Sustainable Forest Management

Project No. PN04.4007

Australian Government

Forest and Wood Products Research and Development Corporation

Socio-economic impacts of plantation forestry in the Great Southern region

Socio-economic impacts of plantation forestry in the Great Southern region of WA, 1991 to 2004

Report produced for FWPRDC Project PN04.4007

Schirmer, J.; Parsons, M.; Charalambou, C.; Gavran, M.

Australian Government

Forest and Wood Products Research and Development Corporation

ISBN 0 642 47583 0

Publication: Socio-economic impacts of plantation forestry in the Great Southern region of WA, 1991 to 2004

Project no: PN04.4007

Researchers:
J. Schirmer, M. Parsons, C. Charalambou and M. Gavran
Bureau of Rural Sciences
PO Box E11, Kingston ACT 2604

Final report received by the FWPRDC in September 2005

Forest and Wood Products Research and Development Corporation

PO Box 69, World Trade Centre, Victoria 8005

Phone: 03 9614 7544 Fax: 03 9614 6822 Email: info@fwprdc.org.au

Web: www.fwprdc.org.au

Foreword

Plantation forestry has expanded considerably in recent years in Australia. Plantations are being established on agricultural land on an ongoing basis in several regions of the country, and provide a source of employment and income for many people.

Understanding the current and historical socio-economic impacts of plantation forestry is important, particularly to aid prediction of the impacts of future expansion of the sector.

The Bureau of Rural Sciences (BRS) provides a range of scientific advice on Australia's forest resources and management. During the Regional Forest Agreement process, BRS provided guidance and leadership in areas including social impact assessment in the forest sector.

This study represents an important addition to the body of literature on socio-economic impact assessment of the plantation forestry sector. It goes beyond previous studies by, for the first time, using a range of data to examine socio-economic change over time in regions with plantation forestry, as well as examining employment and expenditure by the sector. This has allowed key questions about the socio-economic impact of plantations to be answered using independent data on socio-economic change.

The methods used have enabled the socio-economic impacts of the plantation sector to be thoroughly examined.

Executive Director
Bureau of Rural Sciences

Executive summary

Introduction

A rapid expansion of plantations occurred over 1991 to 2001 in the Great Southern region of Western Australia. From an estate of only 6,150 hectares in 1991, the total area of plantations expanded to just under 127,500 hectares by the start of 2001. Most plantations are located in three local government areas in the region – Albany, Plantagenet and Cranbrook.

This represents a significant land use change over a relatively short time. This study examined the socio-economic impacts of this change over 1991 to 2004 by analysing trends in:

- Key agricultural industries;
- Employment and investment by the plantation sector;
- Population living in rural areas and towns;
- Socio-demographic characteristics of the population, including age structure, educational attainment, rate and type of employment, unemployment, number of new residents, and household income;
- Provision of key services including education, retail, government, health, community groups and rural fire fighting services; and
- Rural land prices.

It is often difficult to identify what has caused socio-economic change, as multiple types of land use, social and economic change may be occurring simultaneously in a region. In this study, plantations have been established in high rainfall areas which have been experiencing a number of land use changes. As a result, multiple factors influenced socio-economic change in the region, only one of which was change in the plantation sector.

Key results

Specific types of socio-economic change in the region, and the different factors influencing each type of change, are discussed below.

Land use change

Key changes in land use and agricultural industries in the region since 1991 have included:

- Many farmers exiting agriculture as it has become harder to achieve economically viable returns, particularly on smaller properties;
- Ongoing increases in farm size, as farmers have had to manage larger areas to stay viable;
- A shift to off-farm employment for many farming families;
- A shift from sheep grazing to either grain growing or cattle grazing; and
- In high rainfall areas, a shift from traditional farming to plantation forestry, vineyards and aquaculture, as well as ‘lifestyle’ farming on small blocks.

In higher rainfall areas of the Great Southern with suitable soils, agricultural properties have often been purchased or leased for (a) growing plantations, (b) establishment of vineyards, or (c) in some cases for use as lifestyle rural blocks. In lower rainfall areas with soils less suited to enterprises such as plantation expansion or grape growing, when farmers have left the land their properties have generally been purchased by other farmers who are expanding their holdings.

Plantation LGAs have on average experienced more rapid decline in numbers of farmers and farm managers compared to other LGAs in the Great Southern and to comparison regions. However, although the average decline was higher for plantation LGAs than other areas, when trends for individual LGAs were compared a more complex picture emerged. Some LGAs with no plantations experienced a higher decline in farming population than high plantation LGAs, indicating that plantations are only one factor amongst many influencing the rate of decline in farming population.

The primary difference between high and low rainfall areas has been the agent of change. In the LGAs of Albany, Plantagenet and Cranbrook, it has been plantation companies and, to a lesser extent, grape growers, that have purchased or leased land when farms left farming, while in most other LGAs of the Great Southern it has been farmers who have purchased or leased land. The different pattern has been dictated in part by land prices. Higher demand for land in higher rainfall areas has led to rapid land prices increases. This has made land in these areas less affordable for farmers to purchase. As a result, plantations and vineyards, rather than traditional broadacre agriculture, have been the agents of change in these areas.

Plantation sector employment and spending

The plantation sector has employed a growing number of people since 1991, with the most rapid growth occurring since harvesting began in 2001. By 2004, an estimated 500 people were directly employed in the sector[1], almost twice the 263 employed in 2001 prior to the start of harvesting in the region. Part of the increase was also due to an increased area of new plantings in 2004 compared to 2001.

Within the Great Southern, many employees of plantation management companies/agencies are located in the City of Albany. In 2003-04, 58% were based in Albany, while 6% were based in other towns in the Great Southern (mostly Plantagenet and Cranbrook), and 36% outside the Great Southern.

Much of the direct employment generated by plantation expansion is in contracting businesses. Contractors undertake activities such as site preparation prior to plantation establishment, planting seedlings, and fertilising and insect control activities. In the early 1990s many contractors engaged to undertake work in plantations were based outside the Great Southern. In recent years, contract work has increasingly been sourced within the Great Southern, as businesses have established in the region to supply services to the growing plantation sector. As a result, the amount of contracting work undertaken by businesses based outside the Great Southern fell from 57% in 1996-97 to 36% in 2003-04.

As well as direct employment, the activities of the plantation sector generate flow-on, or ‘indirect’ employment. This flow-on employment includes jobs such as those in local supermarkets generated as a result of plantation sector employees buying household groceries, or those generated by the production of goods that are purchased by a plantation business.

---

[1] Direct employment was defined as including employees of plantation management companies/agencies, processors, and employees working for contracting businesses servicing the plantation sector.

For every $1 million spent by the plantation sector, an estimated 17.15 jobs are created in the Great Southern. This includes both direct employment by the plantation industry, and flow-on employment generated as a result of demand for goods and services from the plantation industry. For every direct job in the plantation sector, this equates to flow-on employment of 0.65 people within the Great Southern. In addition, further flow-on employment is created outside the region when goods and services are imported from other regions.

In 2001-02, expenditure on establishing, managing and early harvesting activities totalled an estimated $35.8 million dollars. This included plantation management expenses, but not the costs of management of investment schemes or other business costs such as servicing loans. Of this, approximately 69% was spent within the Great Southern.

In 2003-04, with rapidly expanding harvesting and processing and a higher area of plantations established than in 2001-02, expenditure totalled an estimated $49.7 million. Of this:

- $12.86 million was paid to contracting firms to undertake work such as site preparation, planting of seedlings, firebreak maintenance or harvesting and transport of logs and woodchips; and
- $36.7 million was spent in operating expenses such as wages, purchase of supplies, and lease payments to landholders.

An estimated 67% of this expenditure occurred within the Great Southern and 33% outside the Great Southern.

Direct expenditure by the plantation sector generates flow-on expenditure. For example, suppliers of services to the sector buy goods and services in the region, and so on, creating a chain of flow-on economic activity. For every $1 million spent by the plantation industry in the Great Southern, an estimated total of $1.76 million is generated in regional output (in other words, in goods and services produced by a range of industries), and $0.53 million of income is generated in the region. In addition, further flow-on activity is generated outside the Great Southern as some goods and services required by the plantation industry are purchased outside the region, and some income is similarly spent outside the region.

Population

Over 1996 to 2001, Great Southern LGAs which experienced high rates of plantation expansion generally experienced either rural population growth, or lower rates of rural population decline, than LGAs with a high reliance on traditional agriculture and few/no plantations.

However, the positive change in rural populations in plantation LGAs was not primarily a result of plantations, but resulted from a mix of influences. Rural population growth primarily resulted from expansion in intensive agricultural uses and influx of ‘lifestyle’ residents. There is potential for further rural population growth if planning authorities permit ‘homestead blocks’ to be subdivided on plantation properties, enabling new residents to purchase houses on plantation properties.

Between 1986 and 2001, 22% of farming families left the land across Australia (ABS 2003a). In the Great Southern, the number of farmers and farm managers fell in both plantation and non-plantation areas of the region over 1996 to 2001. In the coastal and high rainfall LGAs, this has been counterbalanced in some cases by an influx of new population living on rural lifestyle blocks and, less commonly, managing vineyards. When these influences are accounted for, it appears likely that plantation expansion, while representing a different type of land use change than has occurred in many rural areas, had a similar impact on rural

population to ongoing process of farm amalgamation occurring in other parts of the Great Southern.

Plantation expansion has been one of many contributors to population growth in some town populations, primarily in the city of Albany where much of the employment generated in the plantation sector is based.

Socio-demographic change

Most parts of the Great Southern experienced similar patterns of socio-demographic change over 1991 to 2001, with only a few exceptions. There were no observable differences in the type or rate of change in most socio-demographic characteristics between 'high plantation' and other LGAs.

The Great Southern has experienced a generally ageing population, with a decrease in child (0-14) and youth (15-24) age population and increasing in working (25-64) and retirement (65 and older) age population in most LGAs. The LGA of Denmark is perhaps the key exception to this trend, with a higher proportion of youth age population reflecting its reputation as an alternative lifestyle region.

The proportion of population holding high school certificate or higher level qualifications increased across the region over 1991 to 2001.Unemployment rates fell while the proportion of the labour force employed part-time rose substantially. The number of new residents varied, with the proportion of new residents in the population falling in some LGAs and rising in others.

Many of the differences in the rate of change in particular socio-demographic characteristics across LGAs could not be easily explained, with focus group participants unable to pinpoint why different rates of change had occurred.

There was a clear difference in household income growth in different parts of the Great Southern. In Albany, Cranbrook, Denmark and Plantagenet, average household income grew relatively steadily over 1991 to 2001, while in other LGAs with high dependence on broadacre agriculture, there was considerable fluctuation in average household income over this time. The former LGAs have a more diverse mix of industries and land uses, including plantation growing, viticulture and other forms of intensive agriculture as well as broadacre agriculture. This diversity is likely to have underpinned more stable income growth in the high rainfall, diverse land use LGAs, while the high reliance on broadacre agriculture in other LGAs led to fluctuations in household income as climatic conditions and returns from agriculture varied.

Availability of key services

An overall decline in many services was reported in most rural areas of the Great Southern, including areas where plantations have been established and those where they haven't.

Limited data was available on changes in provision of many types of services. While it was possible to identify general trends in service provision, the data available did not in general allow in-depth analysis of whether plantation expansion had led to more rapid service decline. Analysis of the data that was available suggested plantation expansion tended to occur after a decline in services, rather than preceding it.

In general, change in levels of service provision did not appear to be directly linked to expansion of plantations. Changes in the level of education, health, government, retail and

volunteer fire fighting services, and in community groups, were influenced by a range of factors. Probably the greatest of these was overall population change. Rural communities with falling population, and associated ageing of the population, tended to experience withdrawal of services, while service provision generally grew in larger towns.

The level of services to agriculture, and education services (measured by numbers of students enrolled in schools), did decline more rapidly in areas experiencing rapid plantation expansion over 1991 to 2001 than in other areas of the Great Southern or comparison regions outside the Great Southern. However, in both cases the decline was high prior to plantation expansion occurring, suggesting plantation expansion may have been one type of response to the factors causing decline in these services (eg declining viability of farming), rather than a cause of the decline.

Land prices

Rural land prices rose more rapidly over 1988 to 2001in high rainfall areas of the Great Southern than other areas. Demand for land from plantation companies has been a contributor to this trend, particularly in the LGAs of Albany and Plantagenet. In Albany, Cranbrook and Plantagenet, where the majority of plantations have been established, sales of land to plantation companies formed a high proportion of total rural land sales in the late 1990s, and again in 2003 and 2004. In general, land sold to the plantation sector has sold for a higher price per hectare than land sold in the same LGA for other purposes.

There is also some evidence that high demand from the plantation sector may have influenced higher growth in values of agricultural land in nearby LGAs. In focus groups, several participants reported that they had observed a pattern of farmers selling their land for plantation establishment, and then purchasing agricultural properties in nearby areas not suitable for plantation establishment. This was consistent with trends observed in available land price data. However, comparison of price changes in a wider range of areas would be needed to confirm this trend.

Conclusions

The pattern of socio-economic change occurring across ‘plantation’ and ‘non plantation’ regions of the Great Southern has been a result of a number of underlying drivers, particularly:

- Increasing input costs, and stable or falling real prices for many agricultural products, requiring farmers across the region to ‘get big or get out’;
- Few young people entering farming, with a rapidly ageing farming population;
- Increasing shift of population towards coastal areas and onto ‘lifestyle’ rural residential blocks, particularly in higher rainfall areas;
- Introduction of new land uses in high rainfall areas, particularly plantations and viticulture; and
- Withdrawal of services from smaller rural areas into regional centres, leading to a pattern of growth in larger towns and decline in surrounding smaller population centres.

These drivers have led to different types of land use change in different parts of the Great Southern, with a shift to plantations and viticulture in areas suitable for development of these

enterprises, while in other areas individual farm enterprises have tended to become larger through processes of farm amalgamation.

Opportunities for diversification of land uses have generally occurred in high rainfall areas. As a result, land use change in these areas has tended to be from traditional agriculture to new land uses. These areas have also been attractive to 'lifestyle' rural residents. As a result, high rainfall areas have experienced more growth in population and associated services than the lower rainfall areas with higher dependence on broadacre agriculture.

Plantation expansion has not led to higher rates of rural decline at the local government area scale. Further studies are needed to examine changes occurring at smaller scales, eg within different LGAs, and to examine the impact of growing employment associated with the expansion of plantation harvesting currently taking place in the region. A follow-up study should be undertaken after the 2006 *Census of Population and Housing* becomes available.

Acknowledgments

We would like to thank the many individuals and groups who provided advice and information for the study. Without their assistance, it would not have been possible to conduct the study.

We would firstly like to acknowledge FWPRDC for funding the study, and particularly Chris Lafferty and Glen Kile for providing support throughout the project. We would also like to thank the members of the Steering Committee that advised the project – Alan Cummine, Jill Lewis, Jo Roberts, Angela Robinson, Richard Stanton, Stephen Taylor, Phil Townsend and Andrew Wilson.

A number of staff at the Bureau of Rural Sciences assisted with and advised on the project, and we thank these people for their valuable input. We would also like to thank the five independent reviewers who provided comments on draft study reports.

We would like to thank Albany Bulk Handling, the Albany Plantation Export Company, Albany Plantation Forest Company of Australia, Albany Port Authority, Albany Water Corporation, Forest Products Commission, Great Southern Plantations, Integrated Tree Cropping, Sharus, Timbercorp, Toll Logistics and WA Plantation Resources for agreeing to provide data for the project. We would also like to thank the contracting businesses who provided data for the project.

A number of people in the plantation sector invested considerable time and effort providing data and advice for the study, particularly Roger Banks, Steve Blyth, David Boadle, Richard Breidahl, James Bulinski, Ken Eade, Gavin Ellis, Bob Golding, Alan Hordacre, Johnny Ito, Barry Jordan, Karan Maisey, Rick Mitchell, Steve Quain, Geoff Rolland, Denis Sawers, Leanne Tomlinson, and Russell Walters.

Many people contributed their time to participate in focus groups in the region and provide other information, providing invaluable insights into key changes in the region. We would like to thank in particular Vicky Brown, Joan Cameron, Rick Chadwick, Peter Duncan, Henry Esbenshade, Chris Evans, Robert Fenn, Kevin Forbes, Bill Hollingworth, Kath Lymon, Kevin Martin, Ron Pocock, Maynard Rye, Graham Stanley, Peter Thorn, Len van der Waag, Brett Ward, John Walker, Sue Walker, Mark Waud, Karen Webb, Neil Worrell and the staff at the Katanning office of the Department of Agriculture.

Finally, we would particularly like to thank Julia Levinson of Timber 2020 for her considerable time and effort supporting and assisting the study.

Contents

Foreword ii
Acknowledgments ix
Contents x
Figures xi
Tables xiii
Boxes xiv
1.0 Introduction 1
1.1 Overview of the study 1
1.2 Defining socio-economic impact assessment 2
2.0 The Great Southern region 4
2.1 Key changes in the Great Southern 6
2.2 Albany 6
2.3 Plantagenet 7
2.4 Cranbrook 8
2.5 Denmark 8
2.6 The 'agricultural' Shires 9
2.7 Plantation development in the Great Southern 10
2.8 Plantation work cycles 14
3.0 Study goals and key questions 16
4.0 Methods 18
4.1 Data accessed 18
4.2 Geographic links between Great Southern plantations and their socio-economic impacts 22
4.3 Links between socio-economic change and plantation sector activity 22
5.0 Results 28
6.0 Land use change 29
6.1 Broadacre agriculture 29
6.2 New agricultural enterprises 34
6.3 Other agricultural enterprises 36
6.4 Number of farm managers 36
7.0 Plantation sector employment and expenditure 40
7.1 Employment 41
7.2 Plantation sector expenditure 44
8.0 Change in population 46
9.0 Socio-demographic change in the population 54
9.1 Age structure 55
9.2 Educational attainment 57
9.3 Number of new residents 58

9.4 Labour force, employment and unemployment 60
9.5 Household income 64
10.0 Changes in service provision 66
10.1 Education 66
10.2 Health and government services 76
10.3 Community groups 80
10.4 Emergency services - fire fighting 81
10.5 Retail sector 82
10.6 Agricultural service businesses 85
11.0 Changes in land prices 88
11.1 Changes in average land prices 89
11.2 Proportion of land sales to the plantation sector 90
11.3 Differences in prices paid for plantation and non-plantation land 95
11.4 Impact of plantation sector on prices of non-plantation land 96
12.0 Discussion and conclusions 97
13.0 Recommendations for future research 103
Appendix 1: Review of perceptions about the socio-economic impacts of plantations 105
Appendix 2: Previous socio-economic impact studies 112
Appendix 3: National Economic *YourPlace I-O* model 117
Appendix 4: *YourPlace I-O* data on flow-on impacts 123
References 125
Key data sources 128
Other reports from this study 128

Figures

Figure 1: The Great Southern region 5
Figure 2: Area of hardwood plantations in different Great Southern LGAs 11
Figure 3: Area of softwood plantations in different Great Southern LGAs 11
Figure 4: Location of plantation estate in the Great Southern at September 2000 13
Figure 5: Average annual change in primary agricultural activity, 1994-2001 31
Figure 6: Number of sheep and lambs in different LGAs 32
Figure 7: Number of cattle and calves in different LGAs 32
Figure 8: Area of wheat grown for grain production in different LGAs 33
Figure 9: Area of barley produced for grain in different LGAs 33
Figure 10: Area of legumes established for grain in different LGAs 34
Figure 11: Number of establishments undertaking grape growing as their primary agricultural activity in different LGAs 35
Figure 12: Estimated value of aquaculture production in different LGAs 36

Figure 13: Number of farmers and farm managers in different LGAs, 1996 and 2001 37
Figure 14: Average annual change in number of farmers and farm managers in Great Southern LGAs, 1996 to 2001 38
Figure 15: Average annual change in farmers and farm managers in Great Southern LGAs and comparison regions, 1996 to 2001 38
Figure 16: Direct employment in the plantation sector, 1991 to 2004 42
Figure 17: Population of Great Southern LGAs, 1981 to 2001 47
Figure 18: Average annual population growth in Great Southern LGAs, 1981 to 2001 47
Figure 19: Total population living in rural areas of Great Southern LGAs, 1996 and 2001 48
Figure 20: Total change in rural population of Great Southern LGAs, 1996 to 2001 49
Figure 21: Total population living in different towns of the Great Southern (excluding Albany) 51
Figure 22: Change in population of Great Southern towns, 1996 to 2001 51
Figure 23: Average annual change in population in high plantation LGAs and comparison regions 52
Figure 24: Change in population age structure of Great Southern LGAs, 1991 to 2001 56
Figure 25: Change in population age structure of high plantation LGAs and comparison regions, 1991 to 2001 56
Figure 26: Highest level of qualification held by population of different LGAs, 2001 57
Figure 27: Change in proportion of population of different LGAs holding qualifications, 1991 to 2001 57
Figure 28: Proportion of the population who did not live in the same LGA five years previously 59
Figure 29: Change in labour force participation rate in Great Southern LGAs 60
Figure 30: Proportion of labour force employed full-time and part-time by LGA, 2001 61
Figure 31: Change in proportion of labour force employed part-time and full-time by LGA, 1991 to 2001 62
Figure 32: Unemployment rate by LGA, 1991 to 2001 63
Figure 33: Change in proportion of labour force without employment by LGA, 1991-2001 63
Figure 34: Average household income by LGA, 1986 to 2001 64
Figure 35: Average annual growth in household income by LGA, 1986 to 2001 65
Figure 36: Total enrolment in primary and high schools for towns of > 10,000 population 68
Figure 37: Rate of change in enrolment in primary and high schools for towns of > 10,000 population 68
Figure 38: Average enrolment in primary and high schools for towns of 1,000 to 5,000 population 69
Figure 39: Rate of change in enrolment in primary and high schools for towns of 1,000 to 5,000 population 70
Figure 40: Average enrolment in primary and high schools for towns of 500 to 1,000 population 71
Figure 41: Rate of change in enrolment in primary and high schools for towns of 500 to 1,000 population 71
Figure 42: Rate of change in enrolment in primary and high schools for individual towns of 500 to 1,000 population 72
Figure 43: Average enrolment in primary and high schools in towns with < 200 population 74
Figure 44: Rate of change in enrolment in primary and high schools in towns with < 200 population 74

Figure 45: Rate of change in enrolment in primary and high schools in individual towns with < 200 population 75
Figure 46: Rate of change in enrolment in primary and high schools in towns with < 200 population located near large areas of plantation 76
Figure 47: Estimated value of health and community services in Great Southern LGAs 77
Figure 48: Average annual change in value of health and community services in Great Southern LGAs 77
Figure 49: Average annual change in value of health and community services in high plantation LGAs and comparison regions 78
Figure 50: Estimated value of government administration services in Great Southern LGAs 78
Figure 51: Average annual change in value of government administration services in Great Southern LGAs 79
Figure 52: Average annual change in value of government administration services in high plantation LGAs and comparison regions 79
Figure 53: Estimated value of retail services in Great Southern LGAs 83
Figure 54: Average annual change in value of retail services in Great Southern LGAs 83
Figure 55: Average annual change in value of retail services in high plantation LGAs and comparison regions 84
Figure 56: Estimated value of services to agriculture, hunting and trapping in Great Southern LGAs .. 85
Figure 57: Average annual change in value of services to agriculture, hunting and trapping in Great Southern LGAs 86
Figure 58: Average annual change in value of services to agriculture, hunting and trapping in high plantation LGAs and comparison regions 86
Figure 59: Rate of increase in average land prices for sales > 40 ha, 1988-2004 89
Figure 60: Average price per hectare for land sales > 50 ha by LGA, based on individual land sales data 90
Figure 61: Proportion of land sales > 50 ha to plantation companies by dollar value 92
Figure 62: Proportion of land sales > 50 ha to plantation companies by area 93
Figure 63: Number of sales of land parcels to the plantation sector in high plantation LGAs of the Great Southern 94
Figure 64: Proportion of total land sales in Albany, Cranbrook and Plantagenet LGAs involving sales of agricultural land to the plantation sector 95
Figure 65: Average price per hectare for land sold to plantation sector and non-plantation sector buyers – Albany, Cranbrook and Plantagenet LGAs 96

Tables

Table 1: List of comparison regions 26
Table 2: Direct employment in the plantation sector over time……..……...41
Table 3: Key changes in community groups in different regions……81

Boxes

Box 1: Key questions about socio-economic impacts of expanding plantation estate……....17
Box 2: Land use change…….....29
Box 3: Plantation sector employment and expenditure……43
Box 4: Population change……....46
Box 5: Socio-demographic change…….....54
Box 6: Service provision…….....67
Box 7: Rural land prices…….....88

1.0 Introduction

1.1 Overview of the study

In recent years, Australia's plantation estate has expanded rapidly, as has the volume of plantation timber being harvested and processed from plantations. A wide range of claims have been made by different groups about the socio-economic impacts of this expansion on rural communities and regional economies. These include claims about the potential economic and employment benefits of plantations, as well as about the potential impacts of an expanding plantation sector activity on rural populations, social structures, and levels of service provision.

Increasingly there are calls for socio-economic impact assessments to be undertaken to examine the benefits and costs of future expansion of the plantation estate and associated processing. Predicting future socio-economic impacts requires understanding how past expansion of the plantation sector has influenced rural communities and regional economies.

Previous socio-economic impact assessments have often focussed on recording perceptions of impacts of plantations, and using modelling approaches to predict potential future economic and social impacts of plantations. Recently, considerably more data has become available, allowing a better analysis of change in key socio-economic variables over time in areas that have been experiencing rapid expansion of the plantation sector. This allows study of whether particular perceptions and predictions about the impacts of plantations have in fact matched what has occurred.

The goals of this study were to explore the use of independent data to answer key questions commonly raised by rural communities about the socio-economic impacts of plantations. This involved identifying common questions asked about these types of impacts[2], and identifying the extent to which available data could answer these questions in two case study regions. The project was funded by the Forest and Wood Products Research and Development Corporation.

This report presents results of a case study examining the role of plantation expansion in socio-economic and land use change in the Great Southern region of Western Australia over 1991 to 2004. The role of the plantation sector was examined by comparing socio-economic and land use change occurring in areas with (a) high levels of plantation sector activity and (b) little or no plantation sector activity.

The study was designed so it can be followed up over time as further data from sources such as the Australian Bureau of Statistics *Census of Population and Housing* become available.

This report is one of six reports from the overall project. It is structured into several parts:

1. Overview of the Great Southern and the plantation sector in the region;
2. Key questions examined in the study and methods used;
3. Results, including analysis of:

[2] These questions are presented and discussed in Section 3.

a. Different types of land use and industry change occurring in the Great Southern during the period studied. This was then used to inform interpretation of the various socio-economic changes observed in the region;

b. Changes in plantation sector employment and expenditure during the period studied;

c. Change in population of towns and rural areas;

d. Socio-demographic change in the population, including change in age structure, level of qualifications, labour force, employment and unemployment;

e. Changes in service provision in the region; and

f. Changes in rural land markets.

Key conclusions and recommendations for further research are then given.

1.2 Defining socio-economic impact assessment

The term 'socio-economic impact assessment' (SEIA) is used throughout this report to refer to assessments of the impacts of a change on residents of a region or community. The terms 'social' and 'economic' are combined in SEIA in recognition of the inherently linked nature of social and economic impacts, and the difficulty of identifying clear boundaries between the two.

Many social impact assessments examine topics that would also be examined by an assessment of economic impact, and vice versa. For example, understanding the social impacts of the establishment of a new industry requires knowledge of the level of employment generated by this industry, and the regions where spending occurs as part of the industry. This, combined with understanding of the demographic structure of the regions identified, and of social and cultural issues relating to the 'liveability' of the regions, allows analysis of the likely impacts of the new industry on the population of these regions. Conversely, understanding the economic impacts of a change may require knowledge of the demographic characteristics of a community, which can allow prediction of whether new employment can be sourced from the local population or will need to be imported from elsewhere.

The term 'SEIA' is used throughout this report to emphasise the importance of and need for social and economic impact assessment. It highlights the need for appropriate techniques and expertise in assessing the broad spectrum of impacts that may be covered by an assessment of the impacts of a change on a particular region or community.

In this study, the impacts assessed fell mostly into the 'social' end of the socio-economic spectrum. The social impacts examined included impacts on regional and local population levels, socio-demographic characteristics, and provision of services. In addition, some impacts often considered to fall within both 'social' and 'economic' categories were examined – primarily the level of employment generated by the plantation sector. Finally, some analysis of economic impacts occurred, with the level of direct and indirect expenditure and employment generated by the plantation sector calculated. The calculation of indirect

impacts was undertaken by National Economics[3], while all other analysis was undertaken by the Bureau of Rural Sciences, often utilising data already available from previous economic studies.

[3] National Economics is an Australian based economics consulting and research organisation. Amongst other reports, they produce the well-known *State of the Regions* report, and specialise in producing economic analysis of impacts at local and regional scales.

2.0 The Great Southern region

This section gives an overview of the Great Southern and key changes occurring in different parts of the region since 1991. Some of these changes are explored in more depth in subsequent sections of this report.

The Great Southern region consists of 12 local government areas (LGAs) in southern Western Australia, stretching along the coast and inland as shown in Figure 1.

The region has traditionally been dependent on the agriculture and fishing industries, and whaling was a mainstay of the Albany economy for much of the 1800s and into the 1900s. In recent decades an increasing range of industries have established and grown in the region, including tourism, viticulture, plantation and aquaculture development, while commercial fishing has declined.

Broadacre agriculture has underpinned much of the Great Southern economy since Europeans came to the area, with early settlers starting to farm around Albany from the 1830s onwards. However, in much of the Great Southern agriculture has had a relatively short history. While farming in some agricultural areas dates back to the late 1800s and early 1990s, a considerable area was only cleared for agriculture in the 1950s and 1960s, including much of the agricultural land in the Shires of Kent and Jerramungup, and western parts of Plantagenet Shire. Much of this land was made available by the state government after World War II as soldier settler blocks.

In the last two decades, some common changes have affected the region as a whole. These are discussed below, followed by an overview of five different areas of the Great Southern that have experienced unique patterns of development and change. The three Shires that experienced the greatest plantation expansion over 1991 to 2001 - Albany, Cranbrook and Plantagenet – are each discussed separately, as each has different characteristics. Denmark Shire is also described separately as it has experienced different changes to most of the rest of the Great Southern. The predominantly agricultural Shires of Broomehill, Gnowangerup, Jerramungup, Katanning, Kent, Kojonup, Tambellup and Woodanilling are discussed as a group as relatively similar trends have occurred in the population and economy of these Shires over time.

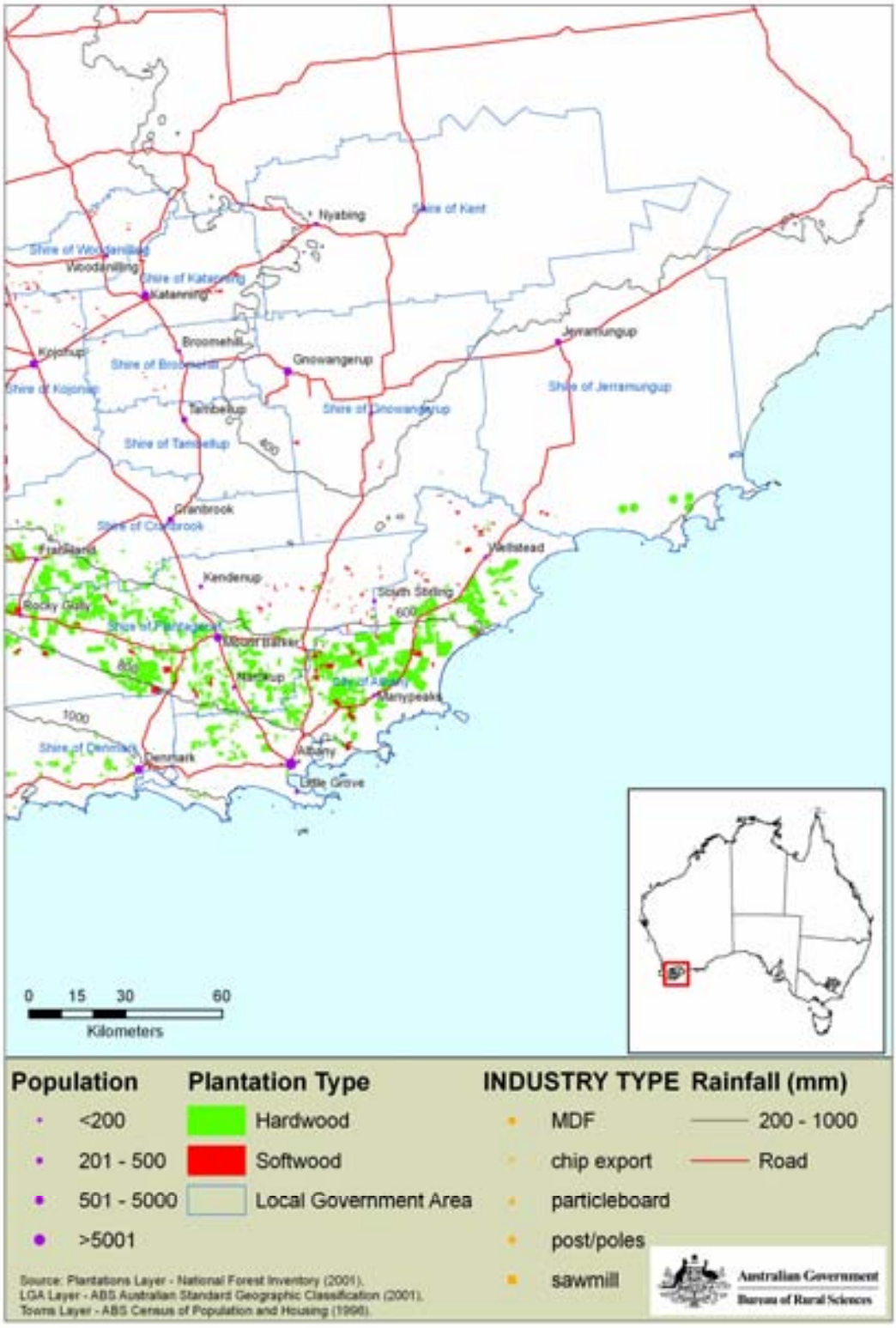


Figure 1: The Great Southern region

2.1 Key changes in the Great Southern

Since 1991, the Great Southern as a whole has experienced significant changes to the agricultural industries on which much of the region's economy was traditionally dependent. In focus groups held for the study, the following key changes were commonly reported by participants:

- In broadacre agriculture, increasing mechanisation and changes to agricultural prices have forced many farmers to increase the area of land they manage, in order to stay economically viable;

- Increasing proportions of children leaving farms and rural areas to live in regional centres and cities and not returning to live in rural areas. This has resulted in a rapidly ageing farming population;

- Declining population in rural areas, resulting from the changes discussed above and from associated withdrawal of services from small rural areas;

- Shifts out of sheep grazing and into cattle grazing (in high rainfall areas) and grain growing (particularly in northern and eastern areas of the Great Southern); and

- Difficulty obtaining farm labour. This was explained as resulting from (a) the trend of young people leaving the country, rather than staying to work on farms prior to owning a farm; (b) low wages paid to farm workers; and (c) declining availability of full-time farm employment resulting in people leaving the area or shifting into other jobs.

The tourism industry has grown, with most growth occurring in coastal areas of the region. The estimated value of the region's accommodation industry (hotels, motels) increased from $10.4 million in 1991 to $32.7 million in 2001. The estimated value of cafés and restaurants – a part of the hospitality industry highly dependent on tourism – increased from $18.4 million to $103.3 million over the same period[4]. A considerable proportion of this growth occurred in Albany and Denmark, while less occurred in Plantagenet, and there was comparatively little growth in tourism in other LGAs of the Great Southern.

These changes are common to rural and, in the case of Albany and Denmark, coastal areas in many parts of Australia (Haberkorn *et al.* 2004, Productivity Commission 2005).

2.2 Albany

Albany LGA covers a large but relatively narrow strip of land along the coast, with a total area of 431,777 hectares (SCRIPT 2004).

The City of Albany forms the central regional town of the Great Southern. With a population of 23,850 living in the City of Albany in 2001[5], it is the largest city for several hundred kilometres. The total population of the LGA in 2001 (including both the city of Albany and rural areas) was 29,571. The next largest town in the Great Southern, Katanning, had a

[4] Dollar values for all years have been adjusted for inflation, are in 2001 dollars. These statistics were sourced from the National Economics *YourPlace* database.

[5] This figure includes the population of Little Grove and Frenchman Bay, which are sometimes listed as separate towns but are effectively part of Albany

considerably smaller population, of 3,676 in 2001, highlighting Albany city's role as the regional centre for the Great Southern.

Exports of agricultural produce, and more recently woodchips from bluegum plantations, occur through Albany port.

The rural parts of the LGA vary considerably from west to east, with eastern areas used more for cropping, and western areas for a higher diversity of land uses. There has been an overall shift out of sheep grazing since 1994, with farmers leasing or selling land for plantation establishment or shifting to focus on beef cattle production. There has also been a small shift into non-traditional agricultural enterprises such as cut flower and seed growing.

The LGA has experienced consistent population growth since 1981, with the City of Albany experiencing the greatest growth. Rural areas of the LGA experienced population growth over 1996 to 2001. This population growth has resulted from a mix of trends, including people shifting to the LGA to live or retire on 'lifestyle' blocks, often located near the coast; residents from other LGAs in the Great Southern retiring into Albany city; and employment opportunities in new industries including the tourism, retail and plantation sectors.

Changes in rural areas of the LGA have included:

- Establishment of plantations on between 17-22% of agricultural land in the LGA from the early 1990s to 2001[6];
- Increasing numbers of 'lifestylers' purchasing small blocks in the LGA; and
- Farm amalgamation, with farmers purchasing other farms to expand properties and stay viable. This appears to have been more common prior to plantation expansion.

Declines in the farming population of the LGA have been counterbalanced by increasing numbers of lifestyle and professional residents living in rural areas, some of whom commute into Albany to work.

Small inland rural towns in the LGA, such as Wellstead and Manypeaks in the east, have generally experienced declining population for the last 20 years. In recent years, there has been difficulty obtaining permission to subdivide land to provide more residential sites in these towns, despite reported demand for residential properties in these areas.

2.3 Plantagenet

Plantagenet Shire is situated immediately north of the LGAs of Albany and Denmark. It covers an area of 497,464 hectares, and as such is considerably larger in area than many other Great Southern LGAs. Situated in a zone with higher rainfall than Shires to the north and east, it has experienced considerable land use change in recent years.

---

[6] The lesser figure is calculated based on dividing the area of plantations by the total area of the LGA excluding nature reserves, publicly owned native forest, land not rated as capable for agriculture, and urban land; the higher figure is based on the area of plantations divided by the total area cropped or grazed as defined in the ABS *Agricultural Census.* The upper figure is considered more likely to reflect the area established to plantation, as the calculated area of plantations underestimates the total area of land owned/managed by the plantation sector. 'Plantable' land typically makes up 70-80% of the total area of land on a property that is established to plantation while the remainder is made up of riparian reserves, firebreaks and other areas not suitable for planting which are not counted as part of the area of plantation established in the region.

The total population of the LGA was 4,330 in 2001. Mt Barker is the largest town in the Shire, with a population of 1,722 in 2001. Smaller localities in the Shire include Rocky Gully, Narrikup, Kendenup and South Stirling.

A considerable proportion of Plantagenet Shire – 19% - is nature reserve, much of this in the Stirling Ranges National Park.

The three key land use changes in the Shire since 1991 have been:

- Establishment of plantations on approximately 14-18%[6] of the Shire's agricultural land between the early 1990s and 2001. Plantations are located primarily in the west and south of the Shire, with fewer in the north-east near the Porongurup ranges;

- Establishment of a number of vineyards and wineries in the Shire. These range from small boutique grape growers to large-scale businesses selling wine nationally and internationally; and

- Increasing numbers of residents living on 'lifestyle' blocks in the Shire. This has occurred primarily in the South Stirling area, near the Porongurup Ranges, and in the Kendenup area. In the latter area, land was subdivided in the early 1900s for a planned market garden industry which did not eventuate. As a result, until the last two decades broadacre farmers owned multiple small blocks to form a farmable area. As these farmers have sold their farms, the individual land parcels have been sold separately for rural residential development.

Relatively little farm amalgamation has occurred in the LGA since the early 1990s. This is likely because most farming properties that came onto the real estate market have been leased or sold for plantations, vineyard or 'lifestyle' blocks, rather than to other farmers. Two real estate agents reported observing a pattern of farmers selling or leasing land for plantations or vineyards and then purchasing farming land further east or north in the Great Southern where land prices were cheaper.

2.4 Cranbrook

The Shire of Cranbrook covers a smaller area than Plantagenet or Albany, of 327,611 hectares. It also has a much smaller population than Plantagenet or Albany, of 1,049 in 2001. It has two small towns – Cranbrook in the east, with a population of 270 in 2001, and Frankland in the west, which had a population of less than 200 in 2001. Approximately 8-10% of agricultural land in the Shire was established to plantation by 2001[6].

There are considerable differences in the rainfall and soils in the east and west of the Shire, which have led to different patterns of land use change. In the west, vineyards, olive and tree plantations have been established, and there has been creation of employment associated with the intensive agriculture (vineyards and olives), particularly in the town of Frankland. In the east, where land is not suitable for these enterprises, farm amalgamation has been the primary land use change, and population of the town of Cranbrook and surrounding rural areas has declined.

2.5 Denmark

The Shire of Denmark has experienced different patterns of change to other LGAs of the Great Southern. This coastal high rainfall Shire covers 185,999 hectares, of which 42% is nature reserve. The Shire has, therefore, considerably less agricultural land than other LGAs

of the Great Southern. The primary agricultural activities are grazing and some intensive agriculture. Although a relatively small total area of plantations has been established, plantations covered 2-5%[6 above] of agricultural land in the Shire by 2001.

Denmark has been well known as an alternative lifestyle community for the last two to three decades. The Shire is widely touted as having 'the highest number of PhD's per square mile' of any LGA in the country. It also has a high number of arts- and environment-focussed community groups. The Shire has a higher reliance on tourism than other LGAs of the Great Southern.

Increasing 'lifestyle' population has been perhaps the biggest change in the Shire in recent years, with a range of people of different ages shifting to Denmark for lifestyle reasons. Rapid increases in land prices over the past 20 years, higher than any other LGA in the Great Southern, reflect this high demand for land in the Shire from 'lifestylers'.

2.6 The 'agricultural' Shires

The remaining Shires of the Great Southern - Broomehill, Gnowangerup, Jerramungup, Katanning, Kojonup, Kent, Tambellup, and Woodanilling - are all characterised by a high dependence on traditional agriculture, which is the predominant economic activity in these Shires. Perhaps the only exception to this is coastal areas of Jerramungup, particularly the coastal town of Bremer Bay, which have experienced increasing population and growth in tourism.

The key town centre for this group of Shires is Katanning, with a population of 3,676 in 2001. The next largest town in this group of LGAs is Kojonup, with a population of 1,125 in 2001. All other towns in the agricultural Shires had a population of less than 700 in 2001.

This group of Shires have experienced similar land use changes over the past two decades. In general, they have experienced declining population, resulting from falling numbers of farmers and farm amalgamation. This has been associated with trends such as 'bachelor' farming, where a husband and wife live separately, often with one working in town and one on the farm. Sometimes one parents lives with children in a town close to schools, due to a lack of available education services near the family farm. Many farming families depend on off-farm income to supplement returns from farming.

The main change in the type of broadacre farming undertaken since 1991 has been a shift out of sheep grazing to grain growing.

Farm amalgamation has occurred on an ongoing basis in these Shires, with farmers already living in the region often purchasing additional properties, and farmers who have sold land in other LGAs of the Great Southern purchasing land in this group of Shires. Not all of the latter have shifted to live in the agricultural Shires, with some commuting other LGAs to manage properties, particularly where they own multiple properties in different LGAs.

In Woodanilling, there has been some subdivision of land to attract rural residents, while in Kojonup a bus building business operated for some years before closing in recent years. Homeswest, the state housing agency, has also housed people in the towns of Katanning and Kojonup. There have been some fluctuations in employment in abattoirs in some towns, particularly Katanning, where numbers have risen and fallen at different times.

2.7 Plantation development in the Great Southern

History and extent of plantation development

Figures 2 and 3 show the area of hardwood and softwood plantations established in each Great Southern LGA at the start of 1991, 1996 and 2001. The large majority of plantations were established in Albany, Plantagenet and Cranbrook, with smaller areas in Denmark, Kojonup and Jerramungup.

As discussed above, by 2001, an estimated 18-22% of agricultural land in Albany had been established to plantation, while 14-18% of Plantagenet and 8-10% of Cranbrook's agricultural land had been established to plantation.

