

Land Use Change in the Green Triangle and Central Victoria
Subproject 2: Quantify and analyse land use, industry and
socioeconomic change in the region using independent
data

Methods

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1.0 Introduction

This document outlines the methods proposed for Subproject 2 (SP2) of a broader study examining socioeconomic impacts of land use change in the Green Triangle and Central Victoria (the 'Land Use Change' project). SP2 aims to profile and analyse relationships between different types of land use and socioeconomic change in the study region. This will provide complementary data to the other two subproject being undertaken as part of the study - Subproject 1 (SP1) examines community attitudes towards land use change of various types in the study region, while Subproject 3 (SP3) examines the direct impacts of land use change to farm and plantation forestry on landholders.

2.0 Research aim and scope

The objectives of Subproject 2 (SP2) are:

- 1) To profile key types of land use, industry and socioeconomic change in the study region over 1991-2006 using statistical data; and
- 2) To identify likely relationships between (a) land use and industry changes and (b) socioeconomic changes observed.

These objectives were identified as important components of understanding the socioeconomic impacts of land use change in the study region. Profiling and analysing independent data on socioeconomic and land use change in the region can assist in informing community discussion about the impacts of these changes, particularly where there are differing perceptions about the nature of the changes that are occurring.

SP2 focuses on using statistical data to quantify socioeconomic change in the region. This limits the types of change that can be explored, as many subjective experiences of change cannot be examined. SP1 (studying community attitudes to land use change) and SP3 (studying landholder decision making processes) form complementary projects to SP2 that examine other dimensions of land use change.

The results of SP2 will be integrated with those of other subprojects to ensure the different approaches used to study impacts will be synthesised. For example, where SP1 and SP2 examine similar topics, it will be possible to compare community perceptions of land use, industry and socioeconomic change identified in SP1 to the results of statistical analysis undertaken in SP2.

3.0 Research design

Achieving the objectives of SP2 requires three stages of research:

- 1) **Scoping: Identifying the land use, industry and socioeconomic changes to be studied.** A large number of changes could potentially be studied in SP2. The initial stage of research is therefore to identify the types of changes that are most relevant to explore in SP2. A series of group interviews, survey of local government authorities and discussions with the Project Advisory Group have been used to identify the highest priority changes to study. The process used and priority changes identified to include are described in Section 4 and Appendix 1.
- 2) **Profiling change¹: Identification of appropriate data sources for quantifying change in the selected variables, and process for profiling social and economic change.** The primary and secondary data sources that will be used, their usefulness and limitations are presented in detail in this document in Section 5 and Appendix 2
- 3) **Social change analysis: Identifying likely relationships between (a) land use and industry change and (b) socioeconomic change.** The key challenge of ex-post² social impact assessment is to answer the question ‘how likely is it that different types of socioeconomic change occurring in a region are partly or wholly the result of land use or industry change?’ The methodological approach proposed is detailed in Section 6.

¹ The term ‘profiling’ here refers to developing an understanding of *what* types of change have occurred in the region – in other words, developing a profile of change. This terminology is drawn from the field of social impact assessment (SIA), in which impacts are assessed typically by developing a ‘baseline’ profile of key characteristics of a community, followed by either predicting impacts or, if the analysis is undertaken after the change has been implemented, analysing what impacts a change has had.

² Ex-post social impact assessment (SIA) refers to SIA that occurs after an event or change has occurred, while ex-ante SIA involves predicting likely future impacts of a planned change that has not yet been implemented. A common problem with accurately predicting likely impacts in ex-ante SIA is the lack of ex-post assessments that have identified what has happened when similar types of change occurred in the past.

4.0 Scoping: Identification of land use, industry and socioeconomic changes to be studied

SP2 has a goal of utilising statistical data to profile and analyse land use, industry and socioeconomic change in the study region over time. A large number of changes could be explored in the study region. Within the limited timeframe and resources available to this project, it is not feasible to study all possible changes that could be profiled and analysed using statistical data.

Therefore the first stage of SP2 involved identifying the changes that should be profiled and analysed with current resources, as well as the suite of further changes that could be studied if time and resources permit.

A combination of a literature review, group interviews and discussions with the project Advisory Group have been used to identify the priority types of change to be analysed in SP2. Each of these methods is described below, followed by a list of the changes identified as those most important to focus on.

4.1 Scoping process

4.1.1 Literature review

A review of the variables commonly profiled in socioeconomic impact assessments of land use change in Australia was undertaken. This review examined recent statistical profiles of land use, industry and socioeconomic change in Australia's rural regions. A relatively consistent picture emerged of the types of variables typically profiled in these types of analyses, with similar statistics typically used.

While the literature review could identify the types of data typically profiled, it could not provide a useful assessment of which variables are the most relevant to profile for this study. To prioritise variables, it was necessary to gather locally relevant information on the land use, industry and socioeconomic changes considered most relevant by residents of the study region. This was achieved by holding eight group interviews in different locations in the study region in September 2006.

4.1.2 Group interviews

Eight group interviews were held in September 2006 in the study region, to assist researchers in better defining the topics that should be focussed on in SP1, SP2 and SP3. In the group interviews, participants were asked to:

- Identify the different types of land use changes occurring in the region, particularly over the last 10-15 years, but not restricted to this time frame.
- Prioritise which land use changes were the most important. Participants were asked to use their own judgment to identify which were the most important, based on their own views about which types of land use change are having, or have had, the greatest impact on their local area.
- For each land use change rated as highly important by participants, discuss:
 - How widespread has the land use change been? (Where has it occurred? Over what time period?)
 - What factors have caused the land use change?

- What have been the consequences of the land use change (this included consequences for individuals, communities and the region as a whole with participants encouraged to think broadly about consequences)?

The goal of the group interviews was to hear from people who have a diversity of views about the consequences of different types of land use change in the study region. To achieve that, the research team ensured that those invited represented a broad range of groups in the community. Participants included:

- Farmers and graziers from various agricultural sectors including dairy, broadacre cropping and grazing and horticulture;
- Members of local environmental, volunteer and community service groups;
- Rural residents other than farmers;
- Local business people; and
- Local government staff and councillors.

The group interview locations and participants were selected with the assistance of the project Advisory Group (AG). As well as utilising the recommendations of members of the AG, the research team accessed local community directories and invited members of a range of local groups living in and near each group interview location to participate in the group interview.

Group interview discussions were held in Colac, Warrnambool, Mortlake, Heywood, Coonawarra, Lucindale, Horsham and Beaufort, during the week of September 11-14th 2006. In total, 57 people participated in the eight group interviews.

Group interview discussions were taped and transcribed in full. Data were analysed using a process of open-ended coding to identify key topics and relationships between concepts. The analysis focused on:

- **Identifying the most important land use changes to study based on the perceptions of group interview participants.** This analysis is provided in Appendix 1. In addition to identifying what types of land use change were considered most important to study, the way each type of change was conceptualised by interview participants was analysed (also presented in Appendix 1). This analysis was then used to both prioritise the types of land use change to be studied, and to identify appropriate statistics for profiling and analysing the extent and nature of land use change in the study region; and
- **Identifying the most important socioeconomic changes to study based on the perceptions of group interview participants.** Interview participants discussed the consequences they believed different land use changes have had in the region. From this, socioeconomic consequences believed to have been caused by different types of land use change were identified and defined. This then informed selection of appropriate statistics for profiling and analysing the socioeconomic impacts of different types of land use change in the region.

4.1.3 Advisory Group discussions

Results of the group interviews were presented to the project Advisory Group on December 13th 2006, and they assisted researchers in prioritising the land use and socioeconomic changes to be studied³.

4.2 Land use and socioeconomic changes to be profiled

The analysis of the literature review, group interviews and discussions with the Advisory Group pointed to a need to ensure SP2 both:

- provides a general profile of the different types of change occurring in the region over the time period to be studied (1991 to 2006); and
- profiles and analyses a subset of changes in more depth – these are the ‘priority’ changes identified as most important to study in depth in the scoping process.

Both these types of profiling are needed as, when analysing what has contributed to change in the ‘priority’ land uses and socioeconomic characteristics examined, it is important to have a broad understanding of the multiple potential influences that may have contributed to a change.

The following sections describe the approach to be taken to (a) the general profile of change and (b) the in-depth profiling of selected types of change for, respectively, land use changes and socioeconomic changes.

4.2.1 Land use changes

4.2.1.1 Developing a broad profile of land use change

Understanding factors that may have influenced socioeconomic change in a region requires having a broad understanding of all major land use and land use industry changes in that region, whether or not they are on the list of ‘priority’ land use changes that will be studied in-depth. For example, in Hamilton the establishment of a new mine has reportedly had a profound influence on some aspects of community life, including availability of affordable housing. While mining is not one of the priority changes identified in Section 4.2.1.2, it is nevertheless important to understand that this new development has influenced socioeconomic change in the region, so that its influence can be taken into account when analysing the likely impact of the priority land use changes identified.

Land use change and industry change are discussed together here as much land use change involves change between or within particular industries, or leads to change in downstream industries. Therefore this section discusses how all types of industries – including those directly dependent on particular land uses – will be profiled.

Change in a wide range of land use and other industries will be profiled using data from the BTRE Industry Structure Database, the Australian Bureau of Statistics and the National Economics *YourPlace* database.

Change in different industries will be profiled utilising definitions of industry boundaries from the 1993 and 2006 Australian and New Zealand Standard Industrial

³ For details of the membership and role of the Advisory Group, see the ‘Project governance’ section of the study website at http://www.crcforestry.com.au/land_use_change.htm.

Classification (ANZSIC). Industry change at the industry subdivision (2-digit) level will be profiled for all areas. Where possible, change will also be profiled at the 3-digit (industry group) ANZSIC classification. Where data are accurate at the small area level, some 4-digit (industry class) profiling may be undertaken⁴. In particular, change in land use-based industries will be profiled at the 3-digit and 4-digit classifications to enable a detailed profile of land use change of all types to be developed for the region.

4.2.1.2 Priority land use changes

Changes in the following land uses will be analysed in more depth than is possible with the broad profile described in Section 4.2.1.1. These land uses were all identified as priority areas for study in both group interviews and by the project Advisory Group as they were either a *previous* or a *new* land use involved in a land use change process:

- Blue gum plantations
- Beef grazing
- Sheep grazing for wool
- Prime lamb production
- Dairy
- Cropping (including raised bed cropping)
- Lifestyle/rural residential properties
- Pine plantations
- Viticulture
- Possibly horticulture, with the type/s to be studied requiring further identification.

Of these land uses, those identified as the land uses commonly being changed *to* in the region in recent years were Blue gum plantations, cropping, and lifestyle/rural residential properties. Those described as being changed *from* were beef and sheep grazing and, to a lesser extent, prime lamb production and dairy. However, prime lamb production and dairy were described as expanding in some parts of the study region and contracting in others. Pine plantations, viticulture and horticulture were not typically reported as industries which had changed greatly over the past 10 to 15 years, although viticulture was reported by some as expanding in some localised parts of the study region. However, they were identified as priority areas for study as:

- The impacts of blue gum plantations and pine plantations were commonly compared by participants in group interviews; and
- Viticulture and horticulture were seen as an important employment producing industry in localised parts of the study region.

