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Socio-economic impacts of the plantation industry on rural communities in Western Australia

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Public report

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Executive summary

This report examines the socioeconomic impacts of the plantation industry in Western Australia (WA). It focuses on examining whether expansion of plantations, particularly the hardwood plantations established in the last two decades, leads to socioeconomic change in rural areas of WA, and the types of impacts these changes may have for different people.

The research carried out for this report was funded by the Cooperative Research Centre (CRC) for Forestry and undertaken by researchers at the Fenner School of Environment and Society of the Australian National University.

The area of plantations established in WA has expanded rapidly in recent decades. Until the 1980s most of these plantations were softwood plantations, while from the 1990s onwards most new plantations have been hardwood plantations. By 2008 a total of approximately 109 150 hectares of softwood plantations and 304 900 hectares of hardwood plantations had been established across the State. Plantations have mostly been established in high rainfall regions in the South West area, Great Southern area and, more recently, around Esperance. In several local government areas, more than 5% of agricultural land has been established to plantations. In recent years the majority of new hardwood plantations have been established on land purchased by institutional investors or plantation companies, and currently approximately 52% of hardwood plantations are established on purchased land, while 48% have been established on land leased from rural landholders.

Group interviews of residents in eight locations in WA were used to identify key questions often asked by rural residents about the socioeconomic impacts of plantations. The interviews revealed a wide-ranging debate over the employment, population and community impacts of plantations. Much of this debate can be informed by research on the socioeconomic changes and impacts associated with plantation industry expansion, and each of the following questions was analysed to help inform debate about the impacts of plantations. While not enough evidence is currently available to answer some questions, others were able to be explored through analysing data on employment, population, land prices and other socioeconomic changes occurring in plantation regions of WA.

How much employment is generated by plantations? In 2006 an estimated 2730 people worked in the plantation industry in WA, equating to approximately 2495 full-time equivalent jobs. Of these, approximately 1510 worked in the softwood plantation sector, and 1220 in the hardwood plantation sector. This equates to generation of 0.45 jobs per 100 hectares of hardwood plantation, and 1.44 jobs per 100 hectares of softwood plantation. In coming years hardwood plantations will likely generate more employment as a greater proportion of the estate reaches maturity and enters harvest and replanting/coppicing, assuming the large majority of the current plantation estate is harvested and regrown.

How does the employment generated by plantations compare to other land uses? Plantations may generate more or less employment than other land uses, depending on the point in the chain of production at which different land uses are compared, the type of land use plantations are compared to, and the type of plantation. To the point of the 'farm gate'—at which goods such as logs, shorn wool, grain, or milk have been

produced but not yet processed—hardwood plantations generate less employment than most other land uses except grain growing, while softwood plantations generate slightly more employment than sheep grazing, beef grazing and cropping, but less than dairy farming or grape growing. When subsequent processing of farm-gate goods is included in the analysis (such as the employment generated in woodchipping and sawmills, wool scouring, abattoirs, and dairy factories), both hardwood and softwood plantations generate more employment than sheep grazing, beef grazing and cropping, but less than grape growing.

What types of jobs are generated by plantations? The plantation industry generates a higher proportion of full-time jobs than the average for the workforce in WA, and almost as high a proportion of full-time jobs as traditional agriculture.

Where are plantation industry jobs located compared to other land uses? Plantation industry workers are more commonly located in large towns and regional cities than those working in sheep grazing, beef grazing, cropping or grape growing, and less likely to be located in small towns or on rural land. Therefore a shift in land use from traditional agriculture to plantations is likely to be accompanied by a shift in the location of job opportunities from smaller towns to larger regional centres.

How does plantation expansion affect local and regional rural economic activity? Not enough evidence is currently available to answer this question.

How does plantation expansion affect rural population levels? Land use change from agriculture to plantations leads to different types of population change depending on how plantations are established. At the scale of the individual property, when land is sold to a plantation company there is a net loss of between 7% and 19% of population living on the properties, with 75% of previous residents shifting away but, within two years, new residents shifting back into housing on the property in a majority of cases. When land is leased to a plantation company, there is a net loss of approximately 5% of the population that used to live on these properties. When farmers establish their own farm forestry, there is no change in the number of people living on the properties involved. These changes are not necessarily higher than those that would occur in the absence of plantation expansion, with trends such as farm amalgamation having similar impacts on rural population in many areas; however, further analysis is needed to confirm this. When population change is examined at a larger scale, the effect of this small net population loss at individual property scale is not observable, as other factors such as population loss due to farm amalgamation, and influx of 'seachange' residents in coastal regions, have had a larger impact on rural population than the expansion of plantations. At the local government area scale, factors such as distance to the coast and proximity to regional cities are better predictors of population change than the area of plantations established in a region.

How does plantation expansion influence the type of people living in rural communities? While there is a relatively small net loss of population associated with expansion of plantations, there is a high turnover of residents on rural properties that are sold to plantation companies. Three-quarters of previous residents shift off these properties when they are sold, and new residents then typically shift in, either renting houses or purchasing subdivided housing on the plantation property. This turnover can create rapid change in the people living in a rural community, but little is

currently known about the characteristics of these new residents compared to those who shifted away from plantation properties.

How does plantation expansion influence service provision and community groups in rural communities? There appears to be a slightly higher decline in school enrolments in areas that experience high plantation expansion compared to other regions, although the reasons for this need to be further explored. In a recent survey, landholders who sold land to plantation companies reported that they ceased or changed location of their membership of local fire brigades in 60% of cases, ceased membership of service groups such as Rotary in 32% of cases, and changed location or ceased membership of sporting groups in 55% of cases as a result of the sale, while those who leased properties reported almost no change in community group membership. The extent to which new residents shifting onto plantation properties join local groups and access local services is not known, something which will help determine the net impact of plantation expansion on community groups and rural services.

How does plantation expansion affect rural land prices? During periods of rapid plantation expansion, plantation companies have often paid higher than average prices for land suitable for plantations. This has led to higher than average land price growth in plantation regions during periods of rapid plantation expansion. Other trends have led to similarly rapid increases in land prices at some point in time in regions not experiencing plantation expansion, with similarly high land price rises experienced at times in most high rainfall areas irrespective of the extent of plantation expansion.

How does plantation expansion affect traditional agricultural industries? Areas experiencing high rates of plantation expansion have typically experienced a higher than average decline in sheep and lamb numbers, and slower growth in beef cattle numbers and the area of land cropped, compared to other regions. It does not appear that plantation expansion has affected expansion of grape growing, vegetable growing or dairy farming, with all of these expanding more rapidly in high rainfall regions than other areas in WA.

Do different types of plantations have different socioeconomic impacts? More work is needed to adequately answer this question. Currently the primary difference noted is that softwood plantations generate greater employment per 100 hectares than hardwood plantations. This is a result of the greater level of downstream processing of softwood plantation timber compared to hardwood plantations, and will change as the amount and nature of downstream processing of hardwood and softwood plantations changes over time.

How do the socioeconomic impacts of plantations vary in different circumstances? The expansion of the plantation estate, or of industry associated with it, can lead to a wide range of socioeconomic changes in rural areas, as can establishment of any new industry. The impacts of expansion of the plantation industry will vary depending on the size of the rural town being examined, the location of processing facilities associated with the plantation industry, the types of new residents who shift onto plantation properties, and the types of agriculture being replaced by plantations.

What do all these changes suggest about the socioeconomic impacts of plantations? Plantation industry expansion is associated with changes to employment availability, rural population, community groups and land prices. How these changes impact on people living in rural and regional communities where plantations are expanding will differ depending on individual circumstances. For example:

- If employment opportunities shift from small rural towns to larger regional centres as a result of the land use change, this may have negative impacts for some people living in the small town, and positive impacts for some people living in the regional centres.
- If land prices rise due to demand from plantation companies, this will be likely to have positive impacts for those who wish to sell land, but may reduce opportunities for other farmers in the area to expand their farm enterprise through purchasing additional properties.

While the information presented in this report cannot answer all questions raised about socioeconomic impacts of plantations, it suggests these impacts differ in different situations. There is therefore opportunity to consider how to maximise the positive changes associated with plantation expansion, and minimise negative impacts.

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Tables and figures

Introduction

Debate about the socioeconomic impact of tree plantations has been common in recent years in Australian rural communities. Rapid expansion of hardwood plantations has been accompanied by a range of differing perceptions about their impacts. Some people strongly believe the plantation industry brings a range of benefits to rural regions, while others have raised a number of concerns about the impacts of plantation industry expansion on rural communities.

This debate often takes place in the absence of detailed information and evidence about the different issues being discussed. However, while not all questions about the socioeconomic impacts of plantation can currently be answered, a more comprehensive understanding of the socioeconomic impacts of plantations is emerging as a result of research undertaken in recent years.

To help inform debate over these issues, this report presents results of recent research that has explored key questions about the socioeconomic impacts of the plantation industry in Western Australia. It focuses in particular on the impacts of expansion of the hardwood plantation estate in recent years, but also refers to softwood plantations where relevant.

First, a number of common questions about the socioeconomic impacts of plantations are identified. Each of these topics is then discussed in turn, with a brief review of different points of view about the topic, consideration of the types of information needed to help answer the questions raised, and presentation of results of research undertaken in recent years, including research undertaken specifically for this report. Limitations and gaps in current research are identified.

