes and transport, trade and other margins.

Production-induced effects are additional output, employment and income resulting from re-spending by firms that receive income from the sale of goods and services to firms undertaking, for example, agricultural activities. Production-induced effects are sometimes referred to as “indirect effects”.

Total impact is the sum of the direct effects and the flow-on effects.

Type I multiplier is calculated as (direct effects + production-induced effects)/direct effects.

Type II multiplier is calculated as (direct effects + production-induced effects + consumption-induced effects)/direct effects.

Appendix 3 Sensitivity of Assumptions for Impact Assessment

Appendix Table 3.1 Regional economic impact of growth in ethanol production (5 per cent price increase for feedstock)

Sector	Plant Capacity 100ML per annum			Plant Capacity 200ML per annum		
	Output [a]	Employment	Contribution to GRP	Output [a]	Employment	Contribution to GRP
	$m	fte	$m	$m	fte	$m
Ethanol Plant	90	55	19.6	180	100	39.1
Flow-on impacts						
Trade		*24*	*0.8*		*48*	*1.5*
Transport & Storage		*4*	*0.3*		*9*	*0.6*
Other Service Sectors		*15*	*1.0*		*30*	*1.9*
Manufacturing		*5*	*0.3*		*9*	*0.6*
Other Flow-on		*14*	*1.9*		*29*	*3.9*
Total Flow-on [b]		62	4.3		125	8.5
Total [b]		117	23.8		225	47.6
% of regional total		0.7%	2.5%		1.4%	4.9%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis

Appendix Table 3.2 Regional economic impact of growth in biodiesel production (5 per cent price increase for feedstock)

Sector	Plant Capacity 15ML per annum			Plant Capacity 110ML per annum		
	Output [a]	Employment	Contribution to GRP	Output [a]	Employment	Contribution to GRP
	$m	fte	$m	$m	fte	$m
Biodiesel production	14	4	5.6	99	24	42.6
Flow-on impacts						
Trade		*3*	*0.1*		*19*	*0.6*
Transport & Storage		*0*	*0.0*		*3*	*0.3*
Other Service Sectors		*2*	*0.1*		*12*	*0.8*
Manufacturing		*1*	*0.0*		*4*	*0.2*
Other Flow-on		*2*	*0.2*		*11*	*1.6*
Total Flow-on [b]		7	0.5		50	3.4
Total [b]		11	6.1		74	46.0
% of regional total		0.1%	0.6%		0.5%	4.8%

[a] To avoid double counting only direct output impacts have been reported.

[b] Totals may not sum due to rounding.

Source: EconSearch analysis