⁴ For an explanation of ANZSIC industry classifications, see Chapter 6 of Australian Bureau of Statistics/ Statistics New Zealand (2006).

4.2.1.3 Land use change characteristics to be profiled

Group interview participants conceptualised land use change in a range of ways. The detail provided in Appendix 1 identifies that land use change involved many dimensions for most people.

Rather than being defined solely as a change in the area of land used for a particular purpose, land use change was discussed as involving change in one or more of: the number of people employed/engaged in a particular land use, the economic activity generated by a land use, the efficiency of production of a land use, or the area of land used for a particular purpose. These broad definitions were important as a change in intensity or efficiency of land use can have socioeconomic consequences as great in magnitude as a change in the total area of land being used for a particular purpose. For example, intensification of a particular land use such as cropping can result in higher employment per hectare, and greater local economic activity due to more inputs being used and greater volume of outputs produced per area of land. This may have impacts as significant as those resulting from a change in the total area of land used for cropping.

To ensure that multiple dimensions of land use change are identified, the following measures of land use change will be profiled as far as possible:

- Change in volume and value of production from a particular land use over time to different points in the chain of production (for all involving production of goods from the land);
- Change in the area of land utilised and location of land utilised by each land use studied;
- Change in the number of people employed in the land use/industry at different points in the chain of production;
- Changes in farm enterprise size; and
- Changes in productivity, measured as changes in volume produced per area of land.

As part of the analysis it is also important to identify the proportion of employment, area of land and local economic activity generated by each land use over time, and the extent to which some land uses have been replaced by others as part of land use change processes.

4.2.2 Socioeconomic changes

The priority types of socioeconomic change to be profiled in SP2 were defined from the literature review, group interviews and Advisory Group discussions as being change in (in descending order of priority):

- **population (numbers and demographics)**
- **employment**
- **farmers and land managers (numbers, characteristics)**
- **farms (number and size)**
- **land prices and land markets**
- **community groups and service provision**

- **local and regional economic activity**
- **thresholds of production required to support downstream processing**
- local government rates
- crime
- housing availability
- farm household debt
- infrastructure changes (e.g. fencing, electricity, housing).

Those highlighted in bold will be studied as part of the project; those not in bold may not be due to (a) the lower priority of the topic as an area of important socioeconomic change, and/or (b) data access difficulties (described in Appendix 1). Further detail on the different ways these broad topics of socioeconomic change will be studied is provided in Section 5.0.

The priority types of socioeconomic change identified incorporate the majority of topics typically examined as part of a statistical profile of socioeconomic change in a community, while the broad industry change profile described in Section 4.2.1.1 will provide an understanding of the economic sectors that have changed in different parts of the study region over time. Because of this, it is not necessary to provide a broad socioeconomic profile accompanied by exploring some types of socioeconomic change in more depth, as was the case for the different land use changes examined.

4.3 Further processes for prioritising changes to be studied

This study will continue through to mid 2008. It is expected that further land use and socioeconomic changes may be identified that would be useful to study. To ensure that researchers are aware of any gaps they may have missed in the initial identification of areas to examine, the following methods will be used:

- An online form on the project website;

(http://www.crcforestry.com.au/land_use_change.htm)

allows any interested member of the public to submit their views on land use change and its impacts in the study region. The form is also available in hardcopy for those without internet access. The website was launched with a media release in December 2006. Further promotional activity will take place in the region to ensure members of the public are aware that they can have input into the project; and

- A series of group interviews will be held after initial statistical data analysis has been completed, and participants will be able to identify gaps in the initial analysis during these groups.

5.0 Profiling: data sources

This section details the data sources proposed to be used to profile change in the priority land use and socioeconomic changes identified in Section 4. Limitations in availability of data are identified and the extent to which it is possible to profile change using different data sources is discussed.

Before identifying data sources, the criteria used to select appropriate data for profiling change are described.

5.1 Criteria for selecting data sources

The key factors considered when selecting appropriate data sources were:

- Validity and reliability of data;
- Availability of comparable time series data over the period 1991 to 2006;
- Availability of comparable geographic data, covering the entire study region; and
- Availability of reliable small area data. Where possible, change will be profiled at the Statistical Local Area (SLA) and smaller scales wherever possible.

The reasons for using these criteria are described below.

5.1.1 Accuracy and reliability of data

Any data sources used must be valid (i.e. measure what they are intended to measure) and reliable (i.e. collected and produced in a replicable way).

This has mostly been ensured by utilising data for which it is possible to clearly identify the methods by which data have been collected and produced. For any source of data used, it must be possible to clearly identify the sampling strategy used (if not a census), response rates, likely standard errors, and if an index, how the index is calculated.

5.1.2 Comparable time series data (1991 to 2006)

Understanding the socioeconomic impacts of change requires examining time series data, to enable comparison of characteristics before, during and, if relevant, after a change has occurred. Ideally, as long a period as possible should be studied. In practical terms, however, it is often not possible to obtain time series data for many of the types of land use change and socioeconomic change identified in Section 4 prior to 1991. Many data have not been collected for a long period; where similar data have been collected prior to 1991 they are often not comparable over time due to factors such as changes in how data are collected or data categories defined, or changes in the geographic boundaries for which data are collected and reported.

Therefore the initial project documentation identified that change would be profiled wherever possible over the period 1991 to 2006; with longer time periods profiled if practicable. For some data, a shorter time period will be profiled due to lack of availability of comparable data for the entire period 1991 to 2006.

5.1.3 Comparable geographic data

Understanding the impacts of change requires comparing changes and how they have occurred in different parts of the study region. It is therefore important that any data accessed are available across the entire study region. This is possible for most types of data; however for some land use industries data may be sourced from different government agencies in Victoria and South Australia, and hence may not be comparable across the State boundary that divides the study region.

5.1.4 Small area data

Participants in group interviews commonly identified different patterns of change they believed occurred in different parts of the study region. Understanding the impacts of land use change requires profiling change at a small area level to gain a detailed understanding of the differential impacts of change on different areas. Where possible, data will be profiled at the Statistical Local Area (SLA) scale, and at smaller scales where possible. The exceptions are when changes such as trends in market prices that would not vary considerably across the study region are profiled, or when no small area data can be identified.

Some of the data sources listed in Section 5.2 are not available at the SLA scale; Appendix 2 provides detail of the scales at which different types of data are available.

5.2 Data sources to be used

The data sources proposed to be used will be either:

- drawn from secondary sources, i.e. from existing data gathered by various government agencies or industry organisations (described in Section 5.2.1); or
- where secondary data are not available, some primary data will be collected directly through surveys of particular industries (described in Section 5.2.2.)

5.2.1 Secondary data sources

A number of secondary data sources will be used to quantify land use, industry and socioeconomic change in the study region. While some data sources will be used only for one type of land use or socioeconomic change, others will be used to quantify multiple types of change or key changes of high priority. The following sources of data will be used widely as part of profiling a range of land use change and socioeconomic trends across the region, including undertaking the broad profiling of land use change described in Section 4.2.1.1:

- The ABS *Census of Population and Housing* and *Agricultural Census*;
- BTRE *Taxable Income Database*, *Industry Structure Database*, and *Education, Skills and Qualifications* database;
- National Economics *YourPlace* database; and
- DEWR *Small Area Labour Market* series.

In addition, these and other data sources will be utilised to undertake the in-depth profiling of change in the priority land use and socioeconomic changes identified in Section 4.2.1 and 4.2.2.

Appropriate data sources were identified based on (a) identifying available data and (b) analysing their usefulness based on the criteria presented in Section 5.1.

Table 1 (Section 5.2.1.1) summarises the data sources proposed to be used to profile different dimensions of land use change. Six measures of land use change are presented, all of which will be profiled as change over time, from 1991 to 2006 where possible. Each of the data sources listed is described in detail in Appendix 2, which describes the types of data available, the time period and geographic scale for which it is available and any key issues with accessing or utilising each data source.

Table 2 (Section 5.2.1.2) summarises the data sources proposed to be used to profile socioeconomic change over time in the region. Again, Appendix 2 describes each data source listed in more detail, including the time period and geographic scale for which data are available.

Table 1 and 2 are followed by a brief description of biophysical data that is to be included in the profile of change (Section 5.2.1.3). This is important as some types of land use change, and in particular variation in land use over time, are largely a result of climate related factors such as occurrence of drought.

Finally, Section 5.2.1.4 describes the direct survey to be used to collect some types of data on land use and socioeconomic change.

5.2.1.1 Data sources for profiling land use change

Table 1: Data sources for profiling land use change

	Volume of production	Value of production (price per unit)⁵	Area and location of land used	Employment	Enterprise size distribution	Productivity & financial performance
Blue gum plantations	Direct survey	Direct survey ABARE Forest and Wood Product Statistics (Commodity prices at State/National scale)	BRS National Plantation Inventory	Direct survey (employment per hectare, spatial distribution) ABS Census – very limited data	Direct survey BRS National Plantation Inventory	As Blue gums are only beginning to be harvested, measures of productivity & returns will be limited & gathered by direct survey.
Beef grazing	ABS Agricultural Census/Survey MLA Individual Saleyard Reports	ABS Agricultural Census/Survey MLA Individual Saleyard Reports MLA Market Statistics database (1997-2007 prices) ABARE BLS industry database SW Farm Monitor Project (Vic only)	ABS Agricultural Census/Survey	ABS Census of Population and Housing SW Farm Monitor Project (Vic only) Direct survey	ABS Agricultural Census/Survey	ABS Agricultural Census/Survey ABARE livestock reports (for large region) SW Farm Monitor Project (Vic only) Direct survey

⁵ Multiple sources of data on average prices are given for most types of land use industry. This is because there are multiple sources readily available for a range of scales (mostly at a large regional or State scale). It is useful to compare the prices recorded for different types of agricultural produce at different scales and so multiple price indices will be compared.