The report focuses on the socioeconomic impacts of plantations. It does not address biophysical issues related to plantations such as fire management, water, pesticide use, or biodiversity. These issues are important, and are being researched by other groups in Australia, with some reports available on these topics[1]. Impacts of changes to native forest management and access are not examined; this is an important area which requires further research.

The report focuses on a particular type of impact assessment: identifying independent evidence that can assist in answering common questions about the socioeconomic impacts of plantations. It does not provide an analysis of all types of socioeconomic impacts. Other studies that have explored issues not covered in this report are listed in the 'references' section of the report to enable readers to explore other aspects of socioeconomic impact.

Where possible, evidence from Western Australia (WA) is used to answer the questions examined in this report, which focuses on understanding the socioeconomic impacts of plantation expansion in WA. Where no WA data was available, results of research undertaken in other Australian regions are drawn on, and the applicability of those results to WA is discussed.

[1] See for example Keenan et al. (2004), Benyon and Doody (2005), Cawsey and Freudenberger (2005), Jenkin and Tomkins (2006). Links to some other scientific reports on environmental impacts of plantations are available at http://www.planningplantations.com.au

How was this report funded, and what measures were used to ensure independence of analysis?

This report was funded by the Cooperative Research Centre (CRC) for Forestry, a research group that is funded by the Australian federal government, state government agencies involved in forestry, private forestry companies, research organisations and universities. A full list of the partners who fund the CRC for Forestry is given at http://www.crcforestry.com.au.

The research was undertaken by researchers at the Australian National University's (ANU) Fenner School of Environment and Society. The ANU is one of the CRC for Forestry's research partners. Information about the Fenner School is available at http://fennerschool.anu.edu.au.

The CRC for Forestry's funders include partners who are actively involved in the forest industry, as well as several who are not. A number of measures have been taken to ensure the research undertaken for this report is independent and not biased due to some funding coming from those involved in the forest industry.

Firstly, it was important to ensure the right questions were being asked. This was done by holding group interviews with members of rural communities in Western Australia to ask them their views about plantations (described in the next section of this report), and reviewing past reports and media to identify the different views expressed about plantations. Both positive and negative views about the impacts of plantations are presented throughout this report, to ensure that all views are clearly communicated.

The data and methods used to answer common questions about plantations are described in detail throughout this report, and limitations in the data are clearly described. By documenting where the information presented comes from and how it has been analysed, you can see how answers to each question have been reached, and decide whether you agree with the analysis presented.

Local experts, such as farmers, local government planners and council members in plantation regions of Western Australia, were asked to help interpret the statistical data collected for this report. Interviewing people with local knowledge of how land use and rural communities are changing in regions including the Great Southern, Esperance and the South West areas helped weed out inaccurate data, enabled correction of any mistakes in the data, and most importantly ensured that different interpretations were identified that people with differing views of plantations might make of the data.

The research reported here is in the process of being published as a set of peer-reviewed journal articles. This ensures that the data presented is thoroughly reviewed by experts who are independent of the project. Later versions of the report will include a list of peer-reviewed papers published from this research.

These measures have been taken to ensure that the research process is clearly documented and replicable, and reviewed by experts in the field who have no vested interest in the plantation industry, ensuring independence of the research.

Plantation forestry in Western Australia

There is a long history of plantation forestry in Western Australia (WA), beginning in the early 1900s with establishment of government-owned softwood plantations, and more recently shifting to establishment of hardwood plantations.

The area of plantations established in WA over time is shown in Figure 1, which separates softwood establishment (primarily *Pinus pinaster* and *Pinus radiata*) from hardwood establishment (primarily *Eucalyptus globulus*, more commonly referred to as blue gum).

Softwood plantations in WA were established primarily from the 1960s through to the 1980s, although in recent years new *Pinus pinaster* plantations have been established. This period of softwood plantation establishment was followed by rapid expansion of hardwood plantations. Hardwood plantations began to be established in the 1980s, but the large majority were established from the 1990s onwards. By 2008 a total of approximately 109 150 hectares of softwood plantations and 304 900 hectares of hardwood plantations had been established across the State[2].

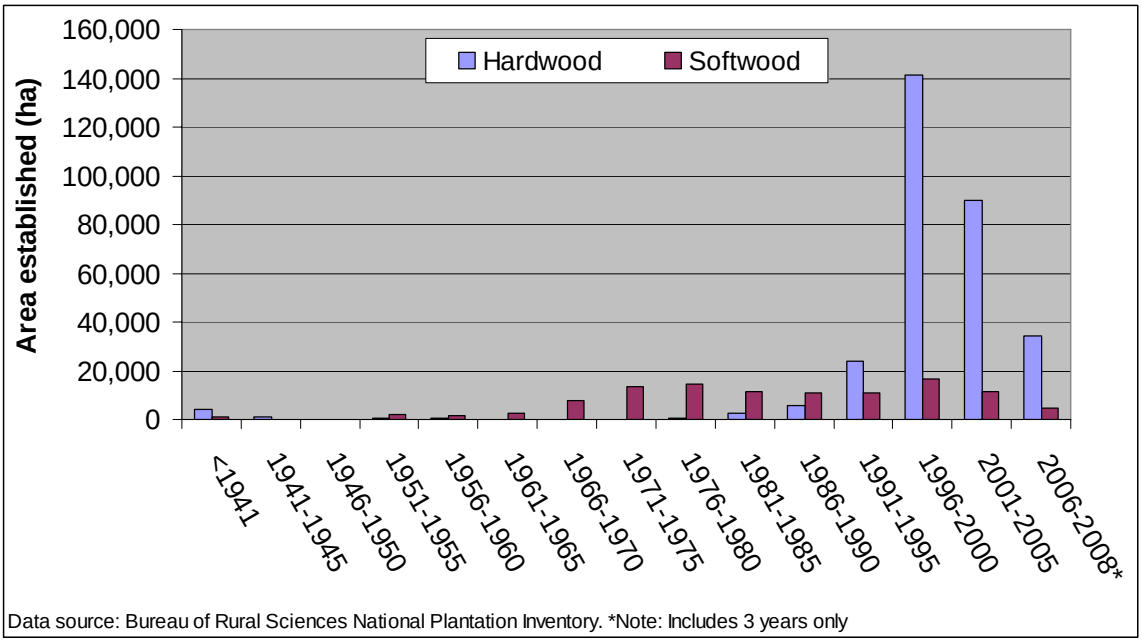

Figure 1: Total area of Western Australian plantations by year of planting or replanting[3]

Along with the shift in focus from establishment of softwood plantations to hardwood plantations in the early 1990s, there was a shift in who undertook the planting. While the State undertook most afforestation up to the 1980s, from the 1990s planting was

[2] Data source: Bureau of Rural Sciences (BRS) *National Plantation Inventory*. Data on the area of plantations in different WA localities can be downloaded from the BRS online Plantation Information Network at www.brs.gov.au/plantations/.

[3] These figures do not include eucalypt mallee plantings, or sandalwood plantings, as data on these types of plantings are not collected by the Bureau of Rural Sciences National Plantation Inventory, the source of the information provided here. The year of establishment reflects when the current plantation was established. In some cases, these are second-rotation plantations, meaning that the original plantations was established earlier, harvested, and then replanted with the current plantations. The data in Figure 1 reflect when the most recent plantation was established on the site.

undertaken almost exclusively by the private sector. By 2005, almost 72% of WA's total plantation estate consisted of privately owned trees established on privately owned land, predominantly as a result of establishment of privately owned hardwood plantations from the 1990s onwards. As can be seen in Figure 2, by 2005 almost 94% of WA's hardwood plantations were privately owned versus only 38% of softwood plantations, while the remaining softwood plantations were fully publicly owned.

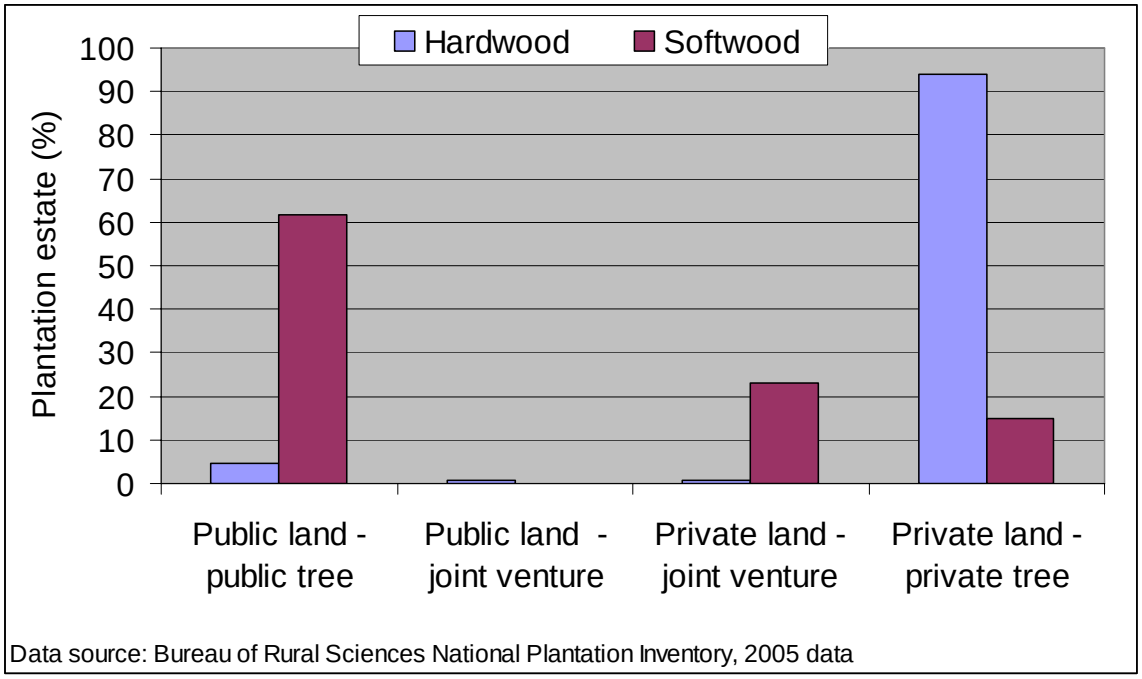

Figure 2: Ownership of plantations in Western Australia, 2005

Privately owned hardwood plantations in WA have generally been established through either direct purchase or lease of land by a plantation company. Table 1 shows the estimated percentage of plantations established on leased versus purchased land in different regions of WA.

