

ECONOMIC OUTLOOK REPORT



RIO | regional
investment
opportunities

A PROJECT OF
THE MURRAYLANDS REGIONAL DEVELOPMENT BOARD INC

Murraylands Economic Outlook Report: Headline Analysis

A report prepared for



Prepared by



30 November 2006

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Document History and Status

Doc Ver	Doc Status	Issued To	Qty elec	Qty hard	Date	Reviewed	Approved
1	Final	Kerry Medlow	1	-	28/11/06	JBM, ESBC	JBM

Printed: 29/11/2006 3:13:00 PM
 Last Saved: 0/00/0000 0:00:00 AM
 File Name: S:\1_Projects\Current\0634_Murraylands Outlook\Reports\Headline Analysis_061128.doc
 Project Manager: Julian Morison
 Principal Author/s: Mathew Ferris, Julian Morison
 Name of Client: Murraylands Regional Development Board Inc.
 Name of Project: Economic Outlook Report: Headline Analysis
 Document Version: 1
 Job Number: 0634





1. Introduction

EconSearch Pty Ltd was contracted by the Murraylands Regional Development Board Inc to prepare an Economic Outlook report that provides investors, stakeholders and the community with an overview of the status of the Murraylands economy. The 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 in 2005/06 of a range of scenarios for irrigated agriculture along the River Murray, namely:

- The economic impact of a 50 per cent water allocation for River Murray irrigators;
- The economic impact of a 40 per cent water allocation for River Murray irrigators; and
- The economic Impact of a 10 per cent increase in irrigated agriculture production by River Murray irrigators.

The analysis presented in this report was undertaken by Matthew Ferris 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:

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

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.

3.1 The Economic Impact of a 50 per cent Water Allocation

Estimates of the regional economic impact in the Murraylands in 2005/06 of a 50 per cent water allocation for River Murray irrigators were based on the use of *Regional Irrigated Agriculture Models* developed by the consultants for PIRSA (EconSearch and SRHS 2004).

The key assumptions associated with a 50 per cent water allocation are summarised below.

- Based on the results of a survey conducted for the study referred to above, the majority of survey respondents indicated that their primary strategy in response to a water restriction scenario would be to buy or lease water and maintain production levels. Clearly, however, if the demand for unused water allocations significantly exceeds supply then the consequent price increase will reduce or nullify the feasibility of this strategy. Thus, across the various crop types it was assumed that only a proportion of growers who have indicated that they will undertake this strategy would ultimately do so. The assumptions made with regard to the likely magnitude and cost of water trades, by crop, are detailed in Table 3.1.

Table 3.1 Assumed water trading in response to a 50 per cent water allocation ^a

	Proportion of Growers who Purchase Water in Response to Restrictions ^a	Proportion of Requirements Purchased ^b	Average Cost of Leased water (\$/ML) ^c
Winegrapes	45%	35%	250
Citrus	45%	40%	250
Stone and pome fruit	70%	35%	250
Almonds and other tree crops	70%	35%	250
Vegetables	70%	40%	250
Dairy	20%	35%	250

^a Based on survey responses from EconSearch and SRHS (2004).

^b As reduced allocations require careful use of available water, the analysis has incorporated a modest (10-15 per cent) increase in water use efficiency.

^c Average over the whole season.

Source: Based on EconSearch and SRHS (2004)

- It was assumed that 75 per cent of the water that would be purchased (permanent or leased) by River Murray irrigators in the Murraylands in response to the 50 per cent water allocation would be transferred from interstate or other regions within SA, with an associated transfer of wealth out of the region.¹. The balance of water trade was assumed to have minimal regional economic impact, as it would represent a transfer of wealth from one group of irrigators to another, within the region.
- It was assumed that a number of growers would adopt a range of water efficiency measures in response to the reduced allocation. Estimates were derived from (EconSearch and SRHS 2004).
- Across all horticultural/viticultural crop types it was assumed that those growers who do not purchase water would suffer from an inevitable yield reduction. A typical yield response in horticultural and viticultural crops to a 50 per cent water allocation was derived from work undertaken by EconSearch and SRHS for the MDBC (EconSearch and AWE 2004). The yield response assumptions are summarised in Table 3.2.