	Volume of production	Value of production (price per unit)⁵	Area and location of land used	Employment	Enterprise size distribution	Productivity & financial performance
Sheep grazing for wool	ABS Agricultural Census/Survey MLA Individual Saleyard Reports	ABS Agricultural Census/Survey MLA Individual Saleyard Reports MLA Market Statistics database (1991-2007) AWEX Wool Market Indicators ABARE BLS industry database SW Farm Monitor Project (Vic only)	ABS Agricultural Census/Survey	ABS Census of Population and Housing Direct survey	ABS Agricultural Census/Survey Note that limitations of the Agricultural Census/Survey will limit the extent to which time series data can be developed.	ABS Agricultural Census/Survey ABARE BLS industry database SW Farm Monitor Project (Vic only) Direct survey
Prime lamb production	ABS Agricultural Census/Survey MLA Lamb Survey MLA Individual Saleyard Reports	ABS Agricultural Census/Survey MLA Individual Saleyard Reports MLA Market Statistics database ABARE BLS industry database SW Farm Monitor Project (Vic only)	ABS Agricultural Census/Survey	ABS Census of Population and Housing Direct survey	ABS Agricultural Census/Survey	ABS Agricultural Census/Survey ABARE livestock reports SW Farm Monitor Project (Vic only) Direct survey
Dairy	Dairy Australia (and related dairy organisations, State milk authorities) ABS Agricultural Census/Survey	Dairy Australia (and related dairy organisations, State milk authorities) ABS Agricultural Census/Survey	Dairy Australia (and related dairy organisations, State milk authorities) ABS Agricultural Census/Survey	Dairy Australia (and related dairy organisations, State milk authorities) ABS Census of Population and Housing Direct survey	ABS Agricultural Census/Survey Dairy Australia (and related dairy organisations, State milk authorities)	ABS Agricultural Census/Survey Dairy Australia (and related dairy organisations, State milk authorities) ABARE AgSurf database

	Volume of production	Value of production (price per unit)⁵	Area and location of land used	Employment	Enterprise size distribution	Productivity & financial performance
Cropping (various types to be profiled including wheat, canola, oats, barley, hay)	ABS Agricultural Census/Survey	ABS Agricultural Census/Survey (note that ABS summarises information from relevant grower marketing boards and groups, so provides a useful single point of information on prices for different crop types & products)	ABS Agricultural Census/Survey	ABS Census of Population and Housing Direct survey	ABS Agricultural Census/Survey	ABS Agricultural Census/Survey ABARE AgSurf database Direct survey
Mixed enterprises	As many farms have a mix of grazing and cropping enterprises, it will be important to include data identifying the proportion of farms undertaking different types of single and mixed enterprises. The ABS Agricultural Census/Survey will be used to do this.					
Lifestyle/rural residential properties	Some estimates to be made using small-property data from ABS Agricultural Census. Limited in usefulness, however, due to the threshold estimated value of agricultural operations (EVAO) used at various times to define whether a property will be included in the Census, and due to changes in population frame between 2001 and 2006 Agricultural Censuses. In recent years, the EVAO of \$5,000 will enable some lifestyle properties to be included, but others would be excluded from this data set.	Cadastral data, discussions with local government to be used. Consultation will occur with VicDPI project examining lifestyle change.	N/A – it is not relevant or possible to identify how many are employed in 'lifestyle' industries.	Land sizes will be examined as part of identifying area and location of land used using cadastral data and local government consultation.	Some estimates to be made using small-property data from ABS Agricultural Census, ABARE data on smaller sized farms. Limited in usefulness, however due to EVAO and other definitions used when gathering data by ABS and ABARE.	

	Volume of production	Value of production (price per unit)⁵	Area and location of land used	Employment	Enterprise size distribution	Productivity & financial performance
Pine plantations	Direct survey	Direct survey ABS Producer Price Indexes ABARE Forest and Wood Product Statistics (national/State scale)	BRS National Plantation Inventory	Direct survey ABS Census provides data for all forest industry; does not enable separate identification of plantation vs native forest employment	Direct survey BRS National Plantation Inventory	Direct survey ABARE Forest and Wood Product Statistics
Viticulture	ABS Agricultural Census/Survey ABS Vineyard Survey ABS Wine Statistics Survey ABS Wine and Spirit Production Survey	ABS Agricultural Census/Survey ABS Vineyard Survey ABS Wine Statistics Survey ABS Wine and Spirit Production Survey	ABS Agricultural Census/Survey ABS Vineyard Survey	ABS Census of Population and Housing Direct survey	ABS Agricultural Census/Survey ABS Vineyard survey	ABS Agricultural Census/Survey ABS Vineyard survey
Horticulture (specific type/s to be identified)	Initial profile to be undertaken using ABS Agricultural Census/Survey data (volume, value, area and location, enterprise size), ABS Census of Population and Housing (employment), followed by determination of relevant horticulture industries for which further data may be analysed. This will provide a broad profile of different types of horticulture in the region, with only some explored in more depth.					
Irrigated agriculture	Some data on the extent and change in irrigated agriculture can be obtained for 2002-03 onwards from the ABS, and by comparison of water accounts from the 1993-94 and more recent Water Accounts reports. However, these have limited detail. Further approaches to quantifying the extent of irrigated agriculture (in all land uses identified above) and water use are being explored.					

5.2.1.2 Data sources for profiling socioeconomic change

As each type of socioeconomic change may be profiled in a different ways, i.e. using different measures of change, Table 2 both describes the types of change to be profiled for each topic, and the data sources to be used for each type of change. Unless otherwise stated, profiles will be at the SLA scale for the time period 1991 to 2006; data from the ABS *Census of Population and Housing* will use the ‘Usual Resident Population’ data wherever possible.

Table 2. Data sources for profiling socioeconomic change

Topic	Types of change to be measured and data sources to be used to profile change			
<p>Population (numbers and demographics)</p>	<p><u>Total population change by (a) number of people, (b) gender (c) age class distribution (using dependency ratio) for each:</u></p> <ul style="list-style-type: none"> • Local government area • Statistical Local Area • Urban centre/locality (UC/L) & rural balance • Collection District <p>Source: ABS <i>Census of Population and Housing</i>, using Usual Resident Population count data. The ABS <i>Estimated Resident Population</i> will be explored to identify whether the annual estimates included are of use for the study</p>	<p><u>Educational attainment:</u> proportion of adult population having attained different levels of education (year 10/leaving, high school certificate, TAFE diploma/certificate, university degree or graduate). At:</p> <ul style="list-style-type: none"> • Local government area • Statistical local area • <p>Source: ABS <i>Census of Population and Housing</i></p>	<p><u>Individual, family and household income</u> (average and distribution across population) for:</p> <ul style="list-style-type: none"> • Local government area • Statistical Local Area • Urban centre/locality • Rural balance • <p>Source: ABS <i>Census of Population and Housing</i></p>	<p><u>Length of residence in local area</u> (if lived in same SLA 1 years ago, 5 years ago) at:</p> <ul style="list-style-type: none"> • Local government area • Statistical Local Area • Possibly Collection District (depends on extent of data randomization) <p>Source: ABS <i>Census of Population and Housing</i></p>

Topic	Types of change to be measured and data sources to be used to profile change			
Employment	<u>Labour force participation</u> Proportion of working age population in labour force. Sources: DEWR <i>Small area labour markets</i> (for quarterly time series data); ABS <i>Census of Population and Housing</i> (5-yearly data with higher validity than the DEWR series). Note: these two sources are not directly comparable.	<u>Employment and unemployment rate</u> Proportion of labour force in employment and not in employment. Sources: DEWR <i>Small area labour markets</i> (for unemployment rate); ABS <i>Census of Population and Housing</i> .	<u>Part-time and full-time employment trends</u> Proportion of employed labour force in part-time versus full-time employment. Sources: ABS <i>Census of Population and Housing</i> .	<u>Industry of employment</u> Employment by major industry classifications (to ABS 2-digit). Sources: BTRE <i>Industry Structure database</i> (2-digit). Note that agricultural employment will be profiled in more detail (see Farmers and land managers section).

Topic	Types of change to be measured and data sources to be used to profile change	
<p>Farmers and land managers (numbers, characteristics)</p>	<p><u>Number of farm & land managers and workers</u></p> <p>This measure will involve profiling number of farmers and land managers in different categories using occupation classifications. The ANZSCO 2006 and ASCO 1997 classification (ABS 1997, 2006a) will be used to profile the number of people employed as:</p> <ul style="list-style-type: none"> • Farm managers (where possible some distinction in different types of farming will be made; however at the small area scale reliable figures require grouping occupations into as few categories as possible to improve validity of data) • Forestry managers • Farm workers • Forestry workers. <p>The agriculture occupations groupings produced by ABS (2006b) will be used as a basis for grouping data into meaningful categories.</p> <p>Source: <i>ABS Census of Population and Housing</i></p>	<p><u>Number employed in agricultural industries</u></p> <p>This measure identifies employment in agriculture by industrial classification, rather than occupation classification. The numbers employed in the following ANZSIC industries will be profiled over time, together with their gender and age class distribution:</p> <ul style="list-style-type: none"> • Agriculture (with 3-digit classification data obtained where possible for small area scales) • Services to agriculture; hunting and trapping • Forestry and logging • Services to forestry. <p>Note that ANZSIC classifications have changed from the 1993 to 2006 classification. This has resulted in some changes to classifications of services to agriculture and services to forestry in particular. The ABS have advised that it is not known when pre-2006 data will be classified into the 2006 ANZSIC categories. Given that there is reasonable concordance across 1993 and 2006 ANZSIC classifications for most agriculture categories, 1993 classifications will be utilised until time series data is made available on the 2006 classification.</p> <p>Source: <i>ABS Census of Population and Housing</i></p>

Topic	Types of change to be measured and data sources to be used to profile change	
Farms (number and size)	<p><u>Farm size</u></p> <p>Change in the number of farm enterprises falling into different land area categories will be profiled over time. However, changes in the threshold used to include properties in the ABS <i>Agricultural Census</i> mean that there the time series data will have breaks in it; these will be clearly identified.</p> <p>Source: ABS <i>Agricultural Census</i></p>	<p><u>Number of farm enterprises</u></p> <p>Change in the total number of farm enterprises in different areas will be profiled over time. However, changes in the threshold used to include properties in the ABS <i>Agricultural Census</i> mean that there the time series data will have breaks in it and create challenges for estimating total number of enterprises; these data limitations will be clearly identified.</p> <p>Source: ABS <i>Agricultural Census</i></p>
Land prices and land markets	<p><u>Average sale price for different size parcels of land</u></p> <p>Land price growth will be compared for areas experiencing different mixes of land use change to identify whether areas experiencing particular types of land use change tend to experience land price growth that is demonstrably different to that of other areas. This will be compared to overall State and National averages.</p> <p>Data sources:</p> <p>South Australia: RP Data database.</p> <p>Victoria: Data access is more difficult for Victoria due to State privacy legislation preventing access for research purposes unless permission is given by the Valuer General. Permission has been applied for and the researchers are awaiting a response from the Valuer General.</p>	<p><u>Comparison of price paid for land by different industries</u></p> <p>In this approach, the land price paid for land with different land uses is compared over time. In South Australia, primary land use is recorded on the central database of land sales, while for Victoria if data are accessed this will require identifying land use based on names of vendors. This is feasible primarily for comparing land prices paid by plantation companies versus other buyers of similar parcels of land.</p> <p>Data sources:</p> <p>South Australia: RP Data database.</p> <p>Victoria: Data access is more difficult for Victoria due to State privacy legislation preventing access for research purposes unless permission is given by the Valuer General. Permission has been applied for and the researchers are awaiting a response from the Valuer General.</p>

Topic	Types of change to be measured and data sources to be used to profile change	
Community groups and service provision – community groups	<u>Change in number of groups</u> Different community groups e.g. the Country Women’s Association, Rotary, Lions, sporting clubs, will be contacted to identify if consistent time series data on the number of active group branches operating in the study region over time can be accessed. Data source: Community groups	<u>Change in number of group members</u> Different community groups e.g. the Country Women’s Association, Rotary, Lions, sporting clubs, will be contacted to identify if consistent time series data on the membership of group branches operating in the study region over time can be accessed.
Community groups and service provision – service provision - School enrolment	<u>Change in number of students enrolled over time</u> Data on enrolment in individual schools across the study region (all government primary and high schools and non-government schools as well if permission is given to access data) will be analysed to identify trends over time for individual schools and for groups of different sized schools and schools in different locations. Data sources: South Australia – Department of Education and Children’s Services Victoria – Department of Education and Training	
Community groups and service provision – service provision - other	Changes in provision of retail services, health services and others can be analysed by examining change at the small area scale in employment by these different industry sectors. This profile is being undertaken as part of the general profile of land use change and will be used to identify changes in service provision for those services recorded as a specific industry (primarily retail services, health services and education services). Data source: BTRE Industry Structure Database	

Topic	Types of change to be measured and data sources to be used to profile change	
Local and regional economic activity	<p data-bbox="607 284 898 309"><u>Gross Regional Product</u></p> <p data-bbox="607 320 1373 504">Measures of GRP at a small area scale are generally estimated by proportioning national accounts data (i.e. Gross Domestic Product) or State data (Gross State Product) to small areas using proxies such as proportion of employment engaged in a particular industry. This measure will be derived from the National Economics series as a useful comparable data set.</p> <p data-bbox="607 555 1346 738">Data sources: National Economics <i>YourPlace</i> database estimates GRP to the local government area scale. However, there are some issues of validity and reliability in this dataset. For this reason, a second proxy measure will be utilised, suggested by one of the peer reviewers of this methodology – BTRE's Aggregate Real Taxable Income.</p>	<p data-bbox="1395 284 1912 309">Local employment by industry classification</p> <p data-bbox="1395 320 2011 472">This measure acts as a useful proxy for measuring local economic flows by industry and showing how local economic activity is changing. Already being profiled as part of the general profile of land use change</p> <p data-bbox="1395 523 1973 549">Data source: BTRE Industry Structure Database</p>
Thresholds of production required to support downstream processing	<p data-bbox="607 753 2045 836">For each of the priority land use industries listed in Section 4.2.1.2, local industry associations will be contacted to identify how this types of information can be accessed. Based on preliminary discussions, it appears this type of data is already available for some industries but may need to be identified through primary data collection for others.</p>	

5.2.1.3 Data sources for profiling biophysical change

It is important to ensure that biophysical influences that may assist in explaining land use changes observed in the region at various points in time are understood as part of this project. For this reason, a limited set of biophysical data will be profiled, all utilising Bureau of Meteorology data:

- Rainfall annual and monthly/seasonal averages at LGA scale (it is important to have reasonably small area data for rainfall as there is considerable rainfall variability across the study region)
- Average monthly day-time and night-time temperatures; and
- Incidence of frost (particularly to identify where an unusual frost occurrence may have affected cropping & horticulture).

5.2.1.4 Direct survey data to profile employment and spending generated by different industries

In group interviews, the impact of land use change was commonly conceptualised as being related to (a) the employment generated by alternative uses of an area of land, and (b) the nature of the land use and in particular, where the people who work in a land use industry are based, and the location of spending flows from that industry.

After identifying (a) data needs and (b) data availability from secondary sources, it became apparent that some types of data were not generally available across different land use industries. These types of data were:

- Data on employment generated per hectare by different industries to comparable points in the chain of production; and
- Data on the spatial distribution of employment and spending by different industries.

It is therefore necessary to undertake direct survey to gather this data.

The sections below provide an overview of (a) planned survey scope and topics, (b) process for designing survey questions and sample, (c) planned process for delivering the survey and (d), data analysis.

Survey scope and topics

1. Land use industries to be included in survey

The survey needs to identify comparable employment and spending data for the following land use industries in the study region:

- Plantation forestry
- Beef grazing
- Sheep grazing – wool
- Sheep grazing – prime lamb
- Cropping – various types but particularly including wheat, canola, barley
- Viticulture
- Horticulture with specific types to be determined based on initial statistical profiles and discussions with the project Advisory Group.

Many of these land use industries occur as part of mixed agricultural enterprises, e.g. farmers undertaking both grazing and cropping. The survey will therefore need to identify employment and spending per hectare for the different land uses as well as identifying any differences between mixed and single use enterprises that may be associated with differences in the employment and spending generated.

2. Topics to be included

The survey questions will be designed to enable the following questions to be answered:

- How much employment is generated by alternative land uses to comparable points in the chain of production?
- Where are employees located in relation to the land they manage/work on?
- How much spending is generated by alternative land uses to comparable points in the chain of production?
- Where is spending located in relation to the land being managed?

To answer these questions, the survey will need to ask land managers questions about:

- How many people are employed at different times of year (where employment may include self employment as a land manager);
- What types of tasks/roles employees undertake (to identify employment in different parts of the production chain);
- The nature of employment e.g. fulltime, part-time, casual, contract;
- Where employees live and where they work;
- The area of land managed by employees and time required per year to undertake their management/working activities on that land;
- The amount of expenditure by category of expenditure;
- Location of expenditure by category.

These types of questions have been asked in many surveys of land managers in agriculture, fishing and forestry industries in the past. Previous surveys will be drawn on to assist in survey design (including Schirmer *et al.* 2005a,b and Schirmer forthcoming). The exact framing of questions will be developed in the survey design process discussed in the following section.

Survey and sample design

The survey will need to frame questions so they can be answered by those managing land for a wide range of different land use industries, including plantation forestry, grazing, cropping, viticulture and various mixed enterprises. It may be necessary to design specific questions for particular land use industries.

The *survey* design process will involve:

- February 2007: Relevant Advisory Group members who undertake different land uses, as well as regional industry groups representing the different land use industries to be surveyed, will be asked to participate in a committee overseeing design of the survey. Additionally, a representative of the South West Farm Monitor Project will be asked to take part in the committee so that any potential links or overlap with that project are identified and discussed;
- March/April 2007: A workshop will be held with committee members, and individual discussions held with representatives of each industry, to achieve: (a) agreement on comparable points in chain of production, (b) a preliminary set of questions for the survey and any points of difference in questions for different industries, and (c) development of appropriate sampling procedures for each land use industry;
- June 2007: The first draft of the survey will be distributed for comment to the committee, and revised after comments received. Ethics approval will be received from university for the survey process and sampling procedure developed in March-April in consultation with the committee. Approval will be sought from the Statistical Clearing House (SCH) to undertake the survey if necessary (depending on the number of small businesses to be surveyed, the survey may need to be cleared by the SCH as part of the project funding is provided by the Australian government);
- July/August 2007: The revised survey will be tested on a small sample of landholders and revised after reviewing results.
- September 2007: Survey delivery.

The *sample* design process will involve:

- March 2007: Utilising ABS data and consultation with industry representative groups to identify the likely population of land managers to be sampled for each industry within the study region;
- April to June 2007: In consultation with industry groups, identifying appropriate approaches for surveying land managers in the different industry groups. This will require negotiation about the appropriate procedures for accessing lists of members of organisations such as the Victorian Farmers Federation while respecting confidentiality of members;

- April-June 2007: Identifying the particular groups to be sampled as part of the survey (i.e. the extent of stratification required within and across different types of land managers);
- July 2007: Identifying appropriate sample sizes given the stratification being used and sample frame developed for each group to be sampled;
- July-August 2007: Finalising sample, cross-checking address data against White Pages to ensure addresses are current; and
- September 2007: Survey delivery.

Survey delivery

The survey will be delivered as a postal survey. This is the most appropriate survey method to use when asking questions that will require the survey recipient to refer to their financial records, as it allow respondents to access their records at times and using methods which suit them best.

The survey will be delivered in mid- to late-September 2007, with recipients asked to complete it by the end of October 2007. This timing aims to ensure data can be collected for Australian financial year July 1 2006 to June 30 2007. Under Australian law, small businesses and individuals must prepare and lodge tax returns for the 2006-07 financial year by the end of October 2007. Delivering the survey in September with a request for response by the end of October will ensure that recipients have prepared their annual tax data, and is therefore the time of year when it will be simplest for them to answer questions about their expenditure in the previous financial year. This timing is proposed based on experience delivering the Tasmanian and Western Australian Forest Industry Survey in August 2006 (Schirmer forthcoming), when many recipients complained that the survey was delivered before they had completed their financial accounts for the financial year the survey was examining.

An adapted form of the Dillman Total Design Method (Dillman 2007) will be utilised in which the survey will:

- be printed in a B5 booklet with the questions designed to be easy to follow and answer;
- be mailed together with a postage paid self-addressed envelope for survey return;
- be accompanied by a personalised letter encouraging survey return;
- be accompanied by a letter of support signed by representatives of key industry groups, to improve recipient confidence in the usefulness and reputable nature of the survey;
- be followed by posting weekly reminders to survey recipients for two weeks, posting a second copy of the survey to non-responders, followed by posting up to three more weekly reminder cards; and
- include information for a 1800 free-call number survey recipients can call to receive advice on the survey.

This process has consistently achieved 50-70% response rates from Australian landholders and natural resource managers in the agricultural, fishing and forest industries (e.g. Byron *et al.* 2004a,b; Schirmer and Pickworth 2005).

Data analysis

Data will be entered into a Microsoft Excel spreadsheet and analysed using the Statistical Package for Social Sciences. The sampling approach will ensure that standard errors can be calculated as appropriate.

5.0 Data analysis: identifying likely relationships between (a) land use and industry change and (b) socioeconomic change

The sections above have detailed the types of land use, industry and socioeconomic changes of interest in the study, and how change in each of these variables will be profiled.

Profiling data, while providing a description of *what* has changed, does not explain *why* different changes have occurred.

This section explains the methods that will be used to identify likely associations between land use and socioeconomic change in the study region once changes have been profiled using the data described in detail in previous section. This section focuses on:

- Explaining the problems inherent in attempting to identify causal links between different types of change, i.e. identifying whether a particular land use change has been the cause of particular types of social or economic change;
- Identifying the methods to be used to examine likely relationships/ associations between different land use changes and socioeconomic changes in SP2; and
- Emphasising the limitations of this analysis.

5.1 *The problem of causality: how do we know if a land use change has caused a socioeconomic change?*

...multiple projects and events in an area may involve synergistic interactions and result in cumulative and indirect impacts that may become perceptible only after long time periods. ... The relationships of causality are complex, multiple and mostly indirect. (Partidário and Arts 2005: 250-251)

Understanding if a land use change has led to change in the social or economic characteristics of a community or region is complex and fraught with problems. While in biophysical sciences it is possible to prove causal relationships through establishing carefully designed experiments in which only one variable differs between replicates of an event, this is not possible when studying events that have occurred in the 'real world'. In other words, it is not possible to statistically prove a causal link between 'cause' (in this case, land use change) and 'effect' (a social or economic change).

It is, however, possible to use circumstantial evidence to identify that there is a likely relationship between a cause and an effect by analysing whether areas experiencing a particular type or mix of land use change are experiencing unique social and economic changes compared to other areas. Many social and health sciences use this approach to analyse the likelihood that a causal relationship may exist.

Typically, statistical tools such as multivariate regression, cross-tabulation and correlation analyses are used to identify the likelihood of causal links or strength of relationships between two variables. However, use of statistical tests such as these relies on having a sample size large enough to provide a robust analysis.

In SP2, the number of cases available to compare is, for the most part, quite small. As land use change can be profiled to the SLA scale and rarely at a smaller scale, the number of cases that can be compared within the study region is limited to the 31 SLAs in the study region. Given the large number of different changes interacting in these 31 SLAs, this is too small a sample to be used as a basis for this type of statistical analysis.

This means that qualitative approaches will be used to identify likely associations between land use and socioeconomic change. These are described in detail in Section 5.2.

No matter what approach is used to identify the possibility of the presence of a causal relationship, there is a wide range of potential logical fallacies that should be avoided. Some of the key fallacies that are particularly relevant to SP2 are (drawn from a range of lists but in particular from the useful layman's website guide to logical fallacies common when claiming causation,

<http://www.don-lindsay-archive.org/skeptic/arguments.html#cause>):

- False cause: Assuming because a socioeconomic change occurred after a land use change, the first must have caused the second. It is entirely possible – in fact, highly likely – that socioeconomic changes have occurred independently of many of the land use changes being examined. The analysis methods used must provide means of identifying whether the socioeconomic change is likely to have occurred irrespective of the land use change, rather than using timing alone as an argument for likely causation;
- Confusing correlation and causation: Assuming that because change in land use and change in a socioeconomic characteristic change in a way that appears related over time, one has caused the other. Correlations in change may have a range of explanations, only one of which is a causal relationship – for example, both the land use change and socioeconomic change may be correlated because they are the result of a third variable that is influencing both;
- Causal reductionism: trying to explain socioeconomic change with reference to only one cause (e.g. a particular land use change) when in fact several causes may have contributed to the socioeconomic change;
- Argument by generalization: Drawing a conclusion about causal relationships from a small number of unrepresentative cases of land use and socioeconomic change;
- Argument by small numbers: Assuming that evidence of an event occurring in a small number of cases means the same pattern will be observed across a large number of cases.

Section 5.2 details the approach to be used and how it assists in avoiding these common logical fallacies.

5.2 Methods for analysing relationships and associations between land use change and socioeconomic change in the study region

Impact assessment practitioners have discussed the problem of causality in assessing social impacts of changes for some time. Most recommend using some form of analysis of ‘baseline’ conditions and then assessing whether the change being studied (in this case, particular types of land use change) has resulted in a noticeable shift in the baseline socioeconomic conditions of a community:

The impact assessor goes back in time – sometimes years, sometimes decades – and reconstructs what has happened as far as the problem is concerned. In order to come as close as possible to a causal analysis, description has to be combined with explanation and interpretation. Insight into the developments that caused the problem is a necessary precondition for designing adequate mitigating strategies. (Becker 2001: 314)

However, this approach is still subject to several of the logical fallacies highlighted in Section 5.1. Schirmer (forthcoming 2007) argues for impact assessors to use multiple methods for identifying whether an individual change is likely to be associated with particular socioeconomic consequences. These methods were initially trialled in a recent study of land use change to plantation forestry (Schirmer *et al.* 2005a,b) and have since been revised and further developed (Schirmer forthcoming 2007).

The analysis method involves profiling land use and socioeconomic change (as described in the earlier sections of this document), and then analysing the likelihood that particular types of land use change have played a role in socioeconomic change through, for each land use change:

- Presence/absence comparisons: Comparing regions that have and have not experienced the land use change. This comparison enables identification of whether areas experiencing the land use change have experienced unique patterns of socioeconomic change compared to those that have not experienced the land use change. Two types of presence/absence comparisons will be used:
 - Comparison of regions geographically close to each other i.e. neighbouring each other, in which some have experienced the land use change and some have not;
 - Comparison of regions not close to each other which have similar socioeconomic characteristics, in which some have experienced the land use change and some have not. Clear criteria will be used to identify what is considered to be ‘similarity’ in socioeconomic characteristics; these criteria are still under development;
- Averages: Comparing socioeconomic change in the regions that have experienced the land use change to average rates of change for larger regions within which the area being studied is located. For example, the rate of population change in an SLA⁶ experiencing plantation expansion can be compared to the average for the Statistical Subdivision (SSD) or Statistical

⁶ See Appendix 2 for an explanation of the different geographic boundaries (such as SLA, SSD and SD) referred to here.

Division (SD) within which the SLA is located, or to the State or National average. In this study, the averages used will be SSD, SD, State and National averages.

- Identifying alternative explanations for changes. This process involves identifying the range of potential explanations for socioeconomic changes observed. It will be achieved through:
 - Profiling a wide range of industry and socioeconomic changes in the study region, as described in Section 4. Undertaking a baseline profile of change in all industry types, for example, ensures that alternative explanations for socioeconomic change can be identified that go beyond the reasonably small set of land use changes that are the focus of this study. This avoids causal reductionism.
 - Utilising focus groups of local residents who have in-depth knowledge of different parts of the study region to assist in interpreting and generating explanations for the socioeconomic changes observed in the statistical profile. Once initial profiling has been completed, a series of 6-8 focus groups will be held throughout the study region. Participants will be selected with the assistance of the Advisory Group and others with in-depth knowledge of the study region. Participants will be asked to provide their interpretations of *why* changes have occurred. The alternative explanations provided will be used to undertake further statistical profiling if necessary, and further comparison analysis to test the theories generated in focus groups about cause-effect relationships.

The analysis process involves an iterative dialogue between (a) generating hypotheses about cause and effect relationships (using the data from group interviews already held, from the profiles of change developed, and from the focus groups to be held to assist in interpreting statistical profiles generated), and (b) using the presence/absence and averages comparisons to identify whether there is evidence for the cause and effect relationships identified, and then revising hypotheses. It is important to identify both the presence and absence of evidence for hypothesised relationships to inform community debate about the consequences of different types of land use change.

5.3 Limitations

Any analysis of likely relationships between cause and effect that relies on incomplete data is subject to limitations. The key limitation of this approach to analysis relationships between land use change and socioeconomic change is that, while it is relatively easy to identify the *absence* of evidence for a hypothesised cause and effect relationships, it is more difficult to show *presence* of evidence. This is because the small number of cases and large number of changes occurring simultaneously in many areas of the study region mean that analysis is likely to result in multiple alternative explanations being generated for the changes observed.

It is important that the reporting of analysis identifies alternative explanations for patterns observed and clearly identifies the evidence for each alternative.

In addition to this limitation, in some cases the lack of robust small area data will limit the extent to which it is possible to analyse the likely relationship between land use change and socioeconomic change.

Limitations of the conclusions drawn in the analysis will be clearly highlighted in all reports of the results of SP2.

6. Reporting SP2 results

Reports of results from SP2 will include:

- Description and detailed statistics profiling land use change and socioeconomic change in the region;
- Explanation of the methods used to analyse likely relationships, with the analysis process presented in detail to enable replication; and
- Presentation of analysis of likely links between land use and socioeconomic change, with alternative hypotheses and limitations of analysis clearly highlighted.

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Appendix 1: Land use and socioeconomic changes identified in the group interviews

A1.1 Land use changes identified in group interviews

This document provides a brief overview of the different types of land use change identified in eight group interviews held across the study region in September 2006.

Table A1 below lists all the different land use changes identified and:

- Which group interviews they were identified in
- Which group interviews prioritised the land use change as being one of the five most important changes in their region.

Land use change was identified as any change in how land was used in the region, where a land use is any commercial or non-commercial experience or utilisation of land. Land use change was defined as any type of shift in how people have used the land, or changes in how it can be used. This might include changes that have had positive or negative impacts. It may involve either a change in *what* is produced on the land, or a change in *how* production occurs. It may also involve a complete change in the type of industry land is used for. It may involve use of land for commercial production or for non-commercial purposes.

This broad definition led to a wide range of changes being identified, many of which are inter-related. Many of the changes identified in the table below affect other changes – for example, a decrease in wool price was commonly identified as triggering multiple types of land use change including increase in cropping, a shift to prime lambs, and others, and these in turn led to further changes and were triggered by other drivers as well as the change in wool price.

An important part of attempting to quantify land use change is identifying appropriate variables by which land use change can be measured. Group interview discussions were analysed to identify how participants conceptualised land use change. This was then used to identify appropriate types of statistics to use in the analysis of land use change.

In group interviews, participants identified land use change as involving the following types of change:

- Change in the area of land used;
- Change in the number of people employed in different land use industries;
- Change in economic activity related to different land uses;
- Changes in the way a land use is undertaken, including technology used, efficiency of production and methods of production; and
- Change in volume and value of produce.

Given the diverse ways that land use change was conceptualised by group interview participants, it is important to ensure that the quantification of land use change involves not only a basic measure of change in land area used for different purposes. Change in employment, efficiency of production and economic value of different land

uses also need to be understood and profiled as part of understanding the nature and extent of land use change occurring in the region.

Table A1. Land use changes identified in different group interviews

Note: If a cell is coloured red (grey if printed in black and white), it indicates the land use change was ranked as one of the top five most important land use changes by group interview participants.

Land use change ⁷	BE	CO	HE	HO	LU	MO	PE	WA	TOT
Blue gums (increase)	1	1	1	1	1	1	1	1	8
Farm amalgamation, increased farm efficiency, increased farm size	1	1	1	1	1	1	1	1	8
Agroforestry/farm forestry/sugar gum/woodlot and related planting of commercial trees on farms	1	1		1	1	1	1	1	7
Cropping (increase in various types including canola, hay, fodder, raised bed – raised bed also included as sep. category)	1	1	1	1	1	1	1		7
Dairy – general changes, intensification, larger size, decrease and increase		1	1	1	1	1	1	1	7
Prime lamb (increase)	1	1	1		1	1	1	1	7
Wool (generally identified as a decrease in wool industry)	1	1	1	1		1	1	1	7
Lifestyle (hobby, weekender, rural res, subdiv, seachange with varying definitions and distinctions between terms used)	1	1	1	1	1		1	1	7
Beef/ cattle		1	1	1		1	1	1	6
Farm conservation practices e.g. direct drilling, Landcare, env works, fencing, non-commercial trees on farms	1	1	1	1	1			1	6
Water (increased water use, decreased water availability) (some relationships to range of other land use changes)	1		1	1	1	1	1		6
Niche/alternative farming (many types identified e.g. emus, some types of organic, berries, etc)	1			1	1		1	1	5
Intensive agriculture and irrigation (particularly pivot irrigation) – related to water use in some aspects but also with additional changes beyond water use	1		1	1	1		1	1	6

⁷ BE = Beaufort, CO = Colac, HE = Heywood, HO = Horsham, LU = Lucindale, MO = Mortlake, PE = Penola/Coonawarra, WA = Warnambool.

Land use change ⁷	BE	CO	HE	HO	LU	MO	PE	WA	TOT
Small farms (decrease, sometimes noted as some remaining)		1	1		1	1		1	5
Pulp mills		1	1		1		1	1	5
Water regulation (increased)	1		1		1	1	1		5
Biofuel (generally discussed as potential future change only just begun)	1	1		1			1		4
Ownership of farms by outsiders e.g. people from overseas, investors	1	1				1		1	4
Raised bed cropping (related to cropping)	1	1	1					1	4
Pine plantation (increase)		1	1		1		1		4
Mining/ gasworks	1			1		1		1	4
Ageing farmers and population, fewer younger farmers and people	1	1			1				3
Drainage (increased)	1				1		1		3
Feedlot (cattle, other)	1	1					1		3
Horticulture					1	1	1		3
Land clearance			1		1	1			3
Urban growth				1		1		1	3
Viticulture				1	1		1		3
Windfarm	1					1		1	3
Managed investment schemes			1		1		1		3
Conservation areas, values							1	1	2
Corporatisation of farming				1	1				2
Tourism				1			1		2
Recreation (sometimes coastal, sometimes lake)	1							1	2
Rock crushing		1						1	2
Delving					1				1
Drought	1								1
Changed management of Crown land	1								1
Native forestry		1							1
Fires (increased or recent occurrence)	1								1
Recreational space								1	1
Salinity					1				1
Soldier settler farming (1900s)					1				1

Land use change ⁷	BE	CO	HE	HO	LU	MO	PE	WA	TOT
Roads					1				1

Other land use changes identified in only one group interview were:

Warnambool	Changes in beach and coastal space (coded as rec change), increase in intensity of coastal land use, gasworks, decreased farmland resulting from inc consvn areas, increased awareness of cultural sites
Colac	Outpaddock, suburban/retired farmers, shifting lake beds, purchase of properties in high rainfall areas (people purchasing property further south), pigs, changed access to fertiliser supplies b/c terrorism,
Heywood	Increase in reliance on off-farm income, more people shifting into city and towns, illicit crops (mentioned only briefly, not clear if has increased), increased regulation, increase in carbon credit plantations (Kangaroo Island), rural decline driven by economics, social change, technological change and changing preferences of young people for what they wanted to do in life, Portland and Hamilton stopped having a show, increased land prices had created difficulty entering farming
Mortlake	Squatter to soldier settler, decreased rainfall driven by climate change, introduction of superphosphate, improved pasture, increase in grazing with reduction in potato farming and vice versus as a regular change in land use ie on a relatively regular cycle, decrease in native grasslands and native wetlands, increased fertiliser use
Lucindale	Increase in improved pasture, increase in delving/claying (rip clay), increase in rotational/cell grazing, increase in town-based farmers, road expansion, duck shooting, vermin, increased town population in Lucindale, change in 13 month tax rule, increased land prices, changed in communication technologies and how that impacts farming e.g. computer controlled irrigation
Penola	Increased potato processing, increased value adding, increased rotational/cell grazing, decreased value adding industries with frozen food veggie factories going in the 1980s, inc illicit crops, inc fertiliser, climate change with reduced rainfall
Horsham	To rock climbing lifestylers, decrease in lake water, larger town businesses, shift of saleyards out of town, decrease in show entries, increased diversity of cropping, continual cropping, debate over whether have more or less diversification of land enterprises
Beaufort	Highway/road expansion, railway expansion, damming on farms, more deep bores, decreasing lake water due to drought, increased rubbish dumping driven by local govt imposing charges, change in drainage practices on farms, reduced diversity of enterprises on farms

A1.2 What types of socioeconomic impact should be studied?

This subproject will focus on studying **social** and **economic** impacts. While a number of environmental impacts of land use change were identified in the group interviews, and are important areas of study, they are not discussed further here as they are not part of the focus of SP2 (perceptions about environmental impacts will be studied as part of SP1)⁸. Table A2 on the following pages lists:

⁸ Key areas which were raised about biophysical impacts were risk of fire occurrence and change in this, use of chemicals, biodiversity impacts, monocultural crops, and volume of water used by different land uses. These are areas where considerable research by biophysical scientists is already taking place. For all of them, this project may examine social and economic flow-on impacts of changes in these, but can only do this where data is available on the biophysical impacts.

- The types of social and economic impacts believed to result from different types of land use change, as identified in group interviews⁹;
- Which impacts fall into the scope of SP2; and
- What research questions can be formulated based on group interview discussions.

⁹ These are not differentiated by type of land use change as studying the impacts of any one land use typically requires comparing it to another.

Table A2. Social and economic impacts identified as potentially resulting from different types of land use change

Impact of land use change	Potential research question for Subproject 2
The impacts have been summarised from group interview data. They are not written using the language used in group interviews, to enable a succinct presentation of the different topics. In subsequent reports, more detailed reporting of group interview results, incorporating the voices of participants through direct quotes, will be produced.	Where the impact is not one that can be studied using independent data, e.g. it requires an understanding of people's subjective perceptions and experiences of land use change, 'N/A' is entered to indicate the impact is not one that falls within SP2. These types of impacts may be studied in one of the other subprojects.
Benefits/costs for neighbours	N/A
Change in any land use was generally identified as potentially impacting the area of land dedicated to other types of agriculture and downstream processing/value adding occurring in the region e.g. dairy, grazing, horticulture	How has land use changed in different areas, in terms of (a) land area, (b) proportion of employment, (c) proportion of local/regional economy, over the past 15-20 years in particular with potential to identify longer term changes where relevant? Does change in one type of land use affect (a) availability of land for other land uses, and (b) viability of downstream processing for other industries (and if so, how)?
Change in community energy/enthusiasm/activity	N/A
Change in number and type of farmers, change in where farmers live (e.g. ageing farmers, less young farmers, more town farmers, change in on-farm versus off-farm residence, shift of farmers to other agricultural areas to farm, increased number of corporate/outside farmers and fewer family farmers)	Are different land use changes associated with change in (a) the overall number of farmers in a region, (b) age of the farming population, (c) residence patterns of farming families, and (d) shift in types of farmers and, if they are, what are the changes?
Change in population (e.g. demographic characteristics such as age and gender balance, change in length of residence, new people shifting into an area, increase/decrease in population diversity, change in temporary versus resident population. In particular, reduction in youth population noted)	Are different land use changes associated with change in (a) total population living in rural areas and towns, (b) age distribution and other demographic characteristics, (c) length of residence and mobility of population, and if they are, what are the changes?
Change in rural community – sense of belonging	N/A
Change in water availability (surface flow, water table, dams, irrigation, rivers, lakes) and water use	Biophysical data on changes in water availability and water use will be accessed if possible to better understand and identify if changes in water availability and use have in turn influence land use change and hence social and economic change in different parts of the study region.
Changes in level of social integration and interaction, particularly when new residents shift into areas	N/A

Impact of land use change	Potential research question for Subproject 2
Changes in water costs/value (related specifically to introduction of water regulation and not directly to other types of land use change)	How have water costs changed for different land uses/land use industries (focusing primarily on past 20 years)?
Changes to level of local economic activity, local spending	Are different types of land use changes associated with changes in spending and economic activity in local and regional areas and, if so, what types of change?
Changes to volunteer fire brigade numbers, fire fighting skills and fire equipment availability	Do different land use changes affect volunteer fire brigade membership and, if so, in what ways? Note: The potential to identify equipment shifts will be further explored before identifying if it is possible to examine this as a research question
Decrease in family farms	Are different land use changes associated with a change in the number of (a) farms, and (b) ownership of farms (e.g. from traditional family structures to more corporatised structures) and, if so, what types of changes have occurred?
Decreased area of farmland/good agricultural land	Are different land use changes associated with a change in availability of (a) total area of agricultural land, and (b) change in availability of land of high productive potential for particular industries and, if so, in what ways?
Decreased food supplies	How has production of different agricultural produce changed in different regions over time? What land use change and other factors have been associated with change in volume of production (e.g. of crops, wool, sheep meat, beef, dairy, viticulture, horticulture)
Decreased participation in groups such as Landcare, local sports clubs	Are different land use changes associated with change in the membership and active participation in different types of community groups and clubs and, if so, what changes occur?
Decreased rural infrastructure (e.g. electricity, fences, houses). Note road infrastructure is discussed in a separate category	Is land use changes associated with change in provision of different types of infrastructure, and if so, in what ways? Obtaining data to identify the extent of infrastructure change would require direct survey of a large number of farmers and plantation managers and is likely to be highly resource intensive. It is not proposed to include this as a research question in the study.
Rural land markets – changes in land prices (increase), availability of land on market. Changes in land markets were identified as having flow-on impacts including difficulty expanding farms and difficulty entering farming	Are different types of land use change associated with change in (a) land prices and (b) volume of land available on the property market, and if so, in what ways?

Impact of land use change	Potential research question for Subproject 2
Employment impacts – including increase/decrease in labour availability, change in local employment, change in regularity/seasonality of employment, changes in use of contractors, decreased rural employment and increased town employment, outsiders obtaining employment, and overall change in employment compared to previous land use	Are different types of land use change associated with change in (a) total employment in the region, (b) difference in spatial distribution of employment (e.g. change in extent of local employment), (c) rural employment, (d) town employment, and if so, what types of changes occur? How does the level of employment generated differ across different land use industries in terms of (a) people employed per hectare of land used and (b) people employed per unit of production.
Health impacts	N/A
Improved opportunities for farmers to leave the land by selling land at a good price	N/A (to be examined in Subproject 3)
Increase financial pressure on farmers, increased farmer debt	Are different land use changes associated with changed levels of average farm household debt and, if so, what types of change?
Housing markets - Increase in empty housing, increased housing demand, increased/decreased rental of houses on rural properties	Are different land use changes associated with changes in housing availability (for rental or purchase) and if so, in what ways?
Increased amalgamation of farms	Are different land use changes associated with change in farm size and if so, what have the changes been?
Increased diversity of production particularly of niche products	How has the diversity of production changed in different areas, and is this associated with other types of land use change?
Increased income for farmers who lease plantations	N/A (to be examined in Subproject 3)
Increased lifestyle properties	How has the (a) number and (b) land area of lifestyle properties changed in different areas over time?
Increased road infrastructure needs, costs, use, condition	N/A as being addressed in other studies on roading issues
Increased sense of isolation	N/A
Increased social dislocation, social conflict	N/A
Increased travel time to attend events/socialise	N/A
Increased vermin/pest/weed problems	N/A
Increased water use	See water availability
Increased weekend/temporary population e.g. lifestyle residents	See population
Increased working hours	See employment
Lower rural security and higher rural crime	To what extent have rural crime levels changed in different areas, and has/how has the rate of change varied in relation to particular types of land use change?

Impact of land use change	Potential research question for Subproject 2
Market glut e.g. overproduction creates a market glut/lack of markets for end product and either low prices or lack of market for products	How have commodity prices for different land use industries changed over time and availability of markets for different produce?
Rates – change in levels	How have local government (a) rate levels, and (b) total rate payments changed over time, and what factors have contributed to change?
Rural decline – see population, services, employment categories	Addressed by a number of the research questions proposed many of which examine different aspects of rural decline
Scale of impact was identified as dependent on scale of the land use change	To what extent does the scale of land use change affect the extent to which socioeconomic impacts are evident?
School enrolment (changes, generally declines were discussed), also decline/change in number of teachers in rural schools	Do different types of land use change lead to changes in school enrolment, schools in rural areas, and teacher numbers and, if so, what types of changes occur?
Services (decline or increase)	Do different types of land use change lead to change in rural service provision and, if so, what types of changes occur? Note: Particular types of service provision will need to be identified; one of these is education which is already proposed to be studied
Shift in values of population, new residents with different values	N/A

The multiple research questions identified in Table A2 can be categorised into 17 potential research themes:

1. Land use change (area/magnitude of change in different land uses);
2. Farmers and land managers (numbers, characteristics);
3. Farms (number and size);
4. Population (numbers and demographics);
5. Employment;
6. Land prices and land markets;
7. Community groups and service provision;
8. Local and regional economic activity;
9. Thresholds of production required to support downstream processing;
10. Volume of production;
11. Value of production and commodity prices;
12. Local government rates;
13. Crime;
14. Housing availability;
15. Water costs;
16. Farm household debt; and
17. Infrastructure changes (e.g. fencing, electricity, housing).

Within all of these topics, a further topic is ‘to what extent does the scale of land use change affect the extent to which socioeconomic impacts are evident?’

Of these categories, some are already planned to be profiled as part of profiling land use change, and so were not further included in the list of potential socioeconomic changes to include in the profiles produced for SP2. These are: land use change, volume of production, value of production and commodity prices, and water costs.

The project Advisory Group and Steering Committee were asked to prioritise the remaining 13 types of socioeconomic change considered for profiling. An initial priority list was tentatively reached in the December meeting of the groups, and is produced below. In February, members were asked to complete a priority ranking to confirm this listing. This may change the order of the categories below, but is unlikely to result in alteration of which socioeconomic changes are to be studied, with those in bold to be examined as part of the project while those not in bold will be examined only if time and resources permit:

- population (numbers and demographics);
- employment;
- farmers and land managers (numbers, characteristics);
- farms (number and size);
- land prices and land markets;
- community groups and service provision;
- local and regional economic activity;
- thresholds of production required to support downstream processing;
- local government rates;
- crime;
- housing availability;
- farm household debt; and
- infrastructure changes (e.g. fencing, electricity, housing).

The changes highlighted in bold were those most commonly discussed in group interviews which could be studied as part of SP2 (other types of socioeconomic change discussed in the group interviews may be studied as part of SP1 or SP3 but generally did not fall within the scope of SP2). Those in normal font were more rarely discussed in group interviews – generally only being raised in one or two of the eight group interviews that were held.

Appendix 2: Data sources considered for use in SP2

This Appendix provides a more detailed description of the different data sources listed in Tables 1 and 2 which are proposed to be used to profile land use and socioeconomic change in the study region.

Each of the data sources listed in these tables, as well as other data sources considered but excluded from those proposed to be used, are described in Table A2.2. For each potential data source, Table A2.2 summarises:

- The types of land use or socioeconomic data available from the data source e.g. on what topics statistics are available;
- The time period over which comparable data are available, and any comparability issues;
- The smallest scale geography for which data are available; and
- Key comments and notes about the data source of relevance to the study.

A number of abbreviations are used in the column describing the geographies for which data are available. Table A2.1 below provides a guide to the different abbreviations, and the geography classifications on which boundaries are defined.

Table A2.1 Abbreviations used to refer to different geographical areas

Abbreviation	Geography	Classification on which geography is based
SD	Statistical division	ASGC (Australian Standard Geographical Classification). See ABS Catalogue No. 1259.0.30.002 for definitions of boundaries.
LFR	Labour force region	Australian Bureau of Statistics Labour Force Survey regions. See ABS Catalogue No. 6105.0 for definitions of boundaries.
SSD	Statistical subdivision	ASGC
LMR	Labour Market Region	Bureau of Transport and Regional Economics (see http://www.btre.gov.au/index.aspx for publications defining LMRs)
LGA	Local government area	ASGC
SLA	Statistical local area	ASGC
UC/L	Urban centre/locality	ASGC. UC/L data is produced for every urban centre or locality with a population of 200 or more people, where a locality has 200-999 people and an urban centre 1000+ people.
RB	Rural balance population	ASGC The population that lives either in a settlement with less than 200 people, or on a rural property.

Table A2.2 Data sources considered for use in profiling land use and socioeconomic change for SP2

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABARE Farm Survey, AgSurf & BLS (beef, lamb and sheep) database	By ABARE farm region for beef, sheep, slaughter lambs, dairy cattle, barley, grain legume, oilseed, rice, sorghum, wheat, canola, field peas, lupins, cotton, oats): <ul style="list-style-type: none"> • Farm area • Labour (measure of employment) • Hired labour (measure of employment) • Number of livestock by type (for beef and dairy cattle, sheep) • Farm capital value • Farm debt • Farm liquid assets • Receipts and costs • Income • Depreciation • Imputed labour cost • Farm business profit • Rates of return • Off-farm income • Productivity • Yield (various measures for different produce) • Government assistance received • Milk production per hectare/per labour unit • Prices received. 	Mostly from 1990 onwards, sometimes earlier, on an annual basis. Some types of data only available for mid-1990s onwards.	ABARE agricultural region (two broadacre regions, 431 and 231, overlap with study region but also extend well beyond it; dairy region 21 overlaps Vic part of study region and extends beyond it.	Based on relatively small survey sample. Can provide data for large areas only, not for small areas within study region. Provides useful trend data over time at a large scale.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABARE Forest and Wood Product Statistics	<ul style="list-style-type: none"> • Consumption, production and trade of various timber products including sawnwood, plywood, particleboard, MDF, paper and paperboard • Imports and exports of various products • Price indexes and unit values for different wooden materials (sourced from ABS Producer Price Index Cat. No. 6427) • Roundwood removals and consumption • Number of sawmills by log intake • Value of turnover in forest product industries • Capital expenditure and disposal of assets 	Early 1990s onwards	Nation/State	Many of the data sourced from ABS (various catalogues) and available at smaller area scale directly from ABS.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABS Agricultural Census	<p><i>Number of holdings</i>, in different area categories</p> <p><i>Pasture</i> – total area, area down</p> <p><i>Pasture for seed</i> – area, production</p> <p><i>Cereal and non-cereal crops</i> – area and production (by type of crop, crop types include hay, silage, wheat, oats, barley, sorghum, maize, rice, triticale, other cereals, cotton irrigated/non-irrigated, canola, chickpeas, coriander, field beans, fennel, hops, lavender, legumes for grain, lentils, lupins, oil poppies, peanuts, peppermint, pyrethrum, safflower, sesame, soybeans, sugar cane, sunflower, tobacco, vetches for seed)</p> <p><i>Vegetables</i> – area and production (types include artichokes, asian, asparagus, beetroot, broccoli, brussel sprouts, butter beans, cabbages, capsicum, carrots, cauliflower, celery, chillies, cucumber, eggplant, fennel bulb, French/runner beans, garlic, ginger, herbs parsley/other, leeks, lettuce, melons, mushrooms, onions, parsnips, peas (proc/fresh), potatoes (proc, fresh, seed), pumpkins, radish, silver beet and spinach, snow/ sugarsnap peas, spring onions shallots and bunching onion, swedes and turnips, sweet corn (proc/fresh), sweet potato, tomatoes, zucchini and button squash, other)</p> <p><i>Orchard fruit and nut trees</i> – by type, area, no. trees < and > 6 yr old, production (orange, grapefruit, lemon, lime, mandarin, other citrus, pome fruit, apples, pears, nashi, stone fruit, apricots, cherries, nectarines, olives, peaches, plums, prunes, avocados, bananas, black currants, blueberries, carambola, custard apples, dates, guava, grapes, jackfruit, kiwi fruit, mangoes, papaw/papaya, pineapples, rambutan, raspberry, strawberry, almonds, cashews, macadamia, nuts, pecans, walnuts)</p> <p><i>Other fruit intended for sale</i> – area not yet/bearing, production</p> <p><i>Vineyards</i> – area bearing/not yet bearing, area by variety</p> <p><i>Livestock</i> – no., no. sold for all of <i>cattle and calves, sheep and lambs, pigs, other livestock</i>. Cattle split into meat cattle (four categories), milk cattle (cows and other). Sheep split into categories including lambs < 1 year, breeding ewes, ewes to be mated to different types rams next season.</p> <p><i>Wool production</i> – no. shorn, wool produced, <i>Lambing, lamb forecasts</i></p> <p><i>Poultry</i> (<i>layer, meat chicken, ducks, turkeys, other poultry</i>)</p> <p><i>Irrigation, Salinity</i></p> <p><i>Business operations</i> (<i>permanent employees</i>)</p> <p><i>Beekeeping</i> (<i>hives</i>)</p> <p><i>Tree planting activities</i> for various purposes.</p>	<p>Annual to 1996-97 (electronic data available from 1982-83 onwards) 2000-01 2005-06 Various</p>	<p>SLA</p>	<p>Various comparability problems due to shifts in estimated value of agricultural operations (EVAO) needed to participate in Census in: 1993-94 (changed to \$5000); 1991-92 (EVAO \$22,500+); 1986-87 (EVAO \$20,000+); 1982-83 (EVAO \$2,500+); prior to 1982-83 EVAO \$1,500+.</p> <p>Additionally some data not available as comparable time series.</p> <p>Tree planting data comparability over time will require further assessment, as consistency of identifying farmer planting versus leasing of land to companies for plantations needs to be established.</p>

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABS Agricultural Survey	See above	1997-98 to 1999-2000; 2001-02 to 2004-05	Usually Statistical Division; occasionally data may be able to be produced at SSD scale (this is subject to discussions with ABS)	The Agricultural Survey is undertaken in each of the intervening years between an <i>Agricultural Census</i> . As it is a sample based survey, data can only be provided at a larger scale than for the <i>Agricultural Census</i> . This data can be utilised to identify if particular trends affected key industries in the years between <i>Censuses</i> .

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABS Census of Population and Housing	<p>The following data are produced. Most are available using three counting methods: place of enumeration (EN) (based on where a person was located on Census night), place of usual residence (UR) (data is adjusted so people are counted where they usually live), and place of employment (EMP). During the time period of this project, EN data will become available for the 2006 Census; it is unlikely UR data will be available before the end of the project. EMP data may be available based on current ABS data release timeframes:</p> <ul style="list-style-type: none"> • Age and population distribution • Birthplace • Cultural and language diversity • Educational attainment • Employment status, employment by industry • Income (individual, family, household) • Indigenous population • Internet and computer usage • Labour force participation • Marital status • Internal migration (place of residence 1&5 years ago) • Occupation • Religion • Dwellings • Home ownership • Hours worked • Household characteristics • Housing costs • Living arrangements • Motor vehicles • Transport access and usage 	<p>1991, 1996, 2001, 2006 For some data, it will be possible to access 1981 and 1986 data in addition to the four Census years listed above (this depends on cost of data concordance to 2006 geographic boundaries)</p>	<p>The smallest geography regularly used will be SLA and UC/L/rural balance information. In some cases, data at CD scale may be used, primarily to analyse rural population change and how it has differed in rural areas experiencing different mixes of land use change.</p>	<p>The Census is the best source of accurate and reliable data on the Australian population to a small scale. Key challenges to utilising Census data are ensuring comparability of geographic boundaries over time, and being aware of potential problems with data at a small scale. In particular, when analysing data on rural industries, it is important to be aware of how the collection of data in August (the Census always occurs in August) may affect estimates of employment in industries where employment may be subject to major seasonal variation throughout the year.</p>

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABS Labour Force Survey (LFS)	Employment, unemployment, labour force participation	Monthly reports	Labour Force Regions (LFR) (77 across Australia)	The LFR are generally large – for example, the study region is covered by 2 LFR, the boundaries of which extend well beyond the boundaries of the study region. The Small Area Labour Market reports from DEWR provide small area labour estimates that are derived from the Labour Force Survey; these will be utilised rather than data drawn directly from the Labour Force Survey.
ABS Manufacturing Survey	Employment, wages, salaries, turnover, industry gross product, industry value added by industry classification (as defined in ANZSIC).	Census – every 5 years (1991-92, 1993-94, 1996-97, 2001-02, 2006-07) Survey - annual	Census – to SLA level Survey – to State/Territory scale only	Data before 2001-02 not directly comparable to data from this point forward due to changes in methodology for collecting data and various definitions.
ABS Producer Price Indexes	Prices of materials, including wooden materials, used in building and other industries	Various, generally at least 1990 onwards	Nationwide, State	Useful for tracking prices for some timber products in softwood sector

