

The Timber Industry and Lower Limestone Coast Water Allocation Planning: Socio-Economic Aspects

A report prepared for

PIRSA Forestry
Limestone Coast Regional Development Board
Green Triangle Regional Plantation Committee
South East Natural Resources Management Board

Prepared by



December 2008

EconSearch Pty Ltd
214 Kensington Rd,
Marryatville SA 5068
Tel: (08) 8431 5533
Fax: (08) 8431 7710
www.econsearch.com.au

Contents

List of Tables	iv
Abbreviations	v
Acknowledgements.....	v
Executive Summary.....	vii
1. Introduction.....	1
1.1 Background.....	1
1.2 Structure of the Report.....	1
2. Measures of Economic Impact	3
3. Timber Industry Survey	5
4. Regional Profile and Input-Output Model Preparation.....	7
4.1 Profile of the South East Region of South Australia.....	7
4.2 Input-Output Model Preparation.....	7
5. Economic Impact of the Timber Industry in the South East Region of South Australia, 2006/07	9
5.1 Introduction	9
5.2 Economic impact of the timber industry in SE SA, 2006/07	9
5.3 Economic impact of the timber industry in SE SA, time-series	11
6. Economic Impact of Permanent Reductions in the Area of the Forestry Plantation Estate	13
6.1 Survey Responses	13
6.2 Other Data and Assumptions	15
6.3 Results of the Impact Analysis	16
6.3.1 Interpretation of the results for the 5,000 ha scenario.....	16
6.3.2 Results for the 10,000, 15,000 and 20,000 ha scenarios.....	19
6.3.3 Observations and conclusions from all plantation area reduction scenarios	20
7. Economic Impact of Reductions in Regional Water Use: Forestry and Irrigated Agriculture	22
7.1 Economic Impact of a Permanent Reduction in Water Use by Plantation Forestry	22
7.2 Economic Impact of a Permanent Reduction in Water Use by Irrigated Agriculture	25
7.3 Observations and Conclusions from the Water Use Reduction Scenarios	30
References	31
Appendix 1 Survey Covering Letter and Questionnaire	33
Appendix 2 Input-Output Methodology and Glossary	38
Appendix 3 Value of Irrigated Agriculture in the LLCPPWA (\$/ha).....	42

List of Tables

Table ES1	Direct and indirect impacts of the timber industry, SE SA, 2006/07.....	vii
Table 3.1	Timber industry survey respondents, SE SA region, 2006/07.....	6
Table 5.1	Direct and indirect impacts of the timber industry, SE SA, 2006/07.....	10
Table 5.2	Direct and indirect GRP and employment impacts of the timber industry, SE SA, 1995/96, 1998/99, 2003/04 and 2006/07 ^a	11
Table 6.1	Net economic impact of a 5,000 ha reduction in the area of the plantation estate in SE SA, 2012/13 ^a	17
Table 6.2	Net economic impact of a 10,000 ha reduction in the area of the plantation estate in SE SA, 2012/13 ^a	19
Table 6.3	Net economic impact of a 15,000 ha reduction in the area of the plantation estate in SE SA, 2017/18 ^a	19
Table 6.4	Net economic impact of a 20,000 ha reduction in the area of the plantation estate in SE SA, 2017/18 ^a	20
Table 7.1	Net economic impact of a 4 GL per annum reduction in water use by plantation forestry, SE SA, 2012/13 ^a	23
Table 7.2	Profile of irrigated activity in the Lower Limestone Coast Prescribed Wells Area, 2006/07.....	26
Table 7.3	Reduced area and gross value of production by crop type necessary to achieve a 4GL reduction in water use/allocation, LLCPPWA, 2006/07.....	27
Table 7.4	Net economic impacts of a 4 GL per annum reduction in water use and water allocation by irrigated agriculture, SE SA, 2012/13 ^a	28

Abbreviations

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
DEWR	Department of Employment and Workplace Relations
dse	dry sheep equivalents
DWLBC	Department of Water, Land and Biodiversity Conservation
fte	full-time equivalent
GRP	gross regional product
I-O	input - output
LLCWAP	Lower Limestone Coast Water Allocation Plan
PIRSA	Primary Industries and Resources South Australia
PWA	prescribed wells area
SE SA	South East (Region of) South Australia

Acknowledgements

The assistance and feedback provided by PIRSA Forestry and the South East Forest Industries Group is gratefully acknowledged. The analysis would not have been possible without the input provided by participants in the timber industry survey.

Executive Summary

In response to challenges to the timber industry in the South East region of South Australia (SE SA) that are being experienced under the proposed Lower Limestone Coast Water Allocation Plan (LLCWAP), PIRSA Forestry, in conjunction with the Limestone Coast Regional Development Board, the Green Triangle Regional Plantation Committee and the South East Natural Resources Management Board commissioned EconSearch Pty Ltd to:

- provide indicators of the contribution of the timber industry¹ to regional economic activity in SE SA in 2006/07; and
- estimate the economic impact of a range of future scenarios for the timber industry that may result from the implementation of the LLCWAP.

The future scenarios for the timber industry included the following.

- A permanent reduction in the area of the plantation estate.
- A permanent reduction in regional water use achieved through a reduction in the area of the plantation estate versus a reduction in the area of irrigated agriculture. For irrigated agriculture two scenarios were analysed:
 - a reduction in water use by irrigated agriculture where water use is defined as water pumped by irrigators from the aquifer; and
 - a reduction in irrigation water allocation, where water use is assumed to be, on average, 40 per cent of the total allocation².

Economic Impact of the Timber Industry in the South East Region of South Australia, 2006/07

Estimates of the economic contribution of the timber industry to the SE SA regional economy in 2006/07 are summarised in Table ES1. These estimates represent a 'snapshot' of the timber industry's contribution to regional economic activity at a specific point in time.

A key source of data for the analysis was a survey of 26 timber industry firms with activity in the SE SA region. Most of forest plantation in the SE SA region by area and at least 95 per cent of the timber processing activity by value was accounted for by the survey responses. Estimates of the direct economic impact of the timber industry were calculated primarily on the basis of these survey responses. Flow-on impacts have been estimated using an input-output model developed for this project by the consultants.

The value of output of the timber industry (i.e. forestry + wood and paper products) was around \$1,200m in 2006/07. Direct GRP generated by the timber industry was over \$500m and accounted for 19 per cent of the regional total. Direct employment generated by the timber industry was almost 3,600 jobs (11 per cent of the regional total). Household income generated directly by the timber industry was almost \$240m (19 per cent of the regional total).

¹ The timber industry includes plantation forestry and wood and paper products processing.

² Derived from Table 1, Chapter 8 of *A New Understanding on the Level of Development of the Unconfined Tertiary Limestone Aquifer in the South East of South Australia* (DWLBC 2007) (PIRSA Forestry, pers. comm.).

Table ES1 Direct and indirect impacts of the timber industry, SE SA, 2006/07 ^a

	Value of Output	Gross Regional Product	Employment	Household Income
	\$m	\$m	No. of jobs	\$m
Direct impact (forestry + wood and paper products)	1,218	520	3,575	236
Proportion of regional total		19%	11%	19%
Total Flow-ons		239	3,921	148
Total impact (direct + flow-on)		759	7,496	384
Regional total		2,681	33,335	1,271
Proportion of regional total		28%	22%	30%

^a All dollar values are in 2006/07 dollars.

Source: EconSearch analysis.

Flow-on GRP in other sectors of the regional economy summed to almost \$240m. Flow-on employment was estimated to be over 3,900 jobs and flow-on household income almost \$150m. Directly and indirectly, the timber industry contributed almost \$760m to GRP for the SE SA regional economy in 2006/07 (approximately 28 per cent of the regional total), almost 7,500 jobs (22 per cent) and approximately \$380m in household income (30 per cent).

Economic Impact of Permanent Reductions in the Area of the Forestry Plantation Estate

Based on responses to the survey, permanent reductions in the area of the forestry plantation estate are expected to result in the following.

- For plantation forestry firms, reductions in plantation area are anticipated to have a more or less proportional impact on the volume of output.
- For most timber processing firms, the initial impact of a reduction in plantation area would primarily be an increase in raw material costs associated with the necessity to import more expensive wood or pulp to substitute for the loss of local product. This would be reflected in reduced processing margins and a consequent loss of profitability. Some firms also indicated that there would be modest reductions in employment and throughput even for the 'low' (i.e. 5,000 ha) scenario. For larger reductions in area (i.e. up to 20,000 ha), some timber processing firms would shed a significant number of jobs and markedly reduce their throughput and at least one smaller processing firm would probably cease operating.
- Many respondents, particularly those in hardwood plantation businesses, referred to the investment uncertainty that has been created by the possible introduction of these restrictions on the industry. This uncertainty is difficult to model in an I-O framework but could have significant economic consequences for the region in terms of investment in, for example, new or expanded processing infrastructure.

The results of the analysis for the area reduction scenarios reflect the non-linearity revealed in the survey responses and the magnitude of each scenario's impact is not proportional to the reduction in area of plantation estate. For example, the total employment impact of the 20,000 ha scenario (-556 jobs for the high impact) is more than twice as great as that for the 10,000 ha scenario (-207 jobs).

Estimates of economic impact exclude the financial implications to plantation forestry owners associated with the potential for carbon trading that is foregone as a result of the inability to re-plant existing plantations or establish new plantations in specified areas. No attempt has been made in this analysis to put a value on these potential losses.

Given the long-term nature of some plantation forestry rotations (i.e. 30 years or more) it is likely that some of the economic impacts attributable to the area reduction scenarios will be experienced beyond the completion of the second water allocation plan in 2017/18.

Economic Impact of Reductions in Regional Water Use: Forestry and Irrigated Agriculture

Estimates of the economic impact of a permanent reduction in regional water use of 4 GL/annum³ achieved through a reduction in the area of the plantation estate and a reduction in the area of irrigated agriculture have also been provided in the report.

Some general observations and conclusions drawn from these scenarios are provided below.

- Based on the survey data, other data sources and assumptions utilised in this analysis, there would appear to be only small differences in the regional economic impacts of a permanent reduction in regional water use of 4 GL/annum achieved through a reduction in the area of the plantation estate versus a reduction in water use (and area) by irrigated agriculture. For example, the high GRP impact from a reduction in the plantation estate (-\$11.4m) is of a similar order of magnitude to that for the reduced water use scenario for irrigated agriculture (-\$8.4m).
- Were the reduction in irrigated agriculture achieved through an equivalent reduction in water allocation, there would be significant differences in the impacts attributable to a reduction in the area of the plantation estate versus a reduction in the area of irrigated agriculture. For example, the high GRP impact from a reduction in the plantation estate (-\$11.4m) is much greater than that for the reduced water allocation scenario for irrigated agriculture (-\$3.4m).
- There is a clear distinction between the relative impacts of the water use and water allocation scenarios for irrigated agriculture.
- The impacts for both irrigated agriculture and plantation forestry are based on a profile of these activities that reflects the regional average (expenditure, employment, value of output, etc.). In reality, were a reduction in the area of the plantation estate or irrigated agriculture enforced, it is likely that the least productive areas (i.e. in terms of yield or profit/ha) would be targeted first by both activities. This, in turn, would be a function of a wide range of factors, including, for example, the nature of the forestry or irrigated agriculture activities in targeted sub-regions.

³ An estimate of the average over allocation for over allocated zones in the Lower Limestone Coast Prescribed Wells Area. Derived from Table 1, page 73 of the *Draft Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area* (South East Natural Resources Management Board 2007) (PIRSA Forestry, pers. comm.).

1. Introduction

1.1 Background

In response to challenges to the timber industry in the South East region of South Australia (SE SA) that are being experienced under the proposed Lower Limestone Coast Water Allocation Plan (LLCWAP), PIRSA Forestry, in conjunction with the Limestone Coast Regional Development Board, the Green Triangle Regional Plantation Committee and the South East Natural Resources Management Board commissioned EconSearch Pty Ltd to:

- provide indicators of the contribution of the timber industry⁴ to regional economic activity in SE SA in 2006/07; and
- estimate the economic impact of a range of future scenarios for the timber industry that may result from the implementation of the LLCWAP.

The future scenarios for the timber industry in SE SA include:

- a permanent reduction in the area of the plantation estate of 5,000, 10,000, 15,000 and 20,000 ha; and
- a permanent reduction in regional water use of 4 GL/annum achieved through a reduction in the area of the plantation estate versus a reduction in the area of irrigated agriculture.

1.2 Structure of the Report

The approach to the analysis and report structure are outlined below. Note that the approach to the first stage of the analysis is similar to that undertaken for previous assessments of the economic impact of the timber industry in SE SA undertaken by the consultants (EconSearch 1998, 2001 and 2005a).

Section 2

Measures of Economic Impact - definition of the input-output (I-O) terminology used in the analysis.

Section 3

Timber Industry Survey - a description of the sample size, questionnaire design, conduct of and response rate to the survey of timber industry firms.

Section 4

Regional Profile and Input-Output Model Preparation - a brief profile of the SE SA region and a description of the method and data sources used to construct an I-O model for the region for 2006/07.

Section 5

Economic Impact of the Timber Industry in the South East Region of South Australia, 2006/07 - estimates of the contribution of plantation forestry and wood and paper products processing to economic activity in the SE SA region in 2006/07.

⁴ The timber industry includes plantation forestry and wood and paper products processing.

Section 6

Economic Impact of Permanent Reductions in the Area of the Forestry Plantation Estate - estimates of the economic impact of a permanent reduction in the area of the plantation estate of 5,000, 10,000, 15,000 and 20,000 ha.

Section 7

Economic Impact of Reductions in Regional Water Use: Forestry and Irrigated Agriculture - estimates of the economic impact of a permanent reduction in regional water use of 4 GL/annum achieved through a reduction in the area of the plantation estate versus a reduction in the area of irrigated agriculture.

2. Measures of Economic Impact

Estimates of economic impact or economic contribution in this report are presented in terms of the following indicators⁵:

- output;
- gross regional product;
- employment; and
- household income.

(Value of) Output is a measure of the gross revenue of goods and services produced by commercial organisations and gross expenditure by government agencies. Total output needs to be used with care as it can include elements of double counting when the output of integrated industries is added together (e.g. the value of timber mill output includes the plantation-gate value of logs). For this reason, only direct output impacts are reported.

Gross regional product (GRP) is a measure of the net contribution of an activity to the regional economy. GRP is measured as value of output less the cost of goods and services (including imports) used in producing the output. In other words, it can 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 GRP as a measure of economic impact avoids the problem of double counting that may arise from using value of output for this purpose.

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

Household income is a component of GRP and is a measure of wages and salaries paid in cash and in kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and income tax, but excluding payroll tax.

Estimates of 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, in this case plantation forestry and wood and paper processing.

⁵ See Appendix 2 for a more detailed glossary of input-output terminology.

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. forestry contractors) that receive payments from the sale of goods and services to firms undertaking, for example, plantation forestry activities. 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.

Total impacts are the sum of direct and flow-on impacts.

Note that this report is a statement of regional economic impact (i.e. so many jobs, so much income, etc.) arising from timber industry activity. The results of the analysis do not indicate whether the costs to the region of the current level of activity in these industries or changes to these levels of activity outweigh the benefits. An assessment of this nature would require a comprehensive cost-benefit analysis.

3. Timber Industry Survey

An outline of the timber industry survey conducted for this project is provided below. Details are provided of the nature of the information sought, the firms and organisations contacted, survey response rate and the processing of completed questionnaires.

Questionnaire

To enable estimation of the current impact of the timber industry in the SE SA region and the impact of a range of future scenarios, a questionnaire was prepared for completion by plantation forestry and timber processing firms that undertake activity in the region.

The questions were designed to elicit:

- the nature of the firm's timber industry activity;
- area of plantation forestry owned or managed;
- the firm's employment levels and total wages and salaries;
- an estimate of employment and the nature of goods and services provided by contractors to the firm;
- the magnitude of other costs incurred by the firm in the course of conducting timber industry operations;
- a breakdown of timber industry related earnings and market share by broad category; and
- the impact of a permanent reduction in plantation area or wood supply from the SE SA region on the firm's employment levels, raw material costs and gross revenue.

A covering letter for the questionnaire was prepared by the consultants to encourage individual firms to participate in the survey. It outlined the background and objectives of the study, explained why the survey was required and indicated that all survey data would be treated in confidence. A copy of the covering letter and questionnaire is reproduced in Appendix 1.

Firms who received the questionnaire

The contact list of timber industry firms for inclusion in the survey was provided by PIRSA Forestry (pers. comm.). Those on the list were contacted by PIRSA Forestry prior to the conduct of the survey to inform them of the motive for and objectives of the study and to encourage participation in the survey.

The covering letter and questionnaire were sent by post on 10 December 2007. Detailed follow-up was undertaken by telephone, fax and e-mail during December 2007 and between January and April 2008. The distribution of questionnaires and subsequent follow-up was undertaken wholly by the consultants.

Responses

A summary of the nature and extent of the responses to the survey is provided in Table 3.1. While the response rate appears to be modest (approximately 60 per cent of firms from whom data were sought, that is, 13 out of 22), it is important to note that most of forest plantation in the SE SA region by area and at least 95 per cent of the timber processing activity by value was accounted for by the 13 completed, relevant responses. That is, those firms that did not respond were thought to be minor operators relative to the total size of the industry.

Table 3.1 Timber industry survey respondents, SE SA region, 2006/07

Total number of firms to which questionnaires were sent	26
Number of firms with no reported timber industry activity in the region	4
Number of firms found to be timber industry service providers only	0
Net total (i.e. firms from whom data were sought)	22
Total non-respondents	9
Number of completed, relevant responses	13

Processing and safeguarding of completed questionnaires

Upon receipt of completed questionnaires, the responses were scrutinised for comprehensiveness and internal consistency with follow-up phone calls undertaken to seek further information or clarify inconsistencies, where necessary. The data were recorded electronically and the completed questionnaires will eventually be destroyed.

4. Regional Profile and Input-Output Model Preparation

4.1 Profile of the South East Region of South Australia

The SE SA region is comprised of the District Councils of Robe, Tatiara, Grant, Lacedpede, Wattle Range, Naracoorte-Lucindale and the City of Mount Gambier. The boundaries of the region correspond to the South East Statistical Division as defined by the ABS. This means that published production and financial data do, for the most part, correspond to such boundaries.

Some of the key measures of economic activity in the SE SA region in 2006/07 were as follows⁶:

- gross regional product (GRP) was estimated to be \$2.68 billion (3.9 per cent of South Australian gross state product⁷);
- total employment was estimated to be 33,335 jobs (4.4 per cent of the South Australian state total⁸);
- the total resident population at 30 June 2007 was estimated to be 64,956 persons (4.1 per cent of the South Australian state total⁹); and
- total forest plantation area in 2006/07 was estimated to be approximately 140,000 ha (PIRSA Forestry, pers. comm.).

4.2 Input-Output Model Preparation

Regional input-output models provide a consistent base to present the plethora of economic data available for analysis of regional economies and can be used to measure, for example, the relative contribution of current levels of economic activity in specified sectors as well as changes in the structure and magnitude of these activities¹⁰.

The input-output table for the SE SA region for 2006/07 was based on a model for the same region for 2002/03 that was prepared by the consultants as part of a project for the Regional Communities Consultative Council, Local Government Association of SA and Regional Development SA (EconSearch 2005b).

Whilst it was assumed that the basic structure of the regional economy did not change significantly between 2002/03 and 2006/07, the I-O model required a number of adjustments for the purpose of this study, including the following.

- An update from 2002/03 to 2006/07 of the value of output estimates in the agricultural and agricultural processing sectors. Given the unavailability of up-to-date *Regional Scorecards* from PIRSA or data from the 2006 ABS *Agricultural Census*, value of output estimates in these sectors were based

⁶ Regional estimates for 2002/03 were derived from EconSearch (2005) and updated to 2006/07, as outlined in Section 4.2.

⁷ Estimated to be \$69.54 billion in 2006/07 (ABS 2007a).

⁸ Estimated to be 755,000 jobs in 2006/07 (DEWR 2007).

⁹ Estimated to be 1,584,513 persons at 30 June 2007 (ABS 2007b).

¹⁰ See Appendix 3 for more detail on input-output methodology.

primarily on price changes over the time period. Price indices were derived from ABARE (2007) and ABS (2008).

- Based on the results of the timber industry survey, the insertion of updated columns and rows in the regional I-O table to reflect value of output, cost structures and employment levels in the plantation forestry and timber processing sectors in 2006/07.
- An update from 2002/03 to 2006/07 of some of the other key indicators of regional economic activity including:
 - price changes in sectors of the regional economy other than primary industries (based on the Consumer Price Index for Adelaide from ABS (2007c));
 - changes in employment (based on DEWR (2007));
 - changes in wage levels (based on ABS (2007d));
 - changes in gross regional product (based on ABS (2007a));
 - changes in population (based on ABS (2007b)); and
 - labour productivity improvements.

5. Economic Impact of the Timber Industry in the South East Region of South Australia, 2006/07

5.1 Introduction

The first objective of this study was to measure the contribution of the timber industry (i.e. plantation forestry and wood and paper products processing) to regional economic activity in the SE SA region in 2006/07. In order to meet this objective it was necessary, through a timber industry survey, to obtain estimates of the regional value of production (output) of these industries and estimate the flow-on effects generated by that production. The flow-on effects are those impacts generated by the purchase of materials, services, labour and capital by forestry firms and by the processing, marketing and handling of forestry products.

The flow-on effects have been estimated using the I-O model outlined in Section 4.2 and the computer program to make these calculations was *IOW*, developed by West (2005). The standard approach for the estimation of the regional economic impact of a particular activity, such as the timber industry, is to employ I-O analysis. See Appendix 2 for a glossary of I-O terminology and outline of I-O methodology.

The estimates of economic impact presented in this section of the report represent a 'snapshot' of the timber industry's contribution to regional economic activity at a specific point in time (i.e. 2006/07). The scope of the analysis does not include, for example, the impacts associated with growth in the harvesting and transport of hardwood for chipping and export. However, a time-series analysis of the economic impacts associated with growth in hardwood chip exports from the Port of Portland on the Green Triangle Regional Economy has been prepared by the consultants (EconSearch 2005c).

The following estimates of economic impact are detailed below:

- contribution of the timber industry to regional economic activity in SE SA in 2006/07 (Section 5.2); and
- time-series estimates of the contribution of the timber industry to regional economic activity in the years 1995/96, 1998/99, 2003/04 and 2006/07¹¹ (Section 5.3).

5.2 Economic impact of the timber industry in SE SA, 2006/07

Estimates of the economic contribution of the timber industry to the SE SA regional economy in 2006/07 are summarised in Table 5.1 and the accompanying text. Estimates are provided in terms of four indicators:

- value of output;
- GRP;
- employment; and
- household income.

¹¹ Based on this and similar studies undertaken by the consultants (EconSearch 1998, 2001 and 2005a).

Table 5.1 Direct and indirect impacts of the timber industry, SE SA, 2006/07

	Value of Output ^a	GRP ^b	Employment ^c	Household Income ^d
	\$m	\$m	No. of jobs	\$m
Direct impact (forestry + wood and paper products)	1,218	520	3,575	236
Proportion of regional total		19%	11%	19%
Flow-on impact				
Trade		50	1,563	42
Transport		40	630	33
Business services		21	343	17
Finance		13	109	5
Other manufacturing		0	5	0
Accommodation, restaurants and cafes		6	196	4
Ownership of dwellings		40	-	-
Other sectors		67	1,075	47
Total Flow-ons		239	3,921	148
Total impact (direct + flow-on)		759	7,496	384
Regional total		2,681	33,335	1,271
Proportion of regional total		28%	22%	30%

^a Value of output is a measure of the gross revenue of goods and services produced by firms within these sectors in 2006/07 dollars.

^b GRP impacts are a measure of gross regional product (i.e. household income, gross operating surplus and all taxes, less subsidies) in 2006/07 dollars.

^c Employment impacts are a measured in terms of the number of full-time and part-time jobs.

^d Household income impacts are a measured as wages and salaries paid in cash and in kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions and income tax, but excluding payroll tax (in 2006/07 dollars).

Source: EconSearch analysis.

Value of output...

The value of output of the timber industry (i.e. forestry + wood and paper products) was around \$1,218m in 2006/07. Flow-on (indirect) and total output impacts are not reported as there are problems with double counting which can give a misleading impression of the significance of the timber industry. For example, the value of saw logs processed locally is included in both the wood and paper products and forestry sectors. If the two values were added together the plantation-gate value of logs would be included twice.

Gross regional product...

Direct GRP generated by the timber industry was around \$520m in 2006/07 and accounted for 19 per cent of the regional total. Flow-on GRP in other sectors of the regional economy summed to \$239m and was greatest in the trade (\$50m), transport (\$40m), ownership of dwellings (\$40m) and business services (\$21m) sectors. Directly and indirectly, the timber industry contributed almost \$760m to GRP for the SE SA regional economy in 2006/07, approximately 28 per cent of the total.

Employment...

Direct employment generated by the timber industry was around 3,575 jobs in 2006/07 and accounted for 11 per cent of the regional total. Flow-on employment in other sectors of the regional economy summed to over 3,900 jobs and was greatest in the trade (1,563 jobs), transport (630) and business services (343) sectors. Directly and indirectly, the timber industry generated almost 7,500 jobs in the SE SA regional economy in 2006/07, approximately 22 per cent of the total.

Household income...

Household income generated by the timber industry was around \$235m in 2006/07, and accounted for 19 per cent of the regional total. Flow-on household income in other sectors in the regional economy summed to almost \$150m and was greatest in the trade (\$42m), transport (\$33m) and business services (\$17m) sectors. Directly and indirectly, the timber industry generated over \$380m in household income in the SE SA regional economy in 2006/07, approximately 30 per cent of the total.

5.3 Economic impact of the timber industry in SE SA, time-series

Based on this analysis and previous work undertaken by the consultants (EconSearch 1998, 2001 and 2005a), it was possible to compile time-series estimates of the contribution of the timber industry to the regional economy of SE SA for the years 1995/96, 1998/99, 2003/04 and 2006/07. The direct and indirect impact of the timber industry on regional economic activity over the eleven year period is summarised in Table 5.2 in terms of the key indicators:

- GRP; and
- employment.

Table 5.2 Direct and indirect GRP and employment impacts of the timber industry, SE SA, 1995/96, 1998/99, 2003/04 and 2006/07 ^a

	Contribution to GRP (\$m)				Employment (no. jobs)			
	1995/96	1998/99	2003/04	2006/07	1995/96	1998/99	2003/04	2006/07
Direct	264	289	467	520	3,434	3,358	3,666	3,575
Indirect (flow-on)	182	194	197	239	3,430	3,422	3,416	3,921
Total timber industry impact	446	483	664	759	6,864	6,780	7,082	7,496
Regional total	1,470	1,728	2,488	2,681	26,790	27,770	34,130	33,335
Proportion of region	30%	28%	27%	28%	26%	24%	21%	22%

^a GRP impacts are a measure of gross regional product in nominal dollars. Employment impacts are a measured in terms of the number of full-time and part-time jobs.

Source: EconSearch analysis.

Caution needs to be exercised when interpreting these estimates. There are a number of important points that need to be taken into account.

- Estimates of the direct impact of the timber industry on the SE SA regional economy for the years 1995/96, 1998/99, 2003/04 and 2006/07 were calculated on the basis of four, distinct surveys. Although the major operators in the industry have responded to each survey, there still exists the possibility of sample bias in the survey results.
- The estimate of direct GRP by the forestry sector has been calculated on the basis of actual output and expenditure provided by plantation forestry specialists and imputed output for processing firms that grow all or a proportion of their own logs. As well as measuring changes in the net contribution of forestry to the regional economy, temporal variability in this indicator could also reflect the quality of the survey data provided and improvements in the interpretation of these data. Data provided in the most recent survey (i.e. for 2006/07) have enabled a more accurate allocation of direct GRP between forestry and processing.
- Time series estimates of the indirect (flow-on) impact of the timber industry on the SE SA regional economy were generated using different I-O models. In turn, these models were constructed using different data sources and methods. The I-O models for 2003/04 and 2006/07 were based on a suite of integrated regional models and a state I-O model prepared by EconSearch (2005), in collaboration with the Centre of Policy Studies at Monash University. These models for the SE SA regional economy are considered to provide a more accurate representation of the structure of the linkages in the regional economy than those used to prepare impact estimates for 1995/96 and 1998/99. Thus, it is possible that the indirect impacts of the timber industry in SE SA were overestimated for the years 1995/96 and 1998/99.

It is apparent, however, that the following trends are evident in these time-series data.

- The total GRP impact of the timber industry increased in nominal terms over the period of analysis from \$446m in 1995/96 to \$759m in 2006/07, a 70 per cent increase. In real terms (i.e. adjusted for price changes¹²), this is an increase of 29 per cent.
- The total employment impact of the timber industry also increased over the period of analysis from 6,864 jobs in 1995/96 to 7,496 jobs in 2006/07, an increase of 9 per cent. The less than proportional increase in employment impacts, when compared with GRP, probably reflects industry and economy-wide labour productivity improvements.

¹² Using a consumer price index for Adelaide from ABS (2007c).

6. Economic Impact of Permanent Reductions in the Area of the Forestry Plantation Estate

The purpose of this section of the report is to provide estimates of the economic impact of permanent reductions in the area of the plantation estate of 5,000, 10,000, 15,000 and 20,000 ha, respectively.

The likely response by timber industry firms to these potential area reductions, based on the survey data, is detailed in Section 6.1. Other data and assumptions and the results of the impact analysis are provided in Sections 6.2 and 6.3, respectively.

6.1 Survey Responses

In order to assess the economic impact of a permanent reduction in the area of the plantation estate in SE SA of 5,000, 10,000, 15,000 and 20,000 ha, respondents to the timber industry survey conducted for this study were posed the following question.

Please indicate the impact on your firm's level of employment, raw material costs and gross revenue of permanent reductions in plantation area in the SE region or permanent reductions in wood supply from the SE region of the following magnitudes; 3.5, 7, 11 and 14 per cent¹³.

A summary of the responses to this question by survey participants is provided below. The level of detail in this summary reflects the assurance provided by the consultants to survey participants that the confidentiality of their responses will be respected.

- For plantation forestry firms, reductions in plantation area are anticipated to have a more or less proportional impact on the volume of output. However, given the supply-induced impact on price (see next dot point), a less than proportional impact on the value of output is expected, at least in the longer term. Direct employment in forestry firms is not expected to decline significantly but employment of local contractors (planting, spraying, harvesting, transport, etc.) is expected to decrease in proportion to the decline in area.
- In the short to medium term (i.e. approximately 5 years) there is expected to be little or no impact on the plantation-gate price of locally sourced wood in response to a decline in the supply of raw material from the SE SA region, reflecting the impact of fixed-price contracts.
- In the longer term (i.e. 10 years or more) there is expected to be a positive impact on the plantation-gate price of locally sourced wood in response to a decline in the supply of raw material from the SE SA region. This relationship can be measured using a price flexibility coefficient, that is, the percentage change in price given a one per cent change in the quantity supplied. This can, in turn, be approximated using the reciprocal of the price elasticity of demand (i.e. the percentage change in the quantity demanded resulting from a 1 per cent increase in price). In the longer term, the price elasticity of demand for locally sourced wood is expected to be relatively elastic, given the availability of substitutes (i.e. wood imported from elsewhere in SA, interstate

¹³ These proportional reductions relate to a total plantation area (2006/07) of 140,000 ha (PIRSA Forestry, pers. comm.).

and overseas). A value of -4 has been used in the analysis. The reciprocal, the price flexibility coefficient, was -0.25¹⁴.

- For the majority of timber processing firms, the initial impact of a reduction in plantation area would primarily be an increase in raw material costs associated with the necessity to import more expensive wood or pulp to substitute for the loss of local product. This would be reflected in reduced processing margins and a consequent loss of profitability. Some firms also indicated that there would be modest reductions in employment and throughput (hence value of output), even for the 'low' (i.e. 5,000 ha) scenario. For larger reductions in area, some timber processing firms would shed a significant number of jobs and markedly reduce their throughput and, based on the survey results, at least one smaller processing firm would probably cease operating.
- Given the paucity of relevant data, it was not possible to quantify the impacts on the proposed Penola pulp mill of permanent reductions in the area of the plantation estate. Based on consultation with John Roche (Director - Project Origination and Development, Protavia Pty Ltd, pers. comm.)¹⁵, the following conclusions were reached.
 - The proposed pulp mill in SE SA is anticipated to directly generate approximately 1,200 fte jobs during its 2.5 year construction phase with a total construction cost of \$1.5 billion. Once operational, the facility is anticipated to process approximately 1.5 Mt of raw material per annum and directly employ 120 fte. Although there are not enough data to accurately estimate the flow-on effects generated in the local economy by this level of activity it is, nevertheless, likely to be significant.
 - Whilst there is uncertainty associated with the water allocation plan and possible permanent reductions in plantation area in SE SA, local plantation companies are not willing to contract more than one rotation's supply to the pulp mill. However, the mill is a capital intensive development with a long term planning horizon. Lending institutions require a minimum of two supply rotations before they will commit funds for the construction and subsequent operation of the facility. The proposals in the draft water allocation plan have thus created considerable investment uncertainty.
- Many respondents, particularly those in hardwood plantation businesses, also referred to the investment uncertainty that has been created by the possible introduction of these restrictions on the industry. This uncertainty is difficult to model in an I-O framework but could have significant economic consequences for the region in terms of investment, for example, in new or expanded processing infrastructure.

¹⁴ That is, there would be a 0.25 per cent increase in price given a 1 per cent decrease in the quantity supplied.

¹⁵ Reflecting confidentiality considerations, the following text was provided to Protavia by email on 26 February 2008 for review prior to publication. No response was received.

6.2 Other Data and Assumptions

In addition to the relevant survey data obtained directly from timber industry firms, the following assumptions and data have been used in modelling the impact of the future plantation area reduction scenarios for the timber industry.

- Permanent reductions in the area of the plantation estate of 5,000 to 10,000 ha were considered to be possible within the life of the first five-year water allocation plan for the region whilst those of 15,000 to 20,000 ha were considered to be possible within the life of the second five-year plan (PIRSA Forestry, pers. comm.).
- Impacts for the 5,000 ha and 10,000 ha scenarios relate to a time period 5 years in the future (i.e. 2012/13) and those for the 15,000 ha and 20,000 ha scenarios relate to a time period 10 years in the future (i.e. 2017/18).
- For each scenario, the alternative land use to plantation forestry was assumed to be a mix of dryland agriculture (60 per cent of the total area) and land with uses for which there is little or no measurable economic impact, for example, the extension of plantation firebreaks (40 per cent).
- Costs that may be incurred by plantation forestry landowners in converting to an alternative land use (e.g. fencing, spraying, pasture re-establishment, etc.) have been excluded from the analysis. Whilst these costs would have a negative impact on profitability levels in the plantation forestry sector, there would be offsetting positive impacts from, for example, the employment of contractors to undertake these types of activities.
- For the dryland agriculture portion of the 5,000 ha and 10,000 ha scenarios, stumps from previous forestry activity would be sprayed to prevent coppice regrowth but would prevent cropping from taking place. For the 15,000 ha and 20,000 ha scenarios, stumps from previous forestry activity would decompose sufficiently to allow cropping to take place.
- Dryland agriculture for the 5,000 and 10,000 ha scenarios would be comprised of wool growing (self replacing merino flock) and beef cattle breeding activities in equal proportions. For the 15,000 and 20,000 ha scenarios, the first 6,000 ha would be 50:50 sheep/beef and the balance (3,000 or 6,000 ha, respectively) would be comprised of sheep, beef and cropping (APW wheat) in equal proportions.
- Value of output estimates for dryland agriculture were based on gross income per hectare for a self replacing merino flock, beef cattle breeding and APW wheat in high rainfall regions reported in Rural Solutions SA (2007). Employment estimates for dryland livestock activities were based on a stocking rate of 10 dry sheep equivalents (dse) per hectare and a labour requirement of 4,000 dse/fte for sheep and 5,000 dse/fte for beef. Labour requirements for cropping were assumed to be 1 fte/500 ha.
- For the purpose of this analysis it was assumed that additional output from the dryland agriculture sectors would be processed within the region and exported in equal proportions.
- The direct and flow-on impacts of the timber industry under the future scenarios have been estimated in constant (2006/07 dollars) and by holding all other variables within the I-O model constant. Thus, for example, it was assumed that labour productivity across industries, processing capacity, long-term average rainfall, etc. remain constant.

- Economic impacts for the future scenarios have been presented as net impacts and represent the economic impact of the timber industry in 2012/13 or 2017/18 net of the current (i.e. 2006/07) economic impact of the timber industry, as detailed in Section 5. Importantly, net impacts also account for growth in the alternative industry, dryland agriculture.

6.3 Results of the Impact Analysis

The results of the impact analysis for the 5,000, 10,000, 15,000 and 20,000 ha scenarios are presented in Tables 6.1 to 6.4, respectively. Detailed interpretation of the results is provided below for the 5,000 ha scenario and some general observations and conclusions drawn from all four scenarios are also reported.

An important assumption of the standard I-O model constructed for the SE SA regional economy is that there is a proportional relationship between household income and consumption. If household income is 'lost' as a result of a decline in employment in an industry (e.g. the timber industry), it is assumed that consumption declines according to the consumption coefficients specified in the model.

In reality, although alternative employment opportunities may be limited in the SE SA regional economy, not all those who lose their jobs will move away from the region or even leave the workforce. Some may still live in the region and commute to work outside the region (e.g. in the timber industry in South-West Victoria) or continue to look for work locally and draw unemployment benefits. In either case, the new source of income will mean that local consumption expenditure, although diminished, will not disappear altogether.

To account for this range of possibilities, the results of the analysis (i.e. flow-on and total impacts) have been presented to include an upper estimate of impact, which assumes a proportional relationship between income and consumption, and a lower estimate, which ignores consumption-related impacts. The actual impact is likely to fall somewhere between these two bounds.

6.3.1 Interpretation of the results for the 5,000 ha scenario

Detailed interpretation of the results of the economic impact analysis for the 5,000 ha scenario (Table 6.1) is provided below.

Value of output...

In response to a 5,000 ha reduction in the area of the plantation estate in SE SA by 2012/13 (i.e. over a period of 5 years), the direct value of output of the forestry sector is expected to decrease by approximately \$5.2m, a decline of 3.5 per cent relative to the current (i.e. 2006/07) value. This would be comprised of a decrease in the volume of forestry output in proportion to the decline in area and, given the short-term nature of the response (see Section 6.1), no offsetting increase in the price of locally sourced product in response to the decrease in supply. The direct value of output of the wood and paper products sector (i.e. timber processing) is expected to decrease by approximately \$11.2m, a decline of 1.0 per cent. Throughput would decline due to a reduction in local wood supply although the shortfall would be partially filled by more expensive raw material from outside the region.

Table 6.1 Net economic impact of a 5,000 ha reduction in the area of the plantation estate in SE SA, 2012/13 ^a

	Value of Output		GRP		Employment		Household Income	
	\$m	Change ^b	\$m	Change ^b	No. of jobs	Change ^b	\$m	Change ^b
Direct impact								
Dryland agriculture	1.4	-	0.6	-	8	-	0.3	-
Agricultural processing	1.0	-	0.3	-	4	-	0.2	-
Forestry	-5.2	-3.5%	-2.7	-7.2%	-9	-1.4%	-0.5	-1.3%
Wood and paper products	-11.2	-1.0%	-10.5	-2.2%	-4	-0.1%	-0.3	-0.1%
Total direct	-13.9	-1.1%	-12.4	-2.4%	-1	0.0%	-0.3	-0.1%
Flow-on impact								
High ^c			-4.5	-1.9%	-71	-1.8%	-2.8	-1.9%
Low ^d			-2.4	-1.0%	-40	-1.0%	-1.7	-1.2%
Total impact (direct + flow-on)								
High ^c			-16.9	-2.2%	-72	-1.0%	-3.0	-0.8%
Low ^d			-14.8	-1.9%	-41	-0.6%	-2.0	-0.5%

^a All monetary values are in 2006/07 dollars. A 5,000 ha reduction in the area of the plantation estate represents 3.5 per cent of the current (i.e. 2006/07) area.

^b Change relative to the 2006/07 estimate (see Table 5.1).

^c High estimates account for both production and consumption-induced flow-on effects.

^d Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

Partially offsetting these negative impacts is direct output generated by 3,000 ha of dryland agriculture (\$1.4m) and output generated by local processing of half of this volume of agricultural output (\$1.0m). In aggregate, the direct output impact of the scenario is expected to be a net reduction of approximately \$13.9m.

Gross regional product...

Direct GRP generated by the forestry sector is expected to decrease by approximately \$2.7m, a decline of 7.2 per cent relative to the current value. Direct GRP generated by the timber processing sector is expected to decrease by around \$10.5m, a decline of 2.2 per cent. Note that the direct GRP impact for this sector is almost as large as the direct output impact (\$11.2m). In other words, whilst the throughput of timber processing firms is only expected to decline marginally (i.e. by 1 per cent), this will be achieved by substituting more expensive imported wood for locally sourced product with significant consequences for profitability. Partially offsetting these negative impacts is direct GRP generated by dryland agriculture and associated processing of around \$0.9m.

Net GRP flow-ons generated by a decline in the timber industry and growth in dryland agriculture and agricultural processing are expected to range from -\$2.4m to -\$4.5m, a decrease of 1.0 to 1.9 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on GRP is expected to decline by \$14.8m to \$16.9m, a decrease of 1.9 to 2.2 per cent.

Employment...

Direct employment in the forestry sector (i.e. plantation forestry firms and forestry contractors) is expected to decrease by 9 jobs, a decline of 1.4 per cent relative to the current level of employment¹⁶. Employment in the timber processing sector is expected to decrease only marginally (4 jobs), a decline of 0.1 per cent. Partially offsetting these negative impacts is employment generated by dryland agriculture and associated processing, estimated to be around 12 jobs.

Net employment flow-ons are expected to range from -40 to -71 jobs, a decrease of 1.1 to 1.8 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on employment is expected to decline by 41 to 72 jobs, a decrease of 0.6 to 1.0 per cent.

Household income...

Direct household income generated by the forestry sector is expected to decrease by approximately \$0.5m, a decline of 1.3 per cent relative to the current value¹⁷. Direct household income generated by the timber processing sector is expected to decrease by around \$0.3m, a decline of 0.1 per cent. Partially offsetting these negative impacts is direct household income generated by dryland agriculture and associated processing of around \$0.5m.

Net household income flow-ons are expected to range from -\$1.7m to -\$2.8m, a decrease of 1.2 to 1.9 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on household income is expected to decline by \$2.0m to \$3.0m, a decrease of 0.5 to 0.8 per cent.

¹⁶ Based on the survey responses it was evident that the jobs losses in the forestry sector would be primarily contractors (i.e. planting, harvesting, transport, etc.) rather than employees of plantation forest companies.

6.3.2 Results for the 10,000, 15,000 and 20,000 ha scenarios

Table 6.2 Net economic impact of a 10,000 ha reduction in the area of the plantation estate in SE SA, 2012/13 ^a

	Value of Output		GRP		Employment		Household Income	
	\$m	Change ^b	\$m	Change ^b	No. of jobs	Change ^b	\$m	Change ^b
Direct impact								
Dryland agriculture	2.7	-	1.2	-	15	-	0.6	-
Agricultural processing	2.1	-	0.5	-	8	-	0.4	-
Forestry	-10.4	-7.0%	-5.4	-14.3%	-19	-3.2%	-1.0	-2.9%
Wood and paper products	-21.6	-2.0%	-21.8	-4.5%	-56	-1.9%	-3.6	-1.8%
Total direct	-27.1	-2.2%	-25.5	-4.9%	-51	-1.4%	-3.7	-1.6%
Flow-on impact								
High ^c			-9.4	-3.9%	-156	-4.0%	-6.3	-4.3%
Low ^d			-5.2	-2.2%	-94	-2.4%	-4.3	-2.9%
Total impact (direct + flow-on)								
High ^c			-34.9	-4.6%	-207	-2.8%	-10.1	-2.6%
Low ^d			-30.7	-4.0%	-145	-1.9%	-8.0	-2.1%

^a All monetary values are in 2006/07 dollars. A 10,000 ha reduction in the area of the plantation estate represents 7 per cent of the current (i.e. 2006/07) area.

^b Change relative to the 2006/07 estimate (see Table 5.1).

^c High estimates account for both production and consumption-induced flow-on effects.

^d Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

Table 6.3 Net economic impact of a 15,000 ha reduction in the area of the plantation estate in SE SA, 2017/18 ^a

	Value of Output		GRP		Employment		Household Income	
	\$m	Change ^b	\$m	Change ^b	No. of jobs	Change ^b	\$m	Change ^b
Direct impact								
Dryland agriculture	4.3	-	2.0	-	23	-	0.9	-
Agricultural processing	3.2	-	0.8	-	13	-	0.6	-
Forestry	-12.7	-8.6%	-4.9	-12.9%	-44	-7.4%	-2.6	-7.3%
Wood and paper products	-33.8	-3.2%	-33.5	-6.9%	-209	-7.0%	-13.2	-6.6%
Total direct	-39.0	-3.2%	-35.6	-6.8%	-218	-6.1%	-14.3	-6.1%
Flow-on impact								
High ^c			-14.6	-6.1%	-243	-6.2%	-9.9	-6.7%
Low ^d			-8.2	-3.4%	-148	-3.8%	-6.7	-4.5%
Total impact (direct + flow-on)								
High ^c			-50.3	-6.6%	-461	-6.2%	-24.1	-6.3%
Low ^d			-43.8	-5.8%	-366	-4.9%	-20.9	-5.5%

^a All monetary values are in 2006/07 dollars. A 15,000 ha reduction in the area of the plantation estate represents 11 per cent of the current (i.e. 2006/07) area.

^b Change relative to the 2006/07 estimate (see Table 5.1).

^c High estimates account for both production and consumption-induced flow-on effects.

^d Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

Table 6.4 Net economic impact of a 20,000 ha reduction in the area of the plantation estate in SE SA, 2017/18 ^a

	Value of Output		GRP		Employment		Household Income	
	\$m	Change ^b	\$m	Change ^b	No. of jobs	Change ^b	\$m	Change ^b
Direct impact								
Dryland agriculture	5.9	-	2.7	-	30	-	1.2	-
Agricultural processing	4.4	-	1.1	-	18	-	0.8	-
Forestry	-16.3	-11.0%	-6.3	-16.8%	-54	-9.0%	-3.1	-8.8%
Wood and paper products	-43.0	-4.0%	-42.8	-8.9%	-240	-8.1%	-15.2	-7.6%
Total direct	-49.0	-4.0%	-45.4	-8.7%	-246	-6.9%	-16.3	-6.9%
Flow-on impact								
High ^c			-18.5	-7.7%	-310	-7.9%	-12.6	-8.5%
Low ^d			-10.3	-4.3%	-189	-4.8%	-8.5	-5.8%
Total impact (direct + flow-on)								
High ^c			-63.8	-8.4%	-556	-7.4%	-28.9	-7.5%
Low ^d			-55.6	-7.3%	-435	-5.8%	-24.8	-6.5%

^a All monetary values are in 2006/07 dollars. A 20,000 ha reduction in the area of the plantation estate represents 14 per cent of the current (i.e. 2006/07) area.

^b Change relative to the 2006/07 estimate (see Table 5.1).

^c High estimates account for both production and consumption-induced flow-on effects.

^d Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

6.3.3 Observations and conclusions from all plantation area reduction scenarios

Some general observations and conclusions drawn from the 5,000 to 20,000 ha scenarios are provided below.

- Reflecting the non-linearity revealed in the survey responses, the magnitude of each scenario's impact is not proportional to the reduction in area of plantation estate. For example, the total employment impact of the 20,000 ha scenario (-556 jobs for the high impact in Table 6.4) is more than twice as great as that for the 10,000 ha scenario (-207 jobs in Table 6.2). In other words, whilst timber industry firms would appear to have the ability to absorb a modest reduction in local plantation area with little more than a reduction in margins, larger reductions would have significant implications for throughput, employment and profitability.
- Whilst the direct and flow-on impacts of the 15,000 and 20,000 ha are regionally significant, there was no indication from the survey respondents that large timber processing facilities would be forced to cease operations. There would, however, be some inevitable downsizing of these operations.
- These estimates of economic impact exclude the financial implications to plantation forestry owners associated with the potential for carbon trading that is foregone as a result of the inability to re-plant existing plantations or establish new plantations in specified areas. No attempt has been made in this analysis to put a value on these potential losses.
- Given the long-term nature of some plantation forestry rotations (i.e. 30 years or more) it is likely that some of the economic impacts attributable to these area reduction scenarios will be experienced beyond the completion of the second water allocation plan in 2017/18.

- As stated in Section 6.1, many respondents, particularly those in hardwood plantation businesses, referred to the investment uncertainty that has been created by the possible introduction of restrictions of this nature on the timber industry. This uncertainty is difficult to model in an I-O framework but could have significant economic consequences for the region in terms of investment in, for example, new or expanded processing infrastructure.

7. Economic Impact of Reductions in Regional Water Use: Forestry and Irrigated Agriculture

The purpose of this section of the report is to provide estimates of the economic impact of a permanent reduction in regional water use of 4 GL/annum achieved through:

1. a reduction in the area of the plantation estate; and
2. a reduction in the area of irrigated agriculture.

The volume of reduced regional water use (4 GL/annum) is an estimate of the average over allocation for over allocated zones in the Lower Limestone Coast Prescribed Wells Area and was derived from Table 1, page 73 of the *Draft Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area* (South East Natural Resources Management Board 2007) (PIRSA Forestry, pers. comm.).

7.1 Economic Impact of a Permanent Reduction in Water Use by Plantation Forestry

On the basis that plantation forestry in SE SA utilises, on average, 1.44 ML/ha/annum (derived from SENRM data by PIRSA Forestry)¹⁷, a 4 GL/annum reduction in water use is equivalent to a permanent reduction in the area of plantation forestry of approximately 2,800 ha which, in turn, represents a 2 per cent reduction in the current plantation area in the region. Although the question was not specifically posed in the timber industry survey, it was assumed that the response by timber industry firms to a permanent reduction in plantation area or permanent reduction in wood supply from the SE SA region of this order of magnitude would be proportional to that provided for the 3.5 per cent or 5,000 ha scenario (Section 6).

In addition to the modified survey data obtained directly from timber industry firms, the following assumptions and data have been used in modelling the impact of this scenario for the timber industry.

- A permanent reduction in the area of the plantation estate of 2,800 ha was considered to be possible within the life of the first five-year water allocation plan for the region and the impact for this scenario relates to a time period 5 years in the future (i.e. 2012/13).
- The alternative land use to plantation forestry was assumed to be a mix of dryland agriculture (60 per cent of the total area) and, the balance, land with uses for which there is little or no measurable economic impact. Costs that may be incurred by plantation forestry landowners in converting to an alternative land use (e.g. fencing, spraying, pasture re-establishment, etc.) have been excluded from the analysis.
- For the dryland agriculture portion of the area it was assumed that stumps from previous forestry activity would be sprayed to prevent coppice regrowth but would prevent cropping from taking place. Dryland agriculture for this scenario would be comprised of wool growing (self replacing merino flock) and beef cattle breeding activities in equal proportions. As for the area reduction scenarios it was assumed that additional output from the dryland agriculture

¹⁷ SENRM (2007).

sectors would be processed within the region and exported in equal proportions.

- The direct and flow-on impacts of the timber industry under this future scenario have been estimated in constant (2006/07 dollars) and by holding all other variables within the I-O model constant. These economic impacts have been presented as net impacts and represent the economic impact of the timber industry in 2012/13 net of the current (i.e. 2006/07) economic impact of the timber industry, as detailed in Section 5.

The results of the impact analysis for the water use reduction scenario for plantation forestry are presented in Table 7.1. As in Section 6.1, the results of the analysis (i.e. flow-on and total impacts) have been presented to include an upper estimate of impact, which assumes a proportional relationship between income and consumption, and a lower estimate, which ignores consumption-related impacts. The actual impact is likely to fall somewhere between these two bounds.

Table 7.1 Net economic impact of a 4 GL per annum reduction in water use by plantation forestry, SE SA, 2012/13 ^a

	Value of Output		Contribution to GRP		Employment		Household Income	
	\$m	Change ^b	\$m	Change ^b	No. of jobs	Change ^b	\$m	Change ^b
Direct impact								
Dryland agriculture	0.8	-	0.3	-	4	-	0.2	-
Agricultural processing	0.6	-	0.1	-	2	-	0.1	-
Forestry	-2.9	-2.0%	-1.5	-4.1%	-5	-0.8%	-0.3	-0.7%
Wood and paper products	-6.3	-0.6%	-6.0	-1.2%	-2	-0.1%	-0.2	-0.1%
Total direct	-7.9	-0.7%	-7.0	-1.3%	-1	0.0%	-0.2	-0.1%
Flow-on impact								
High ^c			-4.4	-1.8%	-69	-1.8%	-2.8	-1.9%
Low ^d			-2.5	-1.0%	-41	-1.0%	-1.9	-1.3%
Total impact (direct + flow-on)								
High ^c			-11.4	-1.5%	-69	-0.9%	-3.0	-0.8%
Low ^d			-9.5	-1.2%	-42	-0.6%	-2.1	-0.5%

^a All monetary values are in 2006/07 dollars. A 4 GL/annum reduction in water use by plantation forestry equates to a 2,800 ha reduction in the area of the plantation estate which, in turn, represents 2 per cent of the current (i.e. 2006/07) area.

^b Change relative to the 2006/07 estimate (see Table 5.1).

^c High estimates account for both production and consumption-induced flow-on effects.

^d Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

Value of output...

In order to reduce water use by 4 GL/annum by 2012/13, the plantation forestry estate in SE SA would need to be permanently reduced by 2,800 ha. In response, the direct value of output of the forestry sector is expected to decrease by approximately \$2.9m, a decline of 2.0 per cent relative to the current value. This would be comprised of a decrease in the volume of forestry output in proportion to the decline in area and, given the short-term nature of the response, no offsetting increase in the price of locally sourced product in response to the decrease in supply. The direct value of output of the wood and paper products sector is expected to decrease by approximately \$6.3m, a decline of 0.6 per cent. Throughput would decline due to a reduction in local wood

supply although the shortfall would be partially filled by more expensive raw material from outside the region.

Partially offsetting these negative impacts is direct output generated by approximately 1,700 ha of dryland agriculture (\$0.8m) and output generated by local processing of half of this volume of agricultural output (\$0.6m). In aggregate, the direct output impact of the scenario is expected to be a net reduction of approximately \$7.9m.

Gross regional product...

Direct GRP generated by the forestry sector is expected to decrease by approximately \$1.5m, a decline of 4.1 per cent relative to the current value. Direct GRP generated by the timber processing sector is expected to decrease by around \$6.0m, a decline of 1.2 per cent. Partially offsetting these negative impacts is direct GRP generated by dryland agriculture and associated processing of around \$0.4m.

Net GRP flow-ons generated by a decline in the timber industry and growth in dryland agriculture and agricultural processing are expected to range from -\$2.5m to -\$4.4m, a decrease of 1.0 to 1.8 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on GRP is expected to decline by \$9.5m to \$11.4m, a decrease of 1.2 to 1.5 per cent.

Employment...

Direct employment in the forestry sector is expected to decrease by 5 jobs, a decline of 0.8 per cent relative to the current level of employment. Employment in the timber processing sector is expected to decrease only marginally (2 jobs), a decline of 0.1 per cent. Partially offsetting these negative impacts is employment generated by dryland agriculture and associated processing, estimated to be around 6 jobs.

Net employment flow-ons are expected to range from -41 to -69 jobs, a decrease of 1.0 to 1.8 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on employment is expected to decline by 42 to 69 jobs, a decrease of 0.6 to 0.9 per cent.

Household income...

Direct household income generated by the forestry sector is expected to decrease by approximately \$0.3m, a decline of 0.7 per cent relative to the current value. Direct household income generated by the timber processing sector is expected to decrease by around \$0.2m, a decline of 0.1 per cent. Partially offsetting these negative impacts is direct household income generated by dryland agriculture and associated processing of around \$0.3m.

Net household income flow-ons are expected to range from -\$1.9m to -\$2.8m, a decrease of 1.3 to 1.9 per cent relative to the flow-ons currently generated by the timber industry. In aggregate, direct and flow-on household income is expected to decline by \$2.1m to \$3.0m, a decrease of 0.5 to 0.8 per cent.

7.2 Economic Impact of a Permanent Reduction in Water Use by Irrigated Agriculture

Estimates of the economic impact of a permanent reduction in regional water use of 4 GL/annum achieved through a reduction in the area of irrigated agriculture are provided below for two scenarios:

1. a reduction in water use by irrigated agriculture where water use is defined as water pumped by irrigators from the aquifer; and
2. a reduction in irrigation water allocation, where water use is assumed to be, on average, 40 per cent of the total allocation¹⁸.

In order to estimate the economic impact of a permanent reduction in regional water use/allocation through a reduction in the area of irrigated agriculture, it was first necessary to construct a profile of irrigated agriculture in the LLCWAP region. The method used to construct this profile was identical to that used by the consultants for a profile of the South East region Prescribed Wells Areas (PWAs) for 2003/04 (EconSearch 2006).

For the purpose of this study, the region of interest is the LLCWAP region or the LLCPWA, formerly comprised of the following PWAs:

- Naracoorte Ranges;
- Lacepede Kongorong; and
- Comaum Caroline.

The basis for the profile was estimates for 2006/07 for each of these PWAs of:

- irrigated crop type by area by irrigation method; and
- crop type by average water use (pumped) per hectare.

These data were supplied by Brian Latcham (Senior Project Officer, DWLBC, South East Region, pers. comm.) and are detailed in Table 7.2.

By applying estimates of the proportion of total irrigated area by crop in the LLCPWA region to estimates of average water use by crop (from Table 7.2), it was possible to develop a profile of the reduced irrigated area (by crop) necessary to achieve a reduction in water use of 4 GL (i.e. 4,000 ML). Similarly, assuming that water use is, on average, 40 per cent of the total allocation for all irrigated crop types, it was possible to develop a profile of the reduced irrigated area (by crop) necessary to achieve a reduction in water allocation of 4 GL. These data are provided in Table 7.3.

In order to achieve a reduction in water use of 4 GL/annum in the LLCPWA, it was estimated that the area of irrigated agriculture would need to fall by approximately 700 ha. An equivalent reduction in water allocation would equate to fall in the area of irrigated agriculture of 280 ha (Table 7.3). In both cases, pasture (60 per cent) and winegrapes (19 per cent) would account for the majority of the reduced area.

¹⁸ Derived from Table 1, Chapter 8 of *A New Understanding on the Level of Development of the Unconfined Tertiary Limestone Aquifer in the South East of South Australia* (DWLBC 2007) (PIRSA Forestry, pers. comm.).

Table 7.2 Profile of irrigated activity in the Lower Limestone Coast Prescribed Wells Area, 2006/07

Crop Type	Area by Irrigation Method ^a				Irrigation Rate ^b			Estimated Water Use/Pumped ^c			
	Drip	Flood	Spray	Total	Drip	Flood	Spray	Drip	Flood	Spray	Total
	ha	ha	ha	ha	ML/ha	ML/ha	ML/ha	ML	ML	ML	ML
Vines	9,701	0	742	10,443	1.7	-	3.8	16,820	0	2,844	19,664
Vegetables	6	0	542	549	2.3	-	5.6	14	0	3,034	3,048
Recreation	0	0	18	18	-	-	2.6	0	0	46	46
Potatoes	0	0	1,910	1,910	-	-	5.7	0	0	10,835	10,835
Pasture/Seed	245	16	2,388	2,648	1.4	6.2	4.9	335	99	11,791	12,225
Pasture	19	7,848	25,515	33,383	1.0	13.9	5.1	19	108,874	129,866	238,760
Oilseeds	0	50	381	431	-	3.0	3.5	0	150	1,335	1,485
Lucerne	0	163	972	1,136	-	16.1	5.4	0	2,630	5,264	7,893
Grain Legumes	0	12	138	150	-	3.0	0.8	0	36	106	142
Fruit and Nuts	178	0	40	217	1.9	-	4.7	340	0	184	524
Fodder	0	402	2,551	2,953	-	10.9	4.8	0	4,398	12,179	16,577
Flowers/Shrubs	156	0	2	158	1.3	-	1.7	204	0	3	207
Cereals	10	88	446	544	1.2	10.7	2.3	12	946	1,025	1,983
Olives	230	0	4	234	2.1	-	2.9	491	0	12	503
Vegetable Seed	9	0	246	254	2.5	-	3.9	21	0	956	978
Other	60	23	633	716	1.6	14.6	4.6	97	342	2,942	3,381
None	0	0	0	0	-	-	-	0	0	0	0
Total	10,613	8,603	36,526	55,742	-	-	-	18,355	117,474	182,421	318,250

^a Estimates of irrigated crop type by area by irrigation method by component PWA were obtained from Brian Latcham (DWLBC pers. comm.). These data are based on a sample of approximately 90 per cent of the Annual Water Use Returns within the region.

^b Irrigation rates by crop type by component PWA were provided by Brian Latcham (DWLBC, pers. comm.). The upper and lower 25 per cent of extractive use data was excluded from the calculation of these estimates to account for incorrect meter reading by licensees. Where these data were unavailable for 2006/07 they have been imputed on the basis of similar data for 2003/04 in EconSearch (2006).

^c Estimates of water use (i.e. water pumped) by crop have been imputed as a product of the area of irrigated activity by crop and estimates of irrigation rates by crop.

Estimates of reduced gross value of production (GVP) by irrigated crop type were imputed as a product of the reduced area by crop type and average values per hectare by crop type. These latter data were obtained from a variety of sources and are detailed in Appendix 3.

In order to achieve a reduction in water use of 4 GL/annum in the LLCPWA, it was estimated that irrigated agriculture GVP would fall by approximately \$3.3m. An equivalent reduction in water allocation would result in a fall in irrigated agriculture GVP of \$1.3m (Table 7.3). In both cases, pasture (21 per cent) and winegrapes (52 per cent) would account for the majority of the reduced GVP.

In addition to the estimates of reduced irrigated agricultural GVP, the following assumptions and data have been used in modelling the impact of this regional water use reduction scenario.

- Permanent reductions in the area of the irrigated agriculture of the order of magnitude referred to above were considered to be possible within the life of the first five-year water allocation plan for the region and the impacts for these scenarios relates to a time period 5 years in the future (i.e. 2012/13).

Table 7.3 Reduced area and gross value of production by crop type necessary to achieve a 4GL reduction in water use/allocation, LLCPWA, 2006/07

	Profile of irrigated agriculture in LLCPWA		Reduction in irrigated agriculture based on average water use/pumped			Reduction in irrigated agriculture based on imputed water allocations		
	Proportion of total irrigated area by crop ^a	Average water use (ML/ha) ^b	Area (ha)	Water use (ML)	GVP (\$m) ^d	Area (ha)	Notional water allocation (ML) ^c	GVP (\$m) ^d
Winegrapes	18.7%	1.9	131	247	1.714	53	247	0.686
Vegetables	1.0%	5.6	7	38	0.094	3	38	0.038
Potatoes	3.4%	5.7	24	136	0.509	10	136	0.204
Pasture/Seed	4.8%	4.6	33	154	0.095	13	154	0.038
Pasture	59.9%	7.2	420	3,001	0.683	168	3,001	0.273
Oilseeds	0.8%	3.4	5	19	0.009	2	19	0.004
Lucerne	2.0%	7.0	14	99	0.029	6	99	0.011
Grain Legumes	0.3%	0.9	2	2	0.002	1	2	0.001
Fruit and Nuts	0.4%	2.4	3	7	0.011	1	7	0.004
Fodder	5.3%	5.6	37	208	0.066	15	208	0.027
Flowers/Shrubs	0.3%	1.3	2	3	0.034	1	3	0.013
Cereals	1.0%	3.6	7	25	0.008	3	25	0.003
Olives	0.4%	2.2	3	6	0.001	1	6	0.000
Vegetable Seed	0.5%	3.8	3	12	0.031	1	12	0.012
Other irrigated agriculture	1.3%	4.7	9	42	0.015	4	42	0.006
Total	100.0%	-	701	4,000	3.301	280	4,000	1.320

^a Based on the profile of irrigated activity in the region in Table 7.2 (total area by irrigation method). Excludes the recreation and 'none' categories.

^b Based on the profile of irrigated activity in the region in Table 7.2 (average of all irrigation methods).

^c Based on the assumption that water use is 40 per cent of water allocation for all crop types.

^d A product of area by crop type and average values per hectare by crop type. These latter data are detailed in Appendix 3.

- The alternative land use to irrigated agriculture was assumed to be dryland agriculture (i.e. wool growing and beef cattle breeding activities in equal proportions). It was assumed that additional output from the dryland agriculture sectors would be processed within the region and exported in equal proportions.
- In order to be consistent with the other scenarios for the future of the timber industry in the region, it was necessary to account for the impact of reduced local supplies of irrigated agriculture products on the relevant local processing sectors. For the purpose of this analysis it was assumed that these firms (i.e. wineries, abattoirs, etc.) would maintain their current levels of throughput, turnover and employment but would be forced to source raw product from outside the SE SA region at greater cost. This additional cost was assumed to be comprised principally of a transport margin, the direct impact of which would be to reduce profit margins in the food products and wine sectors¹⁹.
- Estimates of direct employment, household income and GRP in the irrigated agriculture production and processing sectors were derived from the relevant ratios in the I-O table constructed for this project (e.g. output per job, etc.).

¹⁹ Reductions in the local supply of raw product of the order of magnitude in these scenarios are unlikely to have any positive impact on the price of locally sourced or imported product.

- The direct and flow-on impacts of the irrigated agriculture production and processing sectors under these future scenarios have been estimated in constant (2006/07 dollars) and by holding all other variables within the I-O model constant. The economic impacts of these scenarios have been presented as net impacts, that is, net of the current economic impact of the relevant sectors.

The results of the impact analysis for the irrigated agriculture water use and allocation reduction scenarios are presented in Table 7.4. As in Section 6, the results of the analysis (i.e. flow-on and total impacts) have been presented to include an upper estimate of impact, which assumes a proportional relationship between income and consumption, and a lower estimate, which ignores consumption-related impacts. The actual impact is likely to fall somewhere between these two bounds. Detailed interpretation of the results for the water use scenario is provided below.

Table 7.4 Net economic impacts of a 4 GL per annum reduction in water use and water allocation by irrigated agriculture, SE SA, 2012/13 ^a

	Value of Output (\$m)		Contribution to GRP (\$m)		Employment (no. of jobs)		Household Income (\$m)	
	Reduced water use	Reduced water allocation	Reduced water use	Reduced water allocation	Reduced water use	Reduced water allocation	Reduced water use	Reduced water allocation
Direct impact								
Dryland agriculture	0.3	0.1	0.1	0.1	2	1	0.1	0.0
Agricultural processing	0.2	0.1	0.1	0.0	1	0	0.0	0.0
Irrigated agriculture	-3.3	-1.3	-2.3	-0.9	-25	-10	-0.9	-0.4
Processing of irrigated agriculture products	0.0	0.0	-2.7	-1.1	0	0	0.0	0.0
Total direct	-2.7	-1.0	-4.8	-1.9	-22	-9	-0.8	-0.3
Flow-on impact								
High ^b			-3.6	-1.5	-48	-19	-1.8	-0.7
Low ^c			-2.6	-1.0	-34	-13	-1.3	-0.5
Total impact (direct + flow-on)								
High ^b			-8.4	-3.4	-70	-28	-2.6	-1.0
Low ^c			-7.4	-2.9	-56	-22	-2.1	-0.8

^a All monetary values are in 2006/07 dollars. A 4 GL/annum reduction in water use by irrigated agriculture equates to a 700 ha reduction in the area of irrigated agriculture (280 ha for water allocation) (Table 7.3).

^b High estimates account for both production and consumption-induced flow-on effects.

^c Low estimates account for production-induced flow-on effects only.

Source: EconSearch analysis.

Value of output...

In order to reduce water use by 4 GL/annum by 2012/13, the area of irrigated agriculture in the LLCPPWA would need to be permanently reduced by approximately 700 ha²⁰. In response, the direct value of output of the irrigated agriculture sectors is expected to decrease by approximately \$3.3m (Tables 7.3 and 7.4). The direct value of output of the irrigated agriculture processing sectors is not expected to change as the decline in locally sourced raw product would be offset by the purchase of more expensive raw material from outside the region.

²⁰ Or 280 ha for the water allocation scenario.

Partially offsetting these negative impacts is direct output generated by 700 ha of dryland agriculture (\$0.3m) and output generated by local processing of half of this volume of agricultural output (\$0.2m). In aggregate, the direct output impact of the water use scenario is expected to be a reduction of \$2.7m (\$1.0m for the water allocation scenario).

Gross regional product...

Direct GRP generated by irrigated agriculture is expected to decrease by approximately \$2.3m. Direct GRP associated with the processing of irrigated agriculture products is expected to decrease by around \$2.7m, reflecting the impact on profit margins of sourcing raw product from outside the region. Partially offsetting these negative impacts is direct GRP generated by dryland agriculture and associated processing of around \$0.2m.

Net GRP flow-ons generated by the decline in irrigated agriculture and growth in dryland agriculture are expected to range from -\$2.6m to -\$3.6m. In aggregate, direct and flow-on GRP is expected to decline by \$7.4m to \$8.4m for the water use scenario (\$2.9m to \$3.4m for the water allocation scenario).

Employment...

Direct employment in irrigated agriculture is expected to decrease by 25 jobs. Employment in the processing of irrigated agriculture products is not expected to change. Partially offsetting these negative impacts is employment generated by dryland agriculture and associated processing, estimated to be around 3 jobs.

Employment flow-ons are expected to range from -34 to -48 jobs. In aggregate, direct and flow-on employment is expected to decline by 56 to 70 jobs for the water use scenario (22 to 28 jobs for the water allocation scenario).

Household income...

Direct household income generated by irrigated agriculture is expected to decrease by approximately \$0.9m. Direct household income generated by the processing of irrigated agriculture products is not expected to change. Partially offsetting these negative impacts is direct household income generated by dryland agriculture and associated processing of around \$0.1m.

Household income flow-ons are expected to range from -\$1.3m to -\$1.8m. In aggregate, direct and flow-on household income is expected decline by \$2.1m to \$2.6m for the water use scenario (\$0.8m to \$1.0m for the water allocation scenario).

7.3 Observations and Conclusions from the Water Use Reduction Scenarios

Some general observations and conclusions drawn from the plantation forestry and irrigated agriculture water use reduction scenarios are provided below.

- Based on the survey data, other data sources and assumptions utilised in this analysis, there would appear to be only small differences in the regional economic impacts of a permanent reduction in regional water use of 4 GL/annum achieved through a reduction in the area of the plantation estate versus a reduction in water use (and area) by irrigated agriculture. For example, the high GRP impact from a reduction in the plantation estate (-\$11.4m in Table 7.1) is of a similar order of magnitude to that for the reduced water use scenario for irrigated agriculture (-\$8.4m in Table 7.4).
- Were the reduction in irrigated agriculture achieved through an equivalent reduction in water allocation, there would be significant differences in the impacts attributable to a reduction in the area of the plantation estate versus a reduction in the area of irrigated agriculture. For example, the high GRP impact from a reduction in the plantation estate (-\$11.4m in Table 7.1) is much greater than that for the reduced water allocation scenario for irrigated agriculture (-\$3.4m in Table 7.4).
- There is a clear distinction between the relative impacts of the water use and water allocation scenarios for irrigated agriculture.
- The impacts for both irrigated agriculture and plantation forestry are based on a profile of these activities that reflects the regional average (expenditure, employment, value of output, etc.). In reality, were a reduction in the area of the plantation estate or irrigated agriculture enforced, it is likely that the least productive areas (i.e. in terms of yield or profit/ha) would be targeted first by both activities. This, in turn, would be a function of a wide range of factors, including, for example, the nature of the forestry or irrigated agriculture activities in targeted sub-regions.

References

- Australian Bureau of Agricultural and Resource Economic (ABARE) 2007, *Australian Commodities, December Quarter 2007*, Canberra
- Australian Bureau of Statistics (ABS) 2007a, *2006/07 Australian National Accounts: State Accounts*, ABS Cat. No. 5220.0, Canberra (and previous issues).
- Australian Bureau of Statistics 2007b, *2006/07 Regional Population Growth, Australia and New Zealand*, ABS Cat. No. 3218.0, Canberra.
- Australian Bureau of Statistics 2007c, *Consumer Price Index, Australia*, ABS Cat. No. 6401.0, Canberra.
- Australian Bureau of Statistics 2007d, *Average Weekly Earnings, Australia*, ABS Cat. No. 6302.0, Canberra.
- Australian Bureau of Statistics 2008, *Australian Wine and Grape Industry, 2007*, ABS Cat. No. 1329.0, Canberra.
- Department of Employment and Workplace Relations (DEWR) 2007, *Small Area Labour Markets, Australia, June Quarter 2007* (and previous issues).
- Department of Water, Land and Biodiversity Conservation (DWLBC) 2007, *A New Understanding on the Level of Development of the Unconfined Tertiary Limestone Aquifer in the South East of South Australia*, May.
- Department of Water, Land and Biodiversity Conservation 2008, *Water Allocation and Use in the South East 2006-07, Summary Report*, report prepared by Resource Allocation Division, South East Region.
- EconSearch 1998, *South East of South Australia (SELGA) Area Regional Planning Framework*, report prepared for PIRSA Sustainable Resources.
- EconSearch 2001, *Economic Impact of the Timber Industry in the South East of South Australia*, report prepared for Forestry SA.
- EconSearch 2005a, *Economic Impact of the Timber Industry in the Green Triangle Region, 2003/04*, report prepared for Green Triangle Regional Plantation Committee Inc. and Forestry SA.
- EconSearch 2005b, *Quantifying the Economic Contribution of Regional South Australia*, report prepared for the Regional Communities Consultative Council, Local Government Association of SA and Regional Development SA.
- EconSearch 2005c, *Economic Impact of Hardwood Chip Exports from the Port of Portland on the Green Triangle and Australian Economies*, report prepared for Port of Portland.
- EconSearch 2006, *Profile of Irrigated Activity in the South East Catchment Region, 2003/04*, report prepared for the South East Catchment Water Management Board.
- Rural Solutions SA 2007, *Farm Gross Margin Guide 2007: a gross margin template for crop and livestock enterprises*.
- South East Natural Resources Management Board 2007, *Water Allocation Plan for the Lower Limestone Coast Prescribed Wells Area (DRAFT)*, November.
- 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.

West, G.R. 2005, *IOW Users' Guide and Reference, Part B (DRAFT)*, Department of Economics, University of Queensland, St Lucia.

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 Survey Covering Letter and Questionnaire

«Salutation» «First_Name» «Surname»
«Position»
«Company»
«Address»
«City» «Postcode»

10 December 2007

Dear «Salutation» «Surname»,

The Economic Impact of the Timber Industry in South East South Australia

EconSearch Pty Ltd has been commissioned to undertake a study to assess the current economic impact of the plantation forestry and wood processing industries in South East South Australia as well as some supplementary analysis of the economic impact of a range scenarios for the timber industry based on the proposed Lower Limestone Coast Water Allocation Plan.

The work has been commissioned by PIRSA Forestry in conjunction with the Limestone Coast Regional Development Board, the Green Triangle Regional Plantation Committee, the South East Natural Resources Management Board and the South East Forest Industries Group and will update similar work undertaken by EconSearch in 2001 and 2005. This information has been a valuable tool for promoting the significance of the timber industry in the regional economy. The scope of the analysis is being widened in response to the challenges to the industry that are being experienced under the proposed Lower Limestone Coast Water Allocation Plan.

As part of the study, EconSearch is conducting a survey of firms involved in the plantation forestry and wood processing industries in the South East region of South Australia. A short questionnaire is attached. The survey will provide information that is not available from published sources. It will enable EconSearch to estimate the regional impact of the timber industry, both direct and flow-on effects, in terms of a range of indicators (e.g. employment, contribution to regional income, etc.).

In order to maintain the confidentiality of data from individual organisations, the final report will present results in an aggregated form only. All completed questionnaires will be held by EconSearch, treated in confidence and subsequently destroyed. The client (PIRSA Forestry et al.) will not have access to, nor will they seek to obtain access to, the completed questionnaires.

We will be in contact with you shortly to ensure that you have received the questionnaire and to see if you require any assistance in interpreting it. In the meantime, if you have any queries with regard to the project or the questionnaire, please contact either Matthew Ferris or Julian Morison at EconSearch on (08) 8431 5533.

We would be grateful if you would support this study by completing the attached questionnaire and returning it to EconSearch in the reply paid envelope by **21 December 2007**. The questionnaire can be provided in electronic form (via email), if preferred.

Yours sincerely
EconSearch Pty Ltd

Julian Morison

Encl. Questionnaire



EconSearch Pty Ltd
214 Kensington Road
Marryatville SA 5068
Tel: 08 8431 5533
Fax: 08 8431 7710
Email:

matferris@econsearch.com.au
Contact: Matthew Ferris or Julian Morison

CONFIDENTIAL

SOUTH EAST SOUTH AUSTRALIA TIMBER INDUSTRY ECONOMIC IMPACT STUDY, 2006/07

1. Company Information

Company Name: _____

Timber industry activities (e.g. plantation forestry and/or timber processing):

Contact Name: _____

2. Plantation Area

a) What area of plantation forestry did your firm own or manage in SE SA in 2006/07:

➤ softwood plantation (ha) _____

➤ hardwood plantation (ha) _____

3. Employment

a) Please indicate the number of employees and associated costs incurred in plantation forestry and/or timber processing activities in the South East region of South Australia: (average for financial year 2006/07, including working proprietors, managers, directors):

Employment	
Full time (no. jobs)	
Part time (no. full time equivalent jobs)	
Total wages and salaries (\$'000) (including super, etc.)	

b) Please indicate the proportion of employment in:

➤ plantation forestry and related activities (%) _____

➤ timber processing and related activities (%) _____

c) If your firm out-sources or contracts significant services that are integral to your day-to-day operations in SE SA, could you please provide estimates of:

➤ employment in 2006/07 in those firms (fte) _____

➤ the nature of the goods and/or services provided by those firms

4. Other Costs

a) Please indicate the magnitude of other costs incurred in the course of conducting your timber industry operations in SE SA in 2006/07 (e.g. fuel, R&M, transport, contracted services) by region:

Expenditure (\$'000)	Local (SE SA)	Imported (other SA, interstate or overseas)
Saw logs, roundwood or woodchips		
Harvesting		
Fuel		
Repairs and maintenance		
Contracted services		
Transport		
Insurance		
Other		

b) Please indicate the proportion of these costs incurred in:

- plantation forestry and related activities (%) _____
- timber processing and related activities (%) _____

5. Earnings

Please break down your timber industry related earnings in SE SA in 2006/07 by broad category and estimate market share for each.

Product	Gross Revenue, 2006/07 (\$'000)	Market share (%)
Saw logs		
Woodchips		
Boards (MDF, LVL, etc)		
Paper, paper products, etc		
Preservation products		
Other (please specify)		
TOTAL		

6. Impact of Reduced Plantation Area/Wood Supply

An important objective of the analysis will be to estimate the impact on the timber industry in the SE region of SA and the associated flow-on effects of a possible reduction in the area of the plantation estate and wood supply as a result of the implementation of the Lower Limestone Coast Water Allocation Plan.

Please indicate the impact on your firm's level of employment, raw material costs and gross revenue of a **permanent reduction in plantation area in the SE region or permanent reduction in wood supply from the SE region** of the following magnitude.

Reduction in plantation area in or wood supply from the SE region	Impact on employment (% or no. of fte jobs)	Impact on raw material costs (% or \$)	Impact on gross revenue (% or \$)
3.5 per cent			
7.0 per cent			
11 per cent			
14 per cent			

If appropriate, please provide further comments below.

Thank you for your time and cooperation. Please return the questionnaire by **21 December 2007** in the reply paid envelope **OR** Fax: (08) 8431 7710.

If you have any queries don't hesitate to contact Matthew Ferris or Julian Morison on (08) 8431 5533 or matferris@econsearch.com.au.

Appendix 2 Input-Output Methodology and Glossary

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 table provides a numerical picture of the size and shape of the 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 development scenarios.

Linkages between sectors

The standard approach for the estimation of the regional economic impact of a particular activity, such as timber 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 timber mill that, in the course of its operation, purchases goods and services from other sectors. These goods and services would include saw logs, machinery repairs and maintenance services 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 timber mill, the other sectors in the state economy engage in their own expenditures. For example, as a consequence of winning a contract for work with a timber mill, a machinery maintenance firm 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 timber mill on the regional or state economy. They must be added to the *direct effects* (which are expenditures made in immediate support of the timber mill itself) in order to arrive at a measure of the total impact of the timber mill.

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 or state* economy, an important leakage is expenditure on imports, that is, products or services that originate from *outside the region, state or country* (e.g. milling machinery).

Thus some of the expenditure for 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 that receive 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 timber mill employees on food, clothing, entertainment, and so on, as it is impracticable to measure these effects for an individual case, here the timber mill.

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 timber mills 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 table.

Input-output transactions table

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 table 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 tables 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 table. The rows and columns of the input-output table can be interpreted in the following way:

- The rows of the input-output table 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 table 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 table is also used for the calculation of sector multipliers and the estimation of economic impacts arising from some change in the local economy.

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".

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 table, exports refers to the sale of goods and services interstate and overseas. In a regional input-output table 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 a measure of wages and salaries paid in cash and in kind, drawings by owner operators and other payments to labour including overtime payments, employer's superannuation contributions 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 table is a transactions table 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 $(\text{direct effects} + \text{production-induced effects} + \text{consumption-induced effects}) / \text{direct effects}$.

Appendix 3 Value of Irrigated Agriculture in the LLCPWA (\$/ha)

Appendix Table 3.1 Estimates of the average value of irrigated crops per hectare, LLCPWA, 2006/07 (\$/ha) ^a

Irrigated Crop Type	Average Value, LLCPWA, 2006/07 (\$/ha)
Winegrapes	13,060
Vegetables	13,677
Potatoes	21,203
Pasture/Seed	2,847
Pasture ^b	1,628
Other	1,618
Oilseeds	1,676
Lucerne	2,000
Grain Legumes	1,310
Fruit and Nuts	3,873
Fodder	1,788
Flowers/Shrubs	16,895
Cereals	1,125
Olives	403
Vegetable seed	9,702

^a Estimates were based on those prepared by the consultants for the component PWAs for 2003/04 (EconSearch 2006) and updated to 2006/07 using relevant price indices obtained from ABARE (2007), ABS (2007c) and ABS (2008).

^b A weighted average value for all irrigated pasture was based on the assumption that 23 per cent of irrigated pasture in the LLCPWA region was used for dairy production, 58 per cent for lamb production and 19 per cent for beef production (based on data collected for EconSearch (2006)).