Table 3.2 Imputed regional yield response to a 50 per cent water allocation

	Average On-Farm Yield reduction ^a	Proportion of total growers impacted ^b	Regional Yield Response
Winegrapes	-19%	55%	-11%
Citrus	-39%	55%	-21%
Stone and pome fruit	-39%	30%	-12%
Almonds and other tree crops	-39%	30%	-12%
Vegetables	-39%	30%	-12%

^a Based on yield response functions in EconSearch and AWE (2004).

^b Based on survey responses from EconSearch and SRHS (2004).

- In the vegetables sector, in addition to the yield response, it was assumed that a proportion of growers would defer planned expansion of plantings within the region.
- In the dairy sector, given that buying or leasing water is unlikely to be financially feasible for the majority of growers, it was assumed that there would be a 21 per cent reduction in regional milk production in response to a 50 per cent water allocation and a significant increase (14 per cent) in the cost of purchased feed.
- It was assumed that the impact of these changes in the relevant regional processing sectors (wineries, fruit and vegetable products processing and milk processing) would be minimal. Given the short time frame it is likely that these firms would be able to source product from outside the region at relatively low cost. If the impact on raw product supply were large or sustained, however, there would be significant consequences for the processing sector.

¹ In 2005/06, of the total permanent and temporary water purchased by irrigators below Blanchetown, 67 per cent was from entitlement holders between Blanchetown and the border, 4 per cent from Victoria and 4 per cent from NSW (Greg McCarron, DWLBC, pers comm.).

3.2 The Economic Impact of a 40 per cent Water Allocation

The key assumptions associated with a 40 per cent water allocation are summarised below. Unless otherwise listed, the assumptions listed above for the 50 per cent water allocation scenario would also apply for the 40 per cent scenario.

- The proportion of growers who are able to purchase water (given scarcity of supply and capacity to pay) was assumed to fall under the 40 per cent allocation scenario (Table 3.3). Both the proportion of requirements purchased and the average cost of leased water would increase.

Table 3.3 Assumed water trading in response to a 40 per cent water allocation ^a

	Proportion of Growers who Purchase Water in Response to Restrictions ^a	Proportion of Requirements Purchased ^b	Average Cost of Leased water (\$/ML) ^c
Winegrapes	40%	45%	300
Citrus	40%	50%	300
Stone and pome fruit	65%	45%	300
Almonds and other tree crops	65%	45%	300
Vegetables	65%	50%	300
Dairy	15%	45%	300

^a Based on survey responses from EconSearch and SRHS (2004).

^b As reduced allocations require careful use of available water, the analysis has incorporated a modest (10-15 per cent) increase in water use efficiency.

^c Average over the whole season.

Source: Based on EconSearch and SRHS (2004)

- A typical yield response in horticultural and viticultural crops to a 40 per cent water allocation was derived from work undertaken by EconSearch and SRHS for the MDBC (EconSearch and AWE 2004). The yield response assumptions are summarised in Table 3.4.

Table 3.4 Imputed regional yield response to a 40 per cent water allocation

	Average On-Farm Yield reduction ^a	Proportion of total growers impacted ^b	Regional Yield Response
Winegrapes	-25%	60%	-15%
Citrus	-50%	60%	-30%
Stone and pome fruit	-50%	35%	-18%
Almonds and other tree crops	-50%	35%	-18%
Vegetables	-50%	35%	-18%

^a Based on yield response functions in EconSearch and AWE (2004).

^b Based on survey responses from EconSearch and SRHS (2004).

- In the dairy sector, given that buying or leasing water is unlikely to be financially feasible for the majority of growers, it was assumed that there would be a 26 per cent reduction in regional milk production in response to a 50 per cent water allocation and a significant increase (17 per cent) in the cost of purchased feed.