Table 1: Type of land on which plantations have been established in WA

Region	Hardwood plantations (%)			Softwood plantations (%)		
	Leased private land[1]	Purchased private land[2]	Public land[3]	Leased private land[1]	Purchased private land[2]	Public land[3]
Great Southern	44%	56%	<1%	>99%	<1%	0
South West	64%	33%	3%	10%	1%	89%
Esperance	35%	65%	<1%	94%	3%	4%
Total	48%	52%	<1%	31%	1%	67%

[1]Leased land refers to land leased from a landholder by a plantation company. Where possible, land purchased by an institutional investor for the purposes of leasing to a plantation company has been excluded from this category and instead included in the 'purchased' category as it originally involved a sale of land for purposes of plantation establishment. Sharefarming arrangements (in which a farmer may receive a lease payment, annuity and/or share of payment at harvest) are included in this category.
[2] Purchased land refers to land purchased directly by plantation companies, or purchased by an institutional investor for the purpose of leasing to a plantation company.
[3] Public land refers to land managed by the WA State government on behalf of the public.
Figures have been rounded to nearest percentage point.

While in earlier years of hardwood establishment, a majority of hardwood plantations were established on land leased from farmers, this has gradually changed, and plantings in recent years have been predominantly on land purchased directly from farmers, rather than leased land. In both the Great Southern and Esperance regions, the majority of hardwood plantations have been established on land either purchased outright by plantation companies, or purchased by an institutional investor for the purpose of leasing to a plantation company.

The majority of softwood plantations are on public land or land leased from farmers.

Joint ventures—in which plantation companies or agencies partner with landholders to establish trees on part of the landholder's property, with the partners sharing the returns from those trees—are less common than establishment of plantations through lease or purchase of land. In Western Australia in recent years an increasing area of plantations have been established by the Forest Products Commission under share-farming arrangements (a type of lease) as part of its tree planting programs in low rainfall areas with eucalypts, pinaster pine and sandalwood. Under share-farming arrangements landholders can generally choose between up-front payments, annuities, a share of returns at harvest or a combination of these.

The majority of plantations are located in the South West and Great Southern regions of WA, although there are some large areas of softwood plantations outside these, as well as a large area of hardwood plantations established in recent years around Esperance.

The area of hardwood plantations in each local government area (LGA) with more than 1000 hectares (ha) of hardwood plantation by 2005 is shown in Figure 3[4], together with an indication of when the plantation was established[5]. The LGAs with the greatest area of hardwood plantations are Albany, Plantagenet, Nannup, Esperance, Cranbrook, Williams, Boyup Brook and Kojonup, all of which have more than 10 000 hectares of hardwood plantations. When the area of hardwood plantations as a percentage of agricultural land is calculated (Figure 4), a slightly different picture emerges. Nannup, which has relatively little agricultural land as a percentage of its total land area, has had the largest percentage of agricultural land established to plantation, followed by Albany, Plantagenet, Boyup Brook, Williams, Cranbrook, Collie, Denmark, Bridgetown-Greenbushes, Manjimup and Boddington, all of which have more than 5% of agricultural land established to hardwood plantations. All other LGAs have less than 5% of agricultural land established to plantations[6].

The area of softwood plantations in each local government area (LGA) with more than 1000 hectares (ha) of softwood plantation by 2005 is shown in Figure 5. Similarly to Figure 3, the year of planting is shown; this is often but not always a good indicator of

[4] Only data to 2005 are shown as it was not possible to obtain detailed data on plantation location by LGA for the years 2006–2008.

[5] In some cases, the time of establishment is based on when a second rotation of a plantation was planted, with the original plantation established some time before that.

[6] These estimates are based on Australian Bureau of Statistics (ABS) data estimating the area of agricultural land in each LGA, figures which are sometimes disputed and hence should only be considered accurate to within approximately 5–10%, as indicated by the error bars in Figure 4. A similar analysis could not be undertaken for softwood plantations, as some softwood plantations established in the 1960s and 1970s were established on land cleared of native forest, rather than already predominantly cleared agricultural land.

when the plantation was first established as many softwood plantations were originally established several decades ago and have been harvested and replanted, so that the year of establishment sometimes reflects when a second rotation of the plantation was established. However, it can still be seen that a large proportion of softwood plantations were established prior to 1991, whereas hardwood plantations have predominantly been established since 1991, and most often since 1996.

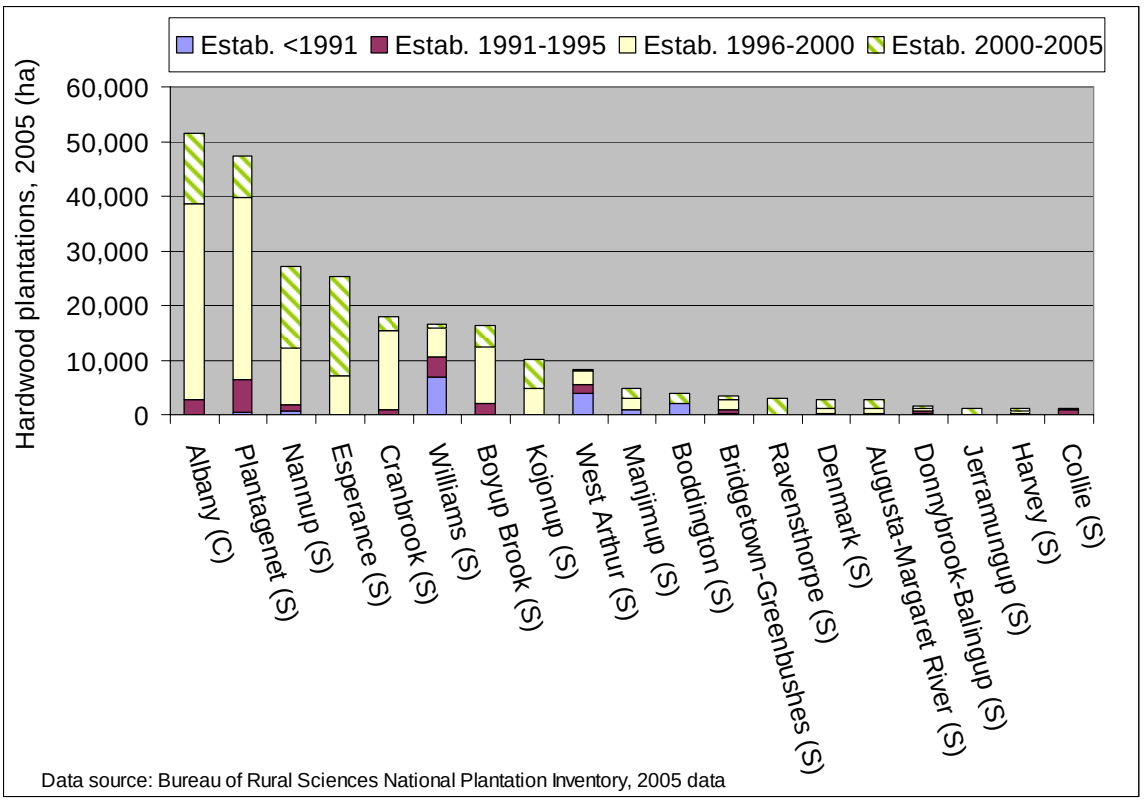

Figure 3: Area of hardwood plantation established in 2005, by LGA and period of establishment