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
ABS Socioeconomic indexes for areas	Indices intended to measured socioeconomic well-being	1996, 2001 (the two time periods are not comparable)	CD, SLA, LGA	As data are not comparable over time, SEIFA indexes can only be provided for a single point in time. SEIFA indexes based on the 2006 <i>Census of Population and Housing</i> will not be available until March 2008 on current ABS proposed product release dates.
ABS Vineyard Survey	<ul style="list-style-type: none"> Bearing and non-bearing area planted at harvest Area if varieties lost Intended plantings Grapes harvested for different markets 	1973-current, annual	SLA	Expands on data collected as part of the <i>Agricultural Census/Survey</i> .
AWEX	Australian wool market indicators and micron price guides AWEX develops indexes based on a fixed basket of wool types.	1990 to current	Southern Region (includes southern Australia and New Zealand)	Index has been revised at various points (generally every 2-3 years) to adjust basket of wool types used. May create some breaks in time series data.
BTRE Education, Skills and Qualification Database	Educational attainment, measured in 4 categories Occupation (categorised into 4 types) Educational attainment and occupation by ANSIZ Industry division (1-digit) Employment share of selected professionals (health, teaching, computer, building-engineering, tradespersons)	5 year intervals 1991, 1996, 2001	LMR, SLA	This provides a useful overview; any detailed profile of the specific industries focussed on in this project requires purchase of more detailed data from the ABS as ANZSIC Industry Divisions group 'agriculture, fisheries and forestry' into a single category.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
BTRE Industry Structure Database	Employment Proportion employed in each ANZSIC industry Subdivision (2-digit) Number and proportion of people employed in technology and knowledge intensive industries Major employing industries (top 3) – 2 digit Top industry specialisations (top 3) - 2 digit Industrial diversity index Share of employed residents working in same LMR/SLA as live Structural Change Index	5 year intervals 1991, 1996, 2001	LMR, SLA	This provides a useful source of information on broad industries; for specific data on industries below the Subdivision level data will need to be obtained direct from ABS. Database includes indication of data quality and potential data limitations resulting from small employment base, absent or temporary workers.
BTRE Social Capital database	Labour force participation rate (%) Language barriers to participation (%) Proportion living in same SLA/LGA as 5 years ago (%) Proportion who accessed internet in week prior to census (%) Proportion living at same address as 5 years ago (%)	2001-02	LGA, SLA (note that more indicators are available for larger geographies)	Because data is available for only one point in time, has limited usefulness for this study.
BTRE Taxable Income database	Number of non-taxable individuals Number of taxable individuals Aggregate real taxable income Real income per taxpayer Aggregate real net tax	Annual 1980-81 to 2003-04 for LGA data 1990-91 to 2003-04 for SLA data	LGA, SLA, LMR	Income measured in \$2004-05 across all years enabling comparison over years

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
Bureau of Rural Sciences National Plantation Inventory	Area of plantations plotted spatially, with information on: <ul style="list-style-type: none"> • Year of establishment, harvesting, replanting • Tree species • Previous land use (in some cases) • Ownership (private, public joint venture etc). 	At LGA scale, 2001 and 2006 are available. However, the data available allows analysis of area planted by year from the 1980s onwards.	Publicly available at LGA scale; smaller scales likely to be obtainable via specific request.	The study will utilise NPI data and may access underlying data sets from the organisations who provided it depending on whether permission can be obtained from relevant organisations. SERIC (the South East Regional Information Centre) provided NPI data for much of the study region.
Community groups	Community groups such as the Country Women's Association, Rotary and Lions will be contacted to identify whether information on the number of (a) branches in rural areas and (b) membership of individual branches is available over time. If data are available, permission will be requested to access data.	Unknown – to be identified as part of research process	Ideally, individual group/branch scale enabling small scale analysis	Previous studies (e.g. Schirmer 2005a,b) have had difficulty accessing this type of data due to limited availability. Many community groups do not keep long term records of membership.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
Dairy Australia/West Vic Dairy/DairySA	Range of data sourced from ABS, State milk authorities and dairy manufacturers. <ul style="list-style-type: none"> • Volume of production (milk at farmgate, various dairy products) • Number of dairy farms • Number of processors • Average her size • Average litres milk per cow per day • Product prices • Volume/weight manufactured of different products 	2003-2006 but with longer periods for some statistics – currently identifying length of availability in consultation with Dairy Australia	Dairy region (south west Vic, Lower South East and Upper South East in SA). Currently identifying which data available at what scale.	Usefulness will be fully determined after further consultation with the relevant dairy bodies. State agencies will also be contacted to identify availability of statistics at regional level over a longer time period. ABS data is reasonably reliable over time at small area level for some dairy data but data should also be sourced wherever possible from Dairy Australia and other relevant dairy groups as they have accurate data to a relatively small scale over a long time period.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
DEWR Small Area Labour Markets (SALM)	Employment Unemployment Labour force size	Quarterly Jun 1990 to June 1996; Dec 1997 to Sep 2006. Note data not always comparable across all years for all SLAs due to boundary changes.	SLA	This data series takes data from the Labour Force Survey and produces it in a 'small area' format. As the Labour Force Survey is sample based and estimates for small areas are subject to a higher rate of sample error than larger regions, the data needs to be used with caution. It is the most accurate small area data source on employment other than the Census (which is undertaken once every five years). Note that Census employment and unemployment figures are not directly comparable to LFS and SALM estimates due to differences in definitions used when collecting data and other differences in approach to data collection.
FAFPESC Forestry survey	<ul style="list-style-type: none"> • Employment in forest industry 	2003-2005 as a single time period no separation of time periods (survey has continued over this time)	Postcode	Not able to be utilised for this study as no time series information available.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
Land sales data – RP data	<p>For South Australia, all individual land transactions are recorded in the RP Data database and can be analysed. Relevant information provided about land transactions in the database include:</p> <ul style="list-style-type: none"> • Property location/address; • Property size; • Property primary land use; • Sale price; and • Date of sale. 	1993 to current	Individual property location	<p>A key limitation in the SA property sales data is that the names of property owners (including those selling and those purchasing property) are not made publicly available. This means it is necessary to rely on the land use descriptions recorded in the database to identify what type of land use change may have occurred as part of a land transaction, and these land use classifications are sometimes inconsistent or unclear.</p>
Land sales data – Victorian Valuer General	<p>A request has been made to the Victorian Valuer General to access land sales data from 1991 to present for the study region. The data requested are name of land seller/purchaser, date of land sale, land area, land price, and property location/address.</p>	Awaiting advice from Valuer General	Awaiting advice from Valuer General	Awaiting advice from Valuer General.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
MLA Lamb Survey	<ul style="list-style-type: none"> • Number of lambs • Type of lambing enterprise (first cross, second cross, Merino) • Joinings • Lamb markings • Planned lamb turn-off 	1990-2006, annual	Lamb survey region (region 7,9,10 overlap with study region)	Large sample produces high quality data. However, data are available at lamb survey region level and there are only three regions within the study region. Therefore there is limited usefulness in profiling the lamb industry at small area scales. Also, data are predictive of planned sales etc – Agricultural Census/Survey data is more reliable in terms of recording historical change. Discussions currently underway with MLA to identify if any data can be reanalysed to produce information at a smaller scale in a meaningful way.
MLA Market Statistics database	Provides data on markets over time. Many statistics come from ABS; those that do not primarily relate to market prices. Pricing data is available for various livestock products (saleyard, wholesale) for varying periods of time for the different products.	Varies, often 1990-2005 with annual averages provided.	Typically provides data to national or State scale.	Limited usefulness; provides useful profile of changes in prices at State/National level for a range of specific livestock product types at saleyard and wholesale. Most other data are ABS-based and can be obtained at a smaller-area scale from ABS than is available in the MLA Market Statistics database.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
MLA NLRS (National Livestock Reporting Service)	A range of specific market information based on individual saleyard reports, includes volumes traded of different categories/classes of livestock, and prices. Note MLA Feedlot Survey may provide useful data and appears to be reported as part of NLRS service and market statistics database (see below).	Varies	Individual saleyard by saleyard location	Currently discussing with MLA the level of access available to individual saleyard data, which would be most relevant for the purposes of this study.

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
National Economics YourPlace database	<p>The database contains 28 indicators in three categories (listed below), plus underlying data used to construct each indicator.</p> <p>Household:</p> <ul style="list-style-type: none"> • Household Growth • Household Prosperity Potential • Job Readiness • Debt Affordability • Socioeconomic Dynamism • Labour Utilisation • Population Growth • Progression to Full Employment • Aged Services • Household Wealth • Income Earning Age Profile • Resident Jobs from National Growth • Resilience to Interest Rises and Income Losses <p>Industry:</p> <ul style="list-style-type: none"> • Local Employment Provision • Output Per Capita • Retained Retail Spending • Industry Jobs from National Growth • Industry Growth • Knowledge Driven Growth Potential • Industry Structure for Future Growth • Global Knowledge Flows • Structural Employment Dynamism <p>Regional:</p> <ul style="list-style-type: none"> • Community Welfare • High skilled residents • Lifestyle Choice • Lifelong Learning • Skills sustainability • Infrastructure 	<p>1986, 1991, 1996, 2001.</p> <p>For some variables 1986 data are not available.</p>	<p>LGA</p>	<p>The National Economics <i>YourPlace</i> database provides a number of indicators of economic change in LGAs across Australia which may be useful for SP2.</p> <p>Database has some limitations, primarily related to the geography for which data are available. The LGA scale while useful is not small enough for some of the profiling required for this study.</p> <p>Additionally, it is unlikely that the <i>YourPlace</i> database will be updated with 2006 data prior to the end of the study. Therefore where possible data will be obtained from other sources; however <i>YourPlace</i> data will be used for those indicators which are updated on a regular basis rather than only every 5 years with Census based data.</p>

Data source	Types of data available	Time period available	Smallest scale geography	Key aspects to note about this source of data
South West Farm Monitor Project	For beef, sheep grazing enterprises: <ul style="list-style-type: none"> • Gross farm income • Operating costs • Net income • Operating profit • Return on assets • Equity • Return on equity • Gross margins • Enterprise profitability • Labour efficiency • Stocking rate • Farm performance analysis • Stocking rate • Prices 	1970 onwards	Western Victoria	As data is based on a small sample, data cannot be broken down into small area information. Data are only for Victoria. Sample selection may be biased towards particular types of producers. Provides useful average data for South West Victoria.
State government education agencies	By individual public school: <ul style="list-style-type: none"> • Number of students enrolled in each year of schooling by gender By private school: <ul style="list-style-type: none"> • No data for South Australia • Unsure of data availability for Victoria 	Annual, from 1990 onwards	Individual school	South Australian data has already been obtained. Victorian data access is currently being negotiated and it is expected data access will be by individual school as listed in 'Types of data available.' Permission is currently being sought to access information on non-government school enrolments in Victoria and SA over time.