3.3 The Economic Impact of a 10 per cent Increase in Irrigated Agriculture Production

In contrast to the reduced water allocation scenarios, the third scenario, a 10 per cent increase in irrigated agriculture production for River Murray irrigators in the Murraylands, was based on the premise that water efficiency measures would be adopted on existing plantings and an expansion of plantings would be undertaken using the 'saved' water. As above, the impacts have been generated using the *RISE* model for the Murraylands region.

The estimates of impact presented for this scenario do not, however, take account of the impacts associated with the capital expenditure incurred in the adoption of water efficiency measures nor the expansion of plantings.



4. The Regional Economic Impact of a 50 per cent Water Allocation

Estimates of the regional economic impact of a 50 per cent water allocation for irrigated agriculture in the Murraylands in 2005/06 are provided in Table 4.1. The estimated impacts represent the change from a 100 per cent water allocation year. It is important to note that actual usage is generally well below allocation, in some districts as low as 65 per cent.

Table 4.1 Estimated net regional economic impact of a 50 per cent water allocation

Sector	Employment	Contribution to GRP
	fte	\$m
Irrigated agriculture	-50	-30.0
Flow-on impacts		
<i>Trade</i>	-52	-1.7
<i>Other service sectors</i>	-44	-2.6
<i>Transport</i>	-8	-0.6
<i>Other flow-ons</i>	-15	-3.6
Total flow-on impacts	-119	-8.4
Total	-169	-38.4
Proportion of regional total	-1.0%	-4.0%

Source: EconSearch Analysis.

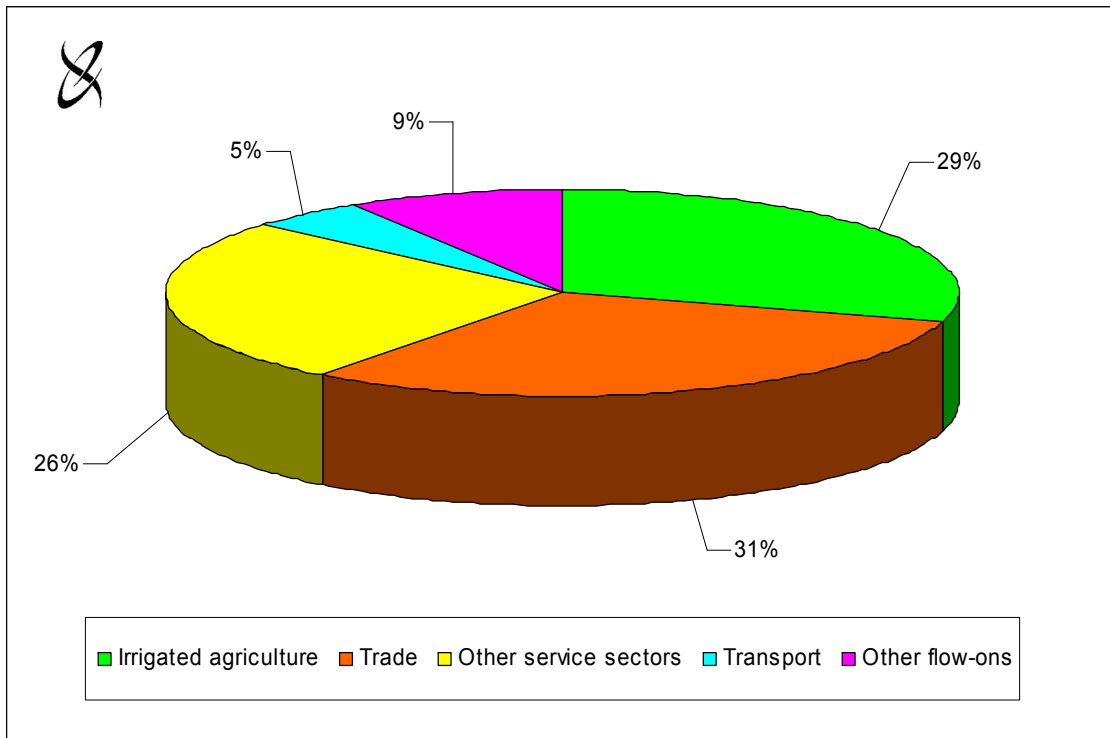
It was estimated that almost 170 fte jobs would be lost from the Murraylands regional economy in response to a 50 per cent water allocation for irrigators in 2005/06, 50 jobs directly in the irrigated agriculture sectors and approximately 120 flow-on job losses in other sectors of the regional economy. The total employment impact represents approximately one per cent of the regional total in 2005/06.