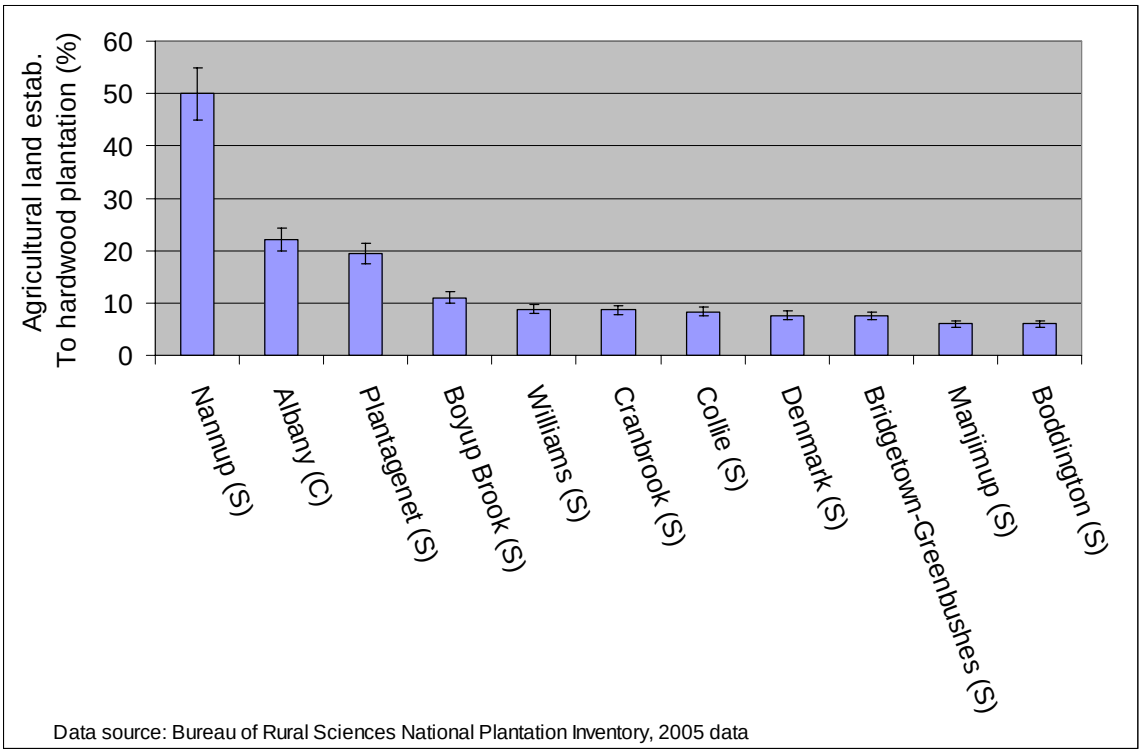

Figure 4: Proportion of agricultural land established to hardwood plantation by LGA, 2005

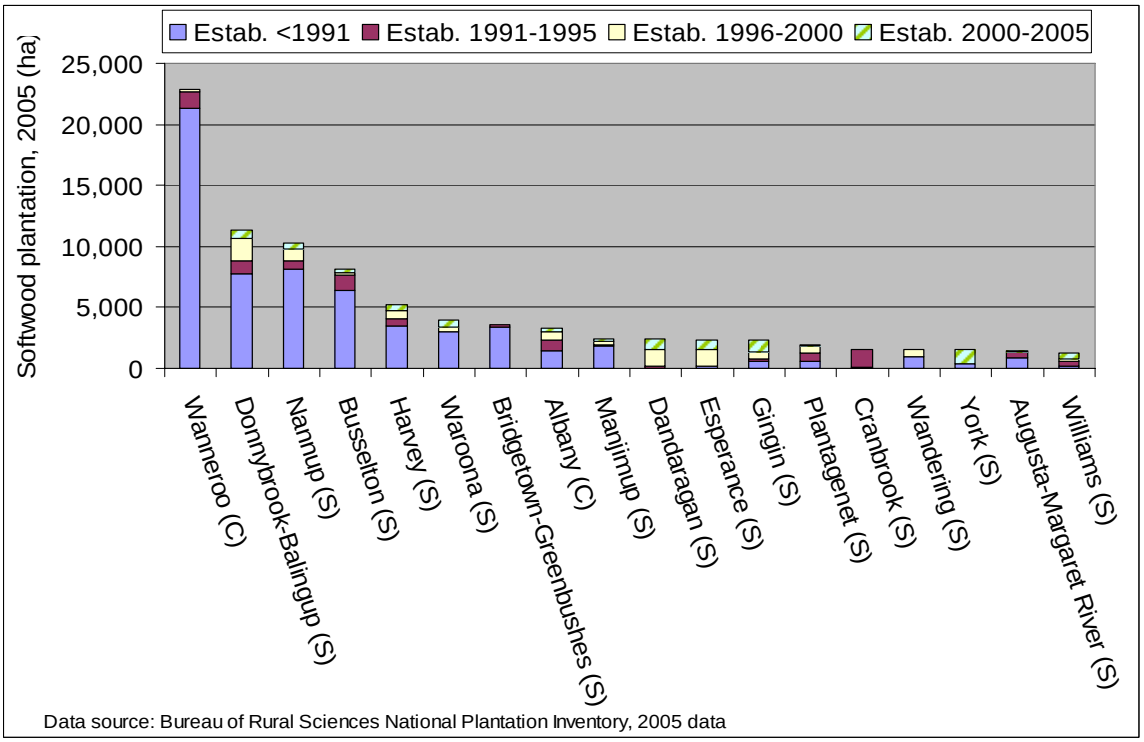

Figure 5: Area of softwood plantations established, by shire and period of establishment

Different LGAs in WA were classified as having low, medium or high area of plantations relative to their total cleared agricultural land, and (for hardwood plantations), low medium or high plantation expansion in recent years. Table 2 lists the LGAs classified as having low, medium or high areas of softwood and hardwood plantation relative to their area of agricultural land. This classification is used to analyse socioeconomic impacts of plantations throughout this report.

Table 2: Local government areas classified by their area of plantations relative to agricultural land

Ranking	Hardwood plantations: area and rate of expansion	Softwood plantations: area of plantation
High[1]	Nannup, Albany, Plantagenet, Boyup Brook	Nannup, Donnybrook-Balingup, Wanneroo, Busselton
Medium[2]	Bridgetown-Greenbushes, Manjimup, Esperance, Cranbrook, Williams, Collie, Kojonup, Denmark, Boddington	Harvey, Waroona, Bridgetown-Greenbushes
Low[3]	Donnybrook-Balingup, Harvey, Waroona, Augusta-Margaret River, West Arthur, Capel, Murray	Albany, Plantagenet, Augusta-Margaret River, Manjimup, Esperance, Cranbrook, Williams, Dandaragan, Gingin, Wandering, York
Negligible/none[4]	All other LGAs	All other LGAs

[1]High = More than 10% of agricultural land established to plantations by 2005

[2]Medium = More than 5% but less than 10% of agricultural land established to plantations, or less than 5% of land but more than 10 000 hectares of plantations

[3]Low = More than 1% but less than 5% of agricultural land had been established to plantations by 2005, and less than 10 000 hectares of plantations had been established in total by this time

[4]Negligible/none = Less than 1% of land, and in all but two cases less than 1000 hectares of plantation established by 2005. The exceptions were Ravensthorpe and Jerramungup where, while 2900 and 1200 hectares of hardwood plantation had been established respectively, the large size of each LGA meant that this represented a very small proportion of land (well below 1% in both cases).

Key questions about socioeconomic impacts of plantations

The first step in examining the socioeconomic impacts of plantations was to identify the key questions often asked in rural communities about these impacts. These were identified by (a) holding a series of group interviews in the region in which participants were asked to discuss their views about the impacts of plantations[7], (b) reviewing previous studies to identify the views expressed by WA residents and reported in these[8], and (c) identifying the differing perspectives reported in the media in recent years about plantations.

In addition, in 2008, Williams (2009) undertook a quantitative survey of attitudes towards plantations, and the results of this helped improve understanding of common beliefs held about the socioeconomic impacts of plantations.

This resulted in identification of a large number of questions about the socioeconomic impacts of plantations. Debate over several of these issues can be usefully informed by independent evidence, particularly the following questions:

- How much employment is generated by plantations?
- What types of jobs are generated by plantations?
- Where are jobs in the plantation industry located compared to traditional rural jobs?
- How does plantation expansion affect local and regional rural economic activity?
- How does plantation expansion affect rural population levels?
- How does plantation expansion influence the type of people living in rural areas?
- How does plantation expansion affect service provision and community groups in rural communities?
- How does plantation expansion affect rural land prices?
- How does plantation expansion affect traditional agricultural industries?
- Do different types of plantations have different socioeconomic impacts?
- How do the socioeconomic impacts of plantations vary in different circumstances?

Many of these questions are interrelated. For example, the amount and location of employment generated by plantations will influence rural population levels, and this in turn is likely to influence local service provision and community groups.

[7] See Appendix 1 for a description of where group interviews were undertaken, the questions asked, and who took part.

[8] Previous studies undertaken in WA that were reviewed include Kelly and Lymon (2000), Tonts et al. (2001) and Schirmer et al. (2005a). In addition, studies undertaken in other regions were reviewed, particularly Petheram et al. (2000), Schirmer (2002) and Schirmer et al. (2008a).

This list doesn't include some of the other important questions people often ask about plantations. In particular:

- Many people questioned whether managed investment schemes (MIS) give plantation companies an advantage over traditional farmers in accessing land or tax regimes. Answering this question requires specialist knowledge of the tax system which falls outside the expertise in socioeconomic impacts used to undertake this research[9].

- Concerns were commonly raised about the impact of plantation harvesting on local roads, with concerns roads are damaged by the transport of logs and woodchips. This issue is not examined further in this report as it requires specialist knowledge of road infrastructure and engineering. This type of analysis has been undertaken for local governments and the plantation industry in several regions in Australia, and several reports are available online on this issue[10].

- Some people expressed differing views about the visual impacts of plantations on rural landscapes. This issue requires further exploration using direct surveys of people's visual perceptions of plantations—something that was not possible for this report.

Questions about the environmental impacts of plantations were also raised. As this report focuses on socioeconomic impacts, these questions are not addressed in this report; links to some existing reports on these topics were provided in the introduction to this report.

[9] Detailed information comparing current tax provisions available to farmers and tree growers can be found at http://www.plantations2020.com.au/assets/acrobat/ComparativeTaxTable%20Feb%2009.pdf. While produced by those who have an interest in the plantation industry, this provides some of the most detailed information on the context of tax provisions currently available. Details on the points of view of different organisations can be found in submissions to the Federal Government's 2005 review of plantation tax provisions at http://www.treasury.gov.au/, although this information is now out of date as some tax provisions have changed since this time.