Plantation establishment in the Great Southern followed a different pattern to the neighbouring South West region, where softwood plantations were established for some time, followed by establishment of hardwood plantations from the mid-1980s.

Plantation establishment started to occur in the Great Southern only from the late 1980s, when softwood plantations were established by the Department of Conservation and Land Management (CALM) using a sharefarming approach. Under these sharefarm agreements, farmers provided land and CALM established and managed the plantation, with the farmer and CALM sharing the returns from the plantation at harvest.

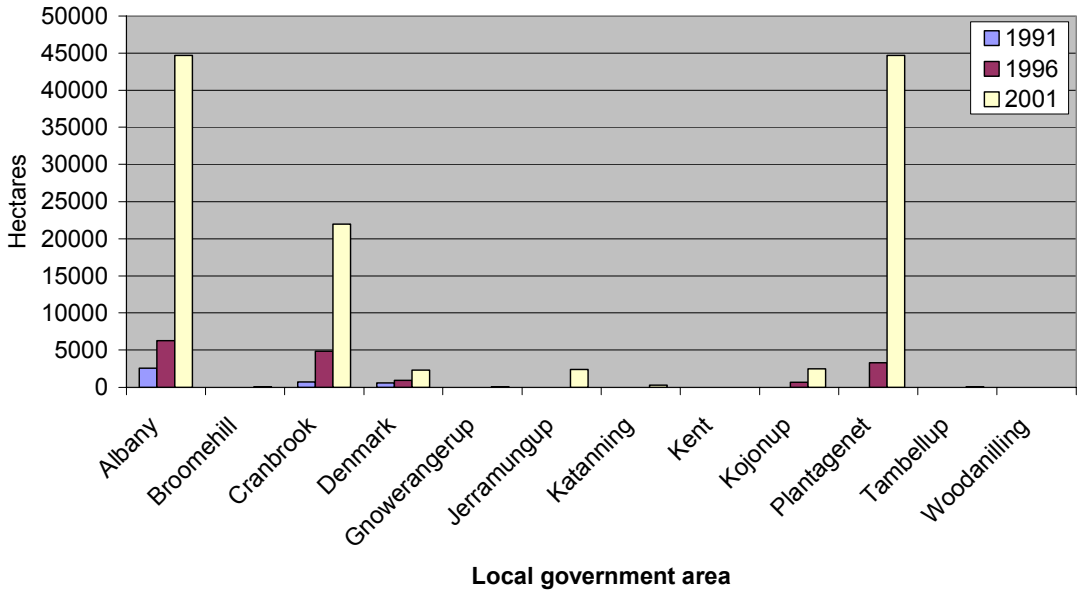
By the early 1990s, this type of joint venture arrangement was generally replaced by leasing arrangements, under which farmers received an annual lease payment for use of their land.

In 1988, CALM began establishing bluegum (*Eucalyptus globulus*) plantations under sharefarming arrangements with farmers. Private sector plantings began shortly after CALM established its early plantations. By the mid-1990s, several private companies were establishing bluegum plantations in the region, on land either leased or purchased from farmers. Private companies currently establishing and managing bluegum plantations in the region include Albany Plantation Forests Ltd, Great Southern Plantations, Integrated Tree Cropping, Timbercorp and WA Plantation Resources.

In the mid-1990s, CALM began establishing new types of plantations under sharefarming arrangements, including *Pinus pinaster* and sandalwood in lower rainfall zones. In addition, oil mallee plantings have been established since the mid 1990s in northern parts of the Great Southern. The Forest Products Commission (FPC)[7] is continuing these activities.

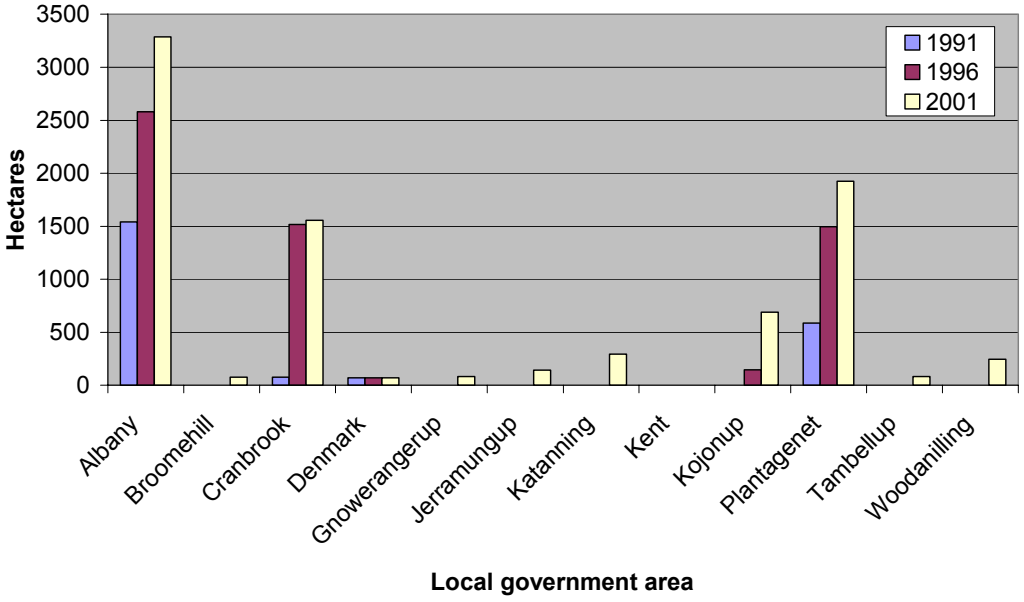
Bluegum plantations form the large majority of plantations in the region, making up just over 93% of all plantings by 2001. Almost all bluegum plantations have been established since 1991. Of these, the large majority – almost 83% - were established between 1996 and 2001.

[7] In 2000, CALM was divided into two agencies, CALM and the FPC. The FPC manages all plantations and commercial forestry activities.



Source: National Forest Inventory

Figure 2: Area of hardwood plantations in different Great Southern LGAs



Source: National Forest Inventory

Figure 3: Area of softwood plantations in different Great Southern LGAs

Figure 4 shows the spatial distribution of plantations in the Great Southern at September 2000. Within the three 'high plantation' LGAs of Albany, Cranbrook and Plantagenet – referred to subsequently as 'plantation LGAs' – the spatial distribution of plantation establishment varied. In Cranbrook, plantations have been established almost exclusively in the western part of the Shire, with almost no plantations in the eastern half of the Shire. In Plantagenet, there is again a pattern of more establishment in the western and central parts of the Shire. In Albany, however, plantations have been established across most parts of the LGA, with the exception of the most northern and southern areas.

This pattern of plantation establishment has resulted from rainfall and soil patterns, together with land availability. The areas in which plantations have been established generally have high rainfall year-round and gravel loams. The northern and eastern parts of the Great Southern have generally lower rainfall and fewer gravel loams.

Harvesting of hardwood plantations began in 2001 and has been expanding rapidly since that time. A woodchip mill has been established just outside Albany, at which harvested logs are processed into woodchips and transported to Albany port by a railway constructed for this purpose. While some logs are processed via the mill, others are processed using 'mobile chippers' which process logs into woodchips at the harvest site. These woodchips are then transported to Albany port by truck.

There are currently plans to establish a second woodchip mill, a biomass energy plant to process residues, and a composite wood products processing facility near Albany in coming years.

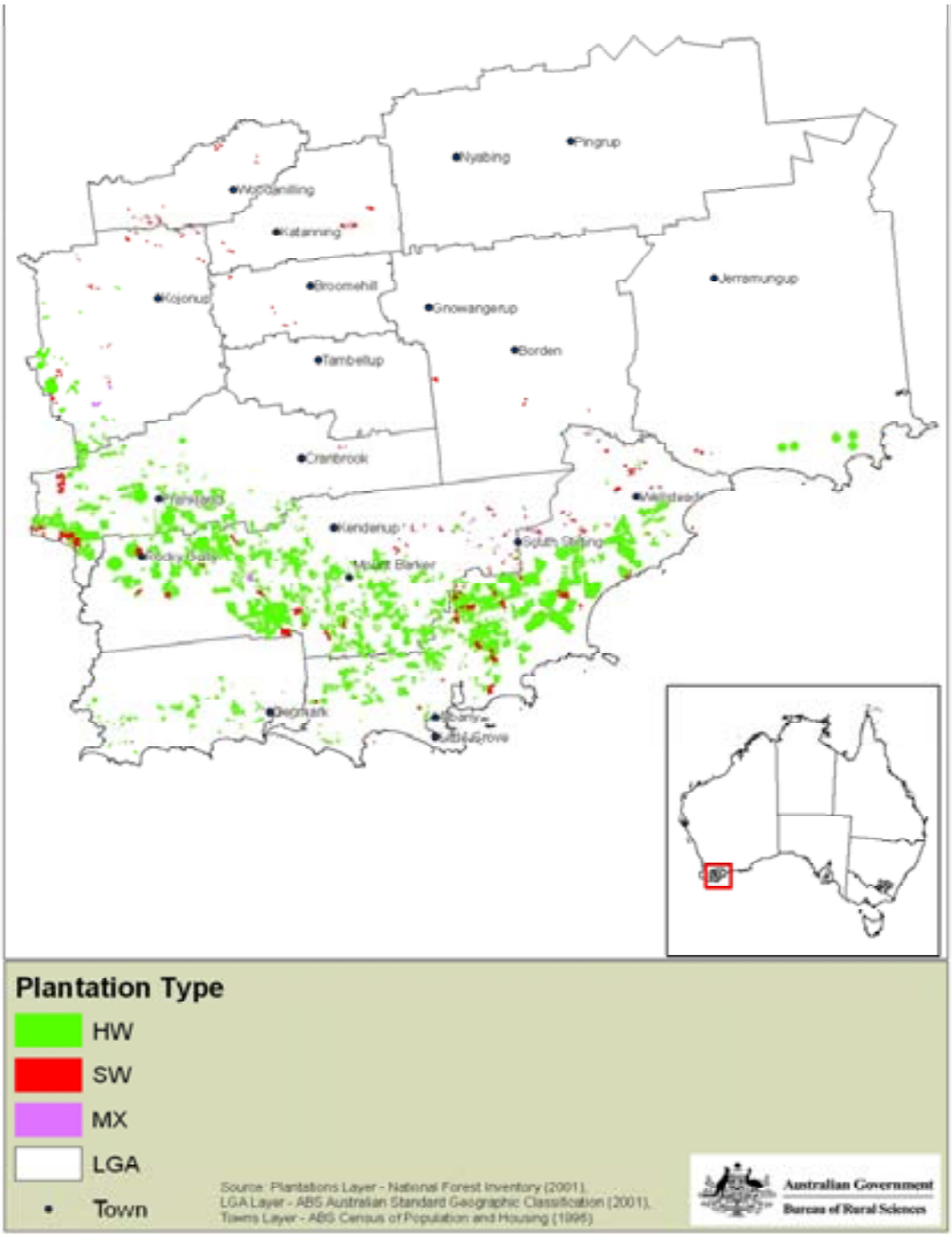


Figure 4: Location of plantation estate in the Great Southern at September 2000

2.8 Plantation work cycles

This section provides an overview of the types of activities required to establish, manage and harvest a plantation, to give a guide to the level and type of direct employment and expenditure generated by the plantation sector.

Plantations require a number of types of activity during the establishment, management and harvesting phases. The hardwood and softwood plantations grown in Australian have generally similar establishment, silvicultural and maintenance requirements, although the length of time over which activities occur varies. Hardwood plantations, which make up the majority of plantations established in the Great Southern, are generally harvested by 12 years of age. Softwood plantations, such as the *Pinus radiata* and *Pinus pinaster* plantings in the Great Southern, are generally harvested at between 30 to 40 years of age although there is variation between different species and different regions.

Once the land has been selected and plantation species chosen, a plantation development plan is prepared. A range of regulatory requirements apply to plantation development, including requirements that trees not be planted within certain distances of streams and boundaries, or on areas considered too steep. There are also operational and silvicultural restrictions and requirements, such as the need to avoid areas prone to waterlogging, and to retain fire breaks. As a guide, these factors can lead to the net area planted being on average about 70% to 80% of the total property area in many parts of the Great Southern.

Once the actual area to be planted has been determined, the land needs to be prepared for planting. The site is cleared of any large debris and then herbicide is usually applied to remove grass and weeds that would inhibit tree growth. Herbicide may be applied more than once depending on the nature of the grass and weeds to be controlled.

Most sites require cultivation to allow good growth of trees. The type of cultivation used depends on the characteristics of the site, eg whether there are any impeding layers in the soil which need to be broken up to allow good root penetration, and the potential for water logging of the site. Ripping and mounding are two common cultivation techniques.

Planting of seedlings usually occurs in late autumn and early winter. Fertiliser is usually applied when the trees are planted and sometimes again as they grow.

It may be necessary to construct access roads and dams to provide water for fire protection when the plantation is established. Upgrading of roads to a standard suitable for heavy truck traffic is usually left to close to the time of harvest.

Annual management and maintenance work includes weed control within the planted area for the first year, regular inspections for pests and diseases throughout the rotation, and maintaining fences, firebreaks and roads. In the Great Southern, regular monitoring for insect attack is necessary, particularly at times when insect activity commonly increases, and insecticides may be applied when pest populations exceed threshold levels.

Tree growth is monitored as the trees mature to provide information to plan harvesting.

Plantations that are managed for woodchip production – which form the majority of plantations in the Great Southern - are not generally thinned or pruned. Plantations managed for sawlog and veneer log production – for example, plantations of *Pinus pinaster* - are thinned to remove inferior stems and concentrate growth on fewer stems so that larger

diameter trees can be grown. Branches may be pruned from the lower part of the bole to improve sawlog and veneer log quality.

Harvesting of bluegums plantations in the Great Southern began in 2001, as the earliest plantings matured. As described above, at present harvesting of bluegum plantations in the Great Southern takes place using one of two systems:

- Trees are harvested and the de-barked logs transported to a woodchip mill. Logs are then processed into woodchips at the mill and the woodchips transported to Albany port for export via rail; or

- Trees are harvested and processed into woodchips onsite, with woodchips then transported to Albany port by truck for export.

Other types of plantations being grown in the Great Southern have not yet reached harvest age.

3.0 Study goals and key questions

The goal of this study was to explore the use of independent data to answer key questions commonly asked about socio-economic impacts of plantations. Rather than examining only the types of data commonly examined in previous SEIA, the study aimed to examine questions commonly asked by communities about the socio-economic impacts of plantations.

The first step required was to identify these questions. As the goals of the project were to explore use of independent data to answer questions likely to be asked across a number of regions, rather than only those regions chosen as case studies for this project, key questions were identified from a review of literature examining perceptions of socio-economic impacts of plantations in a number of regions around Australia. Subsequently, participants in focus groups held in each case study region were asked if the questions identified covered the key questions raised about socio-economic impacts of plantations in their region.

Common questions about socio-economic impacts of plantations were identified from review of a diverse range of previous studies on the impacts of the establishment and management of plantations and associated industry in different parts of Australia (provided in Appendix 1). This review was used to identify (a) whether similar questions were asked about the socio-economic impacts of plantation across the different regions in which plantations have been established, and (b) to identify common topics discussed and formulate questions based on these topics which could be explored using independent data.

A high degree of similarity was found in the perceptions discussed in previous literature, despite a diversity of research methods being used to gather information about attitudes and perceptions to plantations (see Appendices 1 and 2). Similar questions tended to be raised about the socio-economic impacts of plantations in different regions, with one key difference: the type of questions asked varied depending on the maturity of the plantation industry. Some questions related specifically to the socio-economic impacts of expanding plantation estate, while others were related to the establishment of industry to process mature plantations.

Because of this difference, two case studies were undertaken for the project:

- The case study reported on here examined common questions related to expansion of plantation *estate* in a region – the Great Southern;

- The second case study, for which a separate report has been produced, examined common questions related to expansion of *harvesting* and *processing* from a mature plantation estate, in the South West Slopes of NSW.

The questions examined in this case study are provided in Box 1 below. The different questions listed in Box 1 cover a range of topics, and hence are not always directly related to each other, although some have clear relationships to other questions. They represent common questions related to establishment and management of a growing plantation resource, but do not represent all the questions that might be asked about socio-economic impacts. They were chosen as (a) they were commonly raised in previous studies examining perceptions of socio-economic impacts and (b) contradicting perceptions about these types of impacts have been recorded, indicating a need for further examination of these topics.

Questions that can only be answered via perceptions studies were not included, as the goal of the study was to explore data from sources other than perceptions studies. For example,

preferences for particular distributions of plantations in the landscape were not examined as this requires specialised study of people's preferences and perceptions.

Topics related to the ongoing harvesting and processing of a mature plantation resource, such as the impacts of processing expansion on housing availability, were not examined as part of this case study, as harvesting only began towards the end of the period studied. Questions related to harvesting and processing (discussed in Appendix 1) should be examined in future studies of this region as more harvesting and processing takes place.

Box 1: Key questions about socio-economic impacts of expanding plantation estate

Question 1: How much employment is provided by the plantation sector and where is the employment based in relation to the plantation estate?

Question 2: What type of employment is provided by the plantation sector?

Question 3: How much spending occurs from the plantation sector and where does that spending occur in relation to the plantation estate?

Question 4: Does plantation estate expansion have a demonstrable impact on the numbers of people living in rural communities?

Question 5: Does plantation estate expansion have a demonstrable impact on the socio-demographics of the population, eg through an influx of new residents into a community?

Question 6: Does expansion of plantation estate lead to a demonstrable change in levels of provision of local education, fire fighting, retail and other services?

Question 7: Does plantation estate expansion lead to a demonstrable change in land prices?

Question 8: Is there a demonstrable change in other agricultural industries associated with expansion of plantation estate?

In focus groups held in the region, participants were asked if the questions in Box 1 covered key issues raised about socio-economic impacts of plantations in the Great Southern, and what other questions may be relevant. All participants agreed that the questions were representative of common questions asked about plantations in the region. Of the additional questions suggested by participants, most could only be answered through perceptions studies, or related to the impacts of the harvesting and processing beginning to occur in the region. In addition, several participants raised questions related to landscape and environmental change that fell outside the scope of this study.

However, two topics within the scope of the study were raised by participants in focus groups but were not able to be explored in this study:

- *What are the socio-economic impacts of plantation expansion at scales smaller than that of the local government area?* This topic was not explored as data were not readily available at scales smaller than the LGA scale in most cases;

- *How does the employment generated per hectare by plantations compare to other land uses?* This question could not be answered due to a lack of current, comparable data on employment generated by alternative land uses.

These topics should be explored in subsequent studies.

4.0 Methods

This section describes the methods used in this project. A more detailed discussion of approaches to socio-economic impact assessment in the plantation sector is provided in a separate publication from this study, *Recommended approaches for assessing the impacts of plantation forestry*.

Socio-economic impact assessment (SEIA) is a term used to refer to a wide range of methods and approaches. Some SEIAs attempt to predict the impacts of planned future changes, while others assess the impact past changes have had. Some examine impacts at a particular point in time, while others examine changes in impacts over time.

This study examined the socio-economic impacts expansion of plantation estate has had over time in the Great Southern, in order to explore key questions raised in previous perceptions studies about these impacts.

SEIA may examine perceptions of impact, or other data on socio-economic changes over time. As previously outlined, this study focussed on gathering independent data to answer key questions about socio-economic impacts raised in previous perceptions studies.

While it is relatively simple to identify the broad expenditure and employment generated by the plantation sector, going beyond this to identify the geographic location of impacts, and whether this employment and expenditure has had an observable impact on overall population and employment in a region, particularly when plantations have been established on land previously used for other purposes, is much more challenging. Key issues include:

- Identifying appropriate sources of data which can be used to examine socio-economic impacts;
- The need to identify geographic linkages between the plantation resource and its socio-economic impacts when those impacts may not be located in the same area as the resource; and
- The difficulty of isolating the impacts of the plantation sector from the multiple social, economic and land use changes often occurring in a region at the same time as plantation expansion.

The sections below detail the types of data collected, approaches used to identify geographic linkages, and methods used to identify potential links between socio-economic change and the plantation sector.

4.1 Data accessed

A range of data on (a) socio-economic change, (b) change in key land uses, and (c) change in the plantation sector over time was accessed for the study.

While considerably detailed data was accessed, there were several limitations to the use of this data. A key limitation was the scale at which data was available. The data examined was

generally at the scale of the local government area (LGA)[8], with most types of data not available at smaller scales. As a result, it is possible that within-LGA variations have occurred as a result of plantation establishment that were not identified in this study. In others, data for specific towns within LGAs was examined.

The timeframe examined in the study was 1991 to 2004. This timeframe was chosen for two reasons:

- It encompassed the period during which almost all the current plantation estate was established in the Great Southern, allowing examination of changes occurring over time as the plantation estate expanded; and

- Data were generally available for some or all of the timeframe studied.

Where possible, data was accessed for 1986 to 2004, in order to identify the changes occurring prior to the start of the period studied (1991) up to the most recent time possible. In most cases, data was available only for shorter periods within this time period, generally 1991 to 2001 or 1996 to 2001. This was due to a range of factors, including the timing of data collection, changes in boundaries on which data has been collected, and changes in definitions of the socio-economic characteristics for which data were collected.

Data on socio-economic change in the region

Data on different types of socio-economic change was accessed down to the local government area scale where possible, to enable comparison of areas within the Great Southern with different levels of plantation sector activity.

Data was drawn primarily from the 1991, 1996 and 2001 Australian Bureau of Statistics *Census of Population and Housing* (Census), and from the National Economics YourPlace database, which utilises data drawn from the Census and a range of other sources to produce indicators of socio-economic change for Australian LGAs. Additional data was sourced from the WA Department of Land Information and WA Department of Education and Training.

Data accessed included:

- Total population in 1991, 1996 and 2001 (Census and YourPlace);

- Town and rural populations in 1996 and 2001 (Census);

- Age structure of the population in 1991, 1996 and 2001 (Census);

- Proportion of residents who did and did not usually reside in the area 5 years previously, 1996 and 2001 (Census);

- Level of qualifications attained, 1991, 1996 and 2001 (Census);

- Level of participation in the labour force, and proportion of the labour force employed part-time, employed full-time and unemployed in 1991, 1996 and 2001 (Census and the Department of Employment and Workplace Relations' *Small Area Labour Market* report);

[8] In the Great Southern, the boundaries of most LGAs are identical to the relevant ABS Statistical Local Area (SLA) boundaries. The exception is Albany, where the LGA is split into two SLAs.

- Rate of change in average household income, 1991, 1996 and 2001 (YourPlace);

- Change in school enrolments over time (WA Department of Education and Training); and

- Details of individual land transactions for rural land sales, and of average sales prices over time for rural land in different regions (WA Department of Land Information).

Changes in key industries

Data on employment and expenditure by key industries in different LGAs was primarily drawn from the YourPlace database and the ABS *Agricultural Census*. There were similar limitations in the timespan over which consistent data was available to those described above. In addition, use of the Agricultural Census was limited in some cases where focus group participants taking part in the study questioned the accuracy Agricultural Census data produced at the local government area scale.

Agricultural Census data used included:

- Number of agricultural establishments and their primary agricultural enterprises in 1994, 1996 and 2001 (definitions of agricultural establishments changed in the early 1990s so previous data was not comparable);

- Area established to different agricultural crops in 1991, 1996 and 2001; and

- Number of grazing stock and kilograms of wood produced in 1991, 1996 and 2001.

In addition, the number of people identifying themselves as farmers/farm managers in the 1996 and 2001 Census was used as a proxy to measure change in the agricultural sector over time.

YourPlace data on change in estimated value of output from a number of key industries was accessed. This data was all available at the LGA level.

Plantation sector data

Data on direct employment and expenditure

Data on direct plantation sector employment and expenditure was sourced from a survey of the plantation sector. The survey went to all plantation growers and processors operating in the Great Southern. In addition, a sample of contracting businesses were surveyed to obtain data enabling estimates of employment in the contract sector.

The plantation sector survey asked respondents to provide the following details about their business for the 1991-92, 1996-97, 2001-02 and 2003-04 periods:

- Number of employees, type of employment (full-time or part-time/casual), and where employees were located;

- Amount spent on different types of contracting businesses, and where those contractors were located;

- Operating expenses and capital expenditure, including where expenditure occurred.

The extent to which it was possible to obtain data for earlier periods, particularly prior to 1997, was limited. Some plantation sector companies had difficulty accessing archived

records from earlier years for this data, or did not have access to records that had belonged to a previous owner of the business.

As it was not possible to obtain data from all plantation growers and processors (although the majority provided data), the total impacts of the sector were estimated by identifying the percent of activity for which data had been provided. For example, if data for 10% of the plantation estate was missing, the employment and spending generated by the missing 10% was estimated using the average employment/spending per hectare for the other 90%.

The data obtained via the survey provided details on employment and numbers of contractors engaged for growers representing 90% of the total plantation estate in the region in 2001-02 and 2003-04. Accurate expenditure data was only sourced for approx. 70% of the plantation estate for 2003-04, and 55% of the sector for 2001-02. For earlier years, the data provided on employment and numbers of contractors covered approximately 70% of the total plantation estate in the region, while expenditure data was only sourced for 10% to 20% of the sector. As a result, expenditure data for years prior to 2001-02 is not provided in this report and the level of data available did not allow development of reliable estimates for the entire industry.

Additional expenditure data was sourced from annual reports published by publicly owned plantation growers. This data provided a useful benchmark against which to compare the estimates made based on the survey results, and to identify likely levels of expenditure for some businesses who had not provided data via the survey.

Indirect employment and output data

Estimates of indirect employment and expenditure were generated for the project using regional input-output (I-O) models constructed by National Economics.

While I-O modelling has limitations – in particular, it calculates impacts based on an assumption that an economy stays stable apart from the change imposed as part of the input-output modelling – it is a useful tool for identifying the likely quantum of indirect impacts of a sector.

The input-output modelling included modelling of 'first round' or initial effects, and subsequent effects resulting from further rounds of flow-on economic activity generated as a result of the first round of impacts. This allows estimation of the full chain of impacts generated as a result of activity in the plantation sector.

I-O models identify the 'multiplier' effect of the plantation sector within a defined region, including the indirect and induced employment and expenditure generated through a number of rounds of activity. For this project, that region was the LGAs of the Great Southern. Multiplier effects generated by activity *outside* the Great Southern were not included in the model[9].

The input-output models constructed identified the indirect employment and expenditure generated by the forestry and logging sector, up to the point where harvested wood is delivered to processors. As processing activities had only begun at the end of the study period, multiplier effects were not calculated specifically for these activities.

[9] See Appendices 3 and 4 for details of the *YourPlace I-O* model used to model indirect impacts.

4.2 Geographic links between Great Southern plantations and their socio-economic impacts

For this study, direct employment and expenditure generated by the plantation sector was defined as *the employment and expenditure generated both within and outside the Great Southern by the plantation estate established within the Great Southern, up to the point of processed products leaving the 'mill door'*. In other words, the goal was to identify how much employment and expenditure was generated by those plantations grown in the Great Southern.

This definition was used to ensure that it would be possible to identify the flows of employment and expenditure arising from a particular plantation estate, including activity within and outside the Great Southern. This would enable a true identification of the level of benefit in terms of employment and expenditure arising from a defined area of plantation. This is more complex than at first apparent, as:

- Employees and contracting businesses working on plantations in the Great Southern are based within and outside the Great Southern; and

- Many plantation companies manage plantations both within and outside the Great Southern, with some staff working on plantations in multiple areas.

To ensure that the level of activity generated by plantations grown in the Great Southern was distinguished from activity generated by plantations grown outside the region, plantation sector survey respondents were asked to identify all employees located within and outside Great Southern whose employment was dependent on plantations grown in the Great Southern. Additionally, they were asked to provide details of the location of businesses contracted to undertake work in Great Southern plantations.

4.3 Links between socio-economic change and plantation sector activity

While it would be ideal to undertake statistical analysis of socio-economic trends in different regions, to identify whether areas experiencing plantation sector expansion have experienced different trends to areas without plantations, this was not possible in this study for a number of reasons. Firstly, there are a limited number of comparison regions. For the 2001 Census, there were 1353 Statistical Local Areas (SLAs) in all of Australia, of which a large number are located in urban areas with little or no comparative value for understanding changes related to plantation expansion in rural areas. Rural SLAs vary widely in their characteristics, including in geographic area, population, town sizes, and the mix of economic sectors operating in the LGA. As multiple factors may cause change in socio-economic characteristics of a region, undertaking a statistically significant analysis would require using sophisticated statistical analysis techniques to try to determine if change in the plantation sector is associated with different socio-economic trends to other changes. This type of analysis was not feasible for the types of data examined in this study due to difficulties (a) created by boundary changes over time in many SLAs, (b) in identifying the many factors potentially causing socio-economic change in different areas, and (c) the limited number of SLAs and limited availability of data on a range of socio-economic characteristics. However, as improved data becomes available, and a wider range of questions are examined, this type of analysis may be more feasible in future.

Instead, several qualitative methods were used to examine whether socio-economic changes observed in the region were likely to be linked to change in the plantation sector. The key approaches used were qualitative comparisons of socio-economic change in:

- Plantation and non-plantation LGAs within the Great Southern;

- Plantation LGAs within the Great Southern and broader regional, state and national averages;

- Plantation LGAs within the Great Southern and similar LGAs outside the Great Southern without plantation sector activity; and

- Changes within individual LGAs that may have contributed to socio-economic trends observed. These changes were identified both through available data on trends in key industries in the region, and via focus groups held in the region.

The different types of qualitative comparative analysis undertaken are described below.

Comparison of Great Southern LGAs to each other and to regional, state and national averages

Rates of socio-economic change in each plantation LGA were compared with rates of change occurring in neighbouring LGAs which did not experience plantation expansion, and with regional, state and/or national averages where available and relevant.

Comparison of plantation LGAs to non-plantation LGAs within the Great Southern was important to identify whether the plantation LGAs experienced different socio-economic trends to nearby regions. Any differences found were then further explored by examining whether factors other than the plantation sector might be associated with the observed differences. By doing this, explanations involving multiple sets of factors could be identified, rather than assuming differences were necessarily a result of change in the plantation sector.

Comparison to regional and state averages allowed examination of whether the Great Southern as a whole exhibited different types of socio-economic change to the average, or whether particular LGAs within the Great Southern did. Again, this pointed to differences which could then be further explored using other data sets and information provided in focus groups.

Comparing LGAs within the Great Southern

When comparing LGAs within the Great Southern, a broad categorisation of the LGAs was needed. In this case, LGAs were categorised based on their key industries and land uses. They were generally split into three categories, although LGAs within these categories were sometimes also compared and their differences highlighted (for example, the LGAs of Albany, Cranbrook and Plantagenet have all had large areas of plantation established, but are otherwise quite different):

- *High plantation LGAs* – Albany, Cranbrook and Plantagenet. All of these had over 20,000 hectares of plantations established by 2001, while the other LGAs of the Great Southern all had less than 4,000 hectares of plantation by 2001. In Section 2.0 each of these LGAs was described, and their differences highlighted;

- *Coastal LGAs* – Denmark. Denmark is unique compared to all the remaining LGAs of the Great Southern in that socio-economic change has been driven by growth in tourism and

in 'lifestyle' residents, and the Shire's economy is not highly dependent on agriculture (only 15.4% of the Shire's economic output was from agriculture in 2001[10]);

- *Agricultural LGAs* – Broomehill, Gnowangerup, Jerramungup, Katanning, Kent, Kojonup, Tambellup, Woodanilling. These Shires are characterised by a high reliance on broadacre agriculture as the key industry underpinning their economies. With the exception of Katanning and Kojonup, between 69% and 94.8% of economic output in these LGAs was derived from agriculture in 2001. In Katanning, only 16.6% of economic output was derived from agriculture, but much of the town's retail and other business was dependent on demand from the surrounding areas highly dependent on agriculture. In Kojonup, 58.4% of regional output was from agricultural production, with the town of Kojonup providing retail and business activity that was again relatively dependent on agriculture. In comparison, only 7.6% of Albany's, 15.4% of Denmark's and 42.8% of Plantagenet's economic output was from the agricultural sector. In Cranbrook, however, reliance on agriculture was still high, at 56.1%, and it shared many characteristics of the 'agricultural' LGAs[11].

Presentation of averages

Due to the different data sources accessed, and the different types of data examined, it was not always possible or appropriate to present the same averages.

Averages are given where rates of change or proportions of the population experiencing particular phenomena are being compared. They are not provided where the average would be a misleading comparison, for example in some cases the only averages available included large metropolitan areas that would not be expected to be experiencing changes similar to regional areas, and so have not been used. In other cases, for the type of data being examined comparison to an average that includes metropolitan trends is appropriate.

The following types of averages are used in the results:

- *Great Southern average:* The average across all 12 LGAs of the Great Southern. Used where noticeably different trends occurred in different LGAs of relevance to distinguishing plantation-related impacts;

- *Western Australia average* or *Australian average:* The average across the State of Western Australia, or all of Australia. Used where the trends in major cities do not mask trends in regional areas – for example, metropolitan trends do not tend to skew the change in farmer and farm manager numbers across WA; and

- *Non-metropolitan Australia average:* The average for non-metropolitan Australia, ie trends for the Australian population living outside major cities. This is used where an average including metropolitan areas would give an average highly influenced by metropolitan trends.

Comparison of plantation LGAs and similarly structured 'non-plantation' LGAs outside the Great Southern

While comparing to nearby regions is useful, it has the potential to be misleading. Often there are considerable biophysical, social and economic differences between neighbouring regions,

[10] Data source: National Economics *YourPlace* database

[11] Data source: National Economics *YourPlace* database

which may reduce the usefulness of comparisons. For example, Albany LGA consists of a regional city with a population several times larger than any other LGA of the Great Southern. Different types of socio-economic change often occur in areas with an urbanised versus a rural population. Therefore, it was important to compare Albany to similarly sized and structured LGAs in other regions.

For this reason, comparison LGAs were chosen from around Australia for each of the 'high plantation' LGAs of the Great Southern.

These comparison LGAs were chosen using the following criteria:

- At 1991, the comparator LGAs had a similar total population and town/rural structure to the comparison plantation LGA. For example, an Albany comparator region would have a similarly sized city within the LGA;

- At 1991, the comparator LGA had a similar industry structure to the Great Southern LGA/s it was being compared to. In particular, comparison regions for rural LGAs were chosen on the basis of the proportion of cropping, grazing and irrigated agriculture undertaken, which acted as a very broad proxy for rainfall, climatic and soil comparability. The presence of different industries in the comparator region and the Great Southern region, such as large mining enterprises, would reduce the level of ability to identify whether the presence of the plantation sector was associated with noticeably different socio-economic trends;

- At 1991, the comparator LGAs contained an area of agricultural land of more than 10,000 hectares. This was to ensure that similarly rural LGAs were being compared, and ensured that LGAs close to major cities, eg Sydney and Melbourne, were generally excluded;

- The comparator LGA had very little or no plantation-sector related activity, to ensure 'high plantation' LGAs of the Great Southern were being compared to areas without a significant plantation sector; and

- The YourPlace database, which has an in-built 'cluster' function that identifies how similar different LGAs are to each other in terms of their socio-economic characteristics, was used to identify LGAs with similar socio-economic structure.

While every effort was made to compare similar LGAs, the high level of variability between LGAs makes it impossible to find 'ideal' comparisons. In addition, variability in climate between regions may lead to different socio-economic trends over time in LGAs with a high dependence on agriculture. For example, it would be expected that comparison regions might perform differently to Great Southern LGAs in years where a comparison region experienced high rainfall while the Great Southern experienced drought.

The final comparison regions selected are listed in Table 1. The comparison regions are listed under two categories – those that had very similar socio-economic characteristics to the relevant Great Southern LGA, while having somewhat different types of cropping/grazing agricultural land use mixes in 1991 (although still broadly similar), and those that had very similar mixes of cropping, grazing and irrigation activities but were less similar in terms of socio-economic structure to the comparison LGA.

The number of comparison LGAs differs in some cases. This is a result of difficulty finding a high number of suitable comparison LGAs. For example, few LGAs with a similar population and town structure to Albany and a similar mix of agriculture and other industries were found.

Table 1: List of comparison regions

Great Southern LGA	Comparison LGAs sharing similar socio-economic characteristics	Comparison LGAs sharing similar agricultural characteristics
Albany	Geraldton (WA)	Young (NSW)
	Busselton (WA)	Atherton (QLD)
	Livingstone (QLD)	
	Bega Valley (NSW)	
Cranbrook	Karoonda East Murray (SA)	Bendemere (QLD)
	Orroroo-Carrieton (SA)	Elliston (SA)
	Goomalling (WA)	West Arthur (WA)
	Conargo (NSW)	Conargo (NSW)
Plantagenet	Bauhinia (QLD)	Coonamble (NSW)
	Murilla (QLD)	Inverell (NSW)
	The Coorong (SA)	Hindmarsh (VIC)
	Lockhart (NSW)	

The same types of socio-economic data examined for the Great Southern region were examined for comparison regions where possible. However, there were several types of socio-economic data for which this was not possible, as comparable data were not available for all comparison regions.

Use of focus groups

Focus groups were held in the case study region to help identify and explain changes in socio-economic characteristics of different Great Southern LGAs over time. Focus groups were held in areas of the Great Southern which had experienced plantation expansion (Albany, Frankland and Mt Barker) as well as areas which had experienced little plantation expansion (Katanning and Denmark).

Participants were selected based on their knowledge of the region. The majority had lived in the Great Southern for at least a decade, and were employed in areas which allowed them to develop broad knowledge of changes in the region. Participants included:

- Real estate agents;
- Local government council and staff members;
- Employees of regional development, employment and planning agencies;
- Landcare representatives and Department of Agriculture employees;
- Representatives of farming and community groups; and
- Local business owners.

In each focus group, participants were asked to:

- Describe key social, economic and land use changes they had observed in the region since the early 1990s;
- Examine data on socio-economic change over time and discuss why they believed particular trends had occurred; and

- Describe changes in provision of different services in local areas over time.

Where a key informant could not attend a focus group meeting but was available to be interviewed individually, interviews were undertaken either face to face or by phone. This occurred for three key informants in the case study region who were unable to attend a focus group.

The data provided in focus groups was used to help interpret and explain results of the secondary data on socio-economic and land use change. In particular, it was used to identify changes occurring in individual LGAs that may have been associated with unique socio-economic trends.

For example, when examining rates of rural population change, one small LGA – Woodanilling – experienced population growth between 1996 and 2001, while most of the other agricultural LGAs experienced decline. This difference was discussed in focus groups, and several participants explained that a rural subdivision had been developed in Woodanilling Shire during this time, which had led to an increase in the rural population. As Woodanilling has a small total population (of only 394 in 2001 for the entire LGA), this small subdivision could account for the rural population growth observed.

In most cases, focus group participants agreed on likely explanations for socio-economic trends. Where this was the case, focus group results are presented without defining the proportion or type of focus group participants who held particular views, as there was no differentiation within the focus groups. Where there were differences of views, or only one particular group was able to offer likely explanations of particular changes, this is identified in the results.

5.0 Results

Results of the study are presented in several sections, covering:

1. Different types of *land use and industry change* occurring in the Great Southern over 1991 to 2004. The changes identified are used to inform interpretation of socio-economic changes analysed in subsequent sections of the results, and to help answer Question 8 in Box 1;

2. Change in *plantation sector employment and expenditure* during the period studied (answering Questions 1 through 3 in Box 1). Similar to the analysis of land use and industry change, these changes are also used to inform analysis of socio-economic changes in subsequent sections of the results;

3. Analysis of change in the *population* of towns and rural areas over time (related to Question 4 in Box 1);

4. Analysis of *socio-demographic changes* over time including changes in age structure, level of qualifications, labour force, employment and unemployment trends in the Great Southern population (related to Question 5 in Box 1);

5. Analysis of changes in *service provision* in the region over time (Questions 6 and 8 in Box 1); and

6. Analysis of changes in *rural property markets* over time (Question 7).

6.0 Land use change

A number of land use changes have occurred in the Great Southern since the late 1980s. Some of these have already been described in the overview of the region, and are described in more detail in this section.

It is important to understand the range of land use changes occurring in the region in order to understand the different factors that may be causing socio-economic change different parts of the Great Southern. The data provided below on land use change is drawn on through the rest of the results when examining potential explanations for socio-economic changes observed in the region. Key findings on changes in agricultural industries are detailed in Box 2.

Box 2: Land use change

Agricultural industries have followed different patterns of change in the higher and lower rainfall areas of the Great Southern (these areas also have generally different soil types). In the higher rainfall areas of Albany, Denmark, Plantagenet and the west of Cranbrook, a broader range of agricultural industries have been introduced in recent decades. In lower rainfall areas, traditional agricultural land uses have for the most part continued over time, although with a shift out of sheep grazing into more cropping.

Plantation LGAs have on average experienced more rapid decline in numbers of farmers and farm managers compared to other LGAs in the Great Southern and to comparison regions. However, although the average decline was higher for plantation LGAs than other areas, when trends for individual LGAs were compared a more complex picture emerged. Some LGAs with no plantations experienced a higher decline in farming population than high plantation LGAs, indicating that plantations are only one factor amongst many influencing the rate of decline in farming population.

There are three broad types of land use in the Great Southern: traditional broadacre cropping and grazing; new agricultural industries such as viticulture and plantations; and a number of smaller agricultural industries eg cut flower and seed growing. Additionally, there are increasing numbers of 'lifestyle' blocks established in rural areas.

6.1 Broadacre agriculture

Changes to broadacre agriculture have followed different patterns in (a) the high rainfall areas, including Albany, Plantagenet and Cranbrook and (b) the lower rainfall areas – all other LGAs of the Great Southern excluding Denmark.

Key changes affecting broadacre agriculture across the region have included rising input prices, without an associated increase in prices received for livestock and crops in many cases, and overall increasing mechanisation and scale of agriculture. Whereas 20 years ago many farmers employed a full-time farm worker, this is now uncommon. Many farmers currently manage considerably larger areas of land with considerably less labour than at the start of the period examined for this study.

In the higher rainfall areas, there has been a decline in the total area used for broadacre grazing and cropping, a result of a shift to new land uses. There has also been some shift out of sheep grazing into cattle grazing and, particularly in Cranbrook, into grain growing.

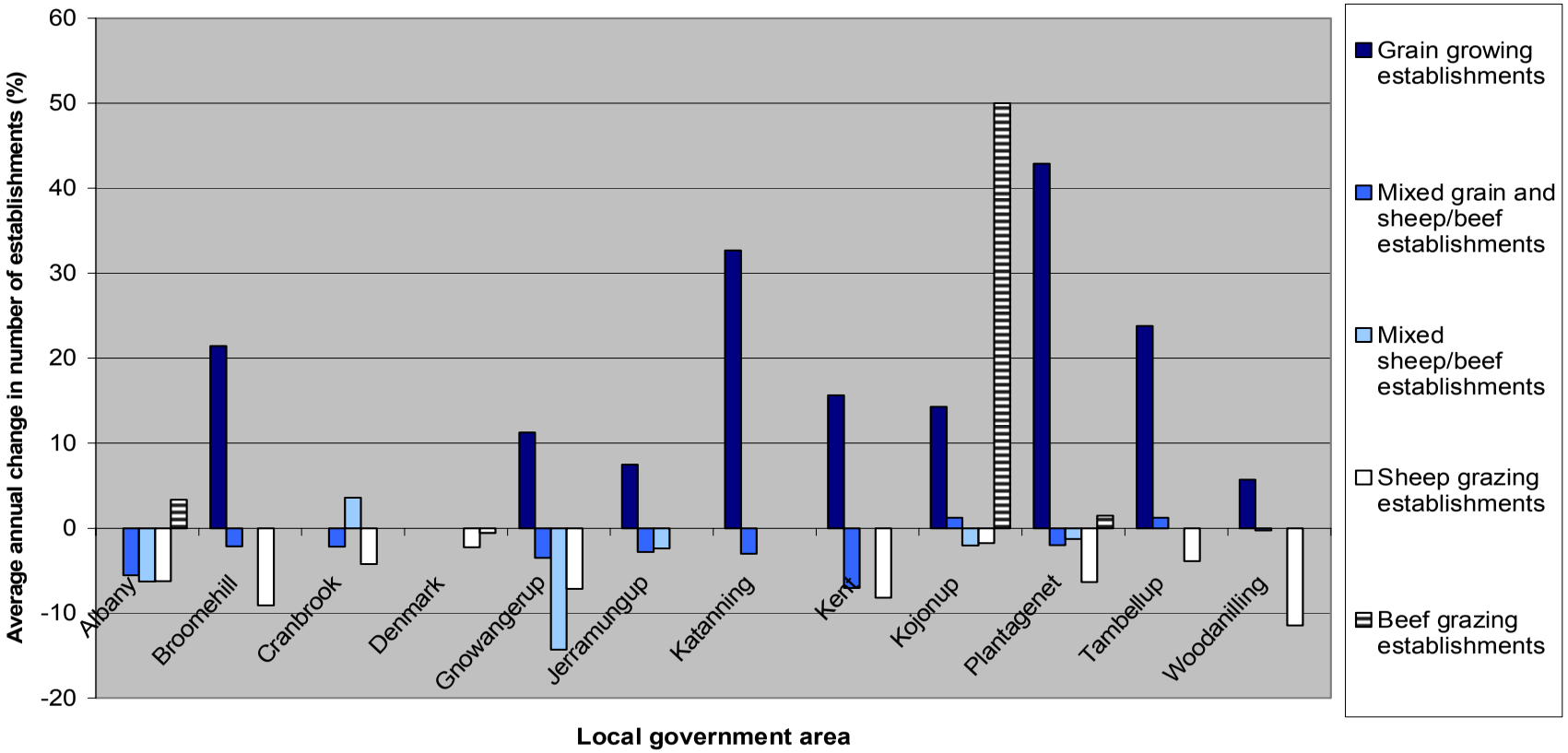
In lower rainfall areas, the major land use change since 1991 has been a shift out of sheep grazing and into grain growing. Dryland salinity has also affected some areas in the northern and eastern parts of the Great Southern.

In focus groups, participants from the farming sector described this overall shift out of sheep grazing as being driven by falling wool prices and also by some ageing farmers choosing to shift into less labour intensive forms of farming. Farmers who have changed land use out of sheep grazing have generally shifted into cattle grazing in suitable high rainfall areas, into grain growing in other areas of the Great Southern, or have exited farming altogether.

Additionally, many focus group participants reported that there has been a shift away from mixed enterprise farming, with many farmers instead focussing on a single enterprise.

This can be seen in Figure 5, which shows the average annual change between 1994 and 2001 in the number of establishments reporting different types of broadacre agriculture as their primary agricultural activity. The shift away from mixed enterprises towards more single enterprise farming – particularly grain growing - can be seen, as can a small increase in the number of enterprises concentrating on beef cattle grazing in higher rainfall areas.

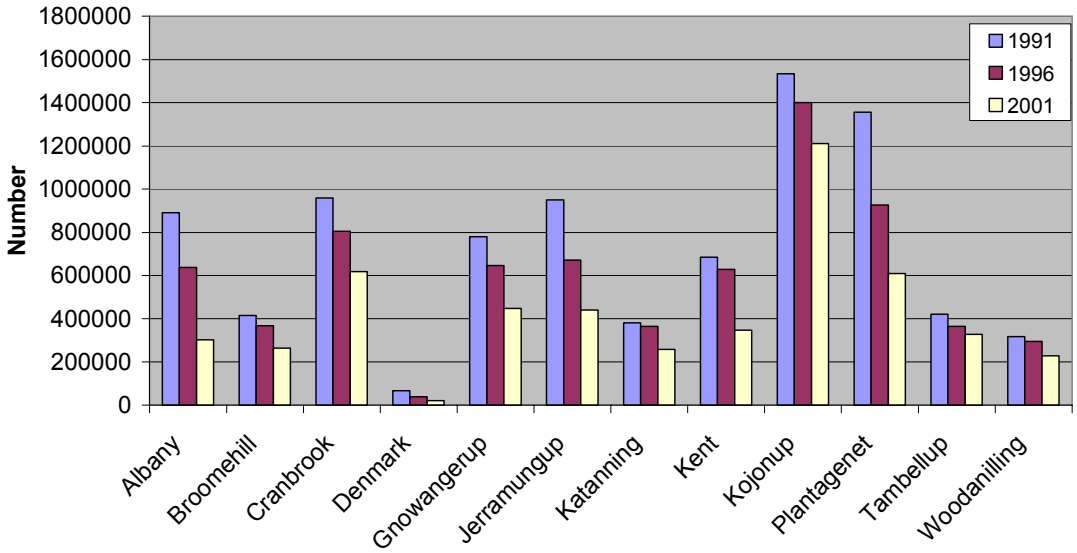
Figures 6 through 10 provide data on trends in key grazing and cropping enterprises. These figures show the areas established to wheat and barley, numbers of sheep and lambs, and numbers of beef cattle and calves over 1991 and 2001. While the figures for individual years may to some extent reflect seasonal variability, the general trends towards falling numbers of sheep and lambs, and increasing areas used for grain growing, can be seen.



Source: ABS *Agricultural Census*

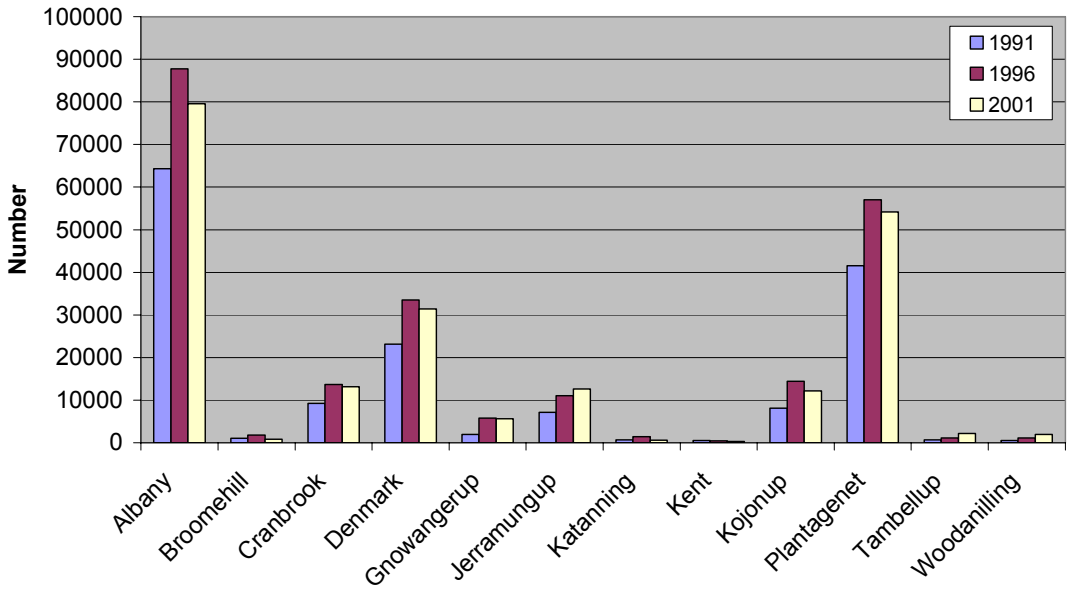
Figure 5: Average annual change in primary agricultural activity, 1994-2001

Note that where relatively few establishments existed in 1994 of a particular type, a small increase in the number of establishments will lead to a large percentage increase in the number of establishments.



Source: ABS *Agricultural Census*

Figure 6: Number of sheep and lambs in different LGAs



Source: ABS *Agricultural Census*

Figure 7: Number of cattle and calves in different LGAs

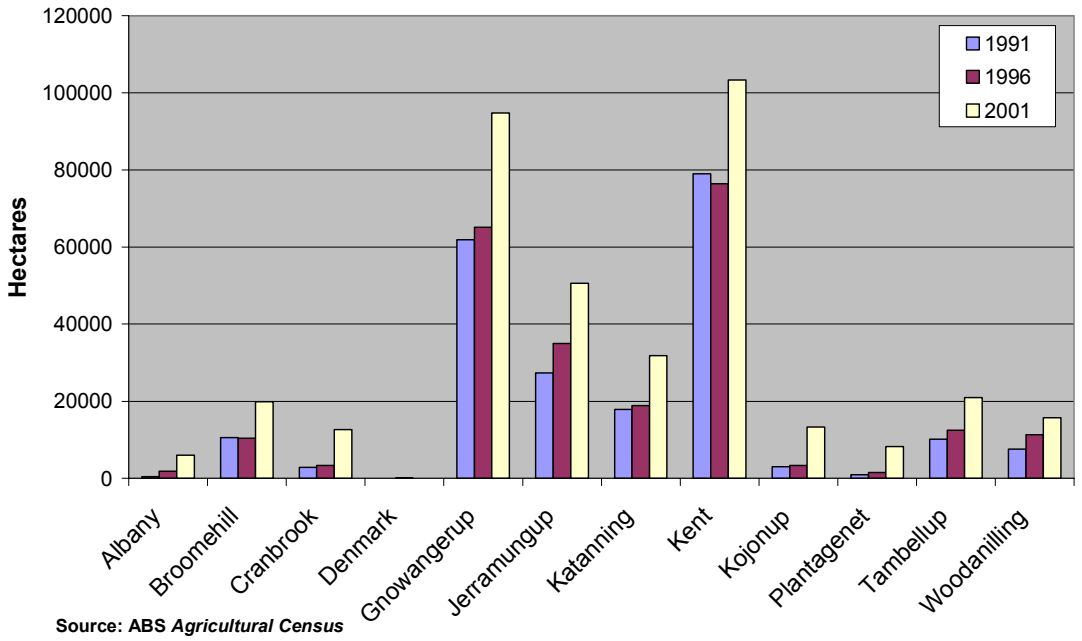


Figure 8: Area of wheat grown for grain production in different LGAs

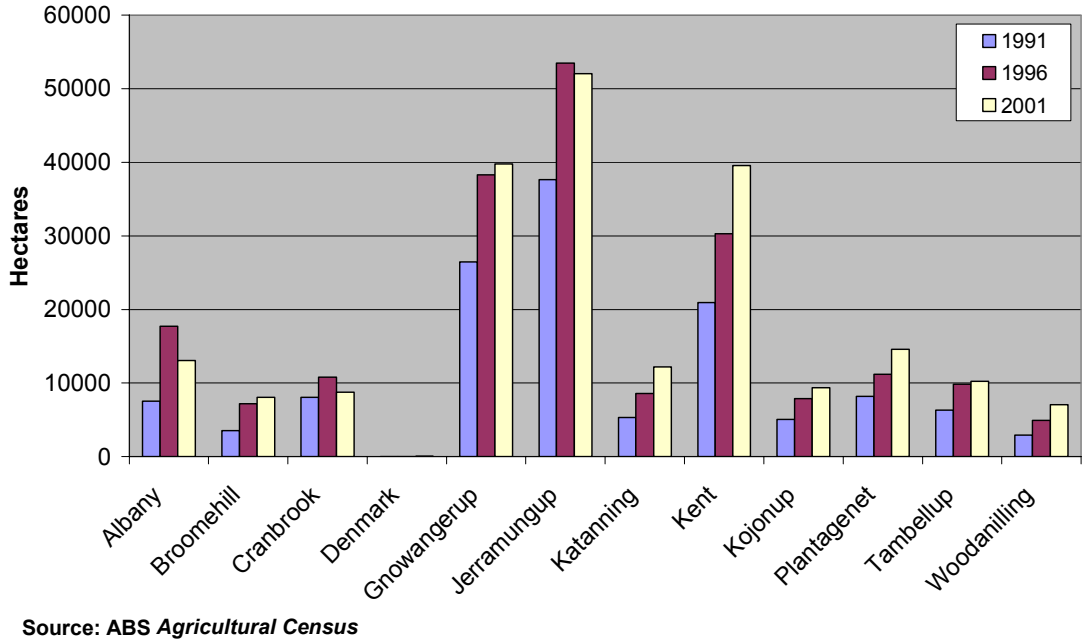
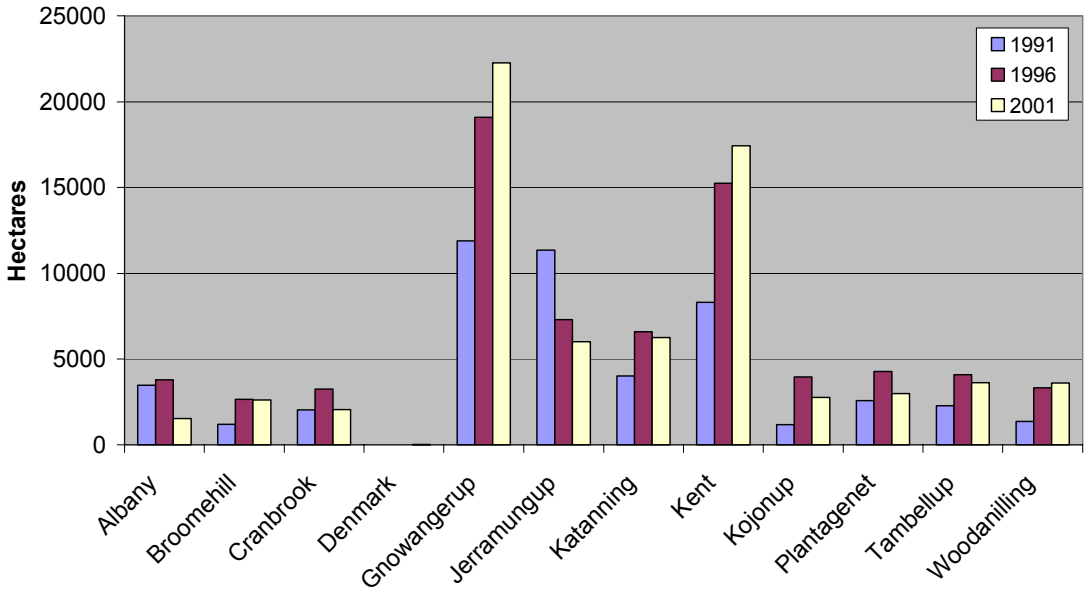


Figure 9: Area of barley produced for grain in different LGAs



Source: ABS *Agricultural Census*

Figure 10: Area of legumes established for grain in different LGAs

6.2 New agricultural enterprises

In addition to traditional broadacre agriculture, three new types of agricultural enterprise have been increasingly undertaken in the region since 1991. One of these was establishment of plantations in as already described. The other two have been grape growing and associated development of wineries, and inland aquaculture. These are described below.

Grape growing

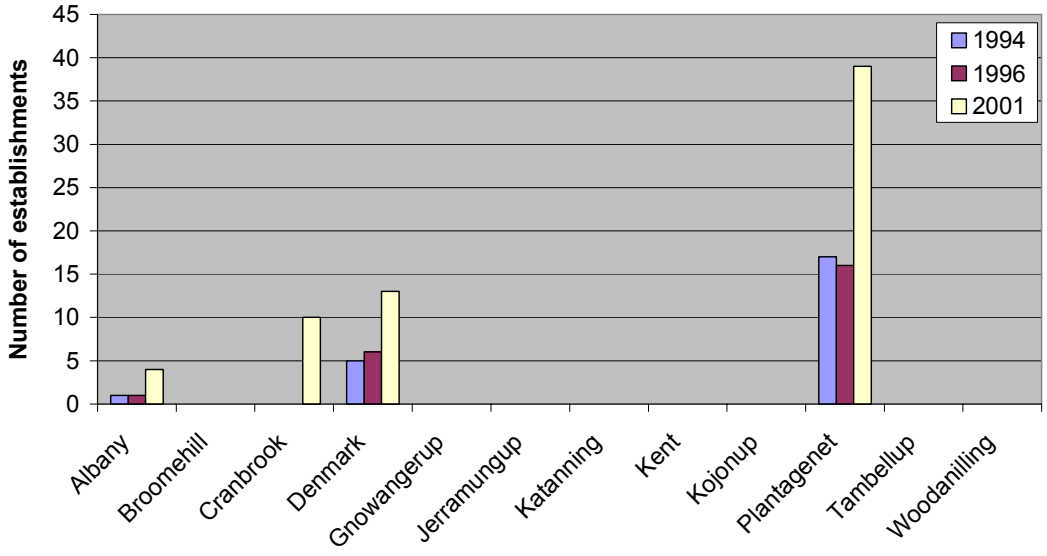
There has been a rapid increase in grape growing in Plantagenet, Cranbrook and Denmark, with a smaller level of development in Albany. Figure 11 shows the number of establishments that undertook grape growing as their primary enterprise in 1994, 1996 and 2001[12]. By 2001, there were an estimated 2,152 hectares of grapes established in the Great Southern, with 941.3 in the area surrounding Mount Barker, 1,137.1 in the area around Frankland, and 73.8 in the Porongurup Ranges area of Plantagenet Shire (near South Stirling) (Farrelly 2001).

The rapid growth of viticulture in the Great Southern followed a trend of rapid expansion across the state. Between 1996 and 2001, there was an increase of 124.5% in the number of people employed in grape growing and wine production across Western Australia (ABS 2003).

While covering a small area of agricultural land, a high level of employment is generated by grape growing. Farrelly (2001) estimated that during high season (eg during harvest of grapes) 437 people were employed in vineyards and wineries in the region (this figure includes both full-time and part-time workers). Fewer people are employed at other times of year. Farrelly reported that much of this employment was of local residents, and there was increasing use of contracting businesses to undertake labour, due to difficulties obtaining

[12] Data on the area established to grapes (as opposed to the number of grape growing establishments) is not reported at it was not consistently available over time from the *Agricultural Census*, and some of the data that was available was reported to be inaccurate by focus group respondents from the grape growing sector.

seasonal labour. She also highlighted that if a shift to mechanical harvesting occurred, the labour required by grape growers would fall. In this study, focus group participants with knowledge of the grape growing industry reported that some increased used of mechanical harvesting has occurred in the region in recent years.



Source: ABS *Agricultural Census*

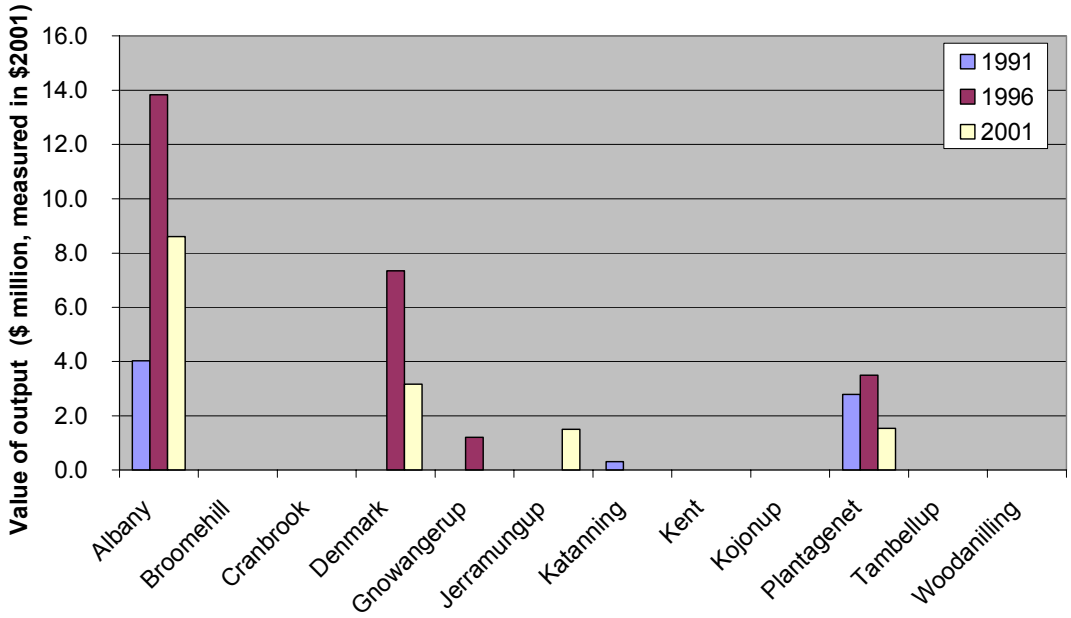
Figure 11: Number of establishments undertaking grape growing as their primary agricultural activity in different LGAs

In focus groups, attendees identified that in some cases farmers already living in the region have diversified into grape growing on their properties, while in others properties have been purchased for the purpose of establishing a vineyard, with new people shifting into the region to manage the vineyard.

Focus group participants identified grape growing and wineries as a key source of employment in some areas of the Shires of Cranbrook and Plantagenet. There was some debate over how much employment of local residents was being generated versus importation of casual labour from outside the region on a seasonal basis. Most vineyards around the Frankland area were reported to have several full-time employees as well as part-time and seasonal labour. In the Porongurups, vineyards tend to be smaller than in the Frankland region and have fewer employees per vineyard as a result.

Aquaculture

Inland aquaculture has been an industry in the region for some time, albeit on a relatively small scale. This can be seen in Figure 12, which shows the estimated value of aquaculture in Great Southern LGAs over time. The value of aquaculture formed less than 2.5% of the total output of any of the local economies in which aquaculture was undertaken in 2001 (National Economics YourPlace database).



Source: National Economics *YourPlace* database

Figure 12: Estimated value of aquaculture production in different LGAs

6.3 Other agricultural enterprises

Some other agricultural land uses take place in the region, albeit on a much smaller scale than for broadacre agriculture, plantations and vineyards. These include:

- Dairy farms in Denmark, Albany and Plantagenet, which have declined in number since deregulation of the dairy industry;
- Cut flower and seed growing;
- Fruit growing, particularly in Plantagenet, Denmark and, to a lesser extent, Albany;
- Honey production in Albany;
- Olive growing enterprises, primarily in Cranbrook; and
- Vegetable growing in the higher rainfall LGAs.

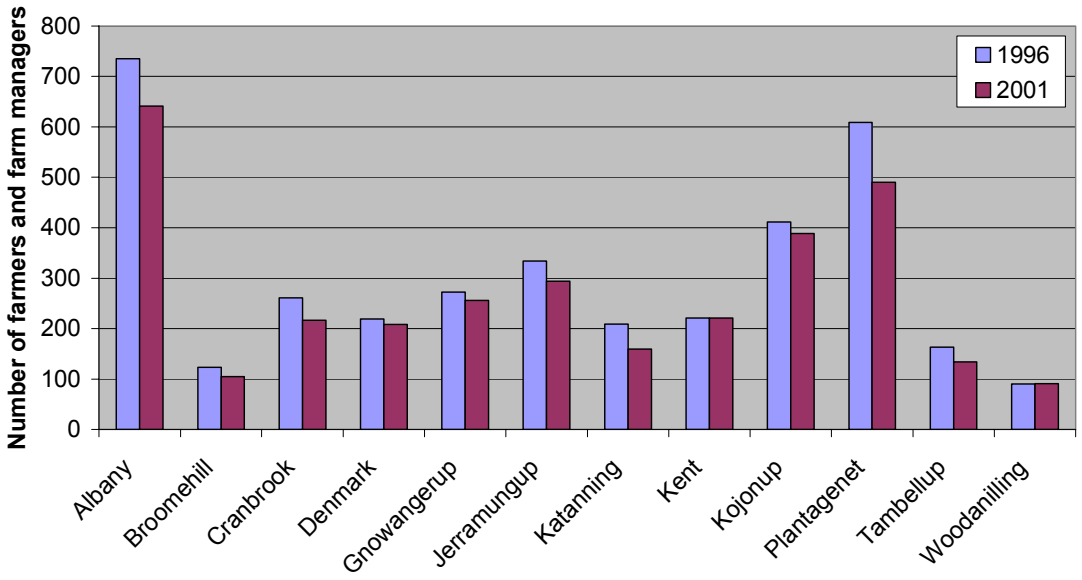
These agricultural enterprises are almost exclusively undertaken in the higher rainfall LGAs. This indicates the greater variety of agricultural enterprises able to be undertaken in these areas compared to the lower rainfall LGAs of the north and east, in which almost all land us used for broadacre cropping and sheep grazing.

6.4 Number of farm managers

Data on the number of farmers and farm managers was accessed for 1996 to 2001, the period in which the most rapid plantation expansion occurred in the region. This data was used to examine whether there was higher decline in farmers and farm managers in areas

experiencing high plantation expansion compared to other regions[13]. Plantation managers are not described in the category of farmers/farm managers (they are defined by the ABS as forest sector workers), and so any impact of plantation expansion should be identifiable from data on farmers/farm managers.

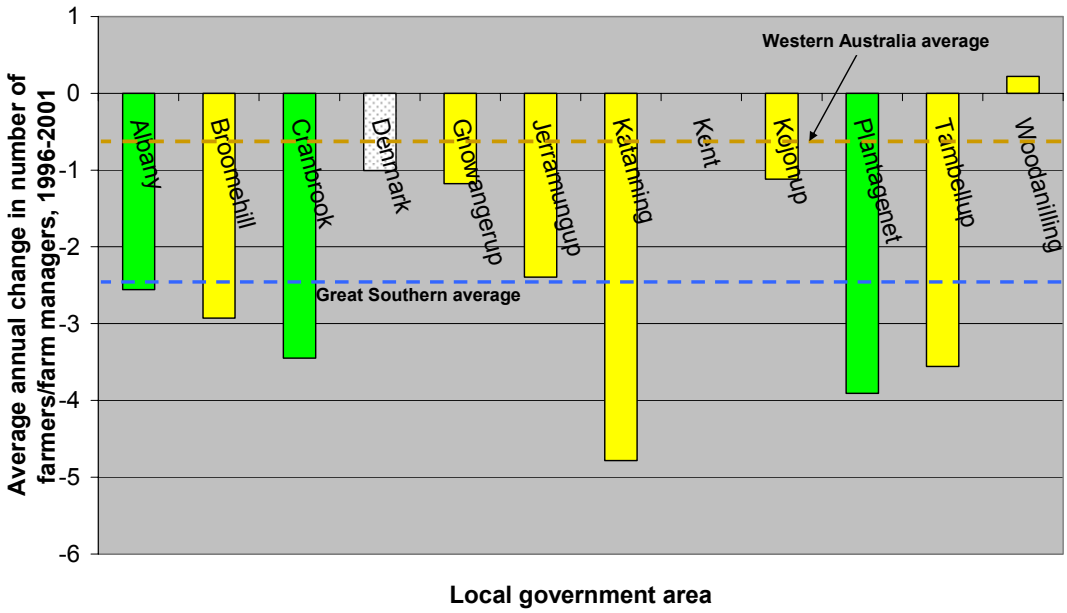
Figure 13 shows the total number of farmers and farm managers in different LGAs of the Great Southern in 1996 and 2001, while Figure 14 shows the rate of change over this period compared to the Great Southern and Western Australian average. Figure 15 compares the rate of change in 'high plantation' LGAs of the Great Southern and the comparison regions listed in Table 1.



Source: ABS *Census of Population and Housing*

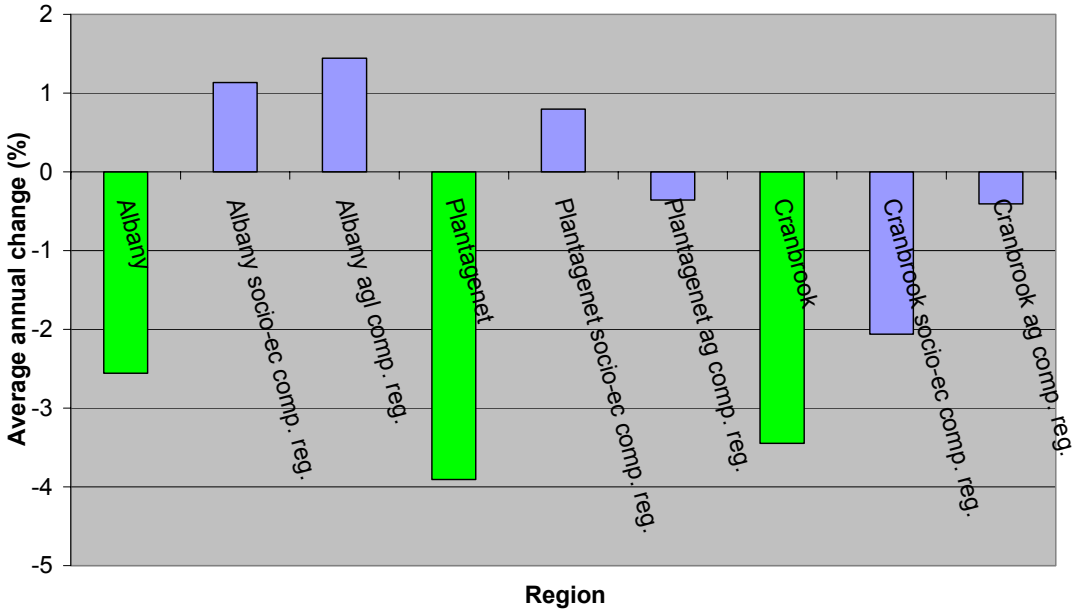
Figure 13: Number of farmers and farm managers in different LGAs, 1996 and 2001

[13] Initially, data from the *Agricultural Census* showing numbers of agricultural establishments by LGA was sourced to try to identify patterns of change. However, while the definition used for an agricultural establishment in the *Census* – the area managed as a single entity, whether it is on a single or multiple parcels of land – should enable changes in size of farms to be reflected as a declining number of establishments in an area, this did not show clearly in the data. In focus groups, several farmers stated that, despite managing multiple properties as a single enterprise, they completed multiple *Census*es for their different properties because the properties were held under the names of different members of their family. Therefore, while farm amalgamation had occurred, this was not necessarily reflected in the *Agricultural Census* data. Department of Agriculture employees agreed that data on number of establishments did not show patterns of farm amalgamation they had tracked in their local areas. As a result, data on number of establishments could not be used to identify patterns of farm amalgamation.



Source: ABS *Census of Population and Housing*

Figure 14: Average annual change in number of farmers and farm managers in Great Southern LGAs, 1996 to 2001[14]



Source: ABS *Census of Population and Housing*

Figure 15: Average annual change in farmers and farm managers in Great Southern LGAs and comparison regions, 1996 to 2001

[14] In Figure 14 and subsequent similar graphs, a colour coded system is used to identify different types of LGAs (in brackets the shading visible on black and white copies of the document is given). Green coloured (dark grey) columns represent 'high plantation LGAs. Blue dotted columns (dotted) represent coastal LGAs. Yellow (light grey) columns represent LGAs mostly dependent on broadacre agriculture with few or no plantations.

Albany and Plantagenet, the largest LGAs by area in the region, had considerably higher numbers of farmers and farm managers than the other LGAs of the Great Southern, while Kojonup also had a higher number of farmers and farm managers due to its large area. All other Great Southern LGAs had less than 300 farmers and farm managers in 2001.

The rate of decline in the number of farmers and farm managers in the Great Southern as a whole was higher than the WA average during 1996-2001. The number of farm managers has dropped in most LGAs, with the exception of Kent – which experienced no change – and Woodanilling, which experienced an increase from 90 to 91 farm managers.

Between 1996 and 2001, the number of farmers and farm managers in the 12 LGAs of the Great Southern declined by a total of 12.2%. This decline was higher in the three LGAs with high areas of plantation (16.1%) than the remaining nine LGAs (9.1%). However, while the average rate of decline was higher in plantation LGAs than others, when individual LGAs were compared the highest rate of decline occurred in Katanning, which experienced an almost 24% decline over 1996 to 2001, equating to an average annual decline of 4.8%. This may be partly a result of increasing salinity of agricultural land in the region, although this explanation was not agreed by all focus group participants, with debate over the extent to which salinity has affected numbers of farmers and farm managers.

In focus groups, a number of changes affecting the number of farmers and farm managers were described. The most common explanations were that numbers of farmers and farm managers had declined in most areas as a result of (a) processes of farm amalgamation and (b) introduction of new land uses such as plantations. When asked why farm amalgamation and new land uses were occurring, focus group participants described the same underlying cause – increasing economic pressures on farmers have reduced economic viability of small farms, forcing farmers to ‘get big or get out’. In different areas, these pressures had resulted in either farm amalgamation or a shift to new land uses such as plantations.

Focus group participants also reported that some farm managers no longer lived on the farms they managed, instead living in a town or on a property in one LGA while also managing properties in other LGAs.

On average, the rate of decline in numbers of farmers and farm managers was greater in high plantation areas than other parts of the Great Southern. It is likely this has been associated with plantation expansion. However, one Great Southern LGA with no plantations – Katanning – experienced higher decline than that occurring in any of the high plantation areas. In addition, the growth in numbers of plantation managers, particularly in Albany where many employees of plantation companies are based, has to some extent offset the decline in farm managers.

7.0 Plantation sector employment and expenditure

Key findings on plantation sector employment and expenditure are detailed in Box 3.

Box 3: Plantation sector employment and expenditure

The plantation sector has employed a growing number of people since 1991, with the most rapid growth occurring since harvesting began in 2001. By 2004, an estimated 500 people were directly employed in the sector[1], almost twice the 263 employed in 2001 prior to the start of harvesting in the region. Part of the increase was also due to an increased area of new plantings in 2004 compared to 2001.

Within the Great Southern, many employees of plantation management companies/agencies are located in the City of Albany. In 2003-04, 58% were based in Albany, while 6% were based in other towns in the Great Southern (mostly Plantagenet and Cranbrook), and 36% outside the Great Southern.

Much of the direct employment generated by plantation expansion is in contracting businesses. In the early 1990s many contractors engaged to undertake work in plantations were based outside the Great Southern. In recent years, contract work has increasingly been sourced within the Great Southern, as businesses have established in the region to supply services to the growing plantation sector. As a result, the amount of contracting work undertaken by businesses based outside the Great Southern fell from 57% in 1996-97 to 36% in 2003-04.

As well as direct employment, the activities of the plantation sector generate flow-on, or 'indirect' employment. For every $1 million spent by the plantation sector, an estimated 17.15 jobs are created in the Great Southern. This includes both direct employment by the plantation industry, and flow-on employment generated as a result of demand for goods and services from the plantation industry. For every direct job in the plantation sector, this equates to flow-on employment of 0.65 people within the Great Southern. In addition, further flow-on employment is created outside the region when goods and services are imported from other regions.

In 2001-02, expenditure on establishing, managing and early harvesting activities totalled an estimated $35.8 million dollars. This included plantation management expenses, but not the costs of management of investment schemes or other business costs such as servicing loans. Of this, approximately 69% was spent within the Great Southern.

In 2003-04, with rapidly expanding harvesting and processing and a higher area of plantations established than in 2001-02, expenditure totalled an estimated $49.7 million. Of this:

- $12.86 million was paid to contracting firms to undertake work such as site preparation, planting of seedlings, firebreak maintenance or harvesting; and
- $36.7 million was spent in operating expenses such as wages, purchase of supplies, and lease payments to landholders.

An estimated 67% of this expenditure occurred within the Great Southern and 33% outside the Great Southern.

Direct expenditure by the plantation sector generates 'flow-on' expenditure. For every $1 million spent by the plantation industry in the Great Southern, an estimated total of $1.76 million is generated in regional output (in other words, in goods and services produced by a range of industries), and $0.53 million of income is generated in the region. In addition, further flow-on activity is generated outside the Great Southern.

7.1 Employment

Direct employment

Table 2 provides details of direct employment by the plantation sector at different points in time. For this study, direct employment was defined as jobs working for plantation managers and processors, and jobs in contracting businesses that depend on the plantation sector – for example, in site preparation, planting seedlings, or harvesting trees. It includes transport of woodchips to Albany port by rail and truck. It does not include flow-on employment resulting from expenditure by plantation businesses and their employees.

Table 2: Direct employment in the plantation sector over time

	1991-92	1996-97	2001-02	2003-04
Direct employment managing plantations and processing timber	14	60	139	139
Plantation management, harvest, transport and processing contractors	6	75	124	360
TOTAL	20	135	263	500

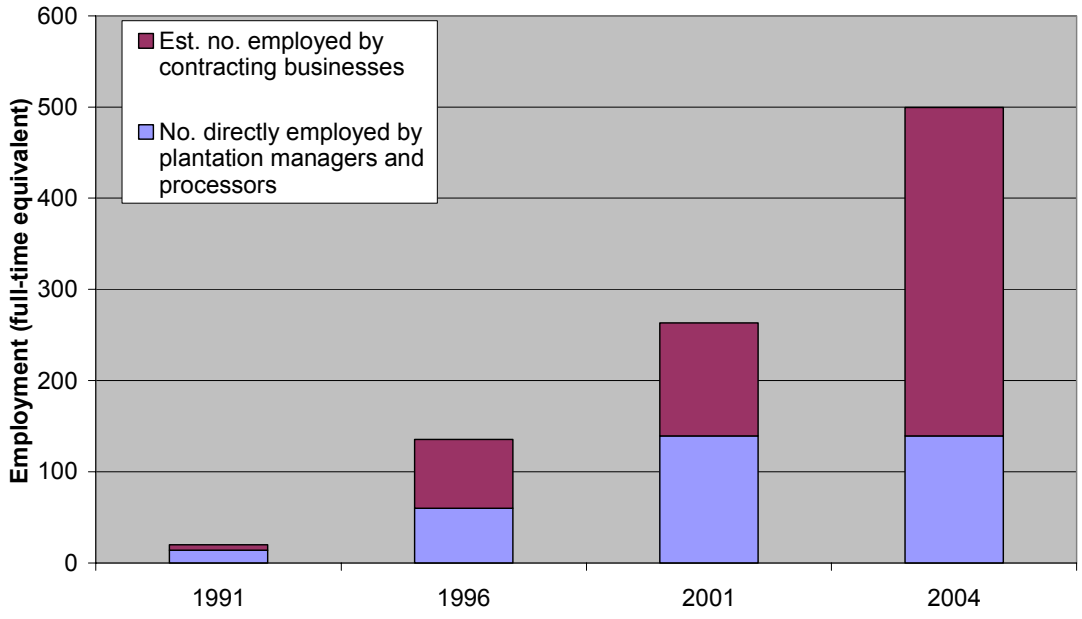
It can be seen from Table 2 that the total number of people employed by the plantation sector has grown considerably over time. Particularly rapid growth has occurred since 2001, as harvesting and processing have begun in the region. Harvesting and processing activities have generated jobs in the felling of trees, processing of roundwood into woodchips, and transport of logs and woodchips.

The total number employed has fluctuated somewhat over time as the rate of new plantations being established has varied in different years. In particular, employment is likely to have been higher in 1999 and 2000 than 2001, as considerably larger areas of new plantation were established over this period.

As can be seen in Figure 16, since the mid 1990s:

- Slightly less than 50% of people directly employed in the plantation sector have been employed by plantation management companies/agencies such as the Forest Products Commission, Great Southern, Integrated Tree Cropping or Timbercorp

- Slightly more than 50% of direct employment has been generated in contracting businesses which supply services to the major plantation managers, with this increasing in 2004 as increasing areas of plantation were established, along with increasing contract employment in the harvest, processing and transport of logs and woodchips.



Source: Survey of plantation industry

Figure 16: Direct employment in the plantation sector, 1991 to 2004

Much of the employment generated by plantation expansion is in contracting businesses. Contractors undertake activities such as site preparation prior to plantation establishment, planting seedlings, fertilising and insect control activities, harvesting trees, and transport of logs and woodchips.

Contracting businesses include businesses which work in both the plantation and other sectors, and businesses that have been established exclusively to provide services for the plantation sector. This makes it difficult to estimate the exact amount of contract employment generated by the plantation sector, as a contractor may work for the plantation sector for only a part of the year and provides services to other agricultural industries at other times. The level of employment was estimated based on the total amount spent by the plantation sector on contracted plantation management activities. A sample of different types of contracting businesses were surveyed, and the results of the survey used to estimate the average number of people employed by different types of contracting businesses for a given amount spent by the plantation sector.

Direct employment in the contracting sector fluctuates considerably more than direct employment by plantation managers. Several of the contractors surveyed discussed having had considerable changes in the amount of work available to them on an annual basis from the plantation sector. Most reported that large changes were particularly related to changes in levels of new plantings.

Type of employment

The plantation sector provides a range of types of employment. These include full-time, part-time and casual/seasonal employment.

Key types of full-time employment include employment in plantation management and various types of contracting businesses. In fact, a large proportion of contractors appear to work full-time, including many employees working for nurseries, spraying contractors, earth moving and fencing contractors, and harvesting contractors.

Part-time and casual employment tends to be confined to seasonal work, particularly planting work.

Location of employment

In the early 1990s many contractors engaged to undertake work in plantations were based outside the Great Southern. In recent years, contract work has increasingly been sourced within the Great Southern, as businesses have established in the region to supply services to the growing plantation sector.

In 1996-97, an estimated 57% of contracting businesses working in plantations in the Great Southern were based outside the region. By 2003-04, this had fallen to 36%, with 64% of contract work undertaken by businesses based within the Great Southern.

Within the Great Southern, many employees are located in the City of Albany. In 2003-04, 58% of employees working for plantation management companies/agencies were based in Albany, while 6% were based in other towns in the Great Southern (mostly Plantagenet and Cranbrook), and 36% outside the Great Southern. It was not possible to identify the location of contract employees as precisely, but a relatively similar mix of locations was identified, with most contractors based out of Albany, a small number in Cranbrook, Plantagenet, Denmark or Katanning, and approx. 36% outside the Great Southern.

Direct employment per hectare of plantation

In early years of plantation establishment, the majority of employment is generated via establishment of new areas of plantation. Employment per hectare of plantation as a plantation resource is being established therefore fluctuates largely as a result of variations in the area of new plantations established. It is only when plantations reach maturity and a cycle of harvest and replanting occurs that a more steady level of employment per hectare is generated.

In the early years of plantation establishment, relatively high employment per hectare established was needed, with 0.52 employees per 100 hectares of plantation estate. This fell as more plantations were established – the average employment per 100 hectares was 0.48 people in 1996-97. In 2001-02, the average employment was 0.22 people per 100 hectares, with few new plantations established in this year and harvesting yet to begin on a large scale.

In 2003-04, however, there were 0.36 employees per 100 hectares of plantation. This was a result of increasing levels of harvesting and processing activities, and planting of a larger area than occurred in 2001. As harvesting and processing will not reach ‘steady state’ levels for some years yet, it is expected that employment per hectare will continue to rise for some years as plantations reach harvest age and increasing areas of plantation are harvested and replanted each year.

Indirect employment

As well as direct employment, the activities of the plantation sector generate flow-on, or ‘indirect’ employment. This flow-on employment might include jobs such as those in local supermarkets generated as a result of plantation sector employees buying household groceries, or in production of goods and services then purchased by a plantation business.

For every $1 million spent by the plantation sector, an estimated 17.15 jobs are created in the Great Southern[15]. This includes both direct employment by the plantation industry, and flow-on employment generated as a result of demand for goods and services from the plantation industry. For every direct job in the plantation sector in 2001-02, this equated to flow-on employment of 0.65 people within the Great Southern. In addition, further flow-on employment is created outside the region when goods and services are imported from other regions.

7.2 Plantation sector expenditure

Direct expenditure

It was only possible to obtain accurate data for expenditure in 2001-02 and 2003-04 for the Great Southern plantation sector. While some data for 1996-97 was obtained, it covered only a small proportion of the sector and so reliable estimates of total expenditure could not be made for this period.

In 2001-02, expenditure on establishing, managing and early harvesting activities totalled an estimated $35.8 million dollars. This included plantation management expenses, but not the costs of management of investment schemes or other business costs such as servicing loans. Of this, approximately 69% was spent within the Great Southern, with an estimated 65% of contracting work sourced within the Great Southern and 71% of operating expenditure eg on wages, salaries and supplies such as seedlings, spent within the region.

Of this $35.8 million, approximately 23% was spent engaging contracting businesses to undertake work such as site preparation or planting seedlings, while 77% was spent on other operating expenses. A small amount represented the early expenditure on harvesting and processing in the region, as the first plantations were harvested.

In 2003-04, as harvesting and processing expanded rapidly, expenditure by the plantation sector on plantations in the Great Southern totalled an estimated $49.7 million. Of this:

- $12.86 million (25.8%) was paid to contracting firms to undertake work such as site preparation, planting of seedlings, firebreak maintenance or harvesting. Of this, 64% was paid to contracting businesses based within the Great Southern and 36% to businesses based outside the Great Southern
- $36.7 million (74.2%) was spent in operating expenses such as wages, purchase of supplies, and lease payments to landholders. Of this, 67% was spent within the Great Southern and 33% outside the Great Southern.

The shift into the 'transition' phase, in which the earliest plantations established in the region are being harvested and processed, has led to a rapid increase in expenditure in the region over 2001-02 to 2003-04. This is likely to continue to increase as harvesting and processing volumes grow over coming years, with a large proportion of the plantation estate yet to reach harvest age by 2003-04. Over time, harvesting levels should reach a steady-state in which a similar area of plantation is harvested and replanted each year on a rotational basis.

Direct expenditure by the plantation sector generates flow-on expenditure. For example, suppliers of services to the sector buy goods and services in the region, and so on, creating a chain of flow-on economic activity. For every $1 million spent by the plantation industry in the Great Southern, an estimated total of $1.76 million[16] is generated in regional output (in

[15] This figure is the employment multiplier, and refers to the direct and indirect, or 'flow-on' employment generated by a one million dollar investment by the plantation sector. See Appendices 3 and 4 for details of the *YourPlace I-O* model used to model indirect impacts.

[16] This figure is the total output multiplier (equivalent to a Type 2A multiplier), and includes both production and consumption induced effects. The total multiplier measures the direct, indirect and consumption induced effects

other words, in goods and services produced by a range of industries), and $0.53 million[17] of income is generated in the region. In addition, further flow-on activity is generated outside the Great Southern as some goods and services required by the plantation industry are purchased outside the region, and some income is similarly spent outside the region.

on output from an initial stimulus (in this case, one million dollars). See Appendices 3 and 4 for details of the *YourPlace I-O* model used to model indirect impacts.

[17] This figure is the income multiplier, which measures the compensation (in other words, wages and salaries) paid to employees to produce the additional output generated by an increase in activity. In this case, it is the compensation paid to generate the output that is produced as a result of an initial one million dollar investment in the plantation sector. See Appendices 3 and 4 for details of the *YourPlace I-O* model used to model indirect impacts.

8.0 Change in population

Change over time in the population of each Great Southern LGA, and of towns and rural areas within each LGA, was examined and participants in focus groups were asked to discuss key factors they had observed that may have influenced changing population levels in their local area. Box 4 summarises key findings on population change.

Box 4: Population change

Over 1996 to 2001, Great Southern LGAs which experienced high rates of plantation expansion generally experienced either rural population growth, or lower rates of rural population decline, than LGAs with a high reliance on traditional agriculture and few/no plantations.

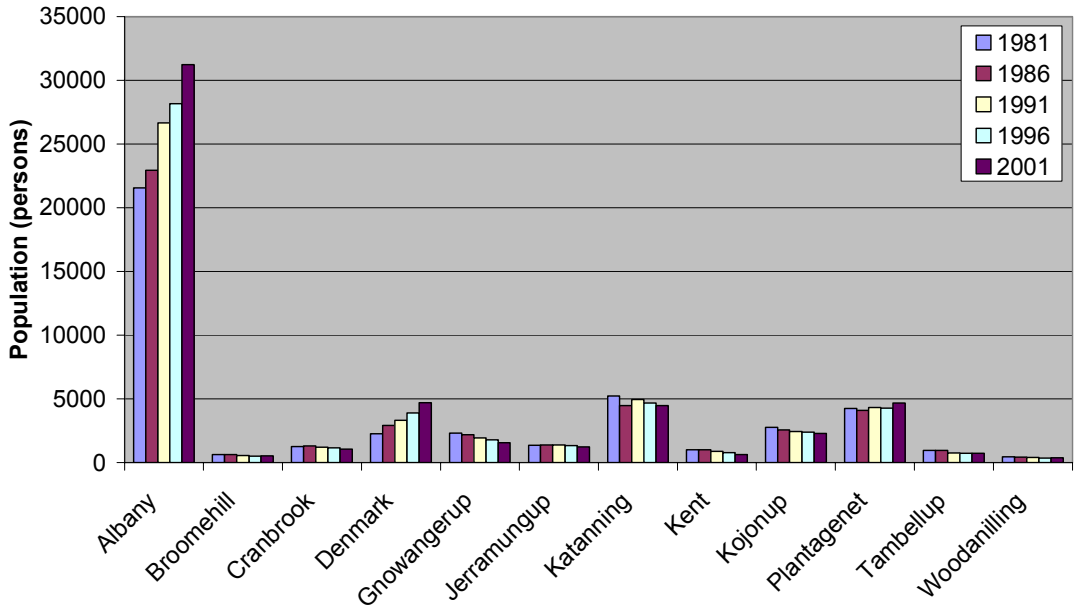
However, the positive change in rural populations in plantation LGAs was not primarily a result of plantations, but resulted from a mix of influences. Rural population growth primarily resulted from expansion in intensive agricultural uses and influx of 'lifestyle' residents. There is potential for further rural population growth if planning authorities permit 'homestead blocks' to be subdivided on plantation properties, enabling new residents to purchase houses on plantation properties.

In the Great Southern, the number of farmers and farm managers fell in both plantation and non-plantation areas of the region over 1996 to 2001. In the coastal and high rainfall LGAs, this has been counterbalanced in some cases by an influx of new population living on rural lifestyle blocks and, less commonly, managing vineyards. When these influences are accounted for, it appears likely that plantation expansion, while representing a different type of land use change than has occurred in many rural areas, had a similar impact on rural population to ongoing process of farm amalgamation occurring in other parts of the Great Southern.

Plantation expansion has been one of many contributors to population growth in some town populations, primarily in the city of Albany where much of the employment generated in the plantation sector is based.

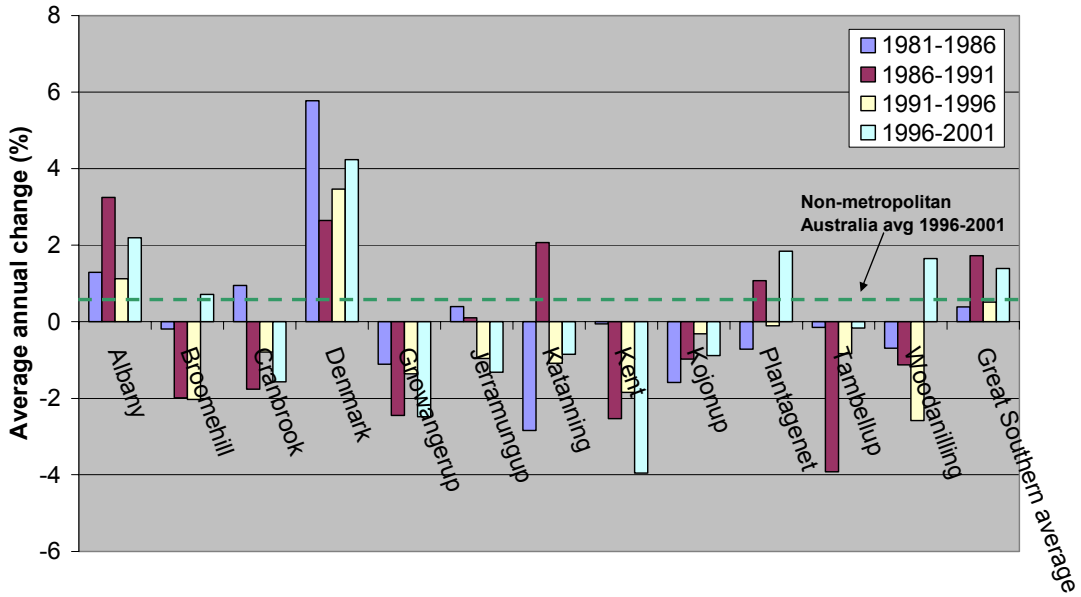
Total population of Great Southern LGAs

Figure 17 shows the total population of each of the 12 Great Southern LGAs over 1981 to 2001, while Figure 18 shows the average annual rate of population change over 1981-2001. The LGAs of Albany, Denmark and Plantagenet experienced overall population growth during this period, while other LGAs mostly experienced population decline with occasional periods of population growth.



Source: National Economics *YourPlace* database

Figure 17: Population of Great Southern LGAs, 1981 to 2001



Source: National Economics *YourPlace* database; Haberkorn *et al.* 2004

Figure 18: Average annual population growth in Great Southern LGAs, 1981 to 2001

In focus groups, population growth in Albany, Denmark and Plantagenet was believed to have resulted from:

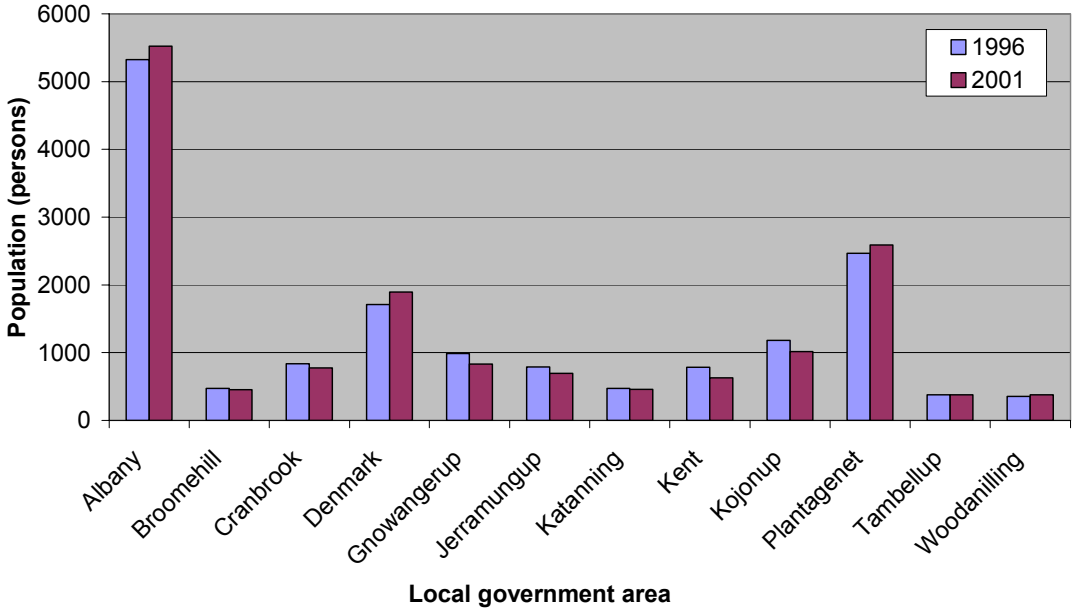
- Ongoing growth in the regional centre of Albany;
- People shifting to the coast in Albany and Denmark for lifestyle reasons;
- In the Shire of Plantagenet, the close proximity of the town of Mt Barker to Albany, and the availability of lifestyle blocks within commuting distance of both Albany and Mt Barker.

Focus groups attendees reported that there is considerable commuting between Albany and Mt Barker, which are only 40 kilometres from each other. Commuting occurs in both directions – some Albany residents are employed in Mt Barker, and vice versa.

Rural population of Great Southern LGAs

For the Census years of 1996 and 2001, data was obtained showing the population of rural areas[18] and individual towns[19] within different LGAs. This period was the time during which the majority of plantations were established in the region.

Figures 19 and 20 show the total rural population and rate of change in rural population over 1996 to 2001. The rural population includes people living in several rural subdivisions, particularly in Plantagenet Shire, as well as people living in many localities with less than 200 population, including South Stirling, Kendenup, Wellstead, Manypeaks, Rocky Gully and others.

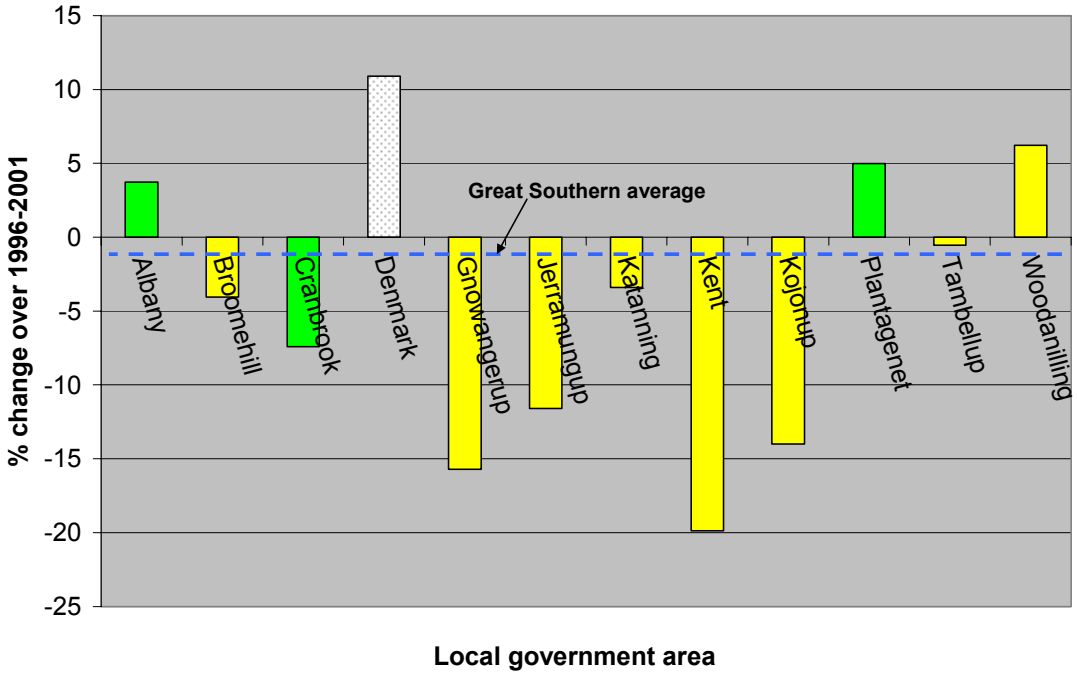


Source: ABS *Census of Population and Housing*

Figure 19: Total population living in rural areas of Great Southern LGAs, 1996 and 2001

[18] Defined as localities with less than 200 population and residents living outside gazetted town boundaries

[19] Defined as towns/localities with higher than 200 population living within their gazetted town boundaries



Source: ***ABS Census of Population and Housing***

Figure 20: Total change in rural population of Great Southern LGAs, 1996 to 2001

Rural population growth primarily occurred in LGAs which experienced growth in rural subdivisions and in intensive agriculture – Albany, Denmark, Plantagenet and Woodanilling[20]. All other rural populations declined. Of the three high plantation LGAs, rural population expanded in two – Albany and Plantagenet – and declined in Cranbrook. However, the decline in Cranbrook, at 7.4%, was lower than the average for the 'agricultural' LGAs of the Great Southern. The number of people living in rural areas of Broomehill, Gnowangerup, Jerramungup, Kent, Kojonup, Tambellup and Woodanilling declined by 10.3% over 1996 to 2001.

It is difficult to identify to what extent different factors have influenced rural population. In the plantation LGAs, the three factors commonly identified as influencing change were (a) farmers leaving the land; (b) introduction of plantations; (c) rural residential growth (in Albany and Plantagenet but not Cranbrook); and (d) growth in employment associated with intensive agriculture.

It was not possible to obtain data showing numbers of people living on rural residential properties, and so the extent to which this contributed to population growth could not be identified. This meant that in Albany and Plantagenet it was not possible to isolate the impact of plantation expansion from other factors potentially causing change.

However, in the Shire of Cranbrook there has been relatively little rural residential growth. There has been growth in intensive agriculture in the west, and any influx of residents as part of this would be reflected in rural population, as most viticulture occurs near the locality of Frankland which, as it has less than 200 population, is counted as part of the rural population figure.

[20] Woodanilling experienced a small increase in rural population likely to have resulted from implementing a small rural subdivision during this period.

In 2001, there was a rural population of 776 people living in Cranbrook Shire, a drop of 62 people since 1996 equating to a 7.4% decline in rural population. Overall, the Shire population (made up of the population of the town of Cranbrook and the rural population) dropped from 1,121 in 1996 to 1,049 in 2001.

In focus groups, participants described a greater drop in population in the east of the Shire compared to the west, and said this was a result of the establishment of a number of vineyards and some olive groves in the western part of the Shire.

Trying to distinguish the rate of population decline that may have occurred if intensive agriculture had not grown in the region – ie, if plantations were the only different land use change occurring in the Shire compared to the agricultural Shires of the region – is difficult. It requires knowledge of the number of jobs provided by viticulture, and knowledge of the likelihood of population leaving the region if viticulture had not been established. Unfortunately, specific data on employment in viticulture within the Shire was not available, and so the likely impacts of plantation expansion net of intensive agriculture expansion could not be calculated.

The rental of houses on many plantation properties, or retention of farmers who have leased land in their houses in some cases, is a factor that has assisted in maintaining rural population.

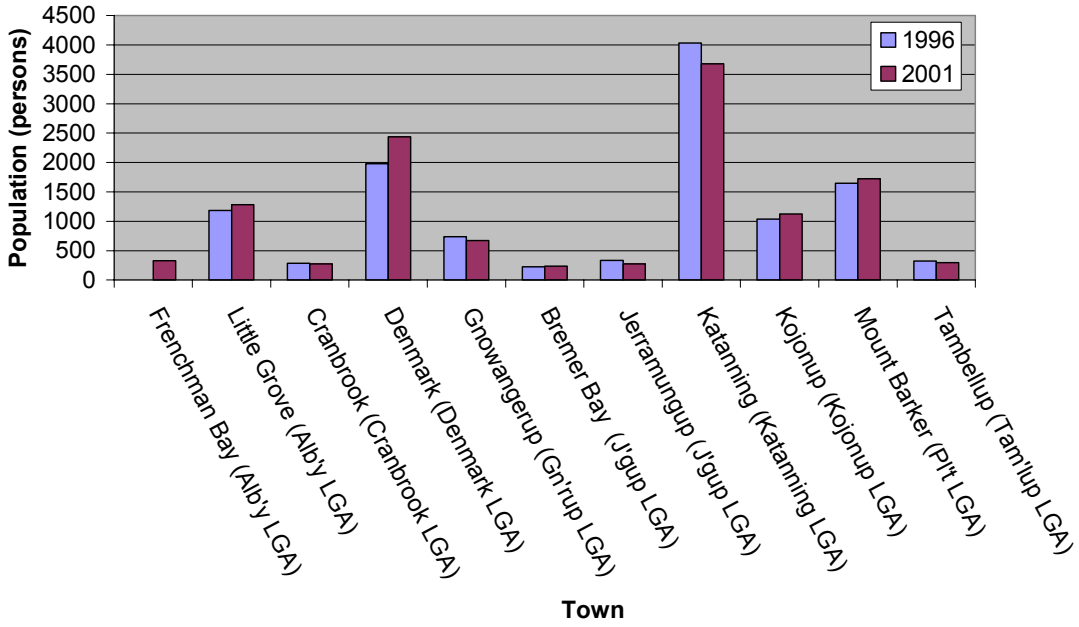
A key issue identified in focus groups was that there was higher demand for lifestyle blocks in rural areas than could be met with available areas of appropriately zoned land. In several areas attempts have been made to have land rezoned to allow subdivision for rural residential blocks, including near Frankland, Manypeaks and Wellstead. In the Frankland area in particular, people employed in vineyards often live in caravans as there is a severe shortage of available housing.

However, the high cost of providing required services such as sewage to these blocks has prevented subdivision in many cases. In addition, it has been difficult to obtain permission to subdivide farming properties that are being established to plantation so that the farm is divided into a homestead block, with a home and surrounding area of land, and the surrounding plantation. Several focus groups attendees from both the plantation sector and farming and rural residents believed that if such subdivision were allowed, higher rates of rural population growth could be achieved.

Population of different towns in the Great Southern

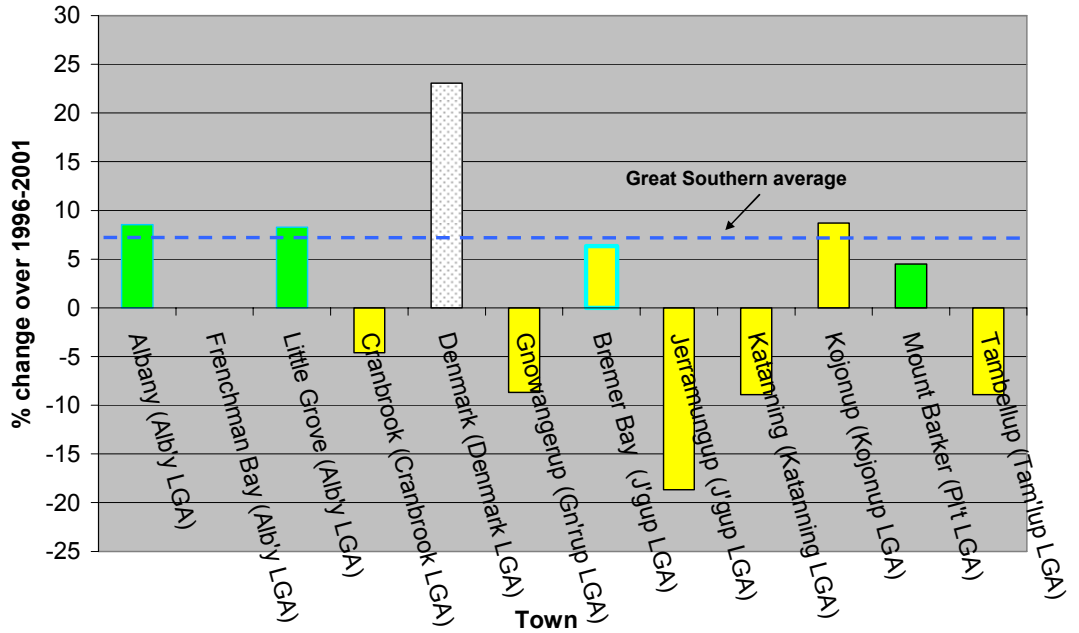
Figures 21 and 22 show the total population living in each town in the region with more than 200 population in 1996 and 2001, and the rate of change in population over this period. The population of all coastal towns increased over this period. The town of Denmark has experienced very high population growth, a result of the high desirability of living in the area for its lifestyle opportunities. Similarly, the city of Albany has grown rapidly, following a pattern common for regional centres.

Mt Barker and Kojonup were the only two inland towns to experience population growth. In Mt Barker, this is likely to have resulted from population growth associated with retirement into the town – the town has good aged care facilities; employment associated with expanding vineyards and wineries; and employment in the plantation industry, with some contractors based out of Mt Barker. Kojonup's population increase may have been partly a result of expansion of the town's bus building business during this period (the business has subsequently closed); influx of Homeswest residents into the town; and retirement into the town from both rural areas of Kojonup Shire and other nearby Shires.



Source: ABS *Census of Population and Housing*

Figure 21: Total population living in different towns of the Great Southern (excluding Albany)



Source: ABS *Census of Population and Housing*

Figure 22: Change in population of Great Southern towns, 1996 to 2001

Population change in comparison regions

Figure 23 compares average annual population change over 1981-1991 and 1991-2001 in high plantation LGAs of the Great Southern with population change in comparison LGAs outside the Great Southern.

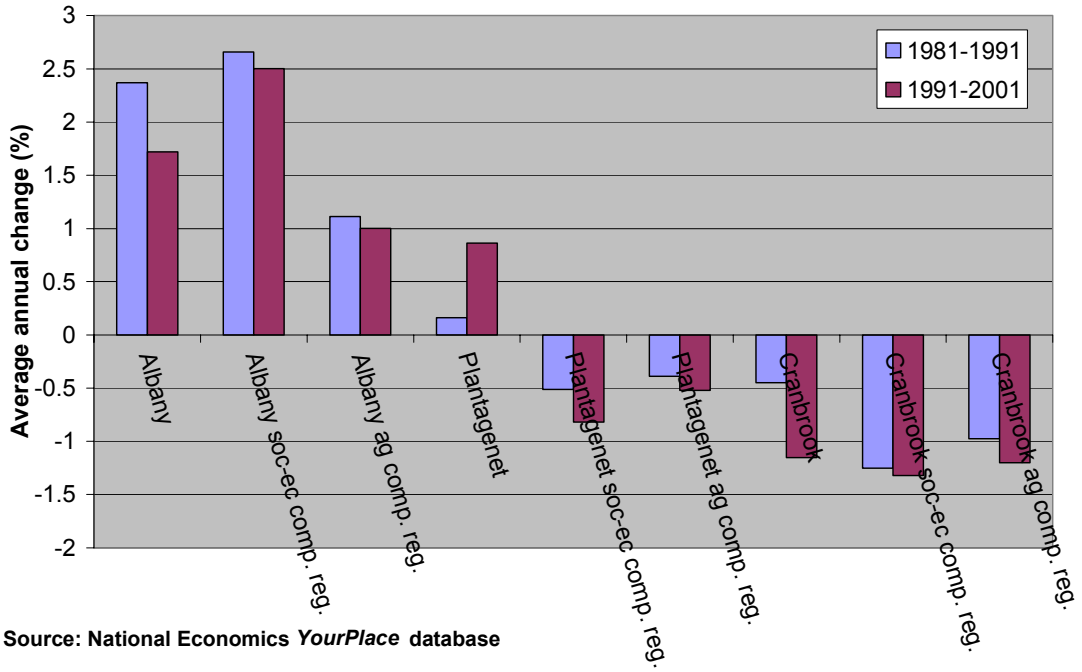


Figure 23: Average annual change in population in high plantation LGAs and comparison regions

Plantagenet and Cranbrook experienced higher population growth and lower population decline than their comparison regions, while Albany experienced slightly less population growth than socio-economically similar regions, but more than regions with similar agricultural industries.

This indicates that high rates of plantation expansion have not resulted in negative impacts on population at the LGA scale, as the rate of population growth in plantation regions was generally similar to or higher than that of comparison regions.

Conclusions on population change

Plantation expansion has predominantly occurred in those LGAs of the Great Southern experiencing multiple forms of land use change, many of which have acted to increase rural and town populations. As a result, these LGAs have experienced population growth for the most part, with the exception of Cranbrook, while other LGAs which are mostly reliant on traditional agriculture have for the most part experienced population decline. Cranbrook Shire – half of which has experienced land use diversification while the other half remains predominantly used for broadacre agriculture – has experienced overall a slightly lower rate of population decrease than many of the LGAs that are more highly reliant on broadacre agriculture, supporting the explanation of land use diversification bringing population growth to the Shires of Albany, Plantagenet and Denmark.

It is not possible to separate the impacts of plantation expansion, vineyard and winery expansion and lifestyle population growth in these Shires. While a different pattern of land use change occurs in plantation LGAs compared to other areas – land is leased or sold to plantation companies, rather than to other farmers as occurs in farm amalgamation processes in other LGAs – there is no evidence that the plantation expansion leads to higher rates of population decline. The rental of houses on many plantation properties, or retention of farmers who have leased land in their houses in some cases, has assisted in maintaining rural population, although some believe further opportunities should be created for residents to live on plantation properties.

Further study of population change at smaller scales is needed to identify if in some areas within LGAs there have been different patterns of population change which can be more closely identified as resulting from a particular land use change such as establishment of plantations.

9.0 Socio-demographic change in the population

Key findings related to socio-demographic change in the region are provided in Box 5.

Box 5: Socio-demographic change

Most parts of the Great Southern experienced similar patterns of socio-demographic change over 1991 to 2001, with only a few exceptions. There were no observable differences in the type or rate of change in most socio-demographic characteristics between 'high plantation' and other LGAs.

The Great Southern has experienced a generally ageing population, with a decrease in child (0-14) and youth (15-24) age population and increasing in working (25-64) and retirement (65 and older) age population in most LGAs. The LGA of Denmark is perhaps the key exception to this trend, with a higher proportion of youth age population reflecting its reputation as an alternative lifestyle region.

The proportion of population holding high school certificate or higher level qualifications increased across the region over 1991 to 2001.Unemployment rates fell while the proportion of the labour force employed part-time rose substantially. The number of new residents varied, with the proportion of new residents in the population falling in some LGAs and rising in others.

Many of the differences in the rate of change in particular socio-demographic characteristics across LGAs could not be easily explained, with focus group participants unable to pinpoint why different rates of change had occurred.

There was a clear difference in household income growth in different parts of the Great Southern. In Albany, Cranbrook, Denmark and Plantagenet, average household income grew relatively steadily over 1991 to 2001, while in other LGAs with high dependence on broadacre agriculture there was considerable fluctuation in average household income over this time. The former LGAs have a more diverse mix of industries and land uses, including plantation growing, viticulture and other forms of intensive agriculture as well as broadacre agriculture. This diversity is likely to have underpinned more stable income growth in the high rainfall, diverse land use LGAs, while the high reliance on broadacre agriculture in other LGAs led to fluctuations in household income as climatic conditions and returns from agriculture varied.

A wide range of socio-demographic characteristics may be examined for any population. For this study, the following characteristics were examined:

- Age structure;
- Educational attainment;
- Number of new residents;
- Part-time and full-time employment;
- Unemployment; and
- Household income.

These characteristics were chosen as they often change when the economy of an area changes, eg as a result of introduction of new industries. Each is examined separately below.

9.1 Age structure

Figure 24 shows change in the proportion of the population made up of four age groups over the period 1991 to 2001. During this period, there was a general trend across the Great Southern of declining child age (0 to 14 years) and youth age (15 to 24 years) aged populations, and increasing working age (25 to 64 years) and retirement age (65 years and older) population. This is consistent with trends occurring across Australia; between 1991 and 2001, the median age of the Australian population as a whole increased from 32 to 35 years[21].

While these broad trends were similar across the Great Southern, some differences did occur in individual LGAs:

- Denmark experienced growth in the proportion of youth-age population, and almost no change in retirement age population. This most likely reflects Denmark's well-known reputation as an 'alternative lifestyle' area;

- Woodanilling experienced slight growth in children as a proportion of the population. With a very small overall population (the total Shire population in 2001 was 394), small shifts in the proportion of different age groups can lead to relatively large shifts in the percent of population falling within each group;

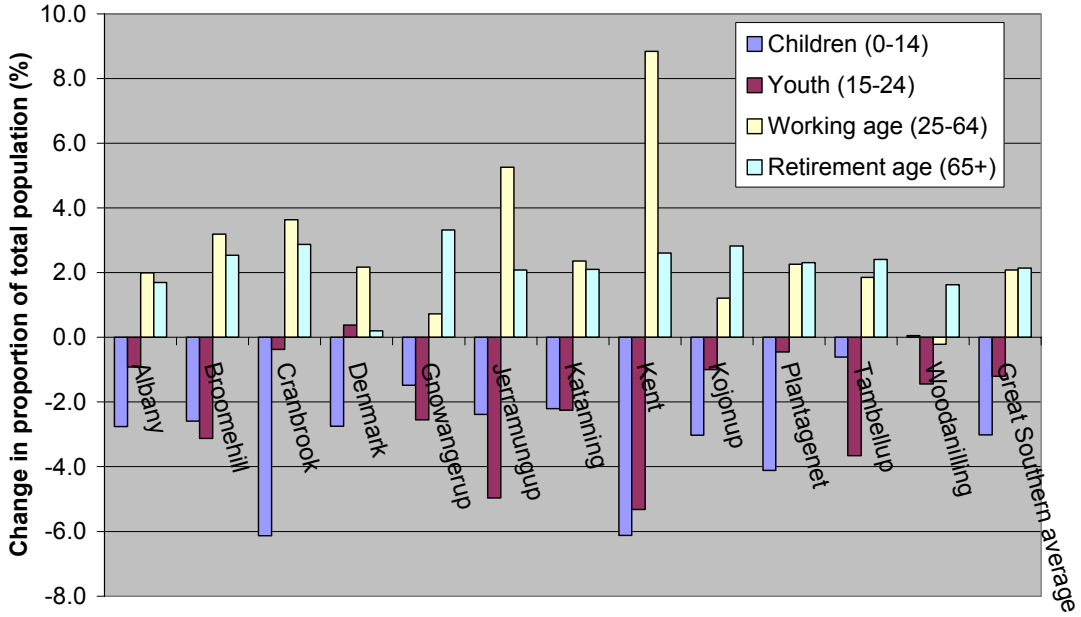
- Cranbrook experienced higher decline in child age population and lower decline in youth population than other Shires. Similarly, Plantagenet and Albany experienced lower decline in youth population than many other Shires. In Albany, the difference was explained in focus groups as resulting from youth shifting into the city of Albany for education and employment not available in other areas of the Great Southern. In focus groups, attendees described an influx of youth aged population in Plantagenet Shire and in the west of the Cranbrook Shire associated with employment in vineyards; and

- Kent and Jerramungup experienced higher declines in child/youth populations and higher increases in working age populations than most other LGAs. One suggested explanation was that this was a result of the unique history of these Shires. The majority of agricultural land in these LGAs was cleared between the 1950s and 1970s. This may have resulted in a trend in which children of the farming population that first settled the land have only since 1991 shifted into the working age population, while other Shires where land was cleared over a longer period had populations with a more diverse age structure. It may also reflect a lack of employment opportunities for young people in these Shires;

In general, no differences that may be related to expansion of plantations were observed. When shifts in age structure in comparison regions were examined, shown in Figure 25, the high plantation LGAs showed broadly similar patterns to their comparison LGAs. However, a key difference again was that the high rainfall LGAs of the Great Southern experienced growth in the youth and adult age population, while comparison regions tended to experience decline.

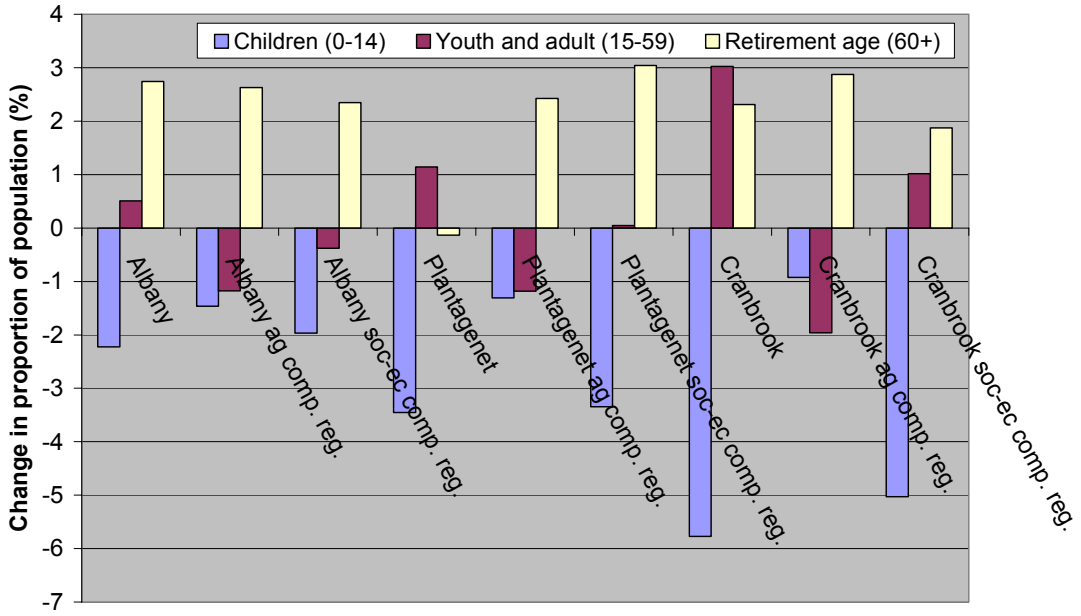
Areas with a high diversity of industries and land uses – generally including those where plantations have been established - tend to have experienced stronger growth in working age population than other areas, which indicates stronger potential for future economic growth.

[21] Statistic drawn from the ABS *Census of Population and Housing*, 1991 and 2001



Source: ABS *Census of Population and Housing*

Figure 24: Change in population age structure of Great Southern LGAs, 1991 to 2001



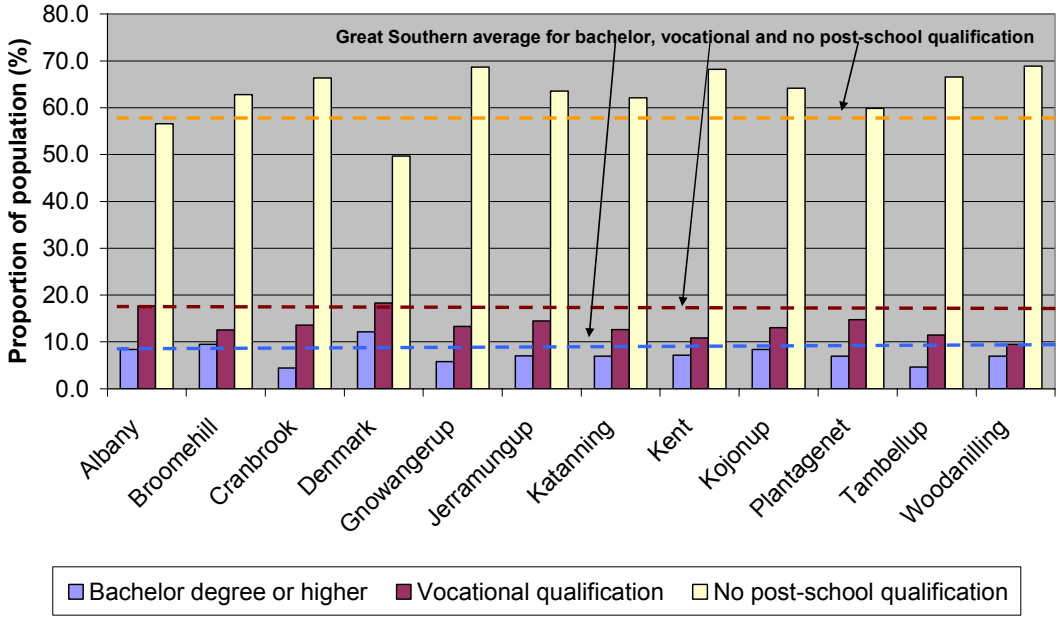
Source: National Economics *YourPlace* database

Figure 25: Change in population age structure of high plantation LGAs and comparison regions, 1991 to 2001[22]

[22] Data for comparison regions in Figure 25 was drawn from the National Economics database which has time series data concorded to 2001 regional boundaries. This database provides information for three age groups that are slightly different to those shown in Figure 24. It was used as it was possible to obtain data for all comparison regions using National Economics data, although not as many age groups could be examined separately as for the data drawn directly from the Census.

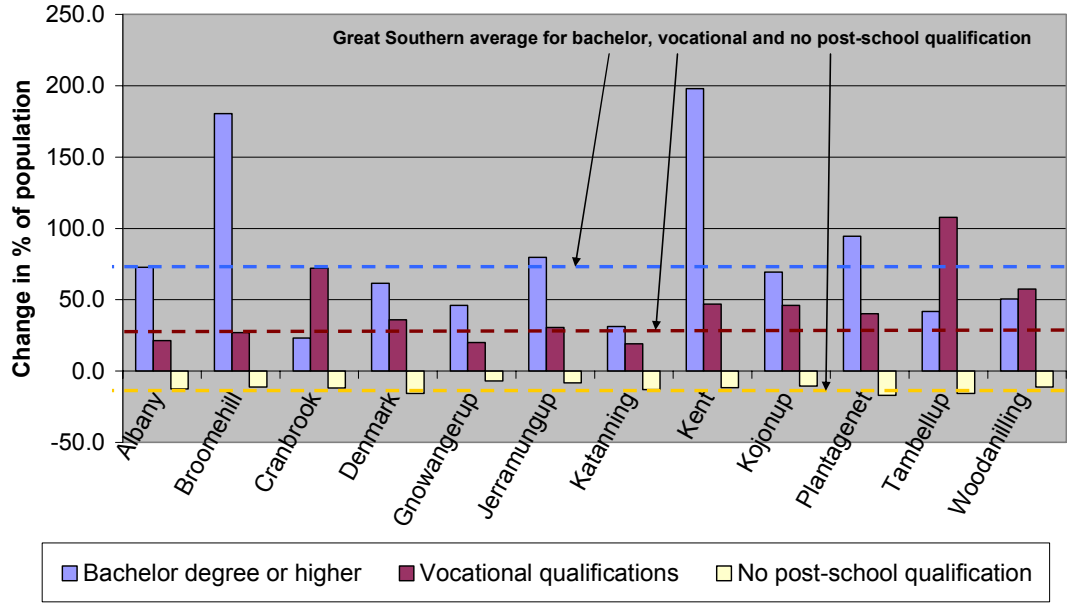
9.2 Educational attainment

Figure 26 shows the highest level of formal education attained by population over the age of 16 in the Shires of the Great Southern in 2001. Figure 27 shows the rate of change over 1991 to 2001.



Source: ABS *Census of Population and Housing*

Figure 26: Highest level of qualification held by population of different LGAs, 2001



Source: ABS *Census of Population and Housing*

Figure 27: Change in proportion of population of different LGAs holding qualifications, 1991 to 2001

Across all LGAs, there has been an increase in the proportion of the population who have achieved a high school certificate or post-school qualification. This is consistent with trends occurring across Australia.

Similarly to age profiles, while the overall changes were similar across the region, there were some differences:

- Denmark has a higher overall proportion of population with a bachelor degree or higher qualification;

- A higher proportions of the population of Albany, Denmark and Plantagenet have achieved post-high school qualifications compared to other LGAs of the Great Southern; and

- Cranbrook experienced higher growth in population with vocational qualifications than other LGAs during 1991-2001.

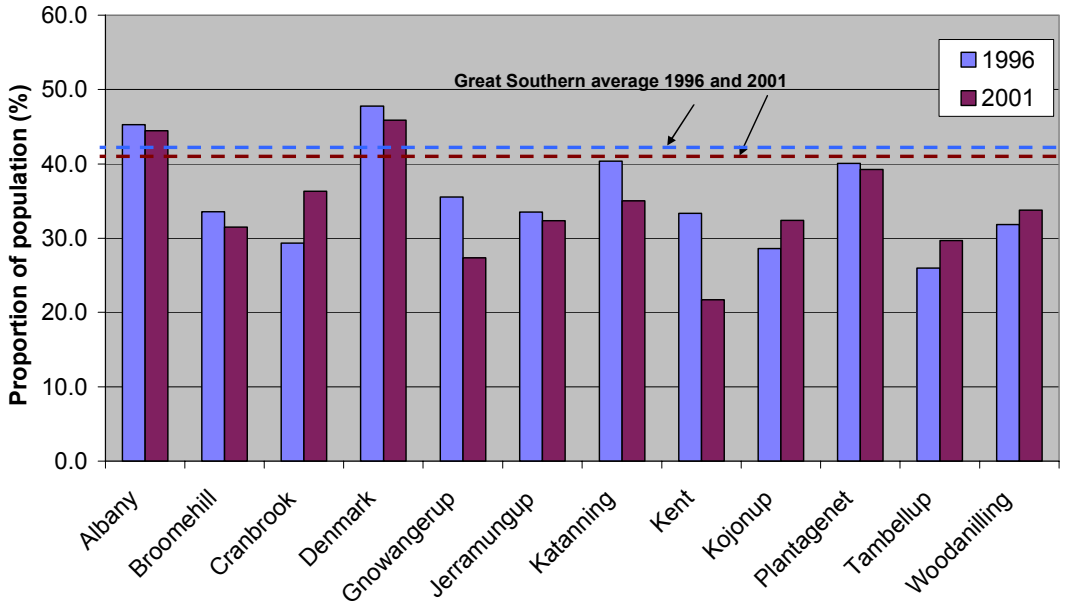
The main pattern observed was that areas with a higher diversity of land uses and industries tended to have a higher proportion of the population with post-high school qualifications. Overall, however, no changes in the levels of qualifications held were associated with rapid plantation expansion.

When comparison regions were examined, no clear differences in rates of change were observed.

9.3 Number of new residents

The ABS *Census of Population and Housing* asks residents whether they have been usually resident at their current address for the past five years, and for their previous address if they have shifted residence. From this, a data series showing the proportion of population usually resident in the same LGA five years previously has been developed.

Figure 28 shows the proportion of the population who reported they did not usually reside in the area five years previously in 1996 and 2001. In most of the LGAs of the Great Southern, the proportion who did not usually reside there five years previously – 'new residents' – fell slightly. However, in four LGAs a different pattern occurred. An increased proportion of new residents were reported in 2001 compared to 1996 in Cranbrook, Kojonup, Tambellup and Woodanilling.



Source: ABS *Census of Population and Housing*

Figure 28: Proportion of the population who did not live in the same LGA five years previously

In focus groups, respondents suggested the following explanations for these patterns:

- Influx of new residents in Cranbrook working on vineyards;
- Residents from surrounding Shires retiring into the town of Kojonup;
- New residents shifting into a rural residential subdivision in Woodanilling; and
- New farmers shifting into Tambellup, including some who purchased farms in the Shire after selling farming properties in other Shires to plantation companies.

However, there was no broad agreement in focus groups that these were likely to be the primary causes of the pattern seen. Therefore it is not known to what extent they explain the differences seen.

While an overall pattern suggesting a clear difference in areas experiencing rapid plantation expansion is not evident from the data presented in Figure 28, in focus groups attendees commonly discussed issues related to new residents in high plantation areas.

In particular, many focus group participants discussed concerns that people choosing to rent houses on plantation properties were sometimes 'undesirable' entrants to the local community. The common perception – described by many focus group participants and disagreed with by none - was that many renters did not take part in local community activities or join community groups. This was reported to be more of a problem in isolated areas, while houses within easy driving distance of key towns were easily rented to people who reportedly integrated better into local communities and were often employed in the region.

A solution suggested to this issue by both plantation sector employees and by local residents was the subdivision of 'homestead blocks' on plantation properties. This would involve subdividing a property so the farm homestead and a surrounding area of anywhere from 10 to 100 hectares formed a small residential block, while the rest of the property was established to plantation. With high demand for rural residential blocks in the area, many believed there

would be high interest in purchase of these homestead blocks, encouraging permanent residents into the area rather than short-term renters.

It was not possible to obtain consistent data on new residents for all comparison regions, and so trends in the Great Southern could not be compared to those in other similar regions.

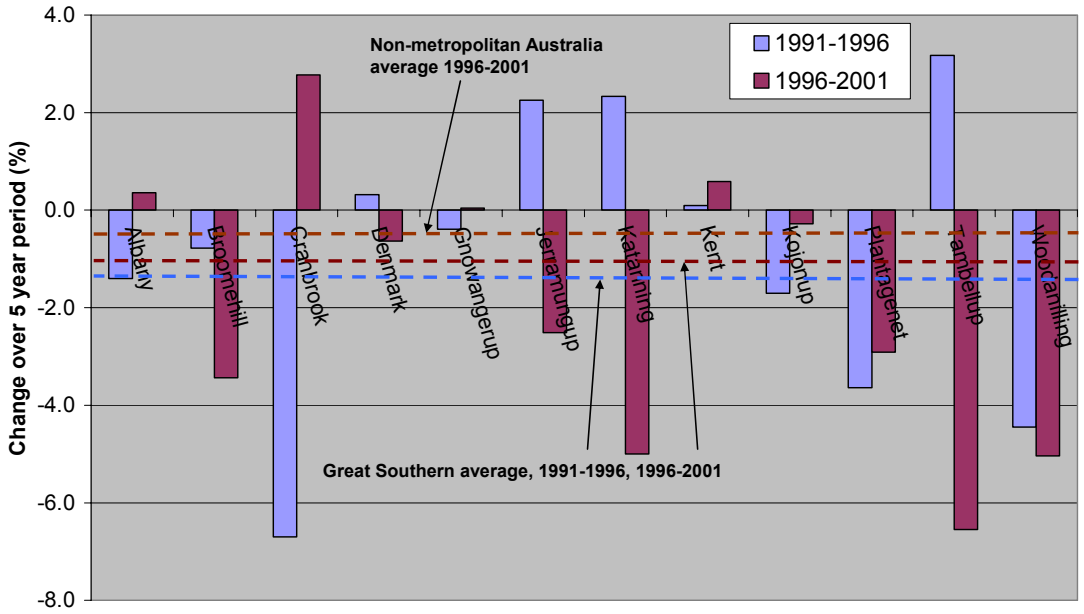
9.4 Labour force, employment and unemployment

Labour force

Figure 29 shows the rate of change in participation in the labour force in different LGAs of the Great Southern over 1991-1996 and 1996-2001. Overall, Denmark and Albany had lower participation in the labour force than other LGAs. LGAs with high reliance on broadacre agriculture tended to have higher labour participation rates, with the exception of Katanning.

While different trends are apparent across different LGAs, participants in focus groups were able to offer few explanations of changes based on their knowledge of their local areas. Many also had difficulty identifying who would be defined as participating and not participating in the labour force, which contributed to the difficulty of explaining the trends seen in these statistics.

Due to this difficulty, trends in comparison regions were not examined as it would not be possible to identify the likely sources of differences across regions when explanations of differences within the Great Southern could not be identified.



Source: ABS *Census of Population and Housing,* Haberkorn *et al.* 2004

Figure 29: Change in labour force participation rate in Great Southern LGAs

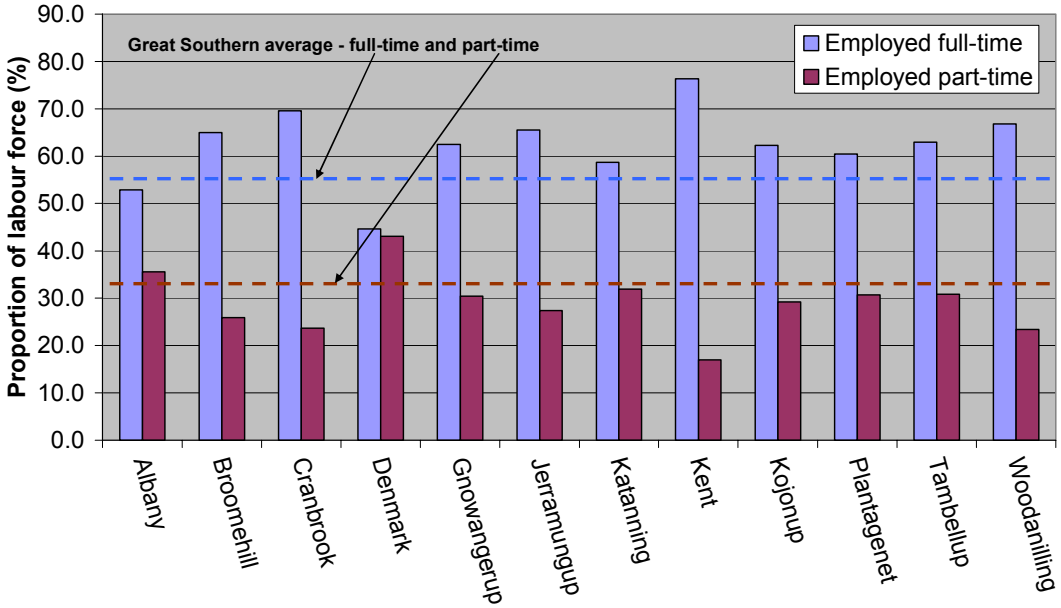
Part-time and full-time employment

Figure 30 shows the proportion of the labour force employed full time and part time in 2001, while Figure 31 shows the rate of change in the proportion of the labour force employed full time and part time over 1991 to 2001.

The proportion of the labour force employed part-time increased in all Great Southern LGAs over 1991 to 2001, while the proportion employed full-time fell in most LGAs. The exceptions to this trends were Cranbrook, Katanning, Kent and Plantagenet, where both full-time and part-time employment increased. This indicates that the drop in unemployment in these LGAs resulted from creation of both full-time and part-time employment, while in other LGAs, decline in unemployment mostly resulted from growth in part-time employment.

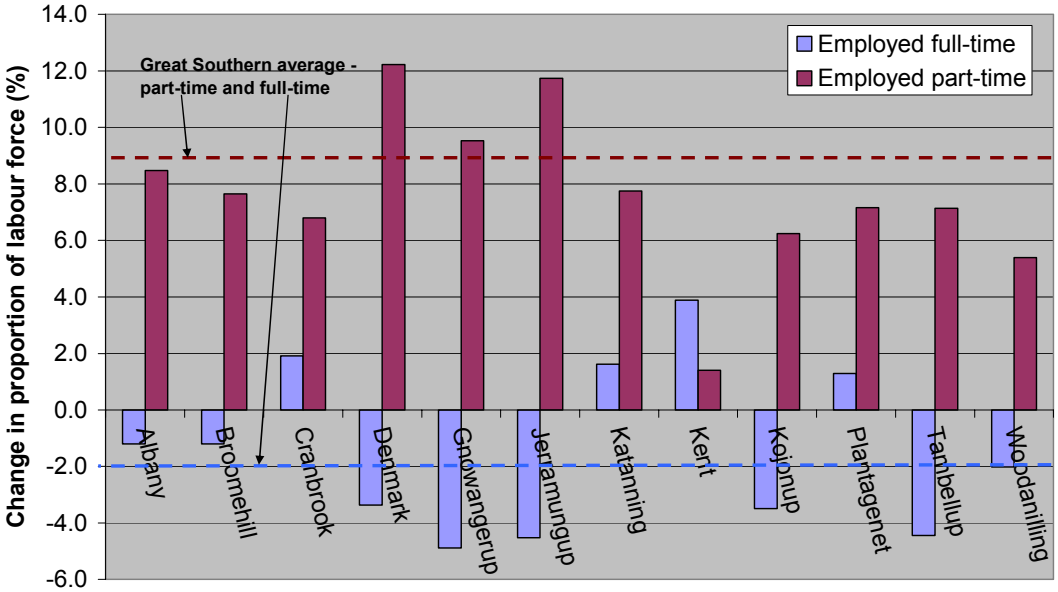
When asked what may have contributed to this pattern, focus group participants were generally unsure. While a range of suggestions were made, they varied widely and no consistent picture emerged of likely explanations for the increase in full-time employment in the four LGAs.

It was not possible to obtain consistent data on part-time and full-time employment for all comparison regions, and so trends in the Great Southern could not be compared to those in other similar regions.



Source: ABS *Census of Population and Housing*

Figure 30: Proportion of labour force employed full-time and part-time by LGA, 2001



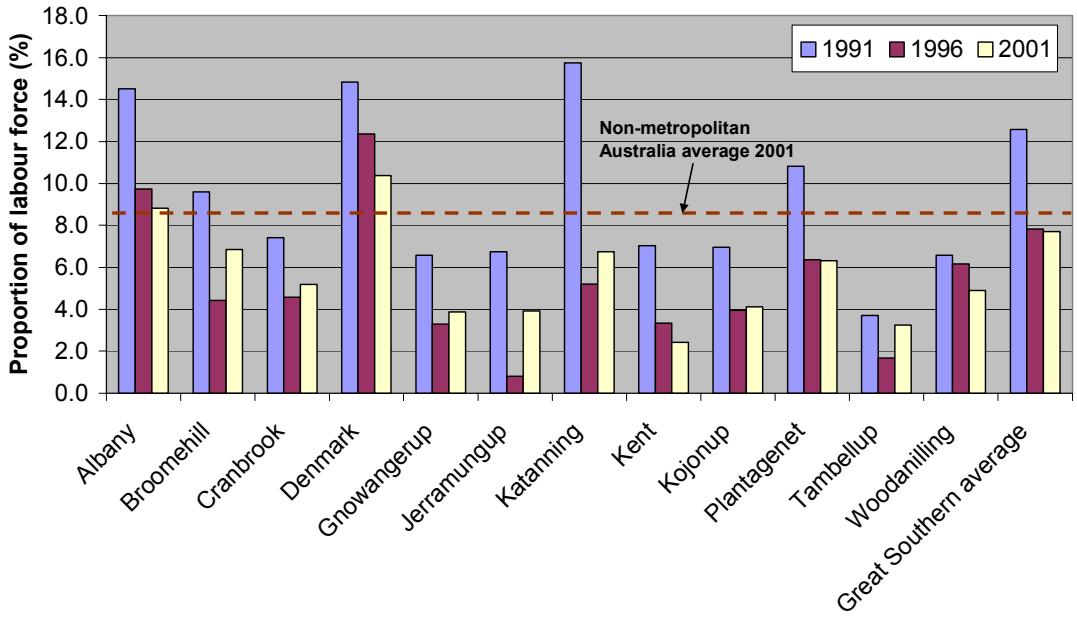
Source: ABS *Census of Population and Housing*

Figure 31: Change in proportion of labour force employed part-time and full-time by LGA, 1991 to 2001

Unemployment

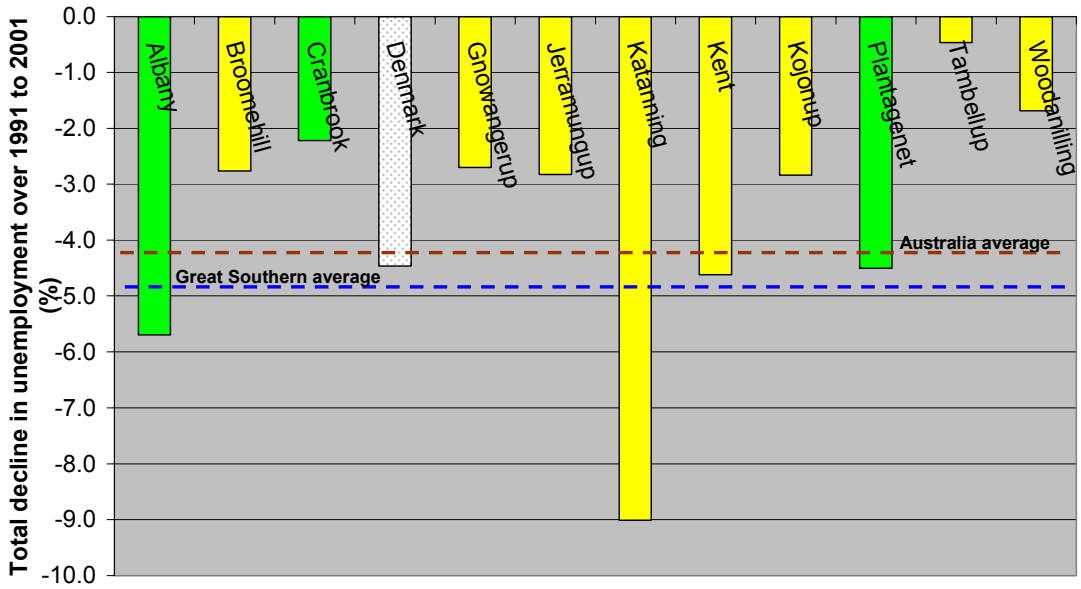
Figure 32 shows the rate of unemployment over time in different LGAs of the Great Southern, while Figure 33 shows the rate of decrease over 1991-2001. Unemployment fell in all LGAs in the Great Southern over this period, with Katanning experiencing the greatest fall. Some focus group participants suggested that the decline in Katanning may reflect a shift of some unemployed people into other LGAs, and some unemployed people enrolling in training courses[23], as well as increased employment.

[23] People enrolled in formal training courses are not defined as participating in the labour force



Source: ABS *Census of Population and Housing*, Haberkorn *et al.* 2004

Figure 32: Unemployment rate by LGA, 1991 to 2001



Source: ABS *Census of Population and Housing*

Figure 33: Change in proportion of labour force without employment by LGA, 1991-2001

When rates of change in unemployment in the Great Southern were compared to rates of change in comparison regions, no clear pattern could be seen. Some comparison regions experienced a similar level of decline in unemployment while others experienced an increased in unemployment rates. In small LGAs used as comparisons for Plantagenet and Cranbrook, the changes were particularly variable.

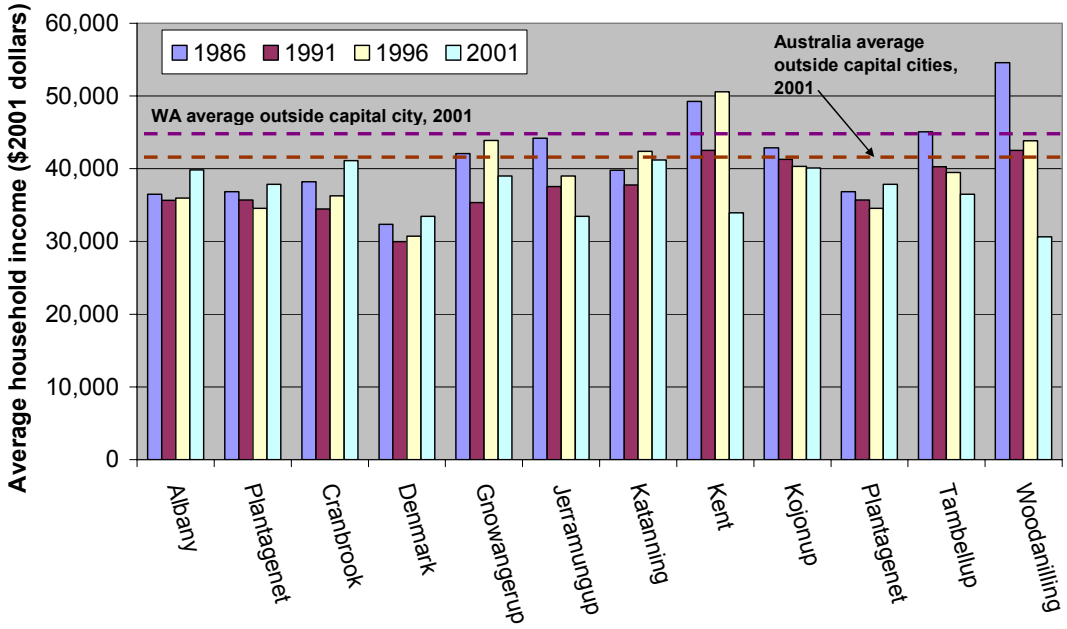
9.5 Household income

Figure 34 shows the average household income in different LGAs of the Great Southern in 1986, 1991, 1996 and 2001. Figure 35 shows the average annual growth in household income (in $2001) in the five years to 1991, 1996 and 2001. Some of the variation in household income over time may be a result of the changing nature of households – for example, if there is a shift from many households with two income earners to having more single person households, this may be accompanied by a fall in average household income.

Overall, average household income has been lower in Denmark compared to other LGAs, probably reflecting relatively high welfare dependence and a high proportion of single income households in the Shire.

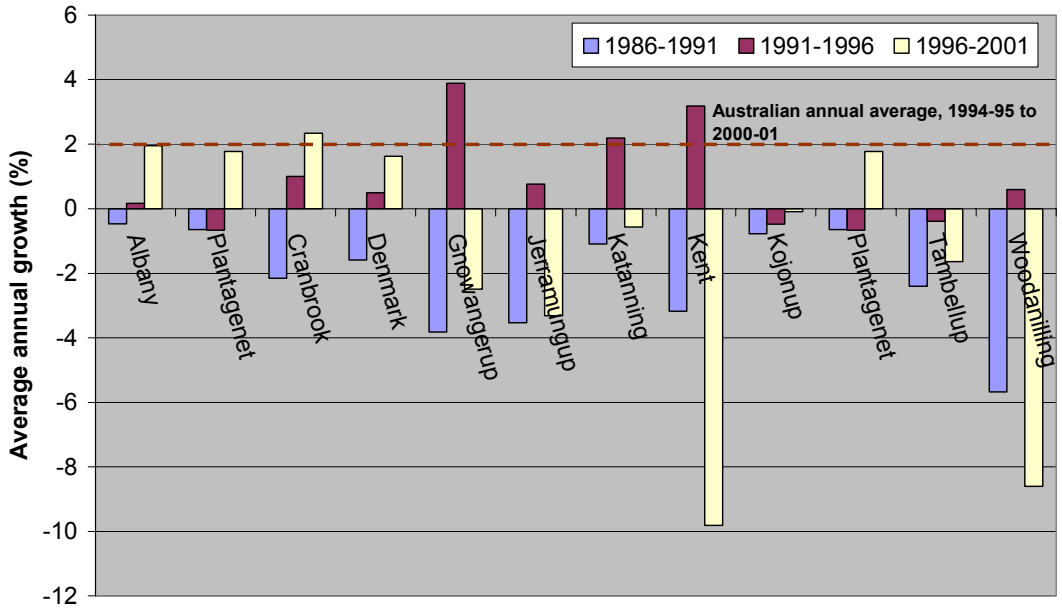
Many of the LGAs with high dependence on broadacre agriculture experienced considerable fluctuations in average household income. This was most likely related to fluctuations in agricultural markets and climatic conditions.

LGAs with a higher diversity of industries – Albany, Cranbrook, Plantagenet, Denmark and to a lesser extent Kojonup – experienced a more stable pattern of income growth than those with high dependence on a single industry (agriculture). While not always experiencing household income growth, these LGAs experienced smaller fluctuations than others. This stable household income growth is a good indicator of stable economic growth, with retail and other industries reliant on household spending less subject to fluctuations in demand for goods and services.



Source: National Economics *YourPlace* database, ABS *Household Income and Income Distribution*

Figure 34: Average household income by LGA, 1986 to 2001



Source: National Economics *YourPlace* database, ABS *Household Income and Income Distribution*

Figure 35: Average annual growth in household income by LGA, 1986 to 2001

When rates of change in household income in comparison regions were examined, no clear pattern was found. Some comparison LGAs experienced higher income growth than the high plantation LGAs, while others experienced lower income growth. This indicates that a range of changes have contributed to average income growth; these clearly involve many influences other than plantation sector expansion.

10.0 Changes in service provision

Data on changes in service provision was collected via focus groups held in the region, as well as from state and national data sets. As most data was sourced locally or from state data sets, it was often not possible to compare change in services with the comparison regions listed in Table 1. In most cases, the data available allowed identification of trends in service provision, but not of the exact magnitude of change in different LGAs, limiting comparisons between LGAs. The following types of services were examined as far as possible given the limited data available:

- Education;
- Health and government services;
- Community and volunteer groups;
- Emergency services groups, focussing on community fire brigades;
- Retail businesses; and
- Agricultural service businesses.

Key findings are detailed in Box 6.

10.1 Education

Changes in education services were analysed by examining changes over time in enrolment in individual schools, utilising data collected by the WA Department of Education and Training and population data from the Census. As comparison data could not be obtained outside WA, due to lack of comparability of data sets across different states, alternative comparison regions within WA were examined. These included data from areas across southern WA, as far north as Geraldton and as far east as Esperance.

Initial analysis indicated that differently sized towns experienced very different trends in school enrolment over time. As a result, comparing trends in school enrolments to averages for particular regions was not useful, as any region would contain a range of schools located in differently sized towns, and the average did not reflect a 'typical' trend for any of these. To ensure detailed analysis, the towns in which schools were located were identified, as was the proximity of towns to plantations (described in more detail below). School enrolment data was then analysed by the size of population of the town in which schools were located, as this allowed the most meaningful comparison of plantation and non-plantation areas. School enrolments in towns of four sizes were examined:

- Towns with more than 10,000 population;
- Towns with 1,000 to 5,000 population;
- Towns with 500 to 1,000 population; and
- Towns with less than 200 population.

Box 6: Service provision

An overall decline in many services was reported in most rural areas of the Great Southern, including areas where plantations have been established and those where they haven't.

Limited data was available on changes in provision of many types of services. While it was possible to identify general trends in service provision, the data available did not in general allow in-depth analysis of whether plantation expansion had led to more rapid service decline. Analysis of the data that was available suggested plantation expansion tended to occur after a decline in services, rather than preceding it.

In general, change in levels of service provision did not appear to be directly linked to expansion of plantations. Changes in the level of education, health, government, retail and volunteer fire fighting services, and in community groups, were influenced by a range of factors. Probably the greatest of these was overall population change. Rural communities with falling population, and associated ageing of the population, tended to experience withdrawal of services, while service provision generally grew in larger towns.

The level of services to agriculture, and education services (measured by numbers of students enrolled in schools), did decline more rapidly in areas experiencing rapid plantation expansion over 1991 to 2001 than in other areas of the Great Southern or comparison regions outside the Great Southern. However, in both cases the decline was high prior to plantation expansion occurring, suggesting plantation expansion may have been one type of response to the factors causing decline in these services (eg declining viability of farming), rather than a cause of the decline.

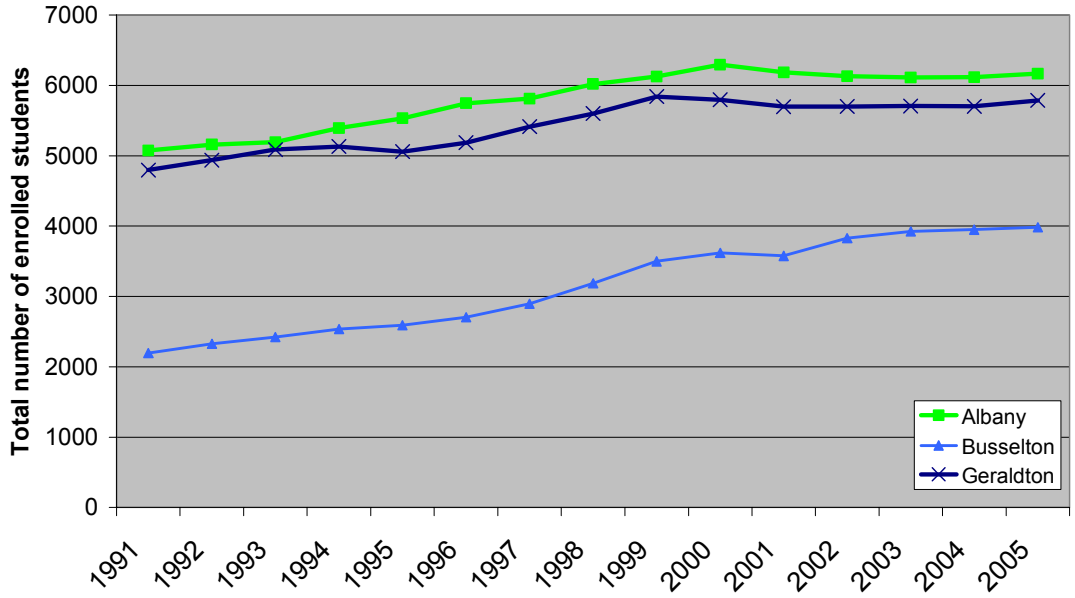
Towns with populations of between 200 and 500 people, and of between 5,000 and 10,000 people, were not examined as there were no towns of this size in areas experiencing high plantation expansion in the Great Southern. While the town of Cranbrook in Cranbrook Shire has a population within the 200 to 500 range, the town itself is located in the east of the LGA, a considerable distance from the concentration of bluegum plantations in the west of the LGA. Therefore Cranbrook was not considered a 'high plantation' town. This definition was supported by focus group participants, who did not describe Cranbrook as a town associated with plantation expansion.

Enrolment in schools in towns with > 10,000 population

School enrolments over time in three cities with more than 10,000 population were compared – Albany (the plantation region), Busselton and Geraldton.

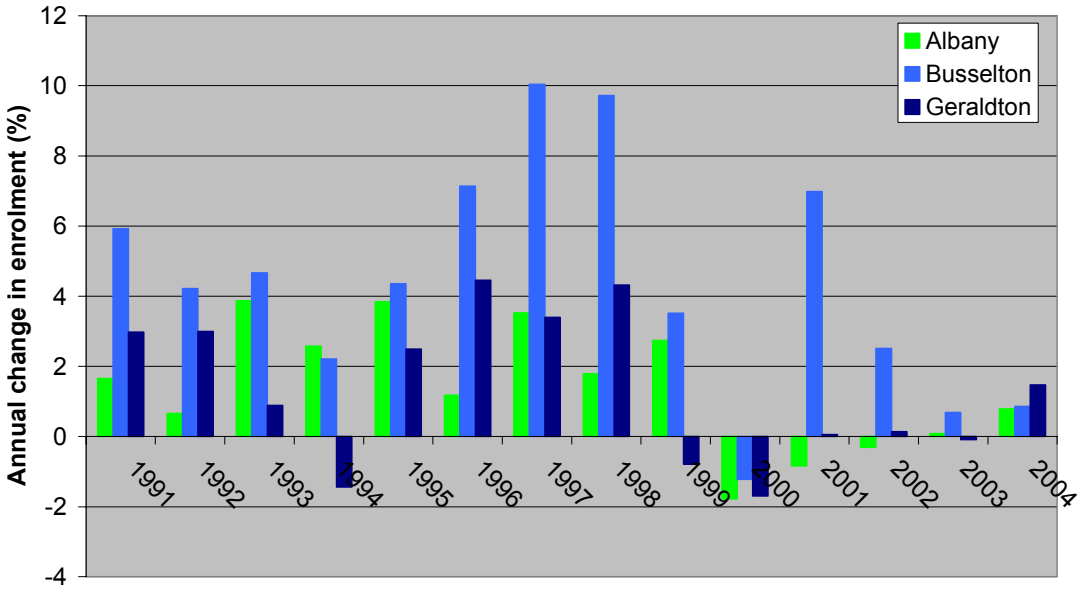
Busselton and Geraldton are two of the only cities in Western Australia of relatively similar size to Albany. While Busselton is in a region which has some plantations, the plantation development in the LGA has been relatively low and so it was considered an appropriate 'low/no plantation' comparison LGA.

Figures 36 and 37 show (a) total enrolment in all schools in each of the three cities (from pre-school to end of high school), and (b) the annual rate of change in enrolments for each city.



Source: Department of Education and Training

Figure 36: Total enrolment in primary and high schools for towns of > 10,000 population



Source: Department of Education and Training

Figure 37: Rate of change in enrolment in primary and high schools for towns of > 10,000 population

All three cities experienced an overall rise in school enrolments between 1991 and 2005. Differences in the rate of enrolment growth in the three cities tended to be consistent with the population growth experienced by each city. The rate of enrolment growth was most rapid in Busselton. Busselton experienced a 4.7% increase in total population over 1991-2001, compared to a 0.5% fall in population in Geraldton and 1.6% increase in Albany. This is likely to be the primary reason for the more rapid increase in enrolments in Busselton compared to the other two towns. While a small proportion of the increase in enrolments in

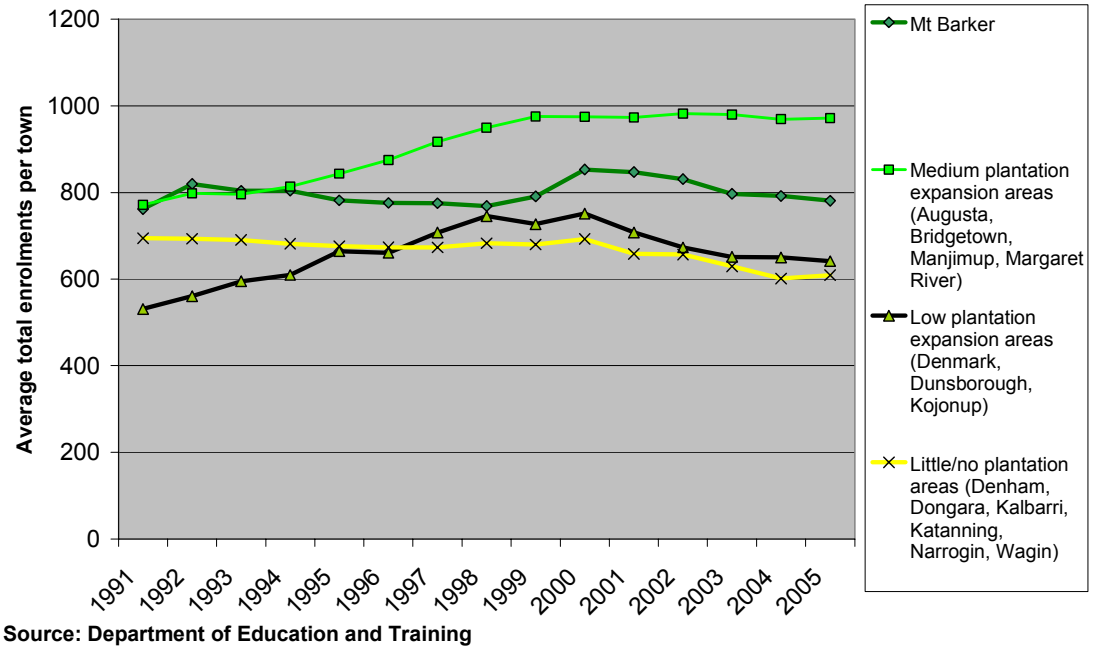
Albany is likely to have involved children of employees in the plantation sector, the plantation sector did not have an observable impact on overall changes in enrolments over time in Albany.

Enrolment in schools in towns with 1,000-5,000 population

School enrolments were compared over time in several towns with between 1,000 and 5,000 total population in 2001, some within the Great Southern and some outside. As these towns had experienced varying levels of plantation expansion, four categories of town were examined:

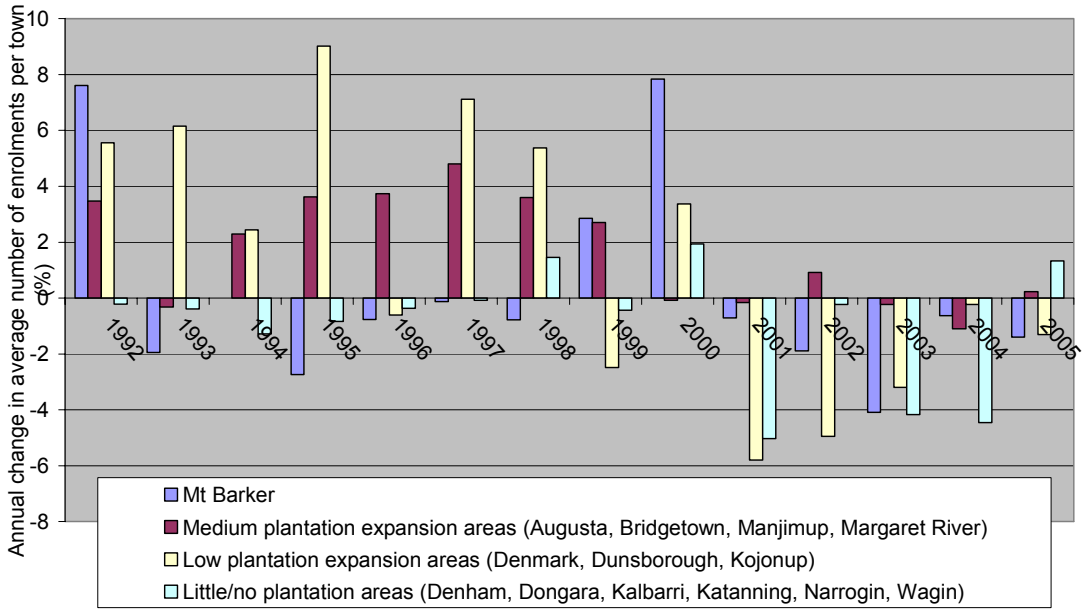
- High plantation expansion – Mt Barker (in Plantagenet Shire)
- Medium plantation expansion – Augusta, Manjimup, Bridgetown, Margaret River. While these towns were near areas of plantations, the total area of plantation by 2001 did not cover the same percentage of land as in Plantagenet Shire, and the rate of plantation expansion over 1991 to 2001 had generally been slower than for Plantagenet Shire
- Low plantation expansion – Kojonup, Denmark. These two towns were near areas where some plantations had been established, but not on the scale of the medium or high plantation expansion areas; and
- Little/no plantation expansion – Denham, Dongara, Kalbarri, Katanning, Narrogin, Wagin.

Figures 38 and 39 show (a) average school enrolment per town for each of the four categories of towns (from pre-school to end of high school), and (b) the annual rate of change in enrolment.



Source: Department of Education and Training

Figure 38: Average enrolment in primary and high schools for towns of 1,000 to 5,000 population



Source: Department of Education and Training

Figure 39: Rate of change in enrolment in primary and high schools for towns of 1,000 to 5,000 population

No clear pattern of difference can be seen when plantation and non-plantation areas are compared. In some years, enrolment grew in high plantation towns while declining in others, while in other years the opposite occurred. This indicates that a range of factors other than plantation expansion are influencing the rate of change in school enrolments in towns of this size.

Enrolment in schools in towns with 500-1,000 population

Change in the average number of school enrolments per town was compared for several towns with between 500 and 1,000 total population in 2001. As these towns had experienced varying levels of plantation expansion, they were coded into three categories:

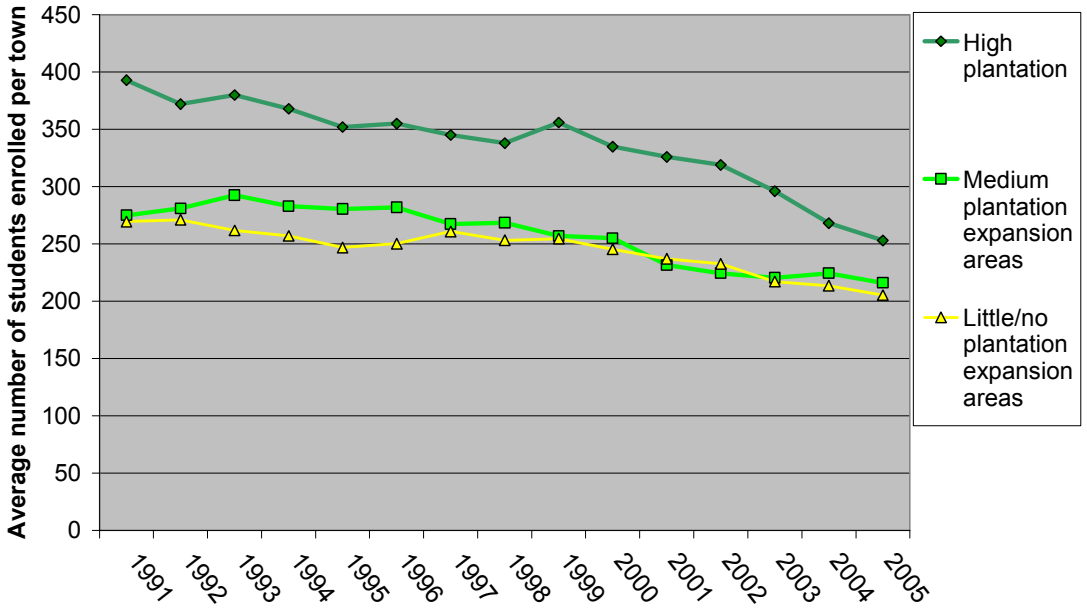
- High plantation expansion – Boyup Brook (while not located in the Great Southern, the Shire of Boyup Brook is adjacent to the LGAs of Plantagenet and Cranbrook);

- Medium plantation expansion – Nannup and Pemberton. While these towns were near areas of plantations, the total area of plantation by 2001 did not cover the same percentage of land as in the Boyup Brook area, and the rate of plantation expansion over 1991 to 2001 had been slower than for Boyup Brook; and

- No plantation expansion – Beverly, Boddington, Brookton, Cervantes, Corrigin, Gnowangerup, Lake Grace, Meekatharra, Morawa, Mt Magnet, Mullewa, Northampton and Pingelly.

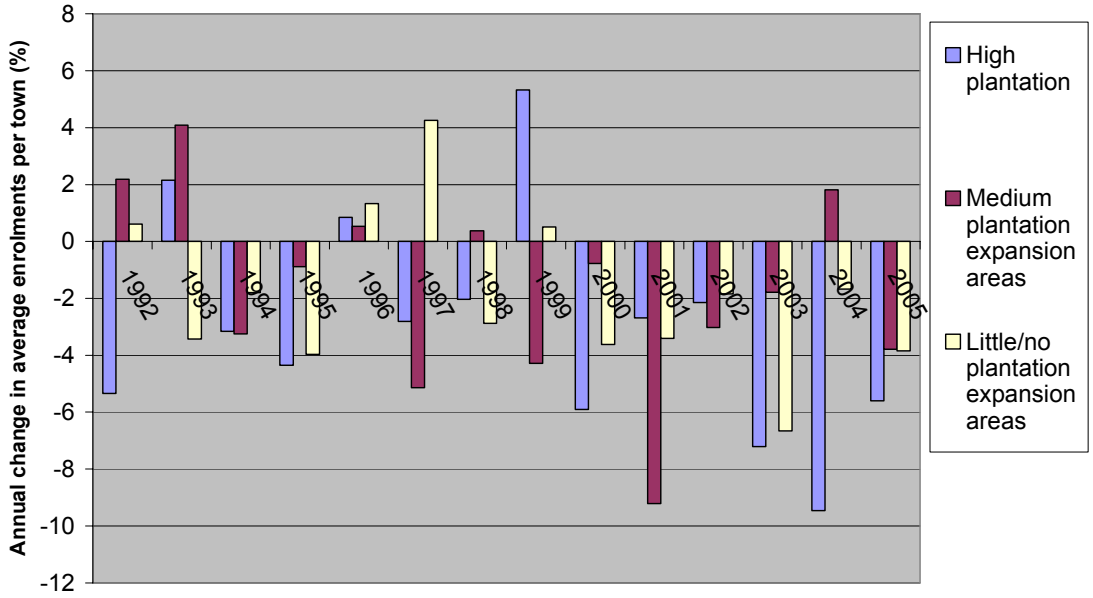
Boyup Brook was examined as, although it is not located within the Great Southern it is located very close to the borders of the region, and has experienced a similar pattern of plantation expansion to Albany, Cranbrook and Plantagenet. As there were no towns of this size in 'high plantation' areas of the Great Southern, it was decided to examine Boyup Brook so that enrolment trends in towns of 500 to 1,000 population could be examined.

Figures 40 and 41 show (a) average school enrolment per town for each of the three categories of towns (from pre-school to end of high school), and (b) the annual rate of change in enrolment.



Source: Department of Education and Training

Figure 40: Average enrolment in primary and high schools for towns of 500 to 1,000 population



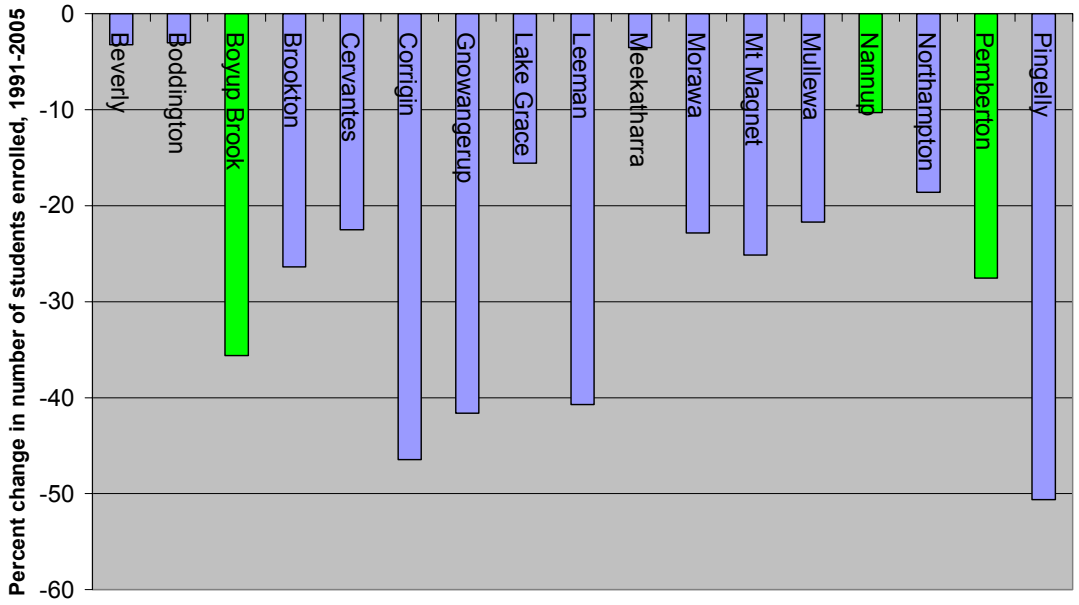
Source: Department of Education and Training

Figure 41: Rate of change in enrolment in primary and high schools for towns of 500 to 1,000 population

Average numbers of enrolments fell in all three categories of towns over 1991 to 2005. Boyup Brook experienced a higher rate of decrease than the average for other towns – school enrolments fell by a total of 35.6% over 1991 to 2005 compared to 21.5% in medium plantation expansion areas and 23.8% in areas with little or no plantation expansion. However, when towns with no plantation expansion were examined individually, shown in

Figure 42, it was found that some had experienced similarly high rates of decline to Boyup Brook, and that Nannup – a 'medium plantation' town – experienced low declines compared to many other towns. A larger number of plantation towns would need to be examined to identify whether plantation expansion has been consistently associated with enrolment decline, or if Boyup Brook simply represents one part of a spectrum of changes in different plantation towns.

This indicates that factors other than plantation expansion influence change in enrolment. While it is possible that plantation expansion is one of the multiple factors, it cannot be said to be a dominant factor leading to decline, given that four out of 14 towns with no nearby plantations experienced higher enrolment declines than Boyup Brook over 1991 to 2005. It is also not possible to determine whether plantation expansion was a response to factors creating a fall in school enrolment or a cause of this decline. The pattern of change in enrolment in Boyup Brook does not show a clear correlation to rates of plantation expansion – the highest declines in enrolment occurred (a) prior to substantial plantation establishment and (b) in recent years during a period when plantation expansion had slowed somewhat.



Source: Department of Education and Training

Figure 42: Rate of change in enrolment in primary and high schools for individual towns of 500 to 1,000 population

Enrolment in schools in towns with < 200 population

A large number of localities (small towns) in both the Great Southern and other regions of WA have populations of less than 200 people. Data on school enrolments was examined for these towns.

Initially, high plantation towns in this category were defined as those located in LGAs which had experienced high plantation expansion. However, in some LGAs all plantation expansion has been concentrated in a single area, and while some small towns within these LGAs are located close to plantations, others are a considerable distance – sometimes more than 100 km – from plantation areas.

Because of this, a smaller scale definition was used. Towns were defined as 'high plantation' if high proportions of agricultural land (over 10%) had been established to plantations within

50 km radius of the town. This represents the distance students often travel to access local schools in small towns.

Three categories of towns were examined:

- High plantation expansion towns of Frankland, Manypeaks, Rocky Gully, and Wellstead, all located close to large areas of plantation in the Great Southern;

- Medium plantation expansion towns of South Stirling and Kendenup. While these towns are located in an LGA – Plantagenet – that has experienced considerable plantation expansion, these towns are not located physically close to high concentrations of plantation estate within the LGA of Plantagenet;

- Little/no plantation expansion towns. Twenty four of these towns were identified, some within and some outside the Great Southern – Badgingarra, Binnu, Borden, Broomehill, Coorow, Darkan, Hyden, Karlgarin, Kukerin, Latham, Nabawa, Nyabing, Perenjori, Pingaring, Pingrup, Sandstone, Tardun, Tincurrin, Useless Loop, Walkaway, Wandering, Woodanilling, Yalgoo and Yealering.

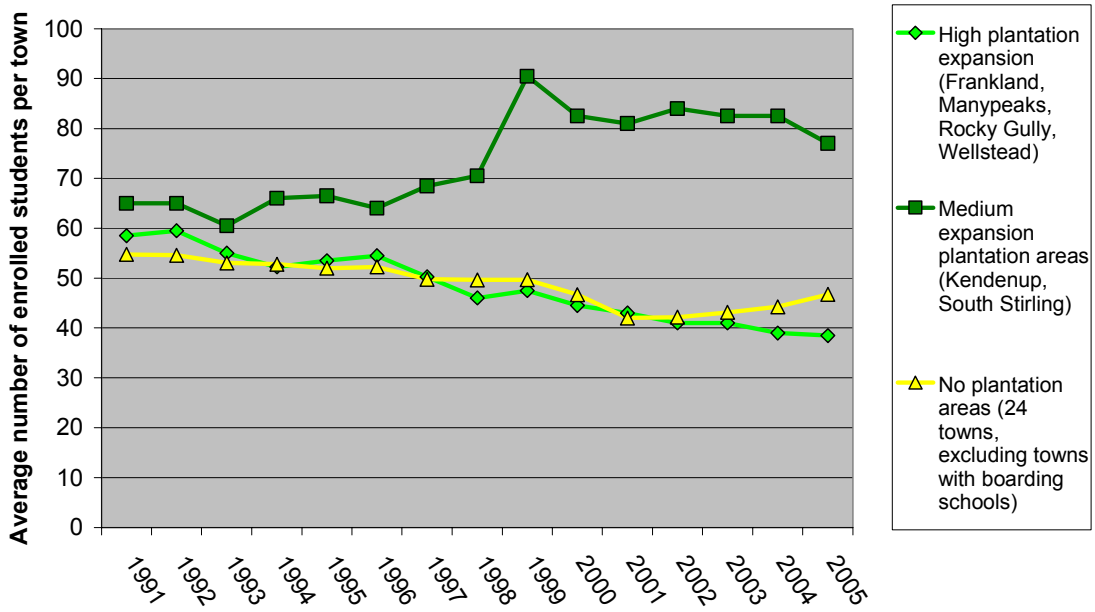
Figures 43 and 44 show (a) average school enrolment per town for each of the three categories of towns (from pre-school to end of high school), and (b) the annual rate of change in enrolment.

While both 'high plantation' and 'no plantation' towns experienced overall decline over this period, enrolments increased in 'medium plantation' towns.

The increase in the average 'medium plantation' town enrolment primarily reflects a large increase in the number of students enrolled in school in the town of Kendenup, an area with many small properties that has experienced population growth in recent years as people have purchased 'lifestyle' blocks in the area.

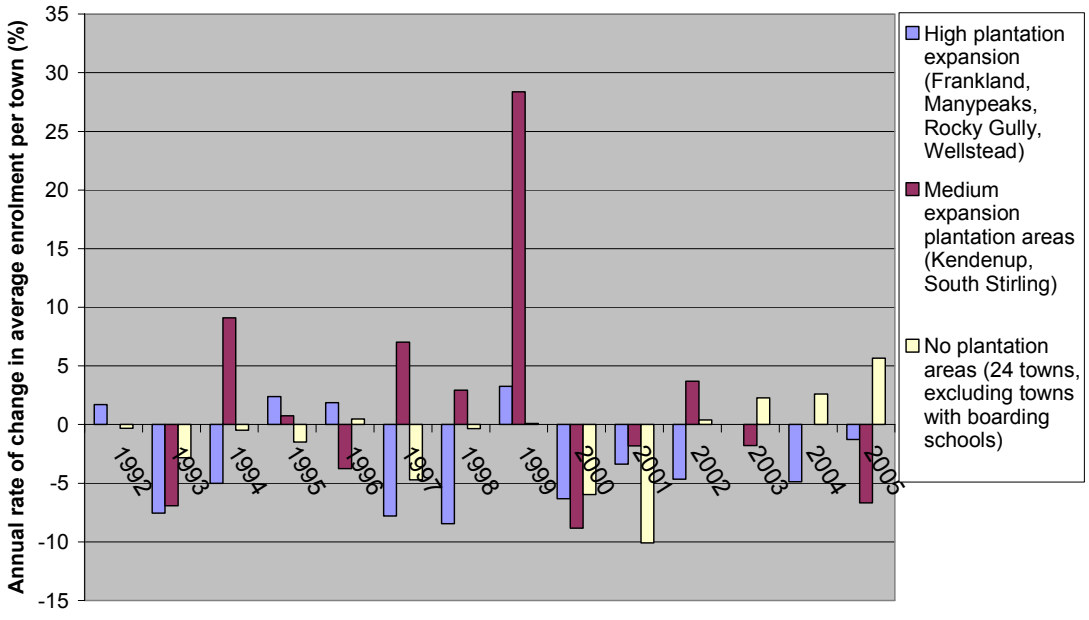
Explaining the difference between the average rate of decline in 'high plantation' small towns (34%) and 'low/no plantation' small towns (17%) is more difficult. The difference may be related to the expansion of plantations, but may also reflect the relatively smaller number of plantation towns available for analysis.

The average rate of decline in high plantation towns was higher than for low/no plantation towns prior to the rapid expansion of plantations. In addition, when the total change in enrolments over 1991 to 2005 is compared for individual towns rather than calculated as averages across all towns (shown in Figure 45), it can be seen that some plantation and non-plantation towns have experienced similarly high rates of decline, while others haven't. The rate of change in enrolments in individual high plantation towns, shown in Figure 46, shows that towns located near plantation estate have experienced very different rates of change.



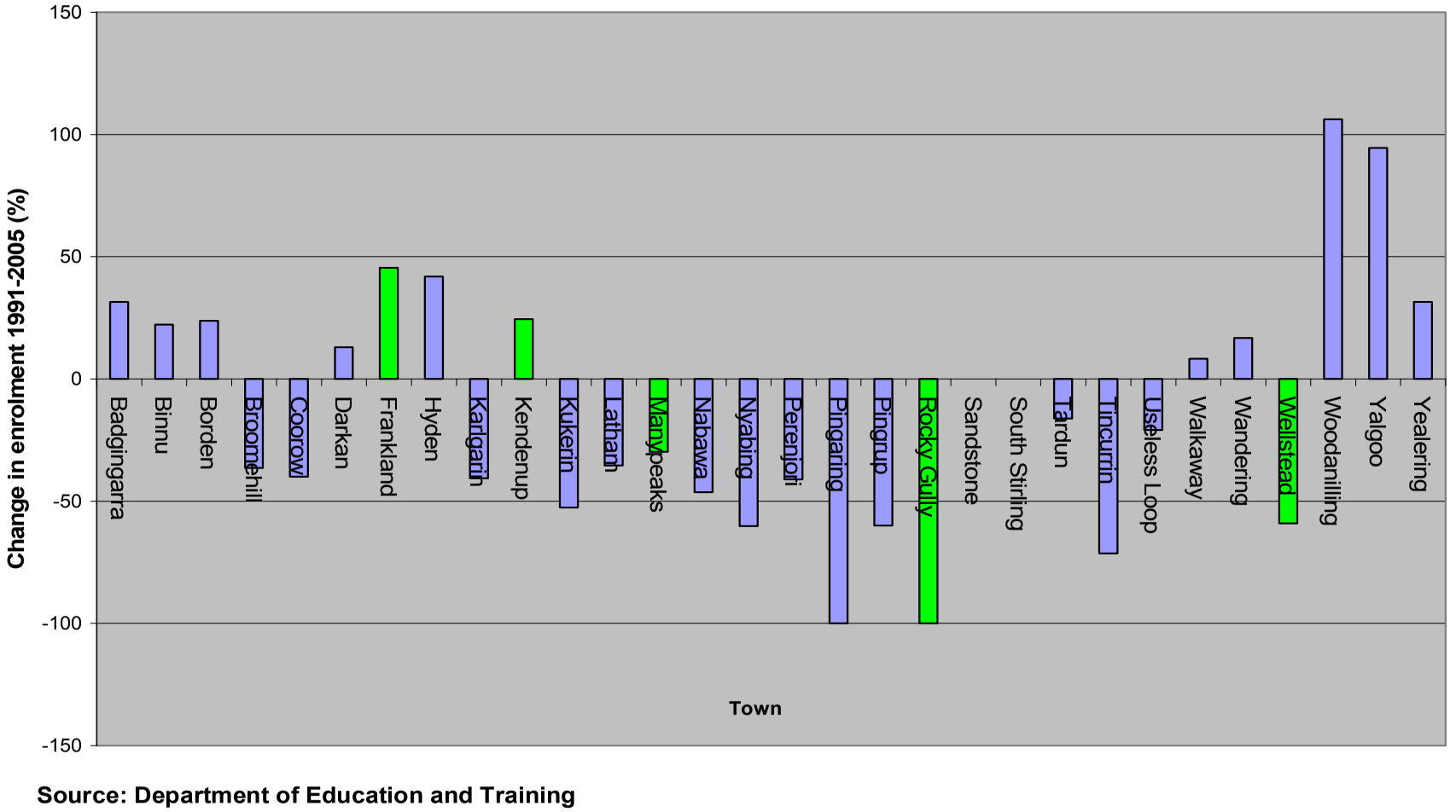
Source: Department of Education and Training

Figure 43: Average enrolment in primary and high schools in towns with < 200 population



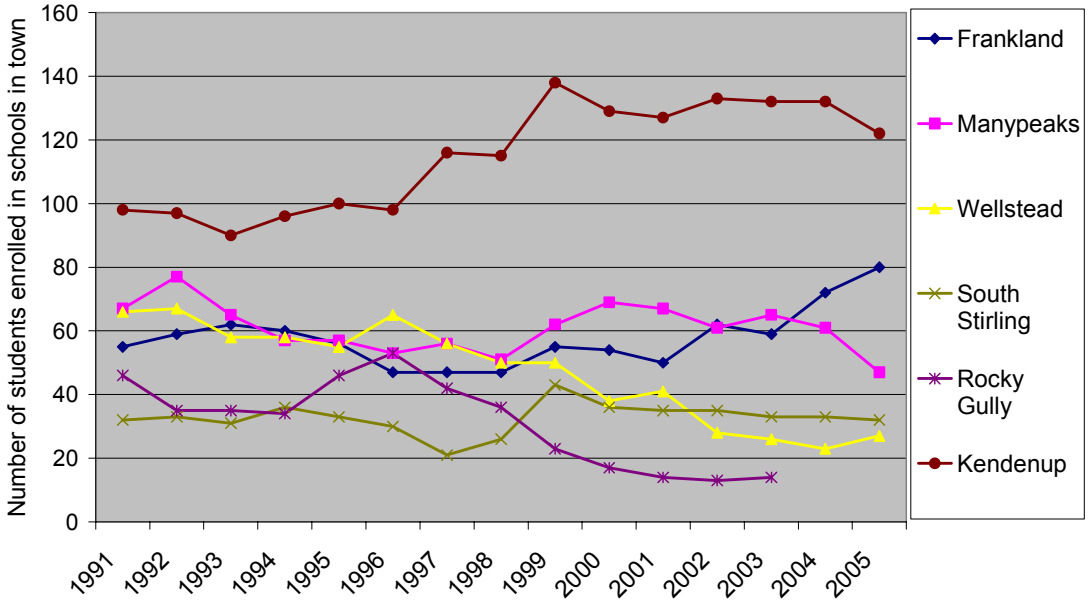
Source: Department of Education and Training

Figure 44: Rate of change in enrolment in primary and high schools in towns with < 200 population



Source: Department of Education and Training

Figure 45: Rate of change in enrolment in primary and high schools in individual towns with < 200 population



Source: Department of Education and Training

Figure 46: Rate of change in enrolment in primary and high schools in towns with < 200 population located near large areas of plantation

The difference in enrolments in different plantation towns with less than 200 population was explored in focus groups.

Frankland and Rocky Gully are located only 20 km apart, and at least some of the growth in school enrolment in Frankland has been a result of children based in Rocky Gully enrolling in Frankland, particularly after closure of the Rocky Gully primary school at the end of 2003. Some focus group participants also suggested that Frankland had more steady enrolments as a result of residents in vineyards providing population stabilisation in the area. Others, however, stated that some residents preferred to send their children to the Frankland school in preference to Rocky Gully, as a result of the Rocky Gully school having some difficult students enrolled at particular points in time who disrupted classes.

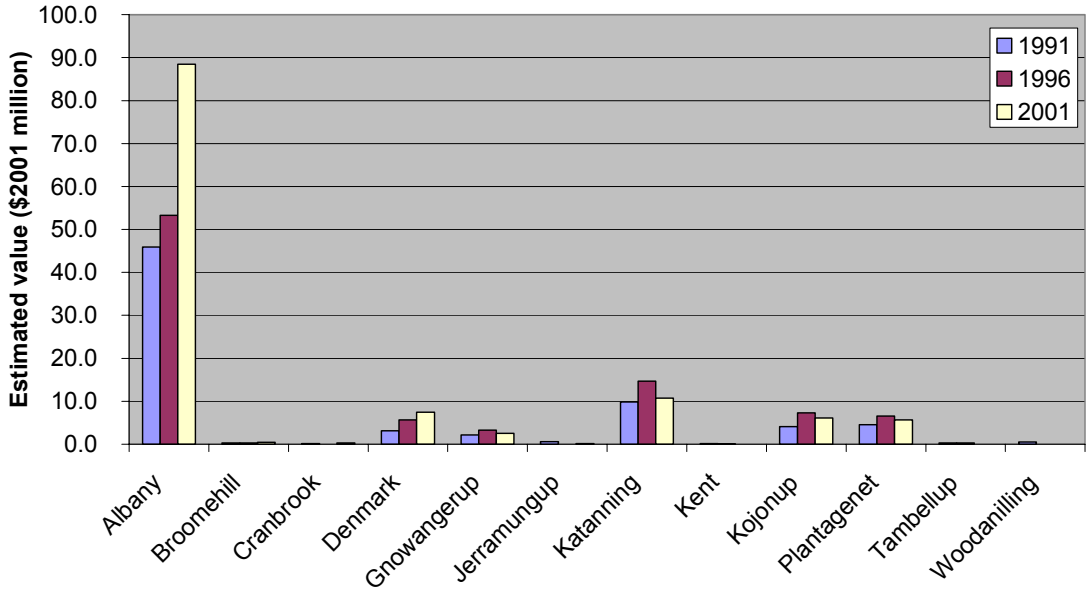
Overall, while decline in school enrolments in high plantation small towns was greater than in low/no plantation small towns, it appears likely that plantation sector expansion was one of the responses to factors causing decline rather than a cause of decline. This argument is based on the fact that enrolment decline was high prior to plantation expansion, and some non-plantation towns experienced declines as high as the two high plantation towns that experienced very rapid decline in enrolments.

10.2 Health and government services

Changes in provision of health and government services were measured by examining the change in estimated total value of this sector, using estimates produced by National Economics for the *State of the Regions* report[24].

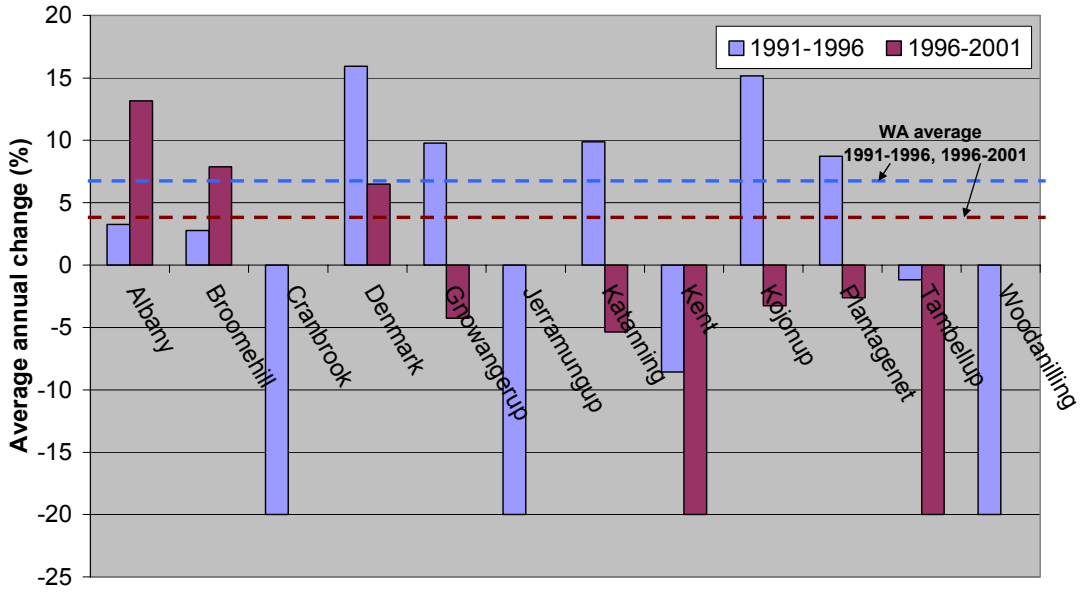
[24] These estimates are derived from reported employment in the sector, with known value of the sector at state level proportioned by LGA according to the proportion of employment in the sector occurring in that LGA.

Figure 47 shows the estimated $2001 value of health and community services over 1991 to 2001 in the Great Southern while Figures 48 and 49 shows the average annual change in the $2001 value of these services in the Great Southern and comparison regions. Figures 50, 51 and 52 provide the same data for government administration services.



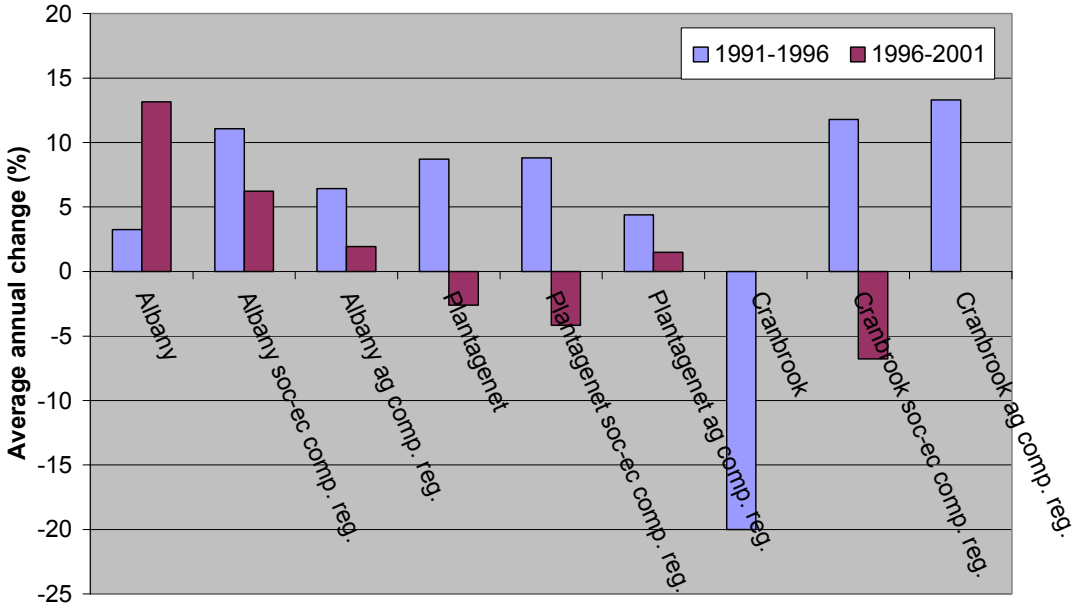
Source: National Economics *YourPlace* database

Figure 47: Estimated value of health and community services in Great Southern LGAs



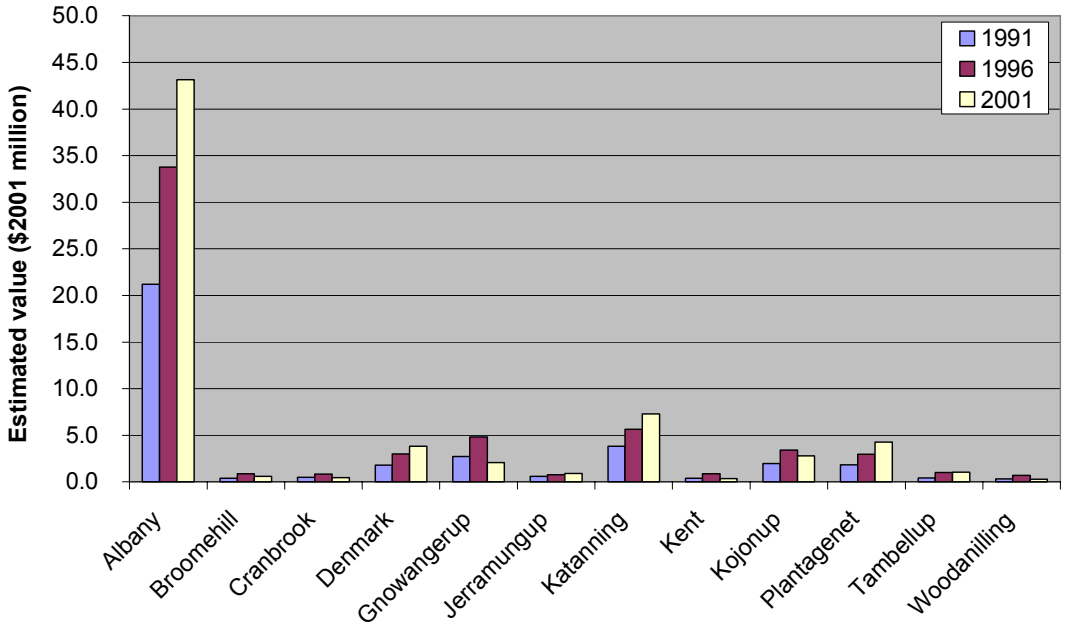
Source: National Economics *YourPlace* database

Figure 48: Average annual change in value of health and community services in Great Southern LGAs



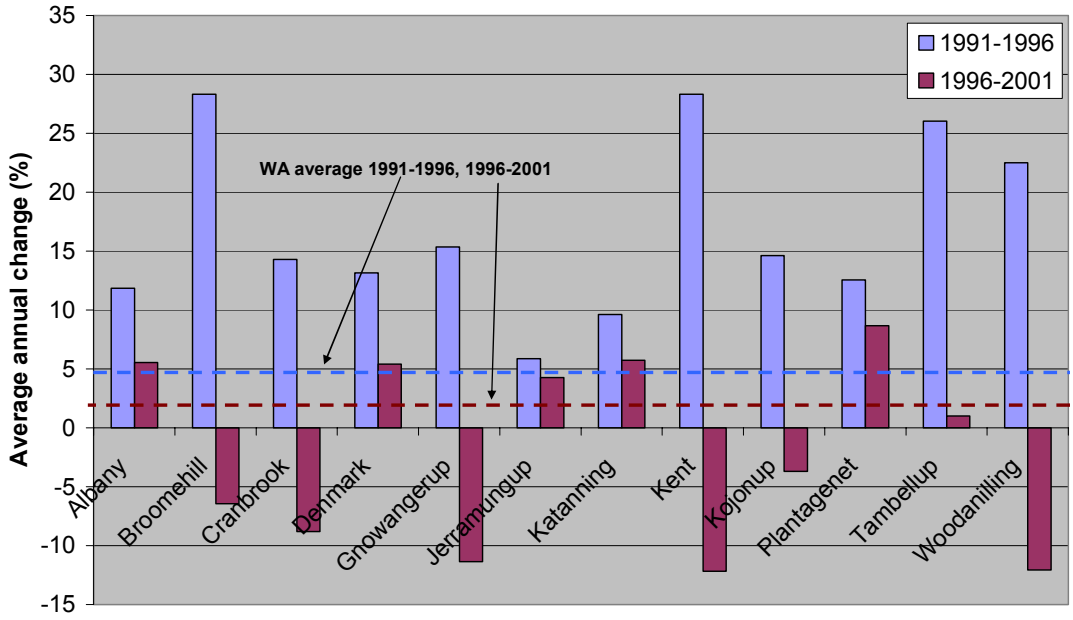
Source: National Economics *YourPlace* database

Figure 49: Average annual change in value of health and community services in high plantation LGAs and comparison regions



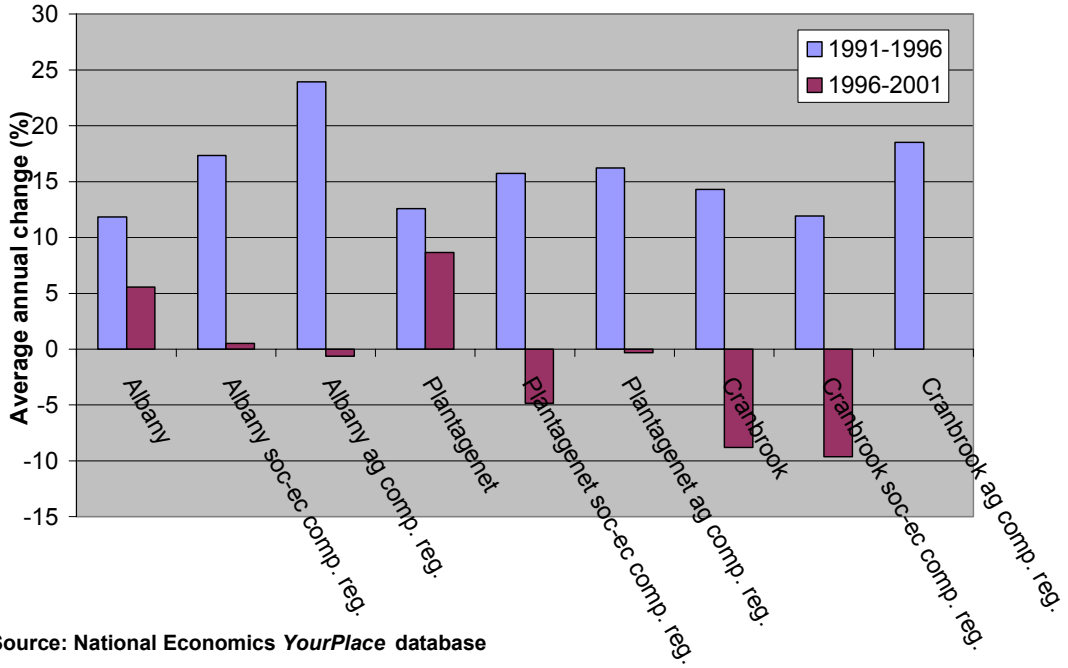
Source: National Economics *YourPlace* database

Figure 50: Estimated value of government administration services in Great Southern LGAs



Source: National Economics *YourPlace* database

Figure 51: Average annual change in value of government administration services in Great Southern LGAs



Source: National Economics *YourPlace* database

Figure 52: Average annual change in value of government administration services in high plantation LGAs and comparison regions

Within the Great Southern, provision of health and community services ceased entirely in the Shires with the smallest populations – Cranbrook, Jerramungup, Kent, Tambellup and Woodanilling – while they tended to grow in other Shires. However, some of the remaining smaller population Shires experienced a slight decrease in the 1996-2001 period (Plantagenet, Kojonup, Gnowangerup and Katanning). This trend of withdrawal of services from areas with low population is common across Australia. Provision of government services did not show as clear a trend. While there was consistent growth in the four largest population centres - Albany, Denmark, Katanning and Plantagenet – a mix of growth and decline occurred in

other areas, with growth experienced in most Shires over 1991 to 1996, and declines in many over 1996 to 2001.

Changes in comparison regions indicate that for the most part high plantation LGAs experienced similar types and rates of change in health and community and government services to comparatively sized LGAs not experiencing plantation expansion. Exceptions were that:

- Cranbrook experienced a drop in health services, with all health services withdrawn by 1996. Cranbrook's decline in health services may be the result of a range of factors, including proximity to nearby health services available in Plantagenet and other nearby LGAs As this withdrawal occurred before the majority of plantations were established in the region, it is unlikely to be related to plantation expansion. Cranbrook's comparison regions experienced some increase in value of health services over 1991 to 2001; and

- Albany and Plantagenet experienced more steady growth in government administration services than their comparison LGAs.

There is no evidence of a higher level of decline in health and community or government administration services in high plantation areas. Changes vary across areas. A wide number of factors are likely to affect the level of service provision, including the policies of the relevant state government, population change, and proximity of LGAs to regional cities.

10.3 Community groups

Community groups such as sports clubs, hobby groups and Civic groups (e.g., Lions, Rotary) play a vital role in local communities.

By their very nature – they are usually local, there are a large number of groups, and a range of different people are involved in them over time – community groups are hard to track over time. In many cases groups are not listed in local or regional directories, although in some cases local governments have produced a local guide to community groups. Usually this guide is for the current period only, and so does not assist in examining change over time.

For this study, it was determined that the most effective method of identifying changes in the number and membership of community groups would be via focus groups held in the case study region.

Focus groups and interviews with key individuals were held in six regions – four with high levels of plantations (Albany, Frankland, Mt Barker and Wellstead) and two which had low or no areas of plantation (Denmark and Katanning).

Attendees were able to identify changes not only in their local area, but often in adjacent areas. For example, in Wellstead local sporting teams play against teams from neighbouring LGAs including Kent, Jerramungup and Gnowangerup. Because of this interaction, focus group participants from Wellstead were able to discuss changes in level and membership of sports groups in these other LGAs.

However, attendees were only able to identify the broad direction and type of changes occurring to numbers and membership of groups. Exact quantification of change over time was not possible.

Table 3 summarises key results on change in community groups in the Great Southern.

Table 3: Key changes in community groups in different regions

Albany	Stable or growing numbers of all types of groups generally reported, albeit with some individual groups not growing as strongly, or individual groups closing while others have been started. Overall picture of growth.
Mt Barker	Mt Barker was mostly reported to have strong community groups, although some groups such as Rotary were reported to be struggling to obtain new members.
Denmark	Denmark has a number of highly active arts and environmental community groups. These were reported to be either stable or growing for the most part, as were other types of groups.
Frankland/Rocky Gully	Membership of groups such as the Country Club have increased in Frankland in recent years, a result of influx of population resulting from the growth in intensive agriculture (viticulture and olive growing) in the region. In Rocky Gully, overall decline was reported, although a community action group has developed in Rocky Gully in recent years.
Katanning	Katanning has experienced declining membership of some groups, although it was not possible to obtain a comprehensive picture of changes in all types of groups. Key problems described were that members of many groups were ageing, and younger people were working long hours or living outside the region and so not tending to join groups.
Broadacre agricultural Shires generally	Overall decline in membership of some groups was described, while others continued to maintain membership. The pattern of change generally described was one of ageing membership of many groups and few new members.
Wellstead	Wellstead and nearby areas have experienced rapidly declining membership of many groups. While most sporting clubs still exist, the difficulty is in obtaining new members. Local community members strongly encourage all residents in the region to participate in groups.

Clearly, a range of factors influence change over time in community groups. In general, smaller rural areas reported struggling to maintain community groups, while areas with larger towns reported more growth in community groups. Reports of decline were similar in rural areas with or without plantations. Additionally, however, some smaller communities were managing to maintain community groups through strongly encouraging local participation.

Further detailed data collection would need to occur over time to detail changes in different regions. Based on the understanding developed in this study of the difficulty of accessing information, this would be best done by a study over time in which the number and membership of groups were repeatedly measured, as the key difficulty in accessing data for this study was that individuals taking part in focus groups could identify current numbers of groups, but could not accurately identify the magnitude of change that had occurred in membership of many of these groups over time beyond general trends.

10.4 Emergency services - fire fighting

In Western Australia, rural fire fighting is undertaken by ‘community fire brigades’. Community fire brigades fall under local government management, and as such records of community brigades are generally kept by local government.

When local governments were contacted to discuss obtaining data on membership of community fire brigades over time, it was found that records are often not up to date – for example, members who left several years previously may still be recorded as active members; or records have been continuously updated without older records of membership preserved.

As a result, it was not possible to obtain accurate data over time on community fire brigade membership. Instead, data was obtained via focus groups held in different regions, and from

discussions with associations representing community fire brigade members. This data was qualitative, and focussed on discussing changes in the number of volunteers over time.

Difficulty maintaining active membership in community fire brigades was reported by communities in both plantation and non-plantation areas. Similarly to community groups, focus group attendees and representatives of fire fighting associations discussed finding it difficult to source volunteers and, in low population areas, often reported falling membership of brigades.

However, in some small communities located near plantations, focus groups attendees felt that the decline had been offset at least in part by provision of fire fighting resources from the plantation sector.

Most people who discussed community fire brigades felt that brigades had received improved resourcing as a result of a recent shift to use of a state-wide levy to provide funds for brigades, rather than funds being allocated at the local government jurisdiction level as occurred previously.

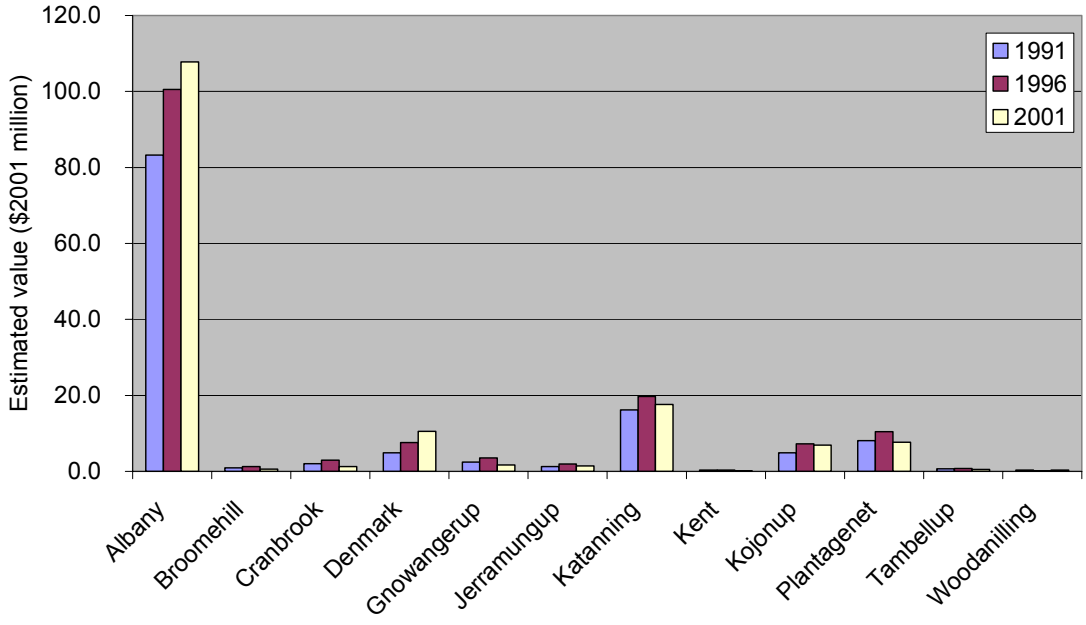
To fully assess whether expansion of plantations has had an impact on community fire brigades would require accurate data on numbers of active members of community fire brigades in different regions over time.

10.5 Retail sector

Changes in provision of retail services- e.g., supermarkets, newsagents, clothing and other retail stores - were measured by examining the change in estimated total value of this sector, using estimates produced by National Economics[25].

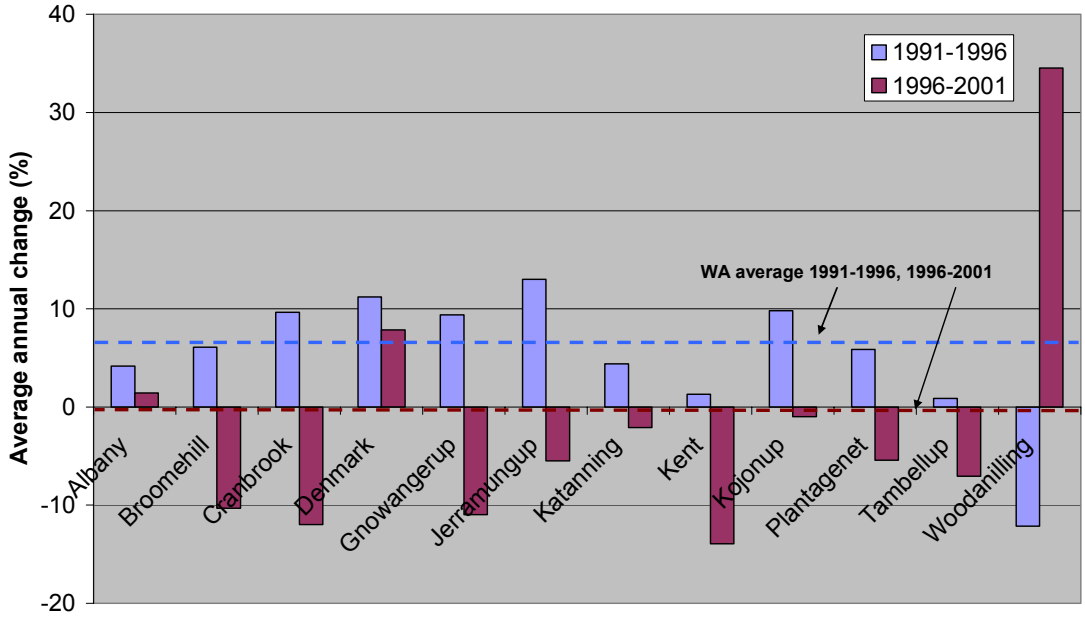
Figure 53 shows the estimated $2001 value of the retail sector over 1991 to 2001 in the Great Southern, while Figures 54 and 55 show the average annual change in the $2001 value of the retail sector in the Great Southern and comparison regions over this period.

[25] These estimates are derived from reported employment in the sector, with known value of the sector at state level proportioned by LGA according to the proportion of employment in the sector occurring in that LGA.



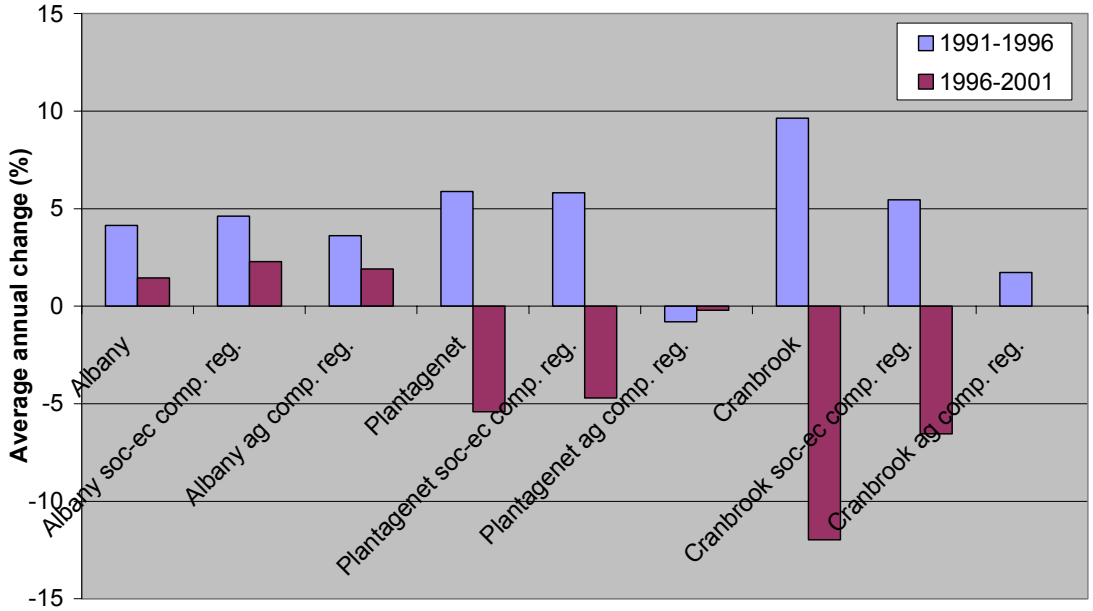
Source: National Economics *YourPlace* database

Figure 53: Estimated value of retail services in Great Southern LGAs



Source: National Economics *YourPlace* database

Figure 54: Average annual change in value of retail services in Great Southern LGAs



Source: National Economics *YourPlace* database

Figure 55: Average annual change in value of retail services in high plantation LGAs and comparison regions

While the value of retail services grew in all Great Southern LGAs other than Woodanilling up to 1996, between 1996 and 2001 all LGAs except Albany, Denmark and Woodanilling experienced decline. In Albany and Denmark, rapid population and tourism growth supported growth in the retail sector. In Woodanilling, while the percentage change in value was high, the total value of retail services was the lowest of any area, and so a small change produced a high percentage shift in value of the retail sector.

In general, Albany, Plantagenet and Cranbrook experienced broadly similar patterns of change to their comparison regions.

However, between 1996 and 2001, Plantagenet and Cranbrook experienced higher decline than both their comparison regions, and Great Southern LGAs with low or no plantations.

This trend would need to be examined using a higher number of LGAs with and without plantations to determine what link, if any, the expansion of plantations may have with the higher rate of decrease observed in 1996 to 2001. Given that comparison regions showed the same overall trend, albeit it not at the same rate; and that retail services decline in both plantation and non-plantation areas of the Great Southern over this period, it is not possible to identify whether plantation expansion influenced this trend.

In focus groups, some suggested that the ease of shopping in Albany – only 40 km from Mt Barker – may have contributed to decline in the retail sector in Plantagenet Shire, while the relative ease of travelling to Denmark from the western side of Cranbrook Shire, and Albany from the eastern side, may have had a similar effect.

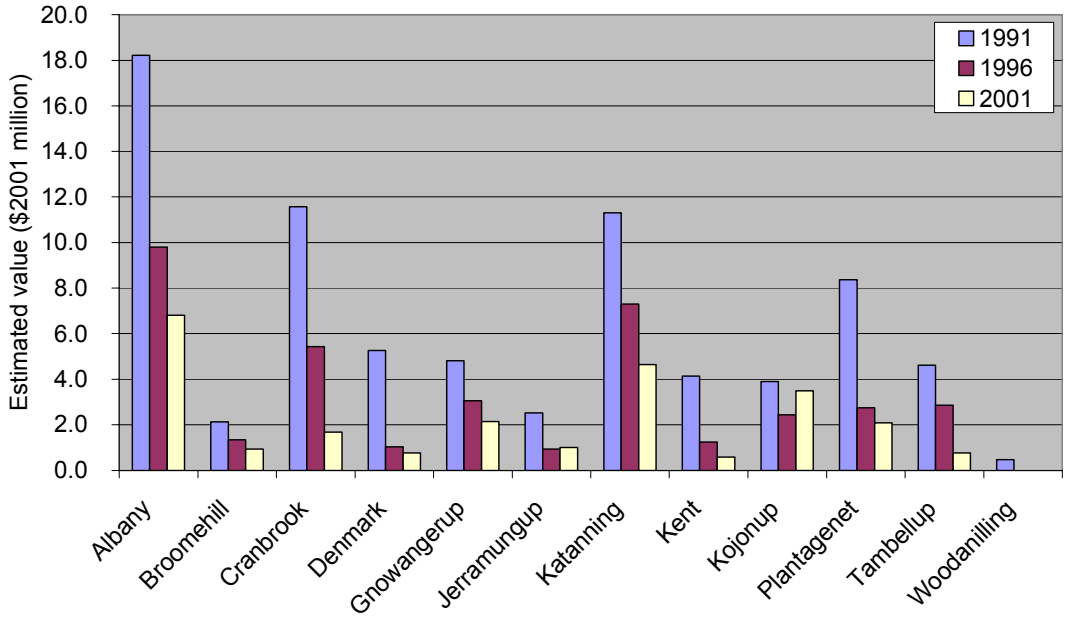
Albany experienced a slightly lower rate of growth in the retail sector than its comparison regions.

10.6 Agricultural service businesses

Changes in provision of agricultural services- e.g., shearing, supplies of fertiliser and seeds, and other supplies and services to farmers - were measured by examining the change in estimated total value of this sector, using estimates produced by National Economics[26].

The category of agricultural service includes some businesses that undertake work in both the agriculture and plantation sectors. However, many contractors supplying the plantation sector work solely in the forestry sector, and would not be defined as agricultural service providers. It is not known to what extent plantation-based activity is reflected in the value of agricultural service businesses as the extent of overlap, and definitions under which different businesses fall, could not be specifically identified.

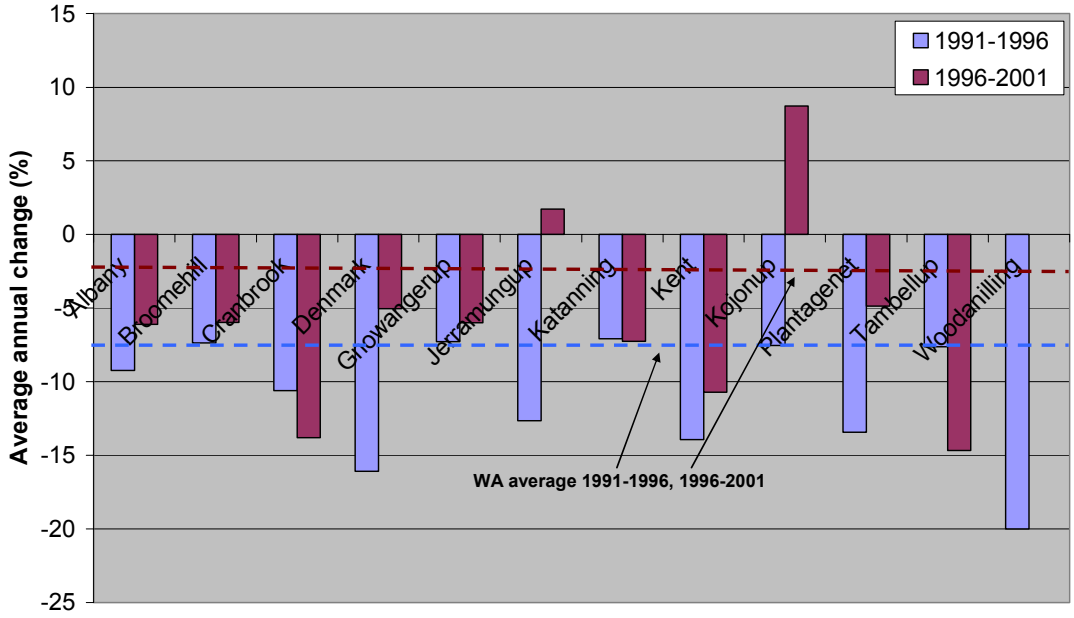
Figure 56 shows the estimated $2001 value of services to agriculture, hunting and trapping over 1991 to 2001 in the Great Southern, while Figures 57 and 58 show the average annual change in value in the Great Southern and comparison regions over this period.



Source: National Economics YourPlace database

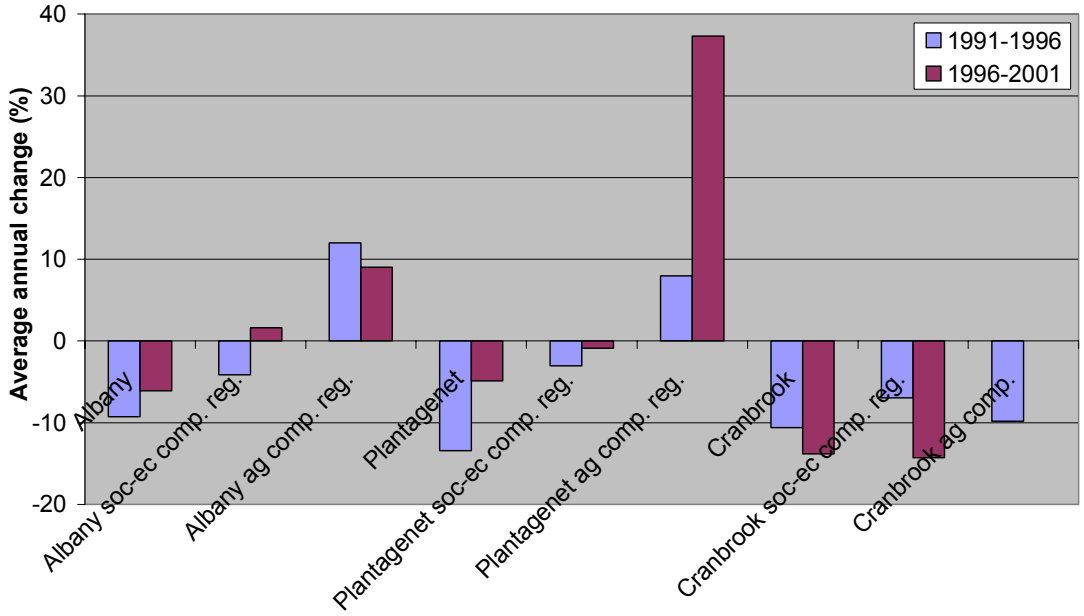
Figure 56: Estimated value of services to agriculture, hunting and trapping in Great Southern LGAs

[26] These estimates are derived from reported employment in the sector, with known value of the sector at state level proportioned by LGA according to the proportion of employment in the sector occurring in that LGA.



Source: National Economics *YourPlace* database

Figure 57: Average annual change in value of services to agriculture, hunting and trapping in Great Southern LGAs



Source: National Economics *YourPlace* database

Figure 58: Average annual change in value of services to agriculture, hunting and trapping in high plantation LGAs and comparison regions

Overall, the Great Southern experienced a higher decline in the value of services to agriculture, hunting and trapping than the Western Australian average. Over 1991 to 2001, value of these services declined by 66.9% in total in the Great Southern, and 47.2% in Western Australia. The decline in the Great Southern was higher during the 1991-1996 period, in which only a small proportion of the plantation estate was established (48.9% decline over the five years), as the 1996-2001 period, in which a much larger proportion of plantations were established (35.2% decline over the five years).

In focus groups, participants based in both plantation and non-plantation regions described a decline in agricultural service businesses such as availability of shearers.

Albany and Plantagenet experienced a much higher decline in the value of these services than their comparison regions. However, when compared to the decline in the value of these services in low/no plantation parts of the Great Southern, the difference is not great. Cranbrook experienced a similar level of decline to its comparison regions.

It appears likely that plantation expansion may be linked to a slightly higher rate of decline in agricultural services in the region. However, the decline in agricultural service provision was high prior to the time at which the plantation estate expanded rapidly, suggesting this link may represent a trend ongoing prior to plantation expansion, rather than simply a trend resulting from plantation expansion.

11.0 Changes in land prices

In the Great Southern, plantation expansion has occurred via both leasing of land and purchase of land. Therefore the amount of land purchased for plantation expansion is less than the total area of plantation in the region.

Data on change in land prices over time was used to examine whether expansion of plantation had discernible impacts on land prices. Key findings are detailed in Box 7.

Box 7: Rural land prices

Rural land prices rose more rapidly over 1988 to 2001in high rainfall areas of the Great Southern than other areas. Demand for land from plantation companies has been a contributor to this trend, particularly in the LGAs of Albany and Plantagenet. In Albany, Cranbrook and Plantagenet, where the majority of plantations have been established, sales of land to plantation companies formed a high proportion of total rural land sales in the late 1990s – over 40% of all sales in some years - and again in 2003 and 2004. In general, land sold to the plantation sector has sold for a higher price per hectare than land sold in the same LGA for other purposes.

There is also some evidence that high demand from the plantation sector may have influenced higher growth in values of agricultural land in nearby LGAs. In focus groups, several participants reported that they had observed a pattern of farmers selling their land for plantation establishment, and then purchasing agricultural properties in nearby areas not suitable for plantation establishment. This was consistent with trends observed in available land price data. However, comparison of price changes in a wider range of areas would be needed to confirm this trend.

Data on land prices was obtained from two sources:

- Rural Value Watch, data on average land values produced by the Regulation and Valuation Research section of the WA Department of Land Information; and
- Individual land transaction data for six key LGAs – Albany, Cranbrook, Denmark, Jerramungup, Kojonup and Plantagenet, also sourced from the WA Department of Land Information.

This data was analysed to examine:

- Changes in average land prices for all rural land sales over 40 hectares (Rural Value Watch) and 50 hectares (individual land sales data). The Rural Value Watch data is smoothed over time to remove sales regarded as outliers, while data on individual land sales was not;
- Proportion of land sales involving sale of agricultural land to the plantation sector (individual land sales data); and
- Differences in prices paid for plantation and non-plantation land (individual land sales data).

11.1 Changes in average land prices

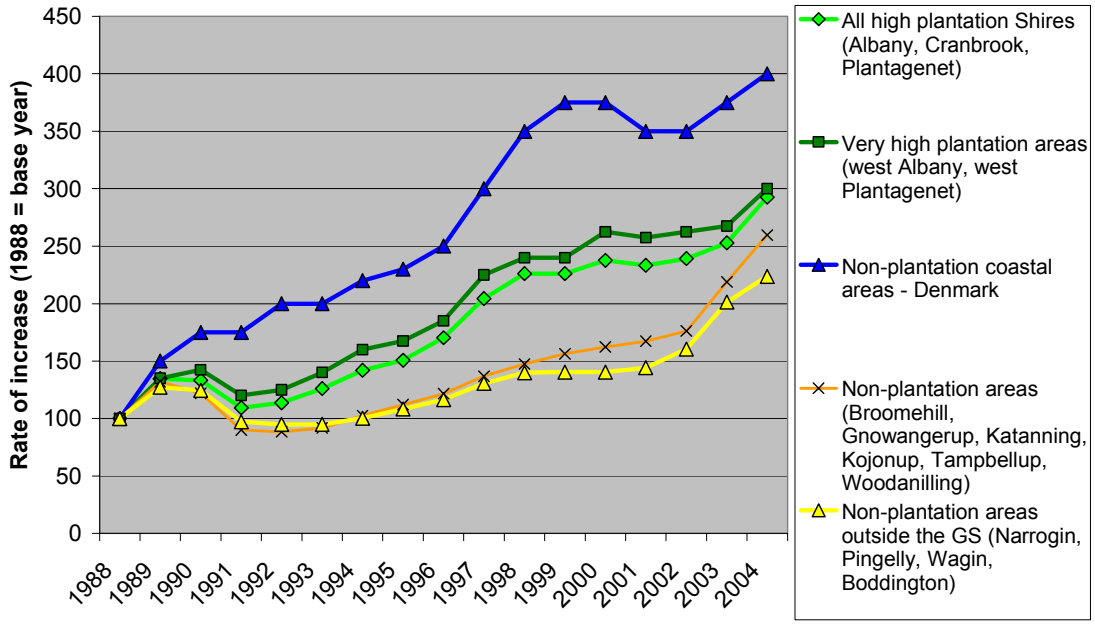
The rate of change in average land prices was calculated using both Rural Value Watch (RVW) data and individual land sales data. When the two were compared, it was found that the RVW data, which uses smoothed estimates, showed longer-term trends in prices but did not show some of the shorter-term peaks and falls in land prices as many of these had been removed when data was smoothed.

As the overall trends were accurate and RVW covered a larger number of areas than the individual land sales data, the RVW was used to compare overall trends in price changes over time, while individual land sales data was used to more accurately identify short term changes in prices.

Figure 59 shows the indexed rate of increase in land prices for all land sales of > 40 hectares from 1988 to 2004. The base year for the index is 1988.

From Figure 59, it can be seen that the highest rate of land price increase occurred in Denmark, followed by the areas in highest demand for plantation establishment. Non-plantation areas experienced slower rates of price increase until 2002, particularly non-plantation areas outside the Great Southern.

From this it can be concluded that areas where plantations have been established have experienced higher land price increases than other areas, particularly from the time when rapidly increasing areas of plantations began to be established in the mid-1990s.



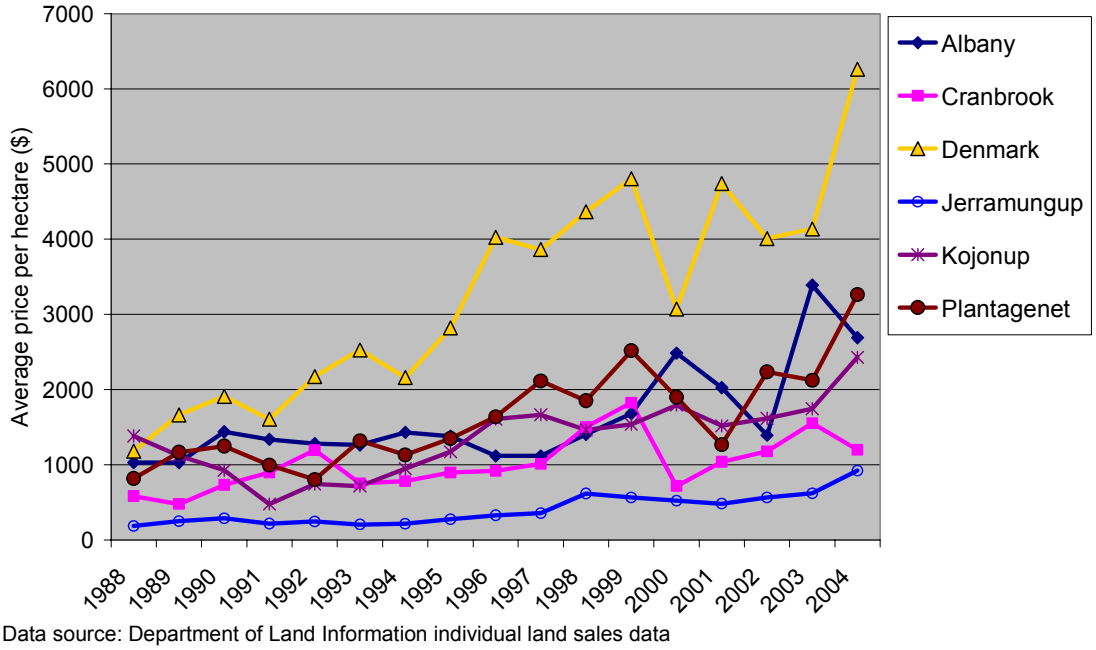
Source: Department of Land Information

Figure 59: Rate of increase in average land prices for sales > 40 ha, 1988-2004

When individual sales transactions were examined, it was possible to see a higher rate of change in some years. Figure 60 shows data for the six 'high' and 'low' plantation LGAs of the Great Southern. In this graph, a spike in prices can be seen around 1999 and 2000 in the three high plantation LGAs, followed by a decrease in prices. This was explained in focus groups as resulting from increased demand for land by the plantation sector in the late 1990s, with reduced demand in 2001 to 2002 followed by an increase in demand from the sector in 2003 and 2004.

In Denmark, rapidly rising prices flattened somewhat from 2000 to 2003. In focus groups, this was believed to have resulted from changes made in late 1999 restricting rural residential development in the Shire.

In Kojonup and Jerramungup, prices remained relatively steady over time until the last two years, when prices have risen at a higher rate. This trend occurred in most non-plantation agricultural areas in the region, and was explained in focus groups as resulting from some good farming years leading to higher demand for agricultural land.



Data source: Department of Land Information individual land sales data

Figure 60: Average price per hectare for land sales > 50 ha by LGA, based on individual land sales data

11.2 Proportion of land sales to the plantation sector

The proportion of sales involving a transfer of agricultural land to the plantation sector was examined. This involved identifying (a) all individual land transactions involving sale to the plantation sector and (b) excluding sales within the plantation sector, e.g. sales of land from one plantation company to another. This was undertaken by identifying the names of plantation businesses purchasing land, and using this knowledge to identify land transactions involving sale of agricultural land to plantation companies.

This approach had some limitations. While the largest plantation companies were easily identified, smaller plantation owners – eg individuals who have purchased one or two blocks of land for plantation establishment – could not always be identified, as the names of all investors were not known. Therefore the number of sales of agricultural land to the plantation sector identified is likely to be an underestimate. The extent of underestimation may be as high as 7%, the percent of plantation estate for which names of landowners was not identified. However, it is likely to be considerably below 7%, as a significant proportion of this area is likely to have been established via leasing, rather than direct purchase of land.

In addition, some companies have purchased land for both plantation establishment and for other agribusiness investments such as establishment of vineyards. These transactions were identified and excluded from the data.

Figure 61 shows sales of agricultural land to plantation companies by dollar value, while Figure 62 shows these sales by area. It can be seen that it was not until 1996 that the proportion of sales involving the plantation sector rose above 30% in one LGA – Plantagenet. Until the late 1990s, sales were almost exclusively in Plantagenet and Albany, with less activity in Cranbrook and none in the other three LGAs[27].

[27] Note that land may have been leased during this time for plantation establishment in Denmark, Kojonup and Jerramungup. Additionally, it is possible that a small number of individual sales for plantation establishment were not identified.

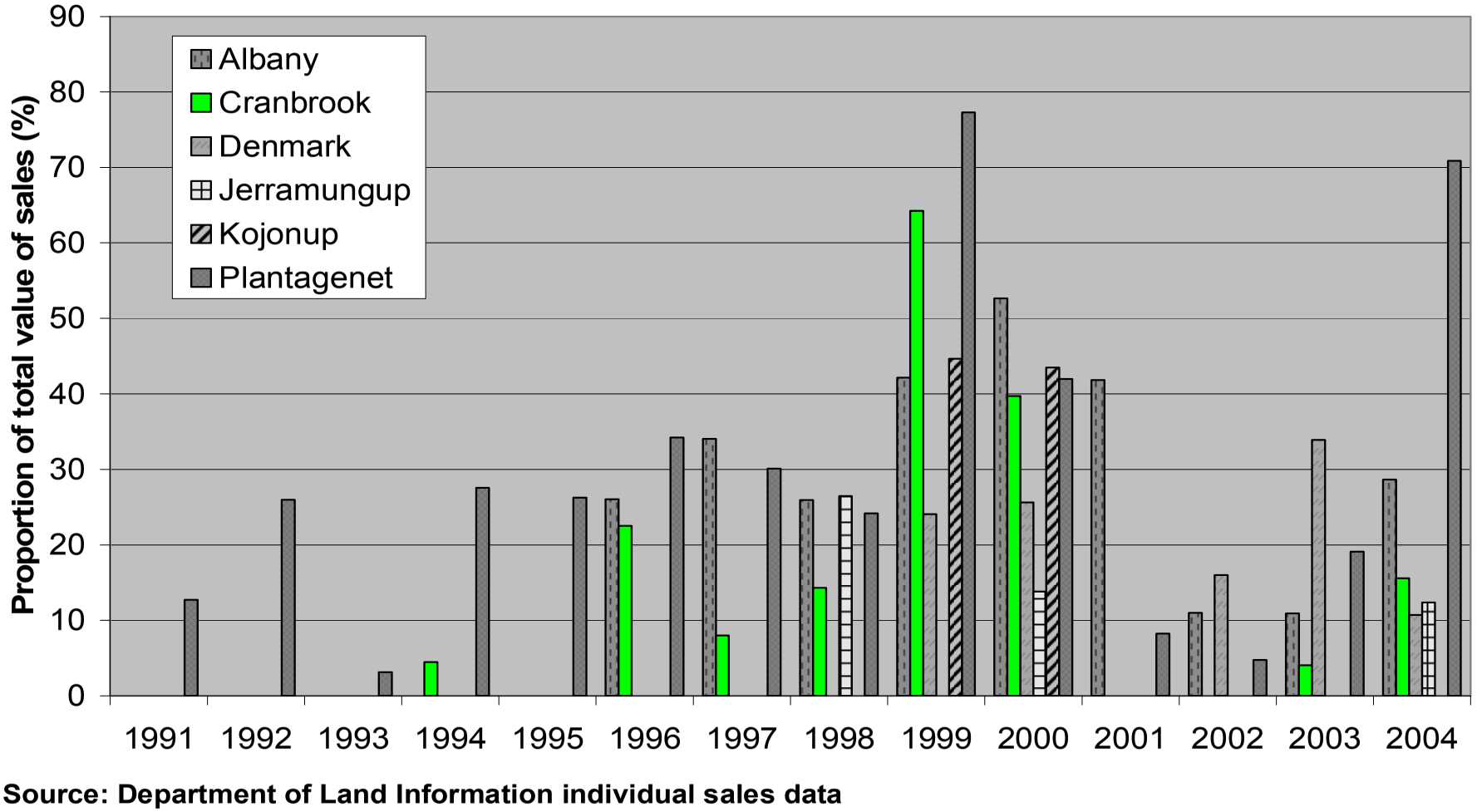


Figure 61: Proportion of land sales > 50 ha to plantation companies by dollar value

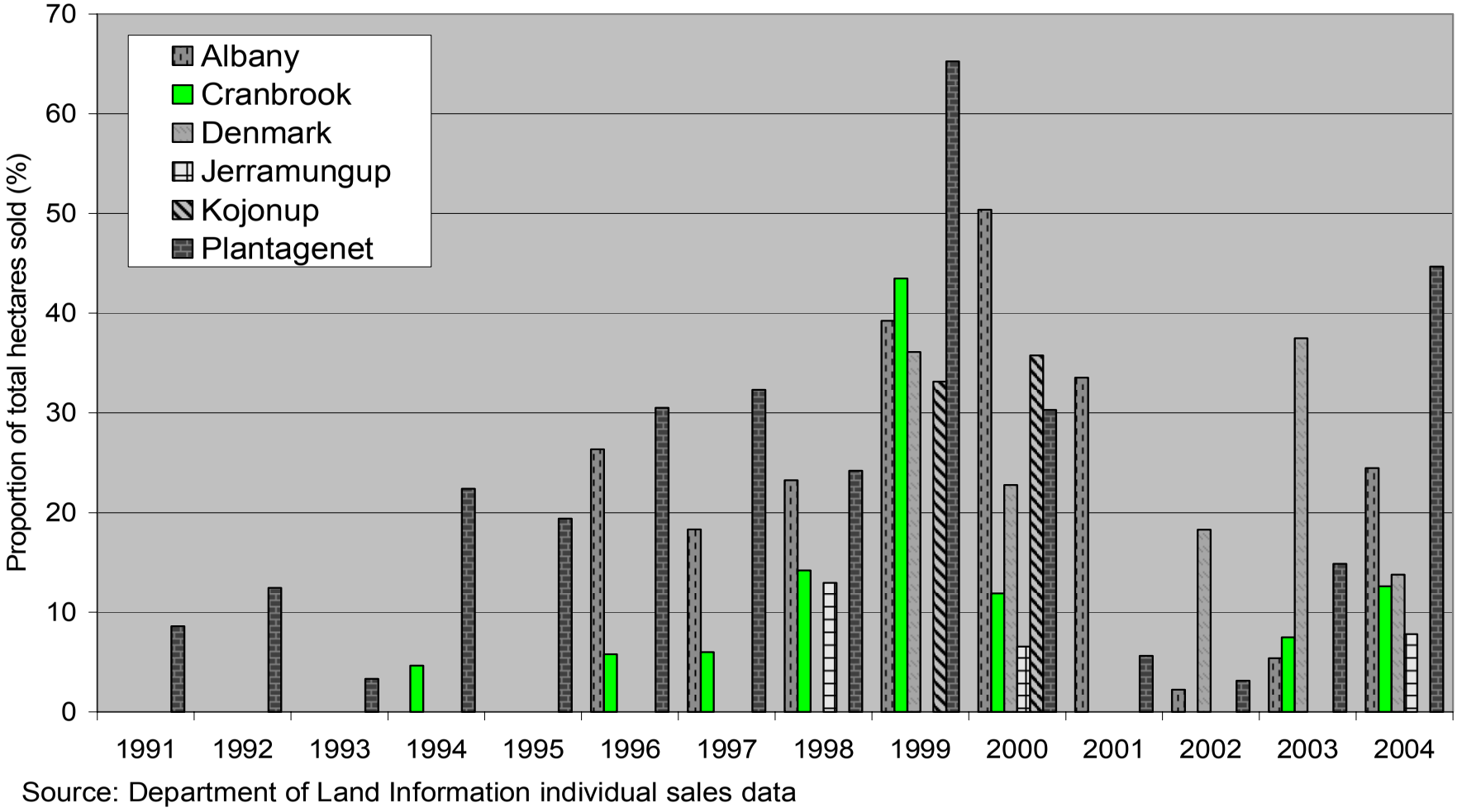
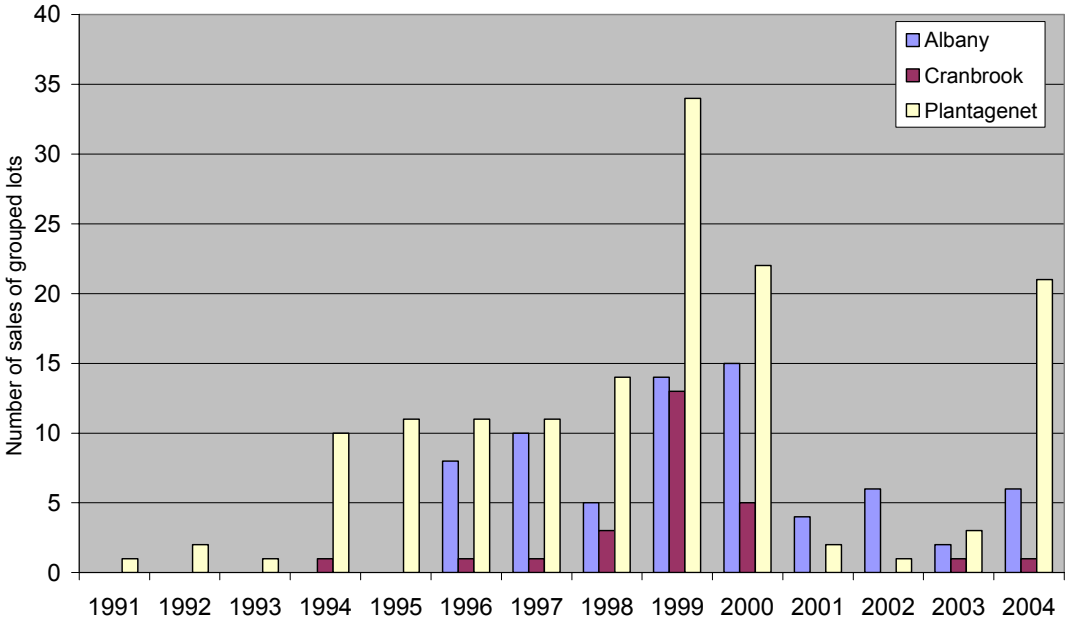


Figure 62: Proportion of land sales > 50 ha to plantation companies by area

In 1999 and 2000, there was a rapid increase in the proportion of total sales involving the plantation sector. A majority of all land sales over 50 hectares in size were to the plantation sector in the LGAs of Cranbrook and Plantagenet; while over 40% of all sales were to the plantation sector in Albany and Kojonup. In 2000, the proportion of total sales was over 40% in these four LGAs and also relatively high in Jerramungup and Denmark compared to previous years. This was followed by a fall in 2001 and 2002.

Figure 63 shows the total number of land sales identified. Due to the nature of the individual land sales data, this data will have a degree of error – if all lots involved in a multiple lot sale were not identified to that sale, then two sales may have been identified where in fact only a single sale of multiple lots of land (often directly adjacent to each other) occurred. This may lead to overestimated of the total number of sales. Conversely, not all plantation sector sales may have been identified, leading to underestimation of total sales.



Source: Department of Land Information individuals sales data

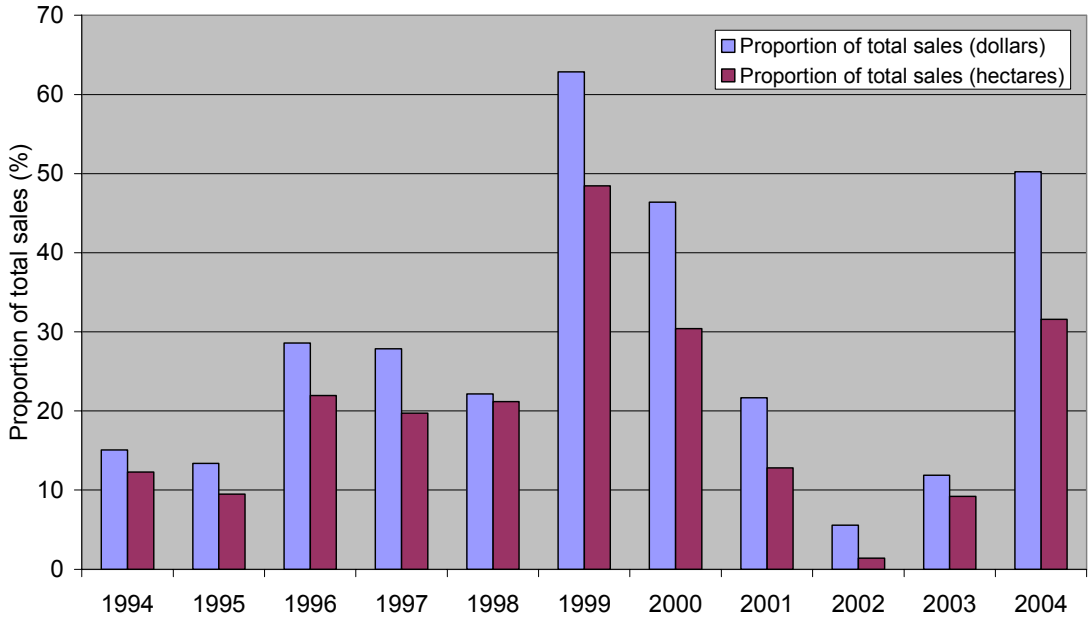
Figure 63: Number of sales of land parcels to the plantation sector in high plantation LGAs of the Great Southern

Again, a rise in the total number of transactions can be seen in the late 1990s, particularly 1999 and 2000.

The increase in land sales to the plantation sector in 1999 and 2000 was largely a result of changes to tax deductibility provisions. The removal of the '13 month rule', in which companies had 13 months to spend investment money after receiving it, led to planned planting having to be brought forward in many cases, and hence to a planting 'boom' and high demand for land from the plantation sector. This was then followed by a drop in demand in 2001 and 2002, triggered by a downturn in agribusiness investment across Australia and, in 2001, from some planned plantings having already been undertaken. The impacts of the uncertainty generated by changes to tax deductibility provision can be clearly seen in the fluctuations in the land market.

11.3 Differences in prices paid for plantation and non-plantation land

Figure 64 compares the proportion of sales involving the plantation sector in the three high plantation LGAs[28] by area, and by dollar value.



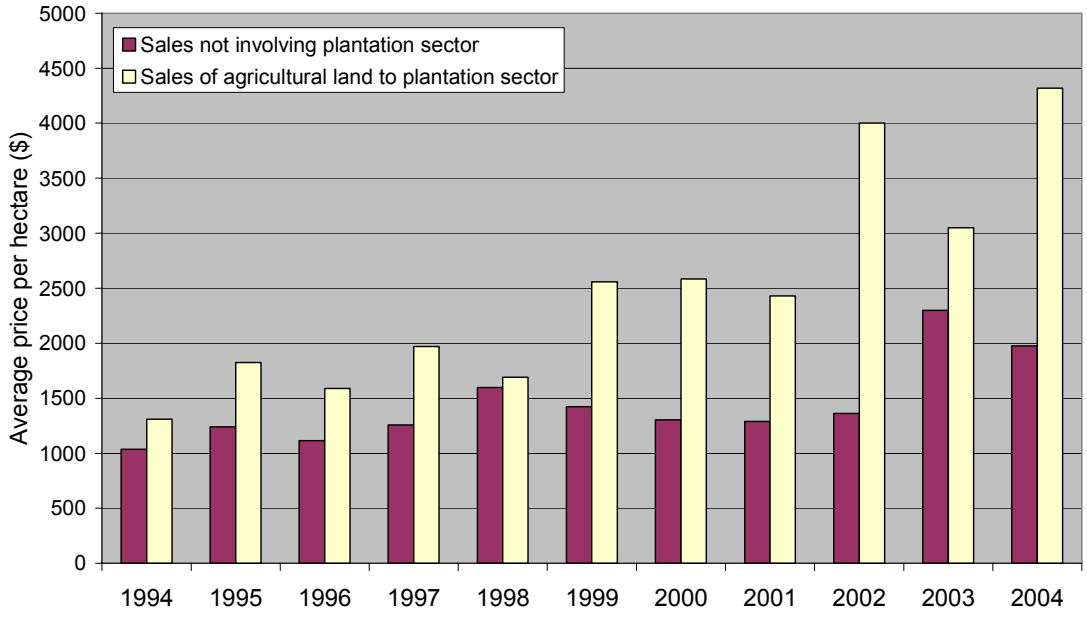
Source: Department of Land Information individual land sales data

Figure 64: Proportion of total land sales in Albany, Cranbrook and Plantagenet LGAs involving sales of agricultural land to the plantation sector

In all years, plantation sales made up a higher proportion of the dollar value of sales than the total hectares sold. The differential was highest in 1999, 2000 and 2004.

Figure 65 compares the average price paid per hectare for plantation and non-plantation land in Albany, Cranbrook and Plantagenet Shires. Data for 1991 to 1993 are not included as they may reveal data about individual sales, due to low numbers of sales. On average, higher prices have been paid for plantation land compared to land sold to other purchasers.

[28] All three have been grouped to ensure that data on single transactions is not identifiable; for the same reason, data from earlier years in which fewer transactions occurred has not been included.



Source: Department of Land Information individual land sales data

Figure 65: Average price per hectare for land sold to plantation sector and non-plantation sector buyers – Albany, Cranbrook and Plantagenet LGAs

11.4 Impact of plantation sector on prices of non-plantation land

In focus groups and interviews conducted for the study several participants, including two real estate agents, stated that they believed high demand for agricultural land suitable for plantations had impacted prices of land not suitable for plantation establishment.

This was believed to have occurred as a result of:

- Greater competition in the land market from plantation companies leaving less land overall for farmers to purchase. This was argued to have led to rising prices for land not suited to plantation establishment, as farmers unable to afford land in areas suitable for plantation establishment seek land in other areas; and

- Farmers selling land to plantation companies and then purchasing land in other areas not suitable for plantation establishment. According to focus group participants, including two real estate agents, these farmers are often able to pay higher prices as a result of the higher prices received for selling their original property to the plantation sector.

In Figure 59, a slightly higher rate of price increase can be seen in the agricultural LGAs of the Great Southern compared to agricultural LGAs in nearby areas outside the Great Southern. This supports this hypothesis, although further investigation comparing trends in non-plantation LGAs of the Great Southern to a broader range of areas outside the Great Southern would be needed to improve confidence in the trend.

12.0 Discussion and conclusions

At the start of this study, eight key questions were identified about the socio-economic impacts of a mature plantation estate. The discussion and conclusions below focus on answering these questions as far as is possible using the results of this study. The effectiveness of the methods used in the study is then explored.

For several of the socio-economic characteristics examined in the study, no observable differences were found between regions experiencing plantation expansion and those that had few or no plantations. This is an important result, as it indicates that the establishment of plantations has in many cases not been associated with large-scale change in particular socio-economic characteristics of the regions where plantations have been established.

Question 1: How much employment is provided by the plantation sector and where is the employment based in relation to the plantation estate?

The plantation sector has employed a growing number of people since 1991, with the most rapid growth occurring since harvesting began in 2001. By 2004, an estimated 500 people were directly employed in the sector, almost twice the 263 employed in 2001 prior to the start of harvesting in the region. Part of this increase was also due to an increased area of new plantings in 2004 compared to 2001. For every $1 million spent by the plantation sector, an estimated 17.15 jobs are created in the Great Southern. This includes both direct employment by the plantation industry, and flow-on employment generated as a result of demand for goods and services from the plantation industry. For every direct job in the plantation sector, this equates to flow-on employment of 0.65 people within the Great Southern. In addition, further flow-on employment is created outside the region when goods and services are imported from other regions.

Over the time period studied, the location of employment has shifted, with increasing proportions of employment located in the Great Southern, rather than outside the region – approximately two-thirds of direct jobs generated by the sector were located in the Great Southern by 2004. This shift to increased employment within the region has occurred as businesses have established in the region to support the growing plantation sector. Within the Great Southern, the majority of employment is located in the City of Albany, with smaller numbers of employees in Mt Barker, the Shire of Cranbrook, and Denmark. Most employees are based in towns.

Question 2: What type of employment is provided by the plantation sector?

Direct employment in the plantation sector is generated as jobs working for plantation managers and processors, and jobs working in contracting businesses that undertake work for these managers and processors.

Much of the direct employment generated by plantation expansion is in contracting businesses, and the amount of work available to contractors was reported to have fluctuated considerably over short periods of time, largely as the area of new planting varied between years. While most employment was reported to be full-time, apart from some seasonal workers engaged in activities such as planting seedlings, high fluctuations in demand for contract work can place considerable pressure on contracting businesses. This reportedly occurred during the period of 1999 to 2002, during which the level of activity first increased and then decreased rapidly, largely a result of changes to taxation provisions and investment in the agribusiness sector.

Question 3: How much spending occurs from the plantation sector and where does that spending occur in relation to the plantation estate?

In 2003-04, expenditure on managing, harvesting and processing plantations in the Great Southern totalled an estimated $49.7 million. This included plantation management expenses, but not the costs of management of investment schemes or other business costs such as servicing loans. Of this, just over 25% was paid to contracting firms to undertake work such as site preparation, planting of seedlings, firebreak maintenance or harvesting; and 75% was spent on operating expenses including wages, purchase of supplies, and lease payments to landholders. An estimated 67% of this expenditure occurred within the Great Southern and 33% outside the Great Southern.

Direct expenditure by the plantation sector generates flow-on expenditure. For example, suppliers of services to the sector buy goods and services in the region, and so on, creating a chain of flow-on economic activity. For every $1 million spent by the plantation industry in the Great Southern, an estimated total of $1.76 million is generated in regional output (in other words, in goods and services produced by a range of industries), and $0.53 million of income is generated in the region. In addition, further flow-on activity is generated outside the Great Southern as some goods and services required by the plantation industry are purchased outside the region, and some income is similarly spent outside the region.

Question 4: Does plantation estate expansion have a demonstrable impact on the numbers of people living in rural communities?

Over 1996 to 2001, Great Southern LGAs which experienced high rates of plantation expansion generally experienced higher rural population growth than LGAs with a high reliance on traditional agriculture and few/no plantations. However, this positive change was not primarily a result of plantation expansion, but rather of expansion in intensive agricultural uses and influx of 'lifestyle' residents. The extent to which each of these factors contributed to rural population change could not be quantified. However, based on the limited data available it appears likely that plantation expansion, while representing a different type of land use change than has occurred in many rural areas, had a similar impact on rural population of individual LGAs to ongoing process of farm amalgamation occurring in other parts of the Great Southern. Areas at scales smaller than individual LGAs be examined with the data available.

There is potential for further rural population growth if planning authorities permit 'homestead blocks' to be subdivided on plantation properties, enabling new residents to purchase houses on plantation properties.

Plantation expansion has been one of many contributors to population growth in some town populations, primarily in the city of Albany where much of the employment generated in the plantation sector is based.

Based on the data available, it appears plantation expansion does not lead to higher rates of rural population where it occurs as part of a mix of land use changes.

Question 5: Does plantation estate expansion have a demonstrable impact on the socio-demographics of the population, eg through an influx of new residents into a community

Most parts of the Great Southern experienced similar patterns of socio-demographic change over 1991 to 2001, with only a few exceptions. There were no observable differences in the type or rate of change in most socio-demographic characteristics between 'high plantation' and other LGAs. The key difference identified between different parts of the Great Southern was that areas where there was a higher diversity of land uses – including those where large areas of plantations have been established - tended to experience more stable household

income growth and growth in working age population compared to areas with less land use diversity.

Question 6: Does expansion of plantation estate lead to a demonstrable change in levels of provision of local education, fire fighting, retail and other services?

Further data is needed to fully answer this question. While it was possible to identify general trends in service provision, the data available did not in general allow in-depth analysis of whether plantation expansion had led to more rapid service decline.

Analysis of the data that was available suggested plantation expansion tended to occur after a decline in services, rather than preceding it. The level of services to agriculture, and education services (measured by numbers of students enrolled in schools), declined more rapidly in areas experiencing rapid plantation expansion over 1991 to 2001 than in other areas of the Great Southern or comparison regions outside the Great Southern. However, in both cases the decline was high prior to plantation expansion occurring, suggesting plantation expansion may have been one type of response to the factors causing decline in these services (eg declining viability of farming), rather than a cause of the decline.

Other data on services was used to identify general trends in service provision but could not be used to quantify the magnitude of changes. From this data, a general pattern of declining services in areas with small populations, and growth in services in regional centres, was observed, irrespective of the area of plantations located in different LGAs.

Question 7: Does plantation estate expansion lead to a demonstrable change in land prices?

Rural land prices rose more rapidly over 1988 to 2001 in high rainfall areas of the Great Southern than other areas. Increased demand for land from plantation companies has contributed to this trend, particularly in the LGAs of Albany and Plantagenet where in some years more than 40% of all land sales were to the plantation sector. In general, land sold to the plantation sector has sold for a higher price per hectare than land sold in the same LGA for other purposes.

The impact of the plantation sector on land prices does not occur only through direct purchase of land. The leasing of land for plantation establishment may reduce the area of new land placed on the market, and hence increase demand for the land that is available, leading to rising prices.

There is also some evidence that high demand from the plantation sector may have influenced higher growth in values of agricultural land in nearby LGAs. In focus groups, several participants reported that they had observed a pattern of farmers selling their land for plantation establishment, and then purchasing agricultural properties in nearby areas not suitable for plantation establishment. This was consistent with trends observed in available land price data. However, comparison of price changes in a wider range of areas would be needed to confirm this trend.

Question 8: Is there a demonstrable change in other agricultural industries associated with expansion of plantation estate?

Change in agricultural industries in both ‘plantation’ and ‘non plantation’ regions results from similar underlying drivers: increasing input costs and stable or falling real prices for many agricultural products requiring agricultural producers to ‘get big or get out’, and associated lack of young people entering farming.

These drivers have led to different types of change in different parts of the Great Southern, depending on the suitability of land for different enterprises. Higher rainfall areas of the Great Southern with suitable soils can grow bluegum plantations, grapes and olives, amongst other crops, while the lower rainfall areas to the east and north are not suited to these enterprises. The higher rainfall areas are mostly close to the coast and ranges of the area, and so are also in higher demand for rural residential development.

Because of this, land has been in high demand for a number of uses other than broadacre agriculture in high rainfall areas suitable for plantations, viticulture, and desirable for rural residential development. This demand has led to land prices rising at a higher rate in these high rainfall areas, with plantation expansion a key factor leading to rapid land price growth. Higher land prices have led to a reported trend of farmers selling or leasing land in areas suitable for plantations, and subsequently purchasing less expensive properties in other areas of the region that are not suitable for plantations.

As a result of this, pressures on the agricultural sector have led to a shift to plantations and vineyards in areas suitable for development of these enterprises, while in other areas the trend has been to amalgamation of farms.

Effectiveness of methods used

The methods used in this study were designed to better identify where plantation sector activity may be associated with socio-economic impacts, and to better quantify some of these impacts. For the most part, these methods have been relatively effective.

Key strengths of the methods used included:

- It was possible to accurately identify the level of employment and spending generated from a specific area of plantation, and the spatial pattern of this employment and spending. This enabled analysis of the extent to which the economic activity generated as a result of growing plantations was captured within the Great Southern. Plantation sector businesses were able to easily identify location data as well as numerical information on their employment and spending for recent years. However, accessing historical data on plantation sector activity was difficult in many cases, indicating an ongoing need to data collection before records become inaccessible;

- By identifying all key land use and industry changes occurring in the region, it was possible to link socio-economic changes to multiple changes impacting different areas, rather than focussing only on changes in the plantation sector. This ensured that links between the plantation sector and socio-economic change were not made inappropriately due to lack of knowledge of other changes occurring in the region;

- By comparing to regional and national averages, and to similar comparison regions, it was possible to identify what was a ‘typical’ trend affecting the nation, the State or other similar regions, versus changes which were specific to LGAs within the Great Southern. This reduced the number of topics for which explanations of difference needed to be identified; and

- Use of focus groups allowed local knowledge of changes to be incorporated into analysis of independent data. This enabled a richer understanding of potential explanations for socio-economic change in the region, and generated new questions which could be further explored using independent data. It also enabled identification of limitations of independent data. If independent data from sources such as the ABS had been used and interpreted without the assistance of focus group participants, a considerably poorer analysis would have resulted. Focus group participants were able to identify where data

should not be used due to inaccuracy or lack of completeness – for example, focus group participants identified problems with data describing change in the number of farm enterprises in the region, and so this type of data was not used except to show broad trends in types of land use enterprises in the region. This ensured that data was only used where it was verified as accurate – or, at least not identified as inaccurate – by focus group participants. They were also able to rapidly identify the different changes to local business and industry that may be associated with particular socio-economic changes, whereas attempting to identify this type of information from data collections is difficult as no single data collection contains information about all the different socio-economic changes affecting a region at any given time. This represented an improved methodology for interpreting and using data from independent sources, with many previous studies presenting and/or interpreting independent data without incorporating interpretation and analysis from local residents with knowledge of the processes and changes being examined.

However, there were limitations to the methods used:

- There are limits to the qualitative data analysis approach used. Focus group participants could not explain some socio-economic changes that had occurred in the region. For example, participants found it difficult to identify why age structure of the population had changed in different ways in Kent and Jerramungup compared to other LGAs. In some cases, no explanations for socio-economic change could be generated either from focus groups or from data on land use and industry change in the region;

- In this study, focus groups were used to assist in analysing and interpreting data, but not in setting the initial study questions to be examined. While participants identified that the questions examined where of relevance to their regions, ideally focus groups should be used more interactively to assist in developing guiding questions for the study. This would ensure the issues of interest/concern to local communities are targeted as effectively as possible by the study;

- The analysis was only effective where comparable, quality independent data was available over time for different socio-economic characteristics. In several cases, limited or no data was available, and the extent to which the impact of expansion of the plantation sector could be understood was limited by this lack of data; and

- The study examined questions which could be answered, at least to some degree, using independent data. This focus was chosen due to the identification of a lack of detailed use of this type of data in previous SEIA of plantations. A SEIA may examine a range of broader questions than those examined in this study, including gathering a range of primary data and directly studying perceptions of and attitudes to plantations. It is important to recognise that the questions examined in this study represent only some of those that may be studied as part of SEIA.

A key challenge in this study was identifying which comparisons were most meaningful for uncovering differences between ‘plantation’ and ‘non-plantation’ areas. Areas that had experienced rapid plantation expansion were compared to (a) other LGAs of the Great Southern, (b) similarly structured LGAs or regions outside the Great Southern, and (c) State and national averages.

Perhaps the least useful comparison for the purposes of this study was the comparison to State and/or national averages. Regional areas vary so much that it is likely any area will be experiencing a trend different to the average – so if an area experiencing plantation expansion

is also experiencing trends different to a State or national average, it is not possible to state whether this is likely to be related to plantation expansion.

More useful were comparisons of 'high plantation' regions to nearby areas not experiencing expansion, and to comparison regions of similar structure. The former is useful as it gives an idea of whether changes in a plantation region were a result of processes affecting the surrounding region, or if they were unique to the plantation region. If unique to the plantation region, explanations for this could then be explored for. The latter is useful as it provides a useful picture of the ways regions with similar socio-economic and land use structure changed over time in the absence of plantation expansion. However, it would be useful to identify a larger number of these comparison regions than was used for this study. This would allow a better understanding of the diversity of socio-economic change occurring in regions that at one point in time had relatively similar characteristics; however, it is resource intensive identifying and analysing a large number of comparison regions.

However, the most useful approach to analysing whether and why plantation expansion was associated with socio-economic change is development of an in-depth qualitative understanding of the different changes occurring within a plantation region over time, and the likely impacts of each on different socio-economic characteristics. It is essential to understand the range of trends affecting regions experiencing plantation expansion, and particularly to identify if particular trends were already occurring prior to plantation expansion, or if an observable shift occurred in parallel with the establishment of plantations. It was this, in combination with comparing trends in high plantation areas with a range of other regions, that allowed trends to be identified as associated or not associated with plantation expansion with a reasonable degree of confidence.

The longitudinal approach used was highly suited to identifying whether plantation expansion was associated with distinct types of socio-economic change. It is recommended that this approach be used in future studies. Any studies examining only a single point in time should be explicitly designed to be followed up over time.

As long as the limits of the analysis are clearly identified, using clearly defined methods to qualitatively analyse independent data on socio-economic change allows a more rigorous analysis than may occur otherwise. The methods used in this study have ensured some common problems of data interpretation are avoided. In particular, the problem of 'over-explaining' a phenomenon based on change in a single sector, while assuming no other changes are occurring at the same time, has been addressed. In addition, the use of focus groups enabled rich local understanding of socio-economic change to be combined with quantitative independent data to provide more in-depth understanding of the complexity of socio-economic change in the Great Southern.

13.0 Recommendations for future research

This study has provided a range of results based on available data. This data, while useful and uncovering a range of important results, has a number of limitations. These have been discussed throughout the report. Recommendations for further research that may help overcome some of these limitations include:

- This study has been designed to be updated over time. It should be repeated when data from the 2006 *Census of Population and Housing* are available, to analyse the socio-economic impacts of the plantation sector as harvesting and processing of the plantation resource expands;

- More specific data on the numbers of 'lifestyle' residents living in rural areas, and their impacts on rural regions, is needed. More specific data on change in other industries, particularly employment in vineyards and wineries, is also needed to disentangle the impacts of different land use changes occurring in the region;

- This study primarily examined data at the local government area scale (in this study, this was generally equivalent to the ABS Statistical Local Area scale). However, there may be changes occurring at the sub-LGA scale as a result of plantation expansion or other changes in land use. This was raised in some focus groups as a key issue requiring examination, with participants pointing out that plantation expansion may result in a shift in where most of the population of an LGA live, even if the overall population of the LGA remains the same. Future studies should examine data for smaller scale regions where possible.

- It may also be useful to examine the aggregate impacts of plantation related activity on larger-scale regions when some types of impacts, such as impact on flows of economic activity, are being examined;

- Regular collection of data on employment and expenditure by the plantation sector – including growers, contractors and processors - should occur. This would allow accurate estimation of employment and expenditure from the sector on a regular basis. Preferably, data should be collected at the same time data collection occurs for key socio-economic data sets (e.g., the *Census of Population and Housing*), to ensure comparability of data;

- Regular collection of comparable data on employment and expenditure by the industries that would be using land if it were not used to grow plantations, eg sheep or beef graziers. It is important to collect this data in a way that allows direct comparison to plantation sector employment and expenditure, which requires accessing data for the same time period and to the same point in the production chain across different land use industries;

- Collection of data on membership of community groups over time is needed to accurately track trends in number and size of community groups over time. This includes collecting data on active community fire brigade membership. This could be undertaken via a regular phone survey of key community group organisers. Similarly, collection of data on service provision on a regular basis would enable better understanding of changes in services over time, and the factors influencing change in service provision;

- Ongoing exploration of the potential to use cross-sectional analysis to identify statistically significant differences between socio-economic characteristics of plantation and other regions; and

- This study examined only those impacts which could be studied using 'non-perceptions' data. However, many socio-economic impacts can only be understood by examining attitudes and perceptions of plantations. Further studies could usefully integrate these different types of data collection to provide an integrated understanding of people's perceptions and understandings of plantations, as well as the socio-economic changes able to be documented using independent data. In particular, when specific regions are being studied it is useful to identify the specific questions local communities have about socio-economic impacts of plantations, so that the study can be designed to examine these questions.

Appendix 1: Review of perceptions about the socio-economic impacts of plantations

Introduction

This section examines key perceptions about the socio-economic impacts of plantations recorded in previous Australian studies.

A perception is the way a person interprets a particular object, action or issue. Different people may hold different perceptions about the same action or issue. For example, one person may believe that the earth is flat while another believes it is a sphere. Both have used available information and their own observations to interpret the information available to them, and their differing information and interpretation of that information has led to different conclusions (for further discussion of the concept of perception, see Marshall 1996).

A diversity of perceptions about the socio-economic impacts of plantations have been documented. In many cases, contradictory perceptions of impacts have been recorded. For example, Pickworth (2005) found that while some residents of the Bombala region of NSW believed plantation expansion brought new population into the community, others believed it led to a reduction of population.

What was included in the review?

The purpose of this review was to identify different perceptions about socio-economic impacts of plantations, in order to develop a set of questions about specific types of impacts, which could then be examined in this study.

This review does not examine the distribution of perceptions. In other words, it does not try to identify *who* or *how many* people hold particular views about plantations. To date there have been very few studies undertaken in Australia that have quantified the proportion of a given population that holds particular attitudes or perceptions. Those that have been undertaken have generally identified a diversity of perceptions about particular socio-economic impacts (see for example Tonts *et al.* 2000; Petheram *et al.* 2001; Pickworth 2005).

Perceptions about biophysical, environmental, health and landscape impacts were not reviewed, although these are often argued to have associated socio-economic impacts. This is because this study aimed to focus on direct socio-economic impacts.

Finally, only perceptions about plantations were reviewed. Perceptions of plantations differ substantially to perceptions about impacts of changes to native forest management and, as such, it was appropriate to focus on plantation sector literature only.

Within the literature reviewed, there is considerable variability. Socio-economic studies of plantations in Australia have included:

- studies of perceptions of impact;
- studies of factors affecting adoption of farm forestry or plantation forestry;
- studies examining interactions between different groups about plantations; and
- studies aiming to quantify socio-economic impacts of the plantation sector.

Studies which examined willingness to adopt farm forestry or plantations were not included in this review unless they examined general perceptions about existing plantations[29]. Studies and papers which examined ways of addressing concerns about some impacts of plantations, but which did not explicitly explore perceptions or evaluate impacts (eg Schirmer and Tonts 2003, Howard 2004) are not included in this review.

The different studies that have examined perceptions are not directly comparable to each other, as they have gathered data using different methods. Some used quantitative surveys with pre-determined questions about perceptions; others asked open-ended questions in in-depth interview with individuals (e.g. 'what are the main impacts of plantations?'). Table A2 in Appendix 2 provides an overview of the methods used in different studies.

Despite the diversity of methods used, many similar perceptions have been recorded in the different studies. Table A1 below describes the key types of perceptions recorded in previous studies.

Key questions about socio-economic impacts of plantations

The review of perceptions summarised in Tables A1 and A2 was used to develop a set of key questions to be explored in this project. Boxes A1 and A2 detail the key questions posed as a result of the review.

In general, perceptions fell into two broad categories:

- Perceptions about impacts of the expansion of plantation estate; and
- Perceptions about impacts of plantation processing and harvesting activities.

The key questions identified are separated into these two categories.

Some key perceptions recorded in previous studies are not included in the list of key questions examined in this study. They were not included as they relate to feelings of attachment to and culture of rural communities, for which the only evidence of impact can be the self-reported perceptions of those in the communities. These perceptions have already been well recorded in previous studies, and methods for uncovering further evidence about them were therefore not explored in this study.

[29] Useful adoption studies which examine the reasons why farmers do and don't adopt farm forestry or plantations include Soutar and Wallis 1986; Byron and Boutland 1987; Curtis and Race 1996; Schirmer 1998).

Box A1: Key questions about socio-economic impacts of expanding plantation estate:

Question 1: How much employment is provided by the plantation sector and where is the employment based in relation to the plantation estate?

Question 2: What type of employment is provided by the plantation sector?

Question 3: How much spending occurs from the plantation sector and where does that spending occur in relation to the plantation estate?

Question 4: Does plantation estate expansion have a demonstrable impact on the numbers of people living in rural communities?

Question 5: Does plantation estate expansion have a demonstrable impact on the socio-demographics of the population, eg through an influx of new residents into a community?

Question 6: Does expansion of plantation estate lead to a demonstrable change in levels of provision of local education, fire fighting, retail and other services?

Question 7: Does plantation estate expansion lead to a demonstrable change in land prices?

Question 8: Is there a demonstrable change in other agricultural industries associated with expansion of plantation estate?

Box A2: Key questions about socio-economic impacts of plantation processing and harvesting activities:

Question 1: How much employment is provided by the plantation sector and where is the employment based in relation to the plantation estate and processing and harvesting activities?

Question 2: What type of employment is provided by the plantation sector?

Question 3: How much spending occurs from the plantation sector and where, and what is the value of output of the plantation sector?

Question 4: Does plantation processing and harvesting expansion have a demonstrable impact on the total population?

Question 5: Does the plantation sector have a demonstrable impact on socio-demographics of the population within a region, eg through an influx of new residents into a community?

Question 6: Does the plantation sector have a demonstrable impact on provision of different services in local regions?

Question 7: Is change in the level of processing and harvesting demonstrably associated with changes in housing availability in processing towns?

Question 8: Do harvesting and processing activities lead to transportation challenges?

Table A1: Key perceptions of socio-economic impacts of plantations recorded in previous studies

Study	Barlow and Cocklin (2003)	Kelly and Lymon (2000)	Lane (1997)	Naughton (2001)	Oberon Community Development Study	Petheram *et al.* (2000)	Pickworth (2005)	Schirmer (2002)	State Plantations Impact Study (1989, 1990)	Tonts *et al.* (2001)
Agricultural industries perception # 1: Commercial plantations displace agricultural activities causing decline in agricultural industries	X	X		X	X	X	X	X	X	X
Agricultural industries perception # 2: Plantations provide farmers an opportunity to obtain income from leasing land for plantation establishment		X				X				
Economic viability perception # 1: Plantations will not produce positive economic returns	X	X				X		X	X	X
Economic viability perception # 2: There is a lack of available markets for plantation wood		X				X		X		X
Employment perception # 1: The plantation sector provides little local employment	X	X				X	X	X	X	
Employment perception # 2: Expansion of plantation estate processing provides employment opportunities in regional areas, particularly large regional towns	X	X	X	X	X	X	X		X	
Employment perception # 3: The plantation sector provides mostly low skilled, casual or part-time employment					X		X	X		

Study	Barlow and Cocklin (2003)	Kelly and Lymon (2000)	Lane (1997)	Naughton (2001)	Oberon Community Development Study	Petheram *et al.* (2000)	Pickworth (2005)	Schirmer (2002)	State Plantations Impact Study (1989, 1990)	Tonts *et al.* (2001)
Housing availability perception # 1: Increased forest industry activity, particularly processing, leads to higher rents, higher house prices and lower housing availability in processing towns					X					
Population perception # 1: Plantation estate expansion leads to rural population decline		X	X			X	X	X	X	X
Population perception # 2: Plantation estate expansion accelerates existing rural population decline	X		X			X		X	X	X
Population perception # 3: Plantation estate and processing expansion bring new people into local and/or regional communities	X			X		X	X			
Population perception # 4: The new people who come to live in communities do not always integrate well with existing members of the community	X	X				X		X		
Rural culture perception # 1: The plantation sector does not participate in the local community	X	X								X
Rural culture perception # 2: Plantation expansion results in loss of scenic views and/or landscape change	X	X					X	X	X	X

Study	Barlow and Cocklin (2003)	Kelly and Lymon (2000)	Lane (1997)	Naughton (2001)	Oberon Community Development Study	Petheram *et al.* (2000)	Pickworth (2005)	Schirmer (2002)	State Plantations Impact Study (1989, 1990)	Tonts *et al.* (2001)
Rural land market perception # 1: Plantation expansion increases demand in the land market, benefiting those wanting to sell their land	X	X				X	X	X		
Rural land market perception # 2: Plantation expansion leads to rising land prices		X	X			X	X	X	X	X
Rural land market perception # 3: Plantation expansion reduces sale price of land, particularly neighbouring land								X	X	X
Rural road network perception # 1: Increased log traffic leads to higher levels of road damage				X	X	X	X		X	X
Rural road network perception # 2: Increased log traffic creates congestion, noise and/or road safety problems		X		X	X		X		X	X
Rural road network perception # 3: Road funding activities related to the plantation sector have improved road maintenance				X						
Services and spending perception # 1: Expansion of plantations leads to downturn in local retail, agricultural and governments businesses and service provision at a local scale	X	X				X	X	X	X	X

Study	Barlow and Cocklin (2003)	Kelly and Lymon (2000)	Lane (1997)	Naughton (2001)	Oberon Community Development Study	Petheram *et al.* (2000)	Pickworth (2005)	Schirmer (2002)	State Plantations Impact Study (1989, 1990)	Tonts *et al.* (2001)
Services and spending perception # 2: Plantation expansion leads to lower availability of volunteers for fire brigades		**X**				**X**		**X**	**X**	**X**
Services and spending perception # 3: Plantation companies have invested in fire fighting equipment and personnel which improve fire fighting efforts and response		**X**			**X**			**X**		**X**
Services and spending perception # 4: Expansion of plantation estate and/or processing has led to establishment of new locally and regionally based businesses		**X**		**X**	**X**		**X**			**X**
Services and spending perception # 5: Plantation companies often obtain supplies non-locally		**X**				**X**		**X**	**X**	**X**
Taxation perception # 1: Plantation agencies/ companies do not contribute adequately to government, eg via rates (usually a perception held about publicly owned plantations)					**X**			**X**	**X**	

Appendix 2: Previous socio-economic impact studies

Table A2 below provides a summary of previous studies of socio-economic impact of plantations in Australia. It includes details of the topics examined, and the methods used to examine these topics.

Table A2: Topics studied and methods used in previous studies on perceptions and socio-economic impacts of plantations

Study	Region	Period studied	Topics studied (perceptions and/or impacts)	Methods used
Access Economics (2002)	Timbercorp operations in Western Australia, Green Triangle	2000-01	• Economic impact assessment	• Direct and contract employment by Timbercorp • Timbercorp profits • Export value of future harvest • Review of types of economic contributions made by Timbercorp • Expenditure on wages, subcontractors, goods and services (broken down into WA, SA and Vic expenditure) • Likely future economic impacts once plantation harvesting begins • Direct impact of Timbercorp operations on government revenues including impacts on income tax paid by growers, payments of company and payroll tax, personal income tax, and indirect taxes from activity generated in economy over a single rotation of a blue gum plantation • Input-output analysis to estimate indirect employment and expenditure impacts
Barlow and Cocklin (2003)	Branxholme, Victoria	2002	• Perceptions of impacts of blue gum plantations	• Semi-structured interviews with selected farmers, town residents, local government and plantation sector
CIE (2005)	Willmott Forests activities in Bombala Shire, NSW	2004	• Socio-economic impact assessment	• Socio-demographics of region (1996, 2001 data) • Local services available in region • Direct employment by Willmott Forests in region • Expenditure by Willmott Forests in region • Output from Willmott Forests sawmill • Other socio-economic contributions of Willmott Forests to the region

Study	Region	Period studied	Topics studied (perceptions and/or impacts)	Methods used
				eg training • Comparison of agriculture and forestry employment per hectare (using data from different years) • Discussion of potential impacts of planned future expansion
Hayter (2003)			Review of studies of socio-economic impact of forest industries in Australia	• Review of previous studies of socio-economic impact of forest industries in Australia
Howard (2004)			Reviews key perceptions of impact found in socio-economic studies	• Review of previous studies
Kelly and Lymon (2000)	Plantagenet Shire, Western Australia	1997-2000	• Perceptions of social, economic, environmental impact • Social impacts	• Unstructured and semi-structured interviews with wide range of groups/individuals • Quantitative community surveys conducted in 1998 and 1999 • Secondary data (ABS, WA Government agencies, some showing trends over time up to 1996 or 1998, depending on source) • Documentary analysis
Lane (1997)	Tumut region	Historical (1960s onward)	• History of plantation development • Perceptions of social impacts focussing on cultural aspects	• Qualitative in-depth interviews
Margules Groome Poyry Pty Ltd (1995)	NSW (all)	1993-94	• Economic impact of NSW timber industry	• Economic profile of timber industry in NSW • Estimate of economic impacts (employment, wages, gross output, value added, wood flows) • Linkages between forest products industry and wider economy via input-output analysis • Analysed by region with ABS Statistical Divisions used as regions • Analysed by eight industry sectors (forest management, contracting, basic processing hardwood, basic processing softwood, basic processing cypress pine, export woodchipping, wood panel products and paper)

Study	Region	Period studied	Topics studied (perceptions and/or impacts)	Methods used
				• Survey of operators within sector (55.6% response rate)
Naughton (2001)	Tumut Shire, New South Wales	2001	• Willingness to adopt farm forestry • Perceptions of impact of expansion of farm forestry and processing	• Semi-structured interviews of key stakeholders from range of groups • Quantitative survey of landholders in Tumut Shire
Oberon Community (multiple reports produced from 1990 to 1995)	Oberon Shire, New South Wales and Central Tablelands Statistical Sub-Division (CTSS)	1985-86 to 1992-93	• Socio-economic impacts • Perceptions of impacts of timber industry • Financial impacts of forest industry on local government operations	• Direct and indirect employment and expenditure via input-output analysis of Oberon and CTSS economy • Quantitative survey of Oberon households in early 1989 and late 1991 • Quantitative surveys of forest industry employees in 1990 and 1994 • Interviews and focus groups • Secondary data on socio-demographics, housing, road accident statistics, and others • Estimated of financial impacts of forest industry on local government operations • Comparison of economic impacts of forestry per hectare to impacts of other key agricultural industries per hectare
Petheram *et al.* (2000)	South-west Victoria	1990-2000 (some variation in dates depending on data availability)	• Employment impacts • Comparison of employment per hectare for plantations and key agricultural land uses • Social impacts on population • Land price impacts • Roading movements • Attitudes to plantations and other key types of land use change in the region • Future scenarios	• Quantitative survey • Economic modelling of employment per hectare and regional cash flows (predictive) • Stakeholder group interviews discussing land use change • Wide range of secondary data on agricultural land use change, employment, school enrolments, much ABS Census data for 1990-91 to 1996-97
Pickworth (2005)	Bombala, NSW	2004	• Perceptions of social, economic and environmental impacts of plantations	• Interviews with key informants to identify key perceptions • Quantitative sample survey of Shire population to identify distribution of perceptions

Study	Region	Period studied	Topics studied (perceptions and/or impacts)	Methods used
Schirmer (2002)	Northern Tasmania, North-east Victoria	Dec 1999-Feb 2000	• Perceptions of impact • Processes used to address concerns	• Semi-structured interviews • Documentary analysis
Shea and Bartle (1988)	South-Western Australia	-	• Predicted potential future impacts • Financial returns • Estimated value of shelter benefits	• Potential returns per hectare from growing blue gums predicted • Prediction of total gross return per annum from 10,000 ha program of plantation establishment • Economic gains from shelter benefits of trees on farms
State Plantations Impact Study	Victoria	1989, and future (10 and 50 years into future)	• Recommended options for development of plantations (hardwood and softwood) • Potential social, economic and environmental impacts of planned expansion • Identified key perceptions about plantations	• Formal and informal interviews and encouragement of submissions on issues of concern (180 submissions received) • Secondary data including ABS • Questionnaire to plantation industry on employment • Expert literature on environmental impacts • Markets for plantation products • Estimated returns and employment per hectare from plantations • Estimated direct employment • Comparison of employment per hectare by plantation and other agricultural land uses • Estimated regional impacts
Tonts and Black (2003)	-	-	• Reports of impacts in previous studies • Perceptions of impacts	• Review of previous studies into social and economic impacts
Tonts *et al.* (2001)	Boyup Brook, WA; Bridgetown-Greenbushes WA; Wattle Range SA, West Wimmera VIC	2000	• Social impacts of plantation in different regions including employment impacts, population, land values • Perceptions of impact by residents of the four communities studied	• Socio-demographic data from range of sources including ABS Census of Population and Housing and Agricultural Census, DEWR, Taxation Statistics, local government and land values data • Semi-structured interviews with major stakeholders from range of groups (inc. local government, plantation sector, farmers, local business, state government agencies) in mid 2000 • Telephone survey of 80 residents (20 in each region studied)
URS Forestry (2004)	South West Slopes, NSW	2004	• Current economic impacts of plantation and native forest	• Value of timber production • Direct employment in management, harvesting, haulage, sawmilling

Study	Region	Period studied	Topics studied (perceptions and/or impacts)	Methods used
			sector	and preservation, panel production and pulp and paper production • Indirect employment (using multiplier of 2) • Wood flows in and out of region • Description of other benefits of forest industry including contributions to local community and provision of fire fighting services
Prospect Consulting Pty Ltd (2002)	North-east Victoria	2000-01	• Economic impact (employment, expenditure) • Location of economic impact by region • Socio-demographic characteristics of region	• Direct employment in softwood plantation, hardwood plantation and native forest sector in management, contract and milling sectors (not broken down by region within north-east Victoria but indicating employment inside and outside study area for some categories) • Expenditure and revenue in softwood plantation, hardwood plantation and native forest sectors • Proportion of total employment from forestry sector in study area • Prediction of benefits of 50% expansion in area of plantation by 2020 (in terms of employment, revenue) • Wood flows in and out of study area • Estimates of indirect employment using multiplier of 2 • Existing and planned capital investment • Socio-demographics of population of study area • Dependence of population on forest sector based on proportion of employment dependent on forest sector • Comparison of $GVP of timber to $GVP of other key industries operating in region

Appendix 3: National Economic *YourPlace I-O* model

YourPlace™ *IO*
An information booklet

National Institute of Economic and Industry Research
trading as National Economics

Using input-output tables in analysis

The following section describes input-output analysis and describes its practical uses. This section is followed with an information booklet on NIEIR's YourPlace-IO software.

The Australian Bureau of Statistics (ABS) collects the input-output tables which represent the flow of goods and services between industries. The basic tables and the industry-by-industry tables provided by the ABS are essentially an accounting record of the flows in the national economy. Using simplifying assumptions the input-output estimates can serve many analytical purposes.

Basic structure of input-output tables

The table below describes the basic structure of an industry by industry table with direct allocation of imports. Flows between industries are shown in quadrant 1 (Q1), called intermediate usage. Each column in this quadrant shows the intermediate inputs into an industry in the form of goods and services produced by other industries and each row shows those parts of an industry's output which have been absorbed by other industries. For example, the intersection of the first column (mining) and the third row (construction), indicates how many goods and services are used by the mining industry from the construction sector to produce mining output.

Industry to industry input/output table

Industry to industry input/output table									
To / From		Intermediate demand				Total	Final demand	Exports	Total supply
		Mining	Manufacturing	Construction	Services		Public and private		
Intermediate inputs	Mining	Intermediate usage Q1					Final demand Q2		
	Manufacturing								
	Construction								
	Services								
Primary inputs	Wages & salaries	Primary inputs to production Q3					Primary inputs to final demand Q4		
	Gross operating surplus								
	Taxes								
	Imports								
Australian production									

The intermediate usage quadrant and the final demand quadrant (Q2) show the total usage of goods and services supplied by each industry. Quadrants 1 and 3 together show the inputs used to produce the total supply (outputs) of each industry.

Final demand (Q2) represents the total level of demand for products (of industries) by households, business and governments. This includes both consumer and capital goods and services. Also goods and services produced for consumption overseas, exports, are included here.

Primary inputs to production (Q3) includes the proportions of labour, profits, taxes and imports used to produce the total supply of output of each industry. Wages and salaries are the labour component whilst gross operating surplus (GOS) is akin to profit. Taxes include all net government taxes on production. Also included are imports which are used as inputs to production by domestic companies.

As mentioned earlier the table above shows the input-output relationships using direct allocation of imports. Basically imports can be treated in 2 ways, either directly or indirectly.

The direct allocation of imports method treats imports as a separate item and imports used as inputs are factored in as a separate line item. That is as they are shown in the table in the last row in primary inputs. In this case quadrants 1 and 2 refer only to the use of domestic production and consequently quadrant 1 does not reflect the technological input structure of the economy. Indirect allocation of imports involves recording all imports as adding to the supply of the industry in quadrant 1. When the tables are depicted in this way the amounts of inputs into one industry supplied by each other industry reflect the true technological relationships between all inputs into the industry.

A simple application of the input-output table is calculating inputs as a percentage of the output of an industry and using these percentages for any given level of output of that industry. In the table above this is done by using quadrant 1 and 3 divided by Australian production in a given industry. The individual results are referred to as direct input-output coefficients.

These coefficients however do not tell the complete story. For example, in order to produce output from the chemicals industry inputs are required directly from the mining industry. To supply this direct requirement, the mining industry itself requires inputs from the chemical industry. To produce this indirect requirement of the mining industry, the chemical industry needs, in turn, additional output from the mining industry and so on in a convergent infinite series. This example is isolated to two industries. When the inter-relationships of all industries in the economy are considered the direct input-output coefficients have major shortcomings. This is not to be confused with the direct allocation of imports which is a separate issue.

What are needed are the total requirements coefficients. This is done by tracing, step by step, throughout the industrial structure, until the increments of output required indirectly from each industry become insignificant. If this operation is carried out for all industries and the direct and indirect requirements are added together, a matrix of total requirement coefficients are obtained. This process is done on a computer using matrix inversion.

In these tables a coefficient at the intersection of row i and column j in quadrant 1 and 3 represents the units of output of industry i required directly or indirectly to produce 100 units of output absorbed by final demand of industry j.

NIEIR's YourPlace-IO – regional input-output software

Input-output information is available for the Australian economy as a whole and is collected by the ABS. With this information a system of building blocks is used each of which shows, for a product (or more commonly combination of products):

- its origin or source of supply divided into domestic production and imports;
- its destination classified into usage by various industries and final demand categories; and

- the difference between the basic price and the purchasers price for each product or margin.

NIEIR has pioneered the creation of region specific input-output tables with the creation of YourPlace-IO. The geographical unit of analysis is the local government area (LGA) and several LGA's can be aggregated to create a regional economy.

This process can broadly be explained in four steps and is undertaken for every region.

These are elaborated on below.

STEP 1 Prepare the national indirect allocation of imports table

STEP 2 Gather all economic data on the region of interest, including industry output and consumption expenditure.

STEP 3 Analyse the regions industries input requirements given its output.

STEP 4 See how much of this input requirement can be sourced from local production.

The input-output tables are estimated for the 106 industries in the national input-output tables prepared by the Australian Bureau of Statistics (ABS). The ABS tables have 107 industries. However, data limitations forced aggregation of two: the agriculture and livestock industries.

YourPlace-IO uses the YourPlace data estimates for each LGA for:

- private consumption expenditure for 400 categories;
- construction expenditure;
- equipment expenditure;
- government consumption expenditure; and
- industry output.

YourPlace-IO estimates exports and imports by 106 industries; and then calculates input-output relationships based on the indirect allocation of imports by the ABS methodology.

To measure the strength of the supply chain within a region, however, the indirect allocation tables have to be converted to tables based on the direct allocation of imports into the LGA (Step 4). These tables show the inter-relationships between industries operating within each LGA boundary.

Such tables are estimated from:

(i) the LGA indirect import allocation tables (technological tables); and

(ii) the national direct import allocation tables (as described above).

Once all the steps are undertaken the following scenario can be analysed. A specific example using the meat industry will be considered. Suppose for a region it is found for the meat industry that the column sum is 1.41. This means that for each $1 million of demand for the meat industry in an LGA that $0.41 million of additional output is generated by other industries in the LGA.

The increase in the output of other industries will represent the supply from the:

- agriculture;
- business services;
- energy;
- transport; and
- other manufacturing,

industries into the next industry to enable the meat industry to function. The more the meat industry sources its supplies of goods and services from outside the region, the smaller will be the 1.41 column sum. This figure is refereed to as a Type I multiplier.

Using input-output for analysis

An important tool for analysts is the input-output multipliers. These provide a way of answering some of the questions often asked by economists and managers. These queries tend to arise because of the types of 'what if?' analysis for which input-output tables can be used (for example, what would be the impact on employment of an x per cent change in output by the chemicals manufacturing industry). This type of analysis is dependent on a knowledge of input-output multipliers and their shortcomings. Using input-output tables, multipliers can be calculated to provide a simple means of working out the flow-on effects of a change in output in an industry on one or more of imports, income, employment or output in individual industries or in total. The multipliers can show just the 'first-round' effects, or the aggregated effects once all secondary effects have flowed through the system.

The basic role of input-output analysis is to analyse the link between final demand and industrial output levels. The inverse table, total requirements coefficient in the national accounts context, could be used to assess the effects on the productive system of a given level of final demand. Employment implications are equally important in this respect.

Input-output tables can also be used for analysing changes in prices stemming from changes in costs or from changes in taxes or subsidies.

Here are some practical examples to help illustrate the application of input-output tables. For instance, it is possible to estimate the levels of output of the production sectors required by a given final demand. The effect on other industries of an additional final output of $100 million of the rubber and plastics industry, or a 30 per cent change in exports of steel can be calculated by assuming that average and marginal utilisation rates are the same.

Another example of input-output application is assessing the benefits of a specific project to a regional economy. The analysis of the impact must be broken up into two stages. Firstly the construction phase and secondly the operational phase. Irrespective of which type of industry the project is in, both phases will utilise different input requirements and need to be analysed separately.

For example, the construction of a new motor vehicle plant will require inputs from industries such as; construction, building services, steel and machinery and equipment. The impact of the construction of a $150 million automobile plant on the economy may be $105 million once the direct and indirect benefits have flowed through the economy. That is, regional suppliers have provided this amount of inputs.

Once the plant is up and running it will be drawing on inputs from a diverse range of industries including; rubber and plastics, transport equipment, non-metallic minerals (glass etc.) and the fabricated metals industry. An estimated annual output of $100 million for the plant, may have additional benefit to the regional economy of $75 million. That is, $25 million will be imported intermediate or primary inputs.

The total benefit to the region in the first year will equal $180 million (combining construction and operation impacts).

The results of user analyses will be correct to the extent to which input-output coefficients are stable. This depends on if the assumptions underlying the input-output estimates have been satisfied. One of the main assumption is homogeneity. It postulates that:

1. each sector produces a single output (i.e. all the products of the sector are perfect substitutes for one another or are produced in fixed proportions); and
2. there is no substitution between the products of different sectors.

The homogeneity assumption may be weakened by changes in the product mix (and consequent changes in inputs), the introduction of new products or materials and the substitution of imported products for domestic production. This assumption may be

realistic for the year the data is collected but becomes progressively less so as time goes on. NIEIR has accounted for the short falls due to the homogeneity assumption by allowing for some of these changes. Estimates of input changes brought about by technological advances have been accounted for using the latest international data and expert advice. Also changes from import substitution have been accounted for by using the indirect import allocation method and analysing trends in trade data.

The second main assumption is the proportionality assumption. It postulates that the changes in the output of an industry will lead to proportional changes in quantities of its input (i.e. for each output, each of these inputs will be a fixed proportion of the total). Economies of scale are therefore ignored. This effect could be accounted for by further refinement of the tables. Given however, that the tables (in quadrant 1 and 3 in our diagram above) represent production functions for firms large and small, any distortions created by the proportionality assumption are balanced out and do not overly bias their use in regional analysis.

Appendix 4: *YourPlace I-O* data on flow-on impacts

The table below provides details of the output from the National Economics produced input-output model *YourPlace I-O* for the *Combined Overall Effects* of a one million dollar investment in the 'forestry and logging' sector – which in this case equates to the plantation sector, as there is no native forest harvesting activity in the Great Southern.

The *Combined Overall Effects* represent all the flow-on effects of this one million dollar investment, through several rounds of activity, and including both production and consumption induced effects.

All sectors in which there is more than $0.0001 million of flow-on effect are listed. In a number of other sectors, there are flow-on effects smaller than this, and they are not listed separately. As a result, the 'Total' figure does not equal the sum of the industry sectors shown. All figures are in $2001.

Table A4: *YourPlace I-O* Combined overall effects table

No.	Commodity name	Output ($ million)	Employment (number of people)	Income ($ million)
0300	Forestry and logging	1.0566	11.0118	0.3768
5101	Retail trade	0.0512	1.2388	0.0190
5701	Accommodation, cafes and restaurants	0.0298	0.7288	0.0118
4501	Wholesale trade	0.0826	0.6742	0.0228
5401	Mechanical repairs	0.0431	0.4582	0.0117
8601	Health services	0.0185	0.2715	0.0071
6101	Road transport	0.0299	0.2484	0.0074
9301	Sport, gambling and recreational	0.0238	0.1849	0.0035
7802	Legal accounting, marketing and business services	0.0171	0.1566	0.0061
7803	Other business services	0.0082	0.1594	0.0038
8401	Education	0.0063	0.1512	0.0043
9501	Personal services	0.0066	0.1440	0.0023
8701	Community services	0.0078	0.1380	0.0024
0107	Other Agriculture	0.0135	0.1250	0.0026
7101	Communication services	0.0155	0.1012	0.0037
7301	Banking	0.0098	0.1005	0.0037
7701	Ownership of dwellings	0.1007	0.00	0.00
0200	Services to agriculture	0.0077	0.0910	0.0025
7702	Other property services	0.0420	0.0479	0.0017
2809	Agricultural, mining and construction	0.0114	0.0710	0.0028
7401	Insurance	0.0049	0.0656	0.0025
2101	Meat and meat products	0.0119	0.0581	0.0013
2402	Publishing; recorded media	0.0057	0.0417	0.0013
8101	Government administration	0.0034	0.0411	0.0013
6601	Services to transport; storage	0.0063	0.0369	0.0013
2111	Wine and spirits	0.0059	0.0370	0.0010
7801	Scientific research, tech and computer services	0.0037	0.0383	0.0018

No.	Commodity name	Output ($ million)	Employment (number of people)	Income ($ million)
9601	Other services	0.0033	0.0320	0.0010
3601	Electricity supply	0.0108	0.0229	0.0010
0103	Beef cattle	0.0026	0.0308	0.0005
2108	Other food products	0.0094	0.0224	0.0006
2202	Textile products	0.0026	0.0289	0.0007
2705	Fabricated metal products	0.0027	0.0230	0.0007
9201	Libraries, museums and the arts	0.0020	0.0237	0.0005
2204	Clothing	0.0011	0.0222	0.0004
2902	Furniture	0.0020	0.0203	0.0004
7501	Services to finance, invest., insurance	0.0039	0.0168	0.0007
0102	Grains	0.0017	0.0177	0.0004
0400	Commercial fishing	0.0030	0.0145	0.0004
2103	Fruit and vegetable products	0.0036	0.0139	0.0003
2302	Other wood products	0.0025	0.0149	0.0004
9101	Motion picture, radio and television	0.0014	0.0137	0.0005
2106	Bakery products	0.0020	0.0113	0.0002
1400	Other mining	0.0040	0.0088	0.0004
2502	Basic chemicals	0.0045	0.0073	0.0003
2506	Cosmetic and toiletry preparations	0.0011	0.0089	0.0002
2507	Other chemical products	0.0029	0.0068	0.0003
2903	Other manufacturing	0.0011	0.0081	0.0002
3701	Water supply, sewerage & drainage	0.0026	0.0058	0.0002
2110	Beer and malt	0.0021	0.0024	0.0001
0105, 0106	Other livestock	0.0017	0.0026	0.0001
2102	Dairy products	0.0012	0.0030	0.0001
	Total	**1.7470**	**17.06**	**0.5259**
	Total multiplier	**1.75**	**17.06**	**0.53**

References

Access Economics (2002). Economic Impact Report: Timbercorp. Prepared for Timbercorp.

Australian Bureau of Statistics (ABS). 2002. *Australian Social Trends 2002: Population – National Summary Tables.* ABS, Canberra. URL: http://www.abs.gov.au

Australian Bureau of Statistics (ABS). 2003a. *Australian Social Trends 2003.* URL: http://www.abs.gov.au

Australian Bureau of Statistics. 2003b. Feature articles – The Winemaking Industry in Western Australia. *Western Australian Statistical Indicators*, September quarter, ABS Catalogue Number 1367.5. Australian Bureau of Statistics, Perth.

Barlow, K. and Cocklin, C., 2003, Reconstructing rurality and community: plantation forestry in Victoria, Australia, *Journal of Rural Studies*, 19(4), pp 503-519.

Byron, N. and A. Boutland. 1987. Rethinking private forestry in Australia: Strategies to promote private timber production. *Australian Forestry* 50(4): 236-244

Centre for International Economics (CIE) 2005. *Plantations, jobs and investment in regional NSW: A socio-economic analysis of private forestry in the Bombala region.* Report prepared for Willmott Forests, March 2005. CIE, Canberra,

CFPLM (Centre for Farm Planning and Land Management). 1989. *Consultant's Report to State Plantations Impact Study*, May 1989. Report prepared for the Steering Committee State Plantations Impact Study by the CFPLM, Faculty of Agriculture and Forestry, University of Melbourne.

Curtis, A. and Race, D. 1996. *A review of socio-economic factors affecting regional farm forestry in Australia.* Albury: The Johnstone Centre of Parks, Recreation and Heritage, Charles Sturt University.

Dwyer Leslie Pty Ltd and Powell, R.A. (1995). *Final report of the Oberon rural community development study.* State Forests of New South Wales, NSW.

Farrelly, M. 2001. *Wine industry growth in the Great Southern: Regional implications for infrastructure provision and environmental planning problems.* Produced for the Great Southern Development Commission. University of Western Australia, WA.

Haberkorn, G; Kelson, S.; Tottenham, R. and Magpantay, C. 2004. *Country Matters – Social Atlas of rural and regional Australia.* Bureau of Rural Sciences, Canberra.

Hayter, M. 2003. *Review of studies of the socio-economic impact of forest industries in Australia.* Forest and Wood Products Research and Development Corporation, Melbourne.

Howard, A. 2004. Applying ecologically sustainable forest management to private plantation development in Australia: is it possible? *Integrating forestry into farms, communities and catchments: Proceedings of the Australian Forest Growers Biennial Conference Ballarat 2004.* Australian Forest Growers, Canberra p. 63-67.

Kelly, G. and Lymon, K. 2000. *To trees, or not to trees? An assessment of the social impacts of the plantation industry on the Shire of Plantagenet.* School of Psychology, Curtin University of Technology, Perth.

Lane, R., 1997. Frontiers of green: pine plantations and local communities. National Conference on Australian Forest History. *Australia's Ever-Changing Forests. Proceedings* 155:165.

Margules Groome Poyry Pty Ltd. 1995. *The Economic Impact of the New South Wales Timber Industry.* December 1995. State Forests of New South Wales, Sydney.

Marshall, G. 1996. *A dictionary of Sociology.* Oxford University Press, Oxford.

Naughton, M. 2001. *Commercial farm forestry adoption in the Tumut Shire and its socio-economic impacts.* Honours thesis, Faculty of Science and Agriculture, School of Agriculture, Charles Sturt University – Riverina, NSW.

PEECE Consulting. 2005. *Regional Transport Plan for the timber industry in the south west slopes of NSW.*

Petheram, J.; Patterson, A.; Williams, K.; Jenkin, B. & Nettle, R. (2000). *Socioeconomic impact of changing land use in South West Victoria.* Institute of Land and Food Resources, University of Melbourne, Melbourne. Online at www.gtplantations.org/publications

Pickworth, J. 2005. *Community perceptions of pine plantations: A report based on a sample survey of residents in the Bombala region of NSW.* Report submitted as partial fulfilment of the Degree of Masters of Environmental Science, School of Resources, Environment and Society – Australian National University

Productivity Commission. 2005. *Trends in Australian agriculture.* Research Paper, Canberra.

Prospect Consulting Pty Ltd (2002). *The Timber Industry in North East Victoria A Socio EconomicAssessment.* Plantations North East Inc. Albury.

Schirmer, J. (1998). *Socio-economics of commercial farm forestry: developing strategies to assist uptake by landowners in north-east Tasmania.* Honours thesis, Department of Forestry, Australian National University, Canberra.

Schirmer, J. 2002. *Plantation forestry disputes: case studies on concerns, causes, processes and paths toward resolution.* Technical Report No. 42 (Revised), Cooperative Research Centre for Sustainable Production Forestry, Hobart.

Schirmer, J. and Tonts, M. 2002. *Plantations and sustainable rural communities.* Paper presented at Prospects for Australian Forest Plantations 2002 20-21 August, 2002, Canberra. Online at: http://www.affa.gov.au/corporate_docs/publications/pdf/rural_science/forest_vegetation/plant_conf02/pap_6_schirmer.pdf

Shea, S., and Bartle, J. 1988. Restoring nature's balance. *Landscope*, 4(2), 6-17.

Soutar, G. N. and Wallis, Y. M. (1986) *Farmers' attitudes towards pine afforestation on farms in the Manjimup area* (Technical Report 5). Perth: Department of Conservation and Land Management

Spencer, R. D, and L. Jellinek, 1995. Public concerns about pine plantations in Victoria. *Australian Forestry* 58:99-106.

SPIS (State Plantations Impacts Study) Steering Committee. 1990. *State Plantations Impact Study Report & Recommendations.* May 1990.

Tonts, M., and A. Black, 2003. The social and economic implications of farm plantation forestry: a review of some key issues. *Rural Society* 13:174-192.

Tonts, M.; Campbell, C. and Black, A. (2001). *Socio-economic implications of farm forestry.* RIRDC, Canberra. Online at http://www.rirdc.gov.au/reports/AFT/01-045.pdf

URS Forestry. 2004. *Profile of the value of the timber industry in the South West Slopes region of New South Wales.* Report prepared for the Riverina Regional Development Board, August 2004.

Key data sources

Australian Bureau of Statistics. *Agricultural Census*, various years. Data for all the years shown in this report was extracted from the ABS *Integrated Regional Database* 2003, and concorded to 2001 geographic boundaries. For more information on the Census, see www.abs.gov.au

Australian Bureau of Statistics *Census of Population and Housing 1991, 1996, 2001*. For more information on the Census, see www.abs.gov.au. All Census data was concorded to 2001 geographic boundaries.

Australian Bureau of Statistics *Household Income and Income Distribution, Australia, 2000-01 (6523.0)*

Bureau of Rural Sciences. *National Forest Inventory*. For information about the NFI, go to http://www.daff.gov.au/nfi

Department of Education and Training, Western Australian. School enrolment data.

Department of Land Information, Western Australia. Land sales data.

National Economics. *YourPlace* database. For information on the *YourPlace* database, go to www.nieir.com.au. All *YourPlace* data was concorded to 2001 LGA boundaries.

Other reports from this study

Schirmer, J.; Parsons, M.; Charalambou, C.; and Gavran, M. 2005. *Socio-economic impacts of plantation forestry in the South West Slopes of NSW, 1991 to 2004.* Report produced for FWPRDC Project PN04.4007. Forest and Wood Products Research and Development Corporation, Melbourne

Schirmer, J. 2005. *Approaches to assessing socio-economic impacts of plantation forestry.* Report produced for FWPRDC Project PN04.4007. Forest and Wood Products Research and Development Corporation, Melbourne

Schirmer, J. 2005. *Socio-economic impacts of plantation forestry in the Great Southern region (WA).* Information booklet produced for FWPRDC Project PN04.4007. Forest and Wood Products Research and Development Corporation, Melbourne

Schirmer, J. 2005. *Socio-economic impacts of plantation forestry in the South West Slopes region (NSW).* Information booklet produced for FWPRDC Project PN04.4007. Forest and Wood Products Research and Development Corporation, Melbourne

Schirmer, J. 2005. *Socio-economic impacts of plantation forestry.* Information booklet produced for FWPRDC Project PN04.4007. Forest and Wood Products Research and Development Corporation, Melbourne