Job losses in the irrigated agriculture sectors would account for almost 30 per cent of the total employment impact (Figure 4.1). Flow-on job losses would account for approximately 70 per cent of the total employment impact and would be concentrated in the trade, transport and other service sectors.

It was estimated that over \$38m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 50 per cent water allocation for irrigators in 2005/06, \$30m directly in the irrigated agriculture sectors and over \$8m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents approximately four per cent of the regional total in 2005/06.

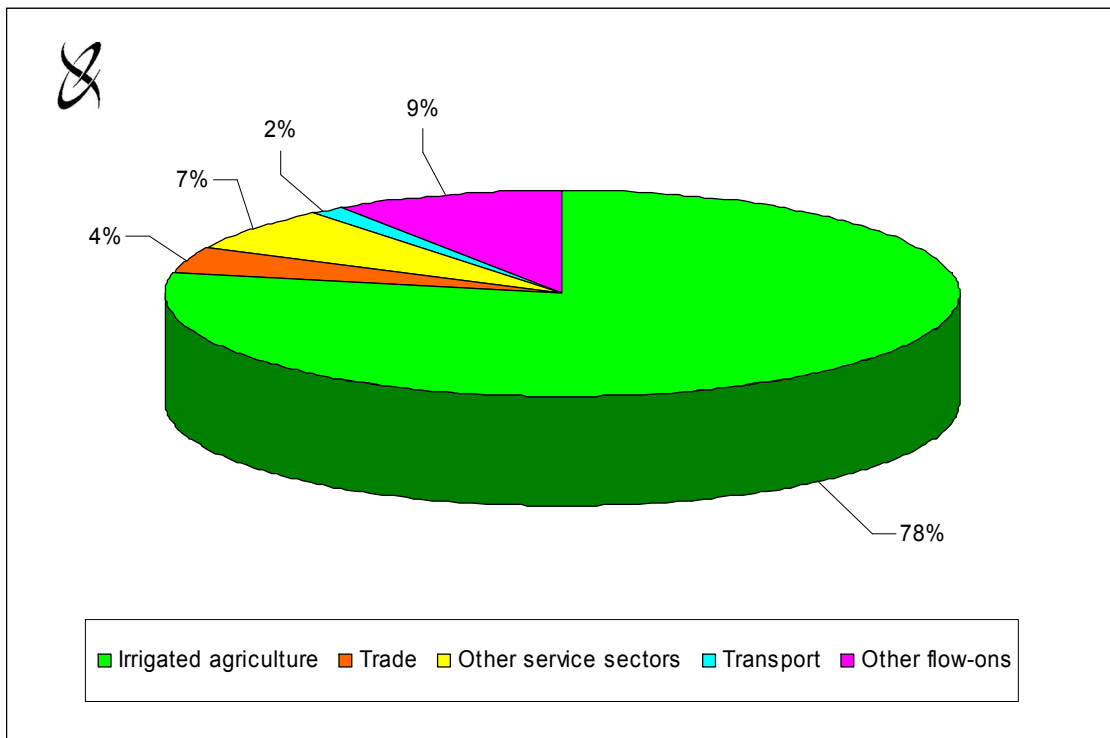
Reduced GRP in the irrigated agriculture sectors would account for almost 80 per cent of the total GRP impact (Figure 4.2). It is apparent that irrigators, faced with water restrictions of this magnitude, would experience a significant reduction in profits and disposable income in response to yield reductions and/or the purchase of temporary water. The impact of this reduction in disposable income is reflected in the flow-on job losses in other sectors of the regional economy (Table 4.1 and Figure 4.1).

Figure 4.1 Distribution of employment impacts for a 50 per cent water allocation



Source: EconSearch Analysis.

Figure 4.2 Distribution of GRP impacts for a 50 per cent water allocation



Source: EconSearch Analysis.



As noted in Section 3 of the report, the impact estimation process has taken account of some offsetting, positive effects, which reduce the magnitude of the overall negative impact. These include the following:

- Water trading - extra cost to buyers but for sellers in the region it represents additional income.
- Water use efficiency - by necessity, reduced allocations require careful use of available water and the analysis has incorporated a modest increase in water use efficiency.
- Short-term response - it is assumed that allocations will improve next year (2006/07) and some irrigators will “hang on” until then. If the low allocations were repeated next year, the impacts would be more severe.
- It was assumed that the impact of these changes in the relevant regional processing sectors would be minimal. Given the short time frame it is likely that these firms would be able to source product from outside the region at relatively low cost.



5. The Regional Economic Impact of a 40 per cent Water Allocation

Estimates of the regional economic impact of a 40 per cent water allocation for irrigated agriculture in the Murraylands in 2005/06 are provided in Table 5.1. The distribution of employment impacts and GRP impacts for a 40 per cent water allocation are similar to that for a 50 per cent allocation (Figures 4.1 and 4.2).

Table 5.1 Estimated net regional economic impact of a 40 per cent water allocation

Sector	Employment	Contribution to GRP
	fte	\$m
Irrigated agriculture	-67	-40.4
Flow-on impacts		
<i>Trade</i>	-70	-2.2
<i>Other service sectors</i>	-60	-3.5
<i>Transport</i>	-11	-0.8
<i>Other flow-ons</i>	-21	-4.9
Total flow-on impacts	-161	-11.4
Total	-229	-51.8
Proportion of regional total	-1.4%	-5.4%

Source: EconSearch Analysis.

It was estimated that almost 230 fte jobs would be lost from the Murraylands regional economy in response to a 40 per cent water allocation for irrigators in 2005/06, almost 70 jobs directly in the irrigated agriculture sectors and approximately 160 flow-on job losses in other sectors of the regional economy. The total employment impact represents one per cent of the regional total in 2005/06.

It was estimated that almost \$52m (in 2006 dollars) in GRP would be lost from the Murraylands regional economy in response to a 40 per cent water allocation for irrigators in 2005/06, over \$40m directly in the irrigated agriculture sectors and over \$11m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents more than five per cent of the regional total in 2005/06.

6. The Regional Economic Impact of a 10 per cent Increase in Irrigated Agriculture Production

Estimates of the regional economic impact of a 10 per cent increase in River Murray based irrigated agriculture production in the Murraylands in 2005/06 are provided in Table 6.1.

Table 6.1 Estimated net regional economic impact of a 10 per cent increase in irrigated agriculture production

Sector	Employment	Contribution to GRP
	fte	\$m
Irrigated agriculture	39	9.2
Flow-on impacts		
<i>Trade</i>	21	0.7
<i>Other service sectors</i>	15	1.0
<i>Other agriculture</i>	12	0.5
<i>Other flow-ons</i>	15	1.9
Total flow-on impacts	63	4.2
Total	102	13.4
Proportion of regional total	0.6%	1.4%

Source: EconSearch Analysis.

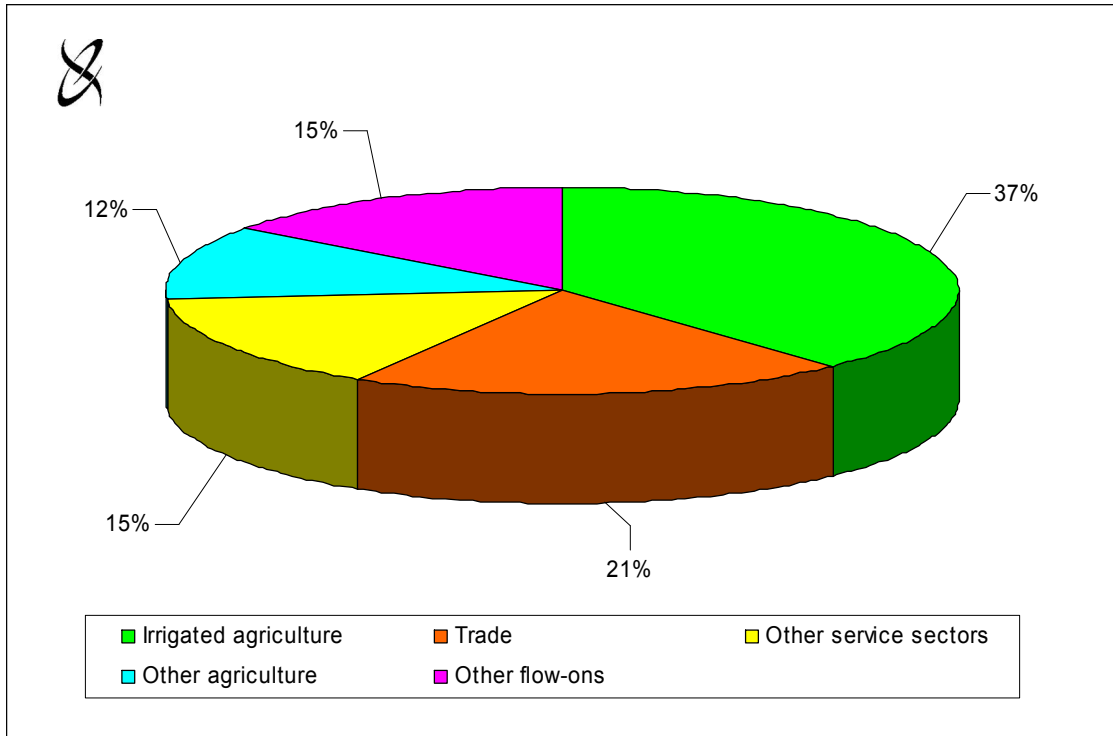
It was estimated that over 100 fte jobs would be generated in the Murraylands regional economy in response to a 10 per cent increase in River Murray based irrigated agriculture production in 2005/06, almost 40 jobs directly in the irrigated agriculture sectors and over 60 flow-on jobs in other sectors of the regional economy. The total employment impact represents less than one per cent of the regional total in 2005/06.

Jobs generated in the irrigated agriculture sectors would account for almost 40 per cent of the total employment impact (Figure 6.1). Flow-on jobs would account for approximately 60 per cent of the total employment impact and would be concentrated in the trade, other agriculture (including contractors and others services to agriculture) and other service sectors.

It was estimated that over \$13m (in 2006 dollars) in GRP would be generated in the Murraylands regional economy in response to a 10 per cent increase in River Murray based irrigated agriculture production in 2005/06, over \$9m directly in the irrigated agriculture sectors and approximately \$4m in flow-on GRP in other sectors of the regional economy. The total GRP impact represents over one per cent of the regional total in 2005/06.

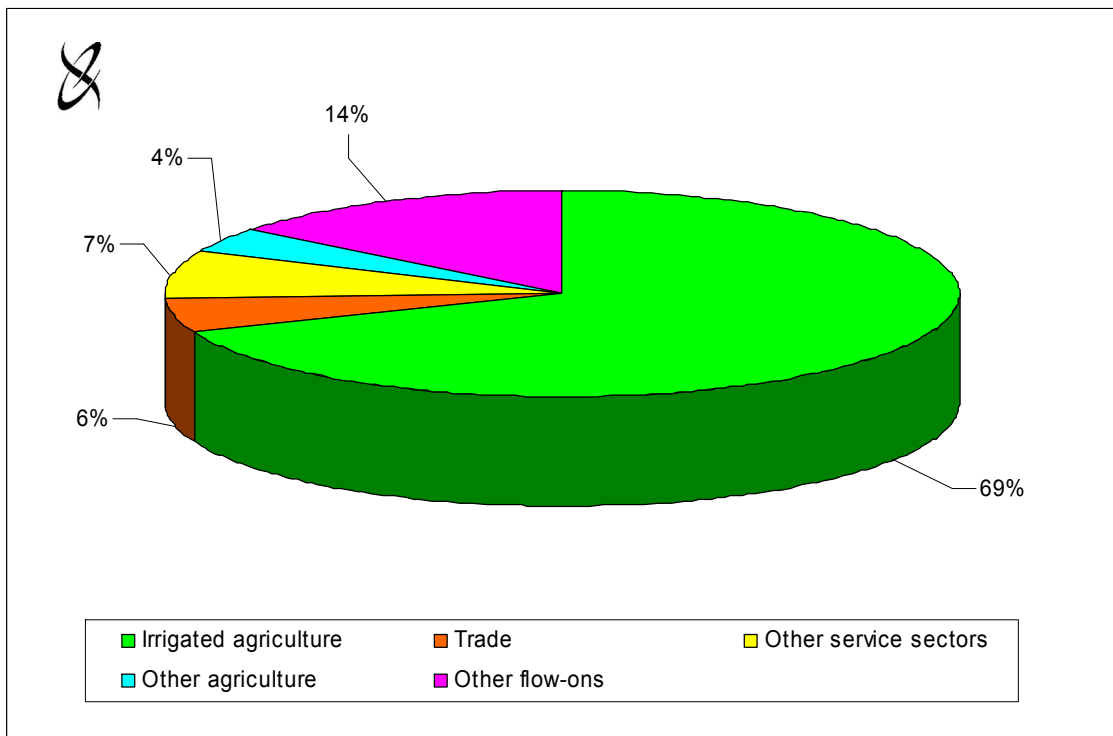
GRP generated in the irrigated agriculture sectors would account for almost 70 per cent of the total impact (Figure 6.2). Flow-on impacts would occur mainly in the trade, other agriculture and other service sectors.

Figure 6.1 Distribution of employment impacts for a 10 per cent increase in irrigated agriculture production



Source: EconSearch Analysis.

Figure 6.2 Distribution of GRP impacts for a 10 per cent increase in irrigated agriculture production



Source: EconSearch Analysis.



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- EconSearch and Australian Water Environments 2004, *Decision Support System for the Lower Murray Region*, a report prepared for MDBC and DWLBC as a component of the project; *Social, Economic and Environmental Values and Indicators for the Lower Murray Region*.
- EconSearch and SRHS 2004, *The Economic Impact of Drought Conditions and Water Restrictions on River Murray Irrigation Industries and Regions*, prepared for Primary Industries and Resources South Australia, July
- EconSearch 2005, *Regional Development Board Economic Models*, a series of RISE impact models prepared for the Office of Regional Affairs, Department of Trade and Economic Development.
- Jensen, R.C. and West, G.R. 1986, *Input-Output for Practitioners, Vol.1, Theory and Applications*, Office of Local Government, Department of Local Government and Administrative Services, AGPS, Canberra.

Disclaimer

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 $(\text{direct effects} + \text{production-induced effects}) / \text{direct effects}$.

Type II multiplier is calculated as $(\text{direct effects} + \text{production-induced effects} + \text{consumption-induced effects}) / \text{direct effects}$.



A PROJECT OF
THE MURRAYLANDS REGIONAL DEVELOPMENT BOARD INC

proudly supported by

 <p>Australian Government Department of Transport and Regional Services</p>		
 <p>Government of South Australia Department of Trade and Economic Development</p>		
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FOR FURTHER INFORMATION

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