[10] See http://www.planningplantations.com.au for further information. Reports on plantations and roads can be downloaded in the 'transport' section of this website.

How much employment is generated by plantations?

A common question asked about plantations is 'how many jobs do they create?' This is often accompanied by questions about how the amount of employment generated by the plantation industry compares to that generated by alternative land uses, what types of jobs are created and where they are located, discussed in the following sections of this report.

What are the different views?

In interviews carried out with WA residents in 2006, a wide range of views were expressed about the amount of employment generated by plantations[11]:

> … there is not a great deal of maintenance or other work required in order to allow the trees to grow.—Interview participant, Margaret River[12]

> If we can value add to the timber industry because that is the reality, it is here to stay, so if we can value add to it and create high level jobs from it that would be the world that I would like to see. —Interview participant, Mount Barker

> … there is some employment involved presumably when they start harvesting and so on …— Interview participant, Kojonup

Some people feel that the plantation industry provides fewer jobs than other land uses, while others believe it has potential to provide new sources of employment. In her survey of residents of WA, Williams (2009) found that there was considerable diversity in views about whether an increase in plantations leads to an increase, decrease or little/no change in employment in the region. In Esperance, 26% of respondents felt it led to an increase while 38% felt it led to a decrease, while in the Great Southern and the South West 34% and 33% respectively felt it led to greater employment versus 23% and 17% believing it led to a fall in employment. Other respondents either felt there would be little or no change to the quantity of jobs available, or indicated they didn't know what the likely impacts would be.

[11] These quotes, together with the description of results of other studies below, represent the diversity of views presented about the employment generated by plantations. A key point to emphasise is that on most of the issues discussed in this report a wide diversity of views exist so that no one perception can be described as 'typical' in most cases. Where possible, quantitative data on the proportion of people who hold particular views about plantations is presented based on Williams (2009); however, this type of data is not available for all the issues discussed in this report.

[12] Note that while the interview in which participants took part is identified, the exact participants are not, so that a label such as 'Interview participant, Esperance' may refer to any of those people who participated in the group interview undertaken in the location indicated. To ensure a diversity of views are reported, almost all quotes are from different interview participants, with only two interview participants quoted more than once (in both cases, two quotes are used from these participants as they expressed a view commonly discussed in the group interviews in a way that clearly summarised that particular point of view).

What evidence is needed to answer this question?

Answering the question of how much employment is generated by plantations requires data on the number of jobs directly generated by the plantation industry. The different types of 'direct employment' generated by the plantation industry are generally considered to include jobs generated by:

- plantation growers, referring to businesses that own and manage plantations
- nursery workers, who grow plantation seedlings
- silvicultural contractors, who undertake jobs such as preparing ground for tree planting, fertilisation, tree planting, thinning, coppicing, pesticide application and firebreak maintenance in plantations
- harvesters and hauliers who harvest and transport plantation timber
- processors, including all people employed in the processing of plantation timber into products such as woodchips, paper, sawn timber and composite wood products
- consultants, who provide expert advice on plantation-related issues
- researchers undertaking specialised research focused on plantations.

Other jobs generated by the industry are generally considered to be indirect or 'flow-on' jobs that result from the presence of the industry. Indirect jobs would include jobs that involve selling goods and services to the industry such as fuel or electricity, and the retail jobs generated indirectly as a result of plantation industry workers spending their wages.

Currently there is no regular collection of data on plantation employment in Australia. The Australian Bureau of Statistics (ABS) produces data on forest industry employment, but does not separate this data into jobs based on native forests and those based on plantations.

However, several 'one-off' studies have estimated the employment generated by the plantation industry. The most recent of these was the Forest Industry Survey of native forest and plantation workers in WA undertaken for this project (full results of this survey are reported in Schirmer 2008). Data from the Forest Industry Survey is utilised here, and is also compared to other recent studies.

What does the evidence tell us?

According to the WA Forest Industry Survey, in 2006 an estimated 2730 people worked in the plantation industry in Western Australia, in jobs including plantation management, silvicultural contracting, nurseries, harvest and haulage, processing and consulting. Once the people who worked part time or on a casual basis were taken into account, this equated to approximately 2495 full-time equivalent jobs.

Of these, approximately 1510 ±10% worked in the softwood plantation sector, and 1220 ±10% in the hardwood plantation sector13.

This equates to generation of:

- 0.45 jobs per 100 hectares of hardwood plantation
- 1.44 jobs per 100 hectares of softwood plantation.

There are two reasons for the large difference in the number of jobs generated per 100 hectares by hardwood versus softwood plantations.

Firstly, a large proportion of the hardwood plantation estate is yet to reach harvest age, and hence the full number of jobs that will be generated as plantations are harvested and regrown through coppicing or replanting is yet to be reached. A larger proportion of the softwood plantation estate has reached harvest age and entered a full cycle of harvesting and replanting. Based on examining employment trends in the Great Southern region of WA, it is likely that once a 'steady state' of harvesting and coppicing/replanting is reached, and assuming that plantations continue to be harvested primarily for woodchip export, hardwood plantations will generate between 0.5 and 0.65 jobs per 100 hectares.

Secondly, there is currently much more downstream processing of softwood plantation timber within WA than there is of hardwood plantation timber. Hardwood plantation timber is usually harvested, processed into woodchips, and exported, although in recent years more processing options have developed such as the densified biomass fuel pellet manufacturing established in Albany, which utilises hardwood plantations as feedstock. In contrast, softwood plantation timber is generally processed through more than one stage domestically, into a wide range of products including sawn timber and moulded products. The additional downstream processing means that softwood plantations generate more jobs per hectare than hardwood plantations. If further downstream processing of hardwood plantation timber is established, the jobs they generate per hectare will increase.

The employment generated in different sectors of the plantation industry is shown in Figure 6. In the softwood plantation industry, a higher proportion of workers are employed in processing compared to the hardwood plantation industry, reflecting the higher amount of downstream processing of softwood plantation timber compared to hardwood plantations.

[13] These figures should be considered accurate to ±10% as in some cases where businesses may undertake work in both hardwood and softwood plantations, it is difficult to identify the proportion of their employee's time that should be allocated to each sector, and to reflect the likely error range of the survey data.

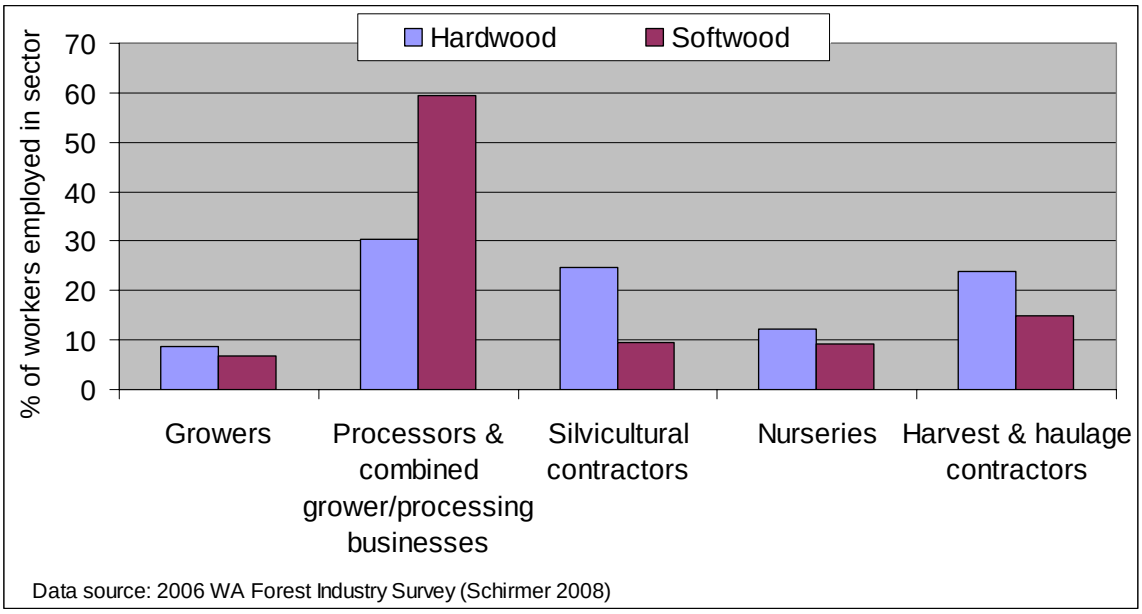

Figure 6: Percentage of workers employed in different sectors of the plantation industry

Data from the *Forest Industry Survey* is comparable to the limited number of other studies that have examined the employment generated by plantations, results of which are summarised in Table 3. Some studies examined only softwood plantations and some only hardwood plantations, while others produced data on both. As studies defined employment differently, the stage of production to which employment was measured is described, with some studies including the processing employment generated by plantations while others did not.

The *Forest Industry Survey* found more employment was generated by hardwood plantations than other studies, largely because previous studies have examined the employment generated when few or no hardwood plantations were being harvested and processed. The harvesting and processing currently taking place in WA add additional employment and hence increase employment per hectare.

The *Forest Industry Survey*'s estimates for softwood employment generated are slightly lower than those from other studies; however, they are similar to those estimated by Schirmer et al. (2005b). The variance in estimates of softwood employment reflects differences in the extent of downstream processing in place in different regions, as well as differences in the type of processing technologies used, both of which affect the amount of employment generated.

Table 3: Employment generated by plantation per 100ha: comparing results of different studies

Study and year of data collection	Hardwood plantations—employment per 100ha	Softwood plantations—employment per 100ha
Forest Industry Survey, WA (Schirmer 2008)	0.45 (harvesting occurring, but full rotation not yet reached) *0.5–0.65 (estimated employment once full harvest reached)*	1.44 (including processing)
Schirmer et al. (2005a) Great Southern region, WA 2003–04	0.36 (early harvest stage) [1]	–
Schirmer et al. (2005b) South West Slopes, NSW, 1991–92; 1996–97; 2001–02; 2003–04	–	1991–92: 1.71 1996–97: 1.84 2001–02: 1.63 2003–04: 1.53 (including processing)
URS Forestry (2004) South West Slopes NSW, 2002–03	–	1.50 (including processing)
URS Forestry (2003) Central Victoria, 2001–02	0.38 (pre-harvest stage) [1]	1.86 (including processing)
Prospect Consulting (2002) North East Victoria, 2000–01	0.3 (pre-harvest stage) [1]	2.07 (including processing)
CFPLM (1989) North East Victoria, 1989	–	0.87 (excluding processing)
Petheram et al. (2000) South-west Victoria, 1999	0.1 (pre-harvest) [1] 0.3 (estimated post-harvest)	0.5 (excluding processing)

[1]Data reflects employment generated when little or no harvesting and processing was yet occurring

How do the impacts vary?

The results presented above suggest that the plantation industry will generate different amounts of employment depending on the type of plantations established, and the downstream processing associated with those plantations. The impacts of this employment on rural communities will depend on how it compares to the employment generated by alternative land uses, the location of the employment, and accessibility of jobs, discussed in subsequent sections of this report.

What more do we need to know?

We need to know more about how the number of jobs generated by plantations varies depending on the amount and type of downstream processing that is in place. In general, the greater the amount of downstream processing undertaken in a region, the greater the number of jobs generated. However, this depends to some extent on the type of downstream processing, with different types of processing generating differing levels of employment. More modern processing facilities typically employ fewer workers per unit of output produced, while older facilities are often less efficient and employ more people per unit of output.

It is likely that, as with other primary industries including agriculture and mining, the work generated per 100 hectares of plantation will decline over time as productivity and efficiency improves, but this needs to be confirmed through continued surveys of the industry over time.

How does the employment generated by plantations compare to other land uses?

Many people want to know not just how many jobs are created by the plantation industry, but how the quantity of jobs compares to that generated by alternative land uses.

What are the different views?

There is considerable debate about the amount of employment generated by plantations compared to other land uses. In group interviews, several participants argued that plantations provide less employment than other potential uses of the same land, referring primarily to hardwood plantations:

> … no one can convince me that the timber industry is going to provide the same amount of employment and the same amount of business opportunity [as cattle farming].—Interview participant, Esperance

> … you actually lose employment opportunities on what would have been otherwise a viable farm—Interview participant, Margaret River

Others have argued that the employment generated is greater than that generated by alternative land uses. In particular, two previous studies found that in some cases plantations generate more employment than other land uses, although this depended on what land use plantations were compared to (CPFLM 1989, Petheram et al. 2000).

The views reported in Williams (2009), described in the previous section, suggest a range of views exist on this topic, with some believing overall employment increases and some that it decreases when plantation expansion occurs, while others believed there was little change.

What evidence is needed to answer this question?

To answer this question requires gathering information on the amount of employment generated by different land uses. The amount of employment generated then needs to be compared for the same area of land at equivalent points in the chain of production, based on the average annual employment generated per annum over the entire life cycle of a land use. For example, a life cycle would be from ground preparation and planting to harvest and processing for plantations, and from ground preparing and sowing to harvest and processing for a grain crop. This approach ensures the employment generated by each land use is compared in equivalent ways.

It is also important to examine whether some of the employment is generated on a seasonal or casual basis—a topic discussed in the next part of this report.

A key issue is that the same land use (e.g. sheep farming) will generate differing levels of employment per unit area (e.g. per 100 ha) depending on the productivity of the land being examined. For this reason, it is essential to compare the jobs generated by plantations to jobs generated by alternative land uses on land of similar productivity. This may still involve comparing employment on land with a relatively wide range of productivity, and therefore there will be some variation in the amount of employment generated as land productivity varies.

What does the evidence tell us?

Only a small number of studies have compared the employment generated by plantations to other land uses, and two of these were undertaken more than eight years ago. The results of these studies are summarised in Table 4, which compares employment to the farm gate only, without including jobs subsequently generated via the processing of the goods produced by the different land uses.

Table 4: Employment generated by different land uses to the 'farm gate'—results of different studies[14]

Land use	Average annual employment generated per 100 hectares to the 'farm gate', excluding processing		
	CFPLM (1989)—NE Victoria	**Petheram et al. (2000)—SW Victoria**	**Schirmer et al. (2005b)—NSW** **Schirmer (2008)—WA** **Schirmer (2009)—SW Vic and SE SA[2]**
Wool and prime lambs	0.24–0.41[1]	0.26	0.33 (range of 0.2–0.6) [1]
Beef cattle/veal	0.21–0.33[1]	0.14	0.22 (range of 0.1–0.5) [1]
Dairy farming	0.88	1.22	1.4 (range of 0.9–1.7) [1]
Cropping	–	0.14	0.23 (range of 0.1–0.5) [1]
Grape growing	–	–	7.7 (range of 5.0–10.0) [1]
Blue gum (pre-harvest)	–	0.1	0.2 (range of 0.15–0.25) [1]
Blue gum (post-harvest)	–	0.3	–
Softwood plantations (radiata pine)	0.87	0.5	0.5

[1]Variation reflects employment generated on land of differing productivity, and different farm enterprise labour structures

[2]These studies are shown in a single column as they all used the same methods to estimate employment. Schirmer et al. (2005b) and Schirmer (2008) generated data on the employment generated by softwood plantations and hardwood plantations respectively, while Schirmer (2009) generated data on employment in all the land uses shown except softwood plantations.

Estimates of the employment generated by different land uses vary across studies, as can be seen in Table 4. This variance partly reflects that each study was undertaken at a different point in time—the CFPLM (1989) data reflects employment generated by different land uses almost 20 years ago, while the more recent Petheram et al. (2000) and Schirmer (2009) data is more likely to reflect current employment generated by different land uses.

The results of these studies are likely to be applicable to most WA plantation areas, as all were undertaken in regions suitable for growing plantations (typically with greater than 600 mm rainfall). Plantations established in low rainfall zones, however, would likely generate different levels of employment.

[14] The studies compared in this table used similar, but not always identical, definitions of what constituted the 'farm gate'. The differences in definition may contribute to some differences in estimates of employment, although these are likely to be small.

The data in Table 4 suggests that hardwood plantations generate less employment to the 'farm gate' than most other land uses except cropping, while softwood plantations generate more employment than sheep or beef grazing or cropping, but less than dairy or viticulture.

However, this provides only part of the answer to the question of how much employment is generated by different land uses. The majority of employment in the plantation industry—up to two-thirds—is generated by the processing of wood products. It is therefore important to compare the employment generated by different land uses when downstream processing is included in the analysis.

The employment generated by downstream processing is shown in Table 5 for several land uses. The data in Table 5 is sourced from several recent 'one-off' studies in specific regions, together with data from the Australian Bureau of Agriculture and Resource Economics (ABARE) *Farm Survey*, the Victorian Department of Primary Industries *Farm Monitor* project, and the ABS[15].

Table 5: Employment generated by processing beyond the farm gate

Land use	Employment per 100ha, 2006–08, to farm gate		Beyond farm gate in study region (jobs/100ha)
	Median	Range	
Beef	**0.22** jobs/100ha	**0.1–0.5**	**0.01–0.03** (abattoir/ transport)
Blue gums	**0.20** jobs/100ha	**0.15–0.25**	**0.30–0.45** (woodchipping and export, based on WA data)
Cropping	**0.23** jobs/100ha	**0.1–0.5**	**0.01–0.03** (storage, transport, sale)
Dairy	**1.4** jobs/100ha	**0.9–1.7**	**0.2–0.3** (manufacturing)
Grapes	**7.7** jobs/100ha	**5.0–10.0**	**6.5–7.0** (wine making)
Sheep	**0.33** jobs/100ha	**0.2–0.6**	**0.01–0.03** (abattoirs, transport)
Softwood plantations	**0.5** jobs/100ha	**0.5**	**1.0–1.3** (sawnwood, pulp, other wood products)

Data source: Data gathered via a survey of primary producers and plantation companies, the South West Victoria Farm Monitor project, the ABS and ABARE, reported in Schirmer (2009); Schirmer (2008); and Schirmer et al. (2005a,b).

When downstream processing is examined, hardwood and softwood plantations generate more jobs beyond the farm gate than most other land uses, with the exception of grape growing (Table 5). Hardwood plantations (blue gums) generate more employment than sheep grazing, beef grazing and cropping, but less overall than dairy farming or grape growing, while softwood plantations generate more employment than all other land uses except grape growing, and a similar amount to dairy farming.

[15] The data in Table 4 are reported in more detail in Schirmer (2009), who compared the downstream employment generated by different land uses in south-west Victoria and south-east South Australia, a region which has considerable processing of dairy, grapes, and timber products, as well as abattoirs processing meat products and a wool-scouring facility. Table 4 also includes data from Schirmer (2005a,b), who gathered similar data for the hardwood plantation industry in the Great Southern region of WA and the softwood plantation industry in the south-west slopes of NSW as did URS Forestry (2003, 2004), while Schirmer (2008) generated this type of data for WA's forest industry. Analysis was also undertaken of data from the Australian Bureau of Agriculture and Resource Economics (ABARE) *Farm Survey*, the Victorian Department of Primary Industries *Farm Monitor* project, and from the ABS to identify whether the employment identified in these studies were typical for other parts of Australia.

The jobs generated by the plantation industry differ to other land uses in that a high proportion of jobs—over two-thirds in many cases—are generated after the farm gate, where the majority of jobs are generated before the farm gate for most traditional agricultural land uses.

The answer to the question of how much employment plantations generate compared to other land uses therefore differs depending on what stages of production are included in the analysis, the type of land uses being compared, and how much downstream processing of the goods produced by each land use occurs in the region being examined.

How do the impacts vary?

Land use change to plantations will result in varying types of changes in employment depending on what purpose the land was used for prior to a plantation being established, and the amount of downstream processing associated with the different land uses being compared. Total regional employment may increase or decrease depending on the previous land use. The impacts of this change in employment will vary for different people. Even if more employment is generated by plantations, it is unlikely that those whose employment is displaced will be directly employed by the plantation industry. Therefore those who lose employment opportunities are likely to be impacted negatively if they are unable to find alternative employment, while those who gain employment in the plantation industry are likely to be impacted positively by this change.

Impacts on individual people therefore depend on whether their employment is affected, and who is able to take advantage of new opportunities provided by the plantation industry, for example by diversifying their business into providing services to the industry.

What more do we need to know?

Further analysis is needed of how applicable the results presented here are to WA, and to identify how the employment generated by different land uses differs depending on factors such as land productivity, and type of farm enterprise.

More data is also needed to identify how the employment generated by different land uses is changing over time in response to trends such as changes in productivity and intensification of land use.

What types of jobs are generated by plantations?

As well as wanting to know how many jobs are generated by plantations, and how the amount of employment compares to that generated by other land uses, some people want to know more about the types of jobs generated by plantations. In particular, in group interviews participants asked about whether most work generated was full time, part time or casual, or generated only at certain stages of the plantation life cycle.

What are the different views?

As with other questions about employment, a wide range of views are expressed on this issue. Some believe that plantations generate a lot of temporary or casual jobs; others argue that the jobs generated are primarily full time as, with many plantations of varying ages established in any one region, there is ongoing work for contractors who may specialise in activities that occur at only one stage in the life cycle of a plantation, such as planting trees:

> [As a result of plantation expansion] … there'd prob[ably] be ... more contractors now as a result, you know, say you've got the seasonal rather than full-time labourers …—Interview participant, Kojonup

> … you have temporary workers come into the district for planting and chopping all the trees down and that sort of thing—Interview participant, Boyup Brook

What evidence is needed to answer this question?

Identifying the types of jobs generated by the plantation industry requires accurate data on the proportion of employment that is full time, part time and casual in the plantation sector, and also whether jobs tend to be generated only at a particular point in the plantation life cycle. Ideally, the same information should be collected for other industries such as sheep and beef grazing, cropping, grape growing and dairy farming, so that the types of jobs generated by the plantation industry can be compared to those generated by alternative land uses.

Different types of work in the plantation industry may generate different types of employment, so it is also necessary to identify the types of jobs generated in plantation growing, nurseries, silvicultural contracting, harvest and haulage contracting, and by plantation processing.

What does the evidence tell us?

Data from the 2006 WA *Forest Industry Survey* (Schirmer 2008) is used here to examine the type of employment generated by the plantation industry. Information from the survey was compared with ABS *Census of Population and Housing* data. The proportion of full-time and part-time/casual employment in the plantation industry was compared to the labour force as a whole, and to people working in what the ABS terms 'agriculture, fishing and forestry', as shown in Figure 7[16]. The plantation industry is split into several sectors to better identify which parts of the industry generate more full-time or part-time work.

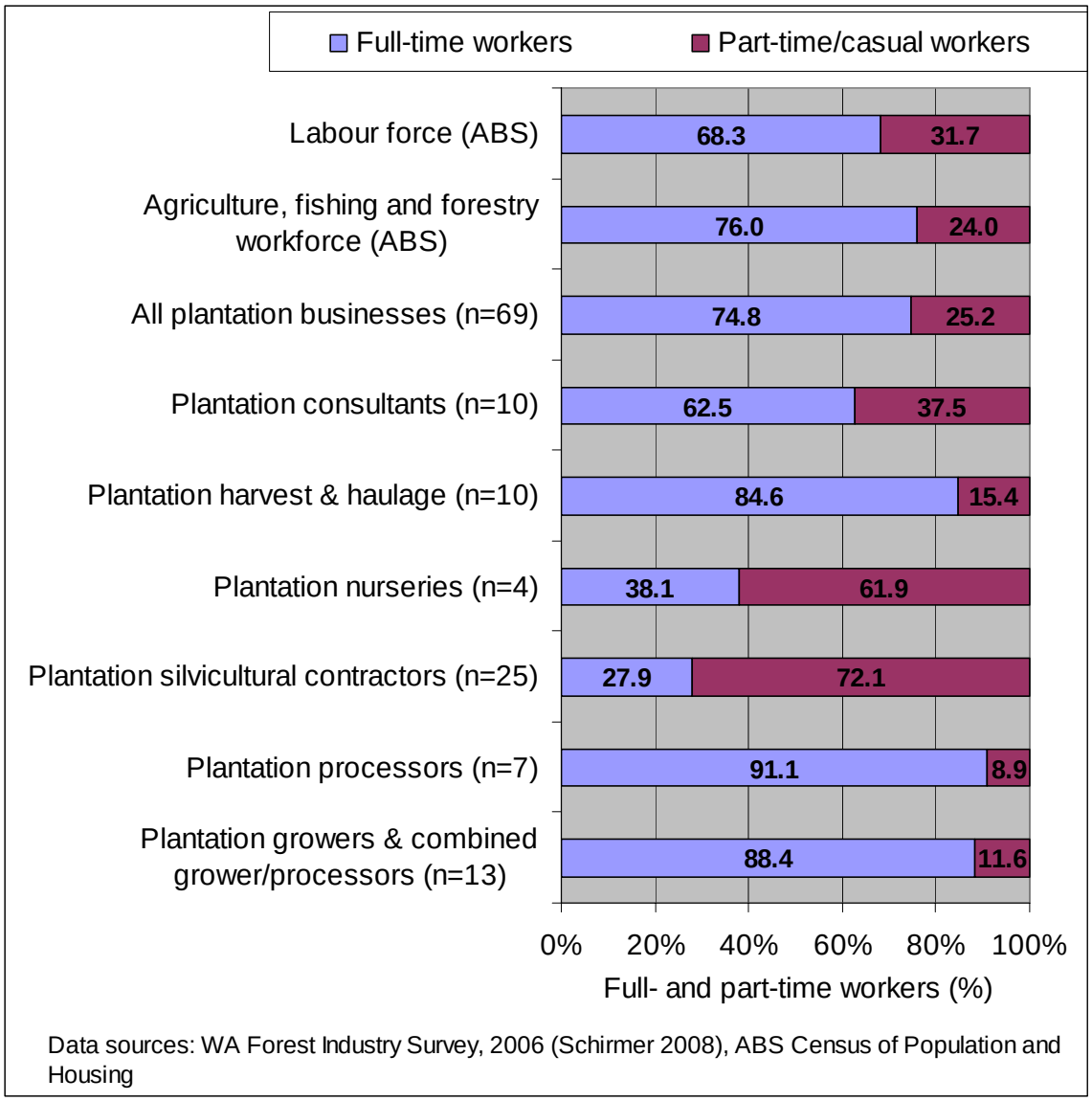

Figure 7: Proportion of workers in full-time and part-time/casual employment in the plantation industry, agriculture and the total labour force

[16] Data on employment in 'agriculture, fishing and forestry' refers to all those who work in these industries to the point of the 'farm gate'. In WA in 2006, of a total 30 843 people who worked in agriculture, forestry and fishing, 85.6% worked in agriculture, meaning that this data largely reflects the types of employment generated by the agricultural sector.

Overall, the plantation industry has more full-time workers than the average for the labour force as a whole, but slightly fewer than the agriculture, fishing and forestry sector as a whole—74.8% of plantation workers work full time, compared to 76.0% of all people working in agriculture, fishing and forestry[17].

When the plantation industry is broken down into individual sectors, it can be seen that some sectors of the industry generate a lot of part-time jobs, while in other parts of the industry jobs are usually full time. Nurseries and silvicultural contractors in particular have a high proportion of part-time/casual work, while most other parts of the industry largely employ full-time workers. This may explain some of the perceptions reported in group interviews, where participants who believed the plantation industry often generates seasonal or temporary work commonly referred to people who work in silvicultural contracting, the sector of the industry where most part time and casual work occurs. Part-time and casual work is much less common in other sectors of the plantation industry.

This suggests that the plantation industry is not significantly different from traditional agriculture in terms of the proportion of part-time/casual versus full-time jobs. This may seem surprising to some, as some work such as planting seedlings only occurs once in the lifetime of a plantation, which means it occurs once every 10 to 15 years for hardwood plantations, and once every 25 to 35 years for softwood plantations. However, in most of WA's plantation regions a large number of individual plantations of varying ages have been established. Because there are plantations of multiple ages in any locality, regular work is available for workers engaged in activities that only occur at one point in each rotation of a plantation.

There is no evidence to suggest that the work generated by plantations is more casualised than for traditional agricultural workers, particularly given the trend in traditional agriculture towards increasing use of contractors, who may provide a specialised service at particular times of year based on seasonal labour needs (National Farmers Federation 2008).

How do the impacts vary?

It does not appear that a shift in land use from agriculture to plantations leads to significant change in the amount of full-time versus part-time work available in rural areas. It is possible that some people leave one type of job for another as a result of this land use change, in which case the impact on that person may be positive or negative depending on the type of job they prefer, and whether the change helps them achieve their preferred type of employment.

[17] Note that Figure 7 shows data for all plantation workers and does not separate workers in hardwood and softwood plantations. This is for two reasons: to preserve confidentiality of individual businesses who provided data, and because no significant differences were found in the type of employment generated by hardwood versus softwood plantations in terms of the proportion of full- and part-time/casual workers.

What more do we need to know?

More work is needed to compare the type of employment generated by plantations to specific agricultural industries such as sheep and beef grazing, which are the most common alternative land uses to plantations.

It would also be useful to have better information on the level of 'wellbeing' of workers in the plantation industry compared to other land use industries. Wellbeing refers to worker's level of satisfaction with their job, their workplace conditions, and the health and safety risks presented by their employment. Gathering this type of information requires direct surveys of workers.

Where are plantation industry jobs located compared to other land uses?

While plantations may generate the same amount of employment as some (but not all) alternative land uses, and more in some cases, these jobs may not be based in the same places as those generated by traditional agriculture. It is important to examine where plantation workers are typically located compared to workers from traditional agricultural industries, as this provides a better understanding of the likely social impacts of a land use change to plantation. If land use change to plantations involves a shift in location of employment opportunities, this is likely to be associated with changes in where people live, spend their wages, use local services and join community groups.

What are the different views?

There is less disagreement on this question compared to some of the other questions discussed in this report. Many people believe that plantation industry workers are more commonly located in large towns/regional centres compared to workers in traditional agricultural industries, and that the converse is also true, with plantation workers less likely to be located in small towns or living on rural properties than those who work in traditional agricultural industries:

> Basically the plantation industry is based around people who live in towns, most of them, some of them live out on the farms, but most of them live in towns and go out to the [plantations]—Interview participant, Harvey

> They bring in contractors to do the work to plant the trees in the first year. Yes they probably employ a lot of people and they employ some local contractors … If there are Esperance based contractors we may retain some of that contracting cost here in Esperance but a lot of their planting teams come from outside of the area; they have brought them from other places in Western Australia—Interview participant, Esperance

> … the fact of life is the plantations doesn't generate jobs in small towns—Interview participant, Boyup Brook

> Similar to the fly-in fly-out employment that the resources sector provides in the north west [of WA], this [plantations] would be a drive-in drive-out employment.—Interview participant, Margaret River

What evidence is needed to answer this question?

To answer this question requires identifying where plantation industry workers are located compared to (a) the general labour force, and (b) people who work in agriculture and food/meat manufacturing industries (the types of employment most likely to be generated by alternative land uses to plantations such as grazing, cropping, and less commonly dairy farming or grape growing).

Data from the 2006 ABS *Census of Population and Housing* was analysed to identify the percentage of workers in different industries who live on rural land and small towns versus larger sized towns. As ABS forest industry data do not separate employment generated as a result of native forests versus plantations, only data for the Great Southern and Esperance regions were examined, as in these two regions over 95% of employment in the forestry industry is based on plantations (Schirmer 2008).

What does the evidence tell us?

People who work in the plantation industry are more likely to live in large towns, and less likely to live on rural land or in small towns, compared to agricultural workers. This can be seen in Figure 8, which compares where the following types of workers live:

- 'land managers', defined as people who manage and work on rural land who are involved in forestry and logging (which, in the regions examined, is 95% based on plantations); sheep, beef or grain farming; and grape growing
- manufacturing workers in the following industries: wood product manufacturing, food manufacturing (including abattoirs), and wine manufacturing
- service industry workers who provide the following services: forestry support services, shearing services, and grain storage.

As can be seen in Figure 8, forestry and logging workers are much more likely to live in large towns than those working in sheep, beef and grain growing, or grape growers. Almost 70% of land managers working in plantations ('forestry and logging' in Figure 8) live in large regional centres (Albany or Esperance). In comparison, over 80% of sheep, beef and grain farmers live on rural properties or in towns with a population of less than 200. Grape growers predominantly live on rural land and in small towns, although to a lesser extent than other types of land managers.

Those working in wood manufacturing were more likely to live in small towns than those working in food manufacturing (the latter mostly involves meat manufacturing at abattoirs in the region). Those employed in wine manufacturing, however, were more likely than wood manufacturing workers to live on rural land or in small towns.

Most workers providing forestry support services (such as tree planting and plantation maintenance) lived in Esperance or Albany, as did most workers providing grain storage services, while people working in shearing were fairly evenly distributed across towns of all sizes.

These results confirm the common perception that those working in the plantation industry are more likely to be located in large regional cities and large towns than those working in agriculture, and less likely to live on rural properties or in small towns with a population of less than 200. This means that a shift in land use from agriculture to plantations is likely to be accompanied by a shift in where jobs are available, and hence where workers live.

Figure 8: Residential location of workers in different industries (Data source: ABS *Census of Population and Housing*, 2006)

How do the impacts vary?

Land use change to plantations is associated with a change in the location of employment. Jobs created by the plantation industry are primarily based in larger towns, with workers either travelling from these towns to undertake work in plantations, or undertaking work related to plantation management or processing at offices or processing facilities located in these towns. The impacts of this change on people living in rural and regional areas will be varied. A net loss of employment in small towns can have negative consequences, with potential for associated population loss and rural decline. Employment growth in larger towns, meanwhile, can provide many benefits for these towns including increased spending of wages, economic activity, and participation in community and sporting groups.

What more do we need to know?

It would be useful to continue to compare the location of jobs in the plantation sector to those in other industries, to see if patterns change over time.

How does plantation expansion affect local and regional economic activity?

Industries contribute to the economy not just directly through employing workers, but indirectly through their expenditure on things such as goods, services and wages that generate activity in the economy. The extent to which the plantation industry contributes to local and regional economic activity is commonly debated.

What are the different views?

Some argue that plantations bring new types of spending into rural and regional economies, providing benefits, while others believe that plantation companies do not spend as much money locally as the farming enterprises the plantations replaced:

> … it [plantations established via managed investment schemes] is bringing money from the city to the country, but the money all goes back to the city. … It does not stay in the wealth in the local community and provide additional employment opportunity…—Interview participant, Esperance

> …it [plantation establishment via managed investment schemes] gets money out of Perth and out of the metropolitan areas into the regions … which would not have occurred in any other way.—Interview participant, Mount Barker

> … [plantation expansion] hasn't reflected in any advantage to the businesses that already exist in the town. I would say that's fair comment.—Interview participant, Boyup Brook

> I know a chap who is working for [a plantation company] with blue gums and I have brought this subject up and he has said to me that the amount of people they are employing and the amount of people they will employ in the harvesting of them, they are generating a lot of money for the area.—Interview participant, Esperance

This debate often centres on where funds for plantation establishment come from, whether those funds are spent in local areas as plantations are established, grown and harvested, and where profits go after harvest.

Williams (2009) asked the WA residents she surveyed whether they believed an increase in plantations led to an increase, little or no change, or a decrease in business for local shops and businesses. Views were very mixed, with around 26% believing business would increase, a similar proportion believing it would decrease, and the remainder believing there would either be little or no change to local business, or that they were not sure how plantation expansion affected the local economy.

What evidence is needed to answer this question?

Answering this question requires comparing the location and amount of expenditure by the plantation industry with that generated by alternative land uses such as broadacre grazing and cropping. Ideally, the location from which funding is sourced and to which profits are paid should also be examined. Unfortunately, relatively little research is currently available that adequately compares different industries to identify if and how plantations are different from others.

What does the evidence tell us?

The only data that can currently help answer this question comes from the 2006 WA *Forest Industry Survey* (Schirmer 2008),which examined the proportion of spending by plantation businesses that took place locally (defined as in the local government areas in which the business's office was based and those adjacent), or non-locally. Only a small number of businesses provided this information, and further work is needed to identify if the figures reported here are typical for the industry. Overall:

- Plantation growers reported a large part of their expenditure—77%—took place in the LGA/LGAs in which their offices were located or in adjacent LGAs. As most are based in large towns, this suggests most expenditure takes place in relatively large towns.
- Plantation timber processors, and businesses that combined growing and processing, reported a much lower level of local spending, with 36% of spending in LGAs in which the processing facility was located or adjacent to it, and 64% of spending non-local.
- Silvicultural contractors spent 57% of their business expenditure in local and adjacent LGAs, while 43% of their expenditure occurred in other areas.
- Harvest and haulage contractors spent 59% of expenditure in local and adjacent LGAs.
- People providing expert advice/consultancy services reported that an average of 66% of their spending took place in local and adjacent LGAs.

Overall, this indicates that the majority of expenditure by most types of plantation businesses is in the local government areas in which the business is located, or those immediately adjacent.

While these results indicate where spending occurred in relation to the office location of the businesses surveyed, they do not provide information on expenditure relative to the location of the plantations themselves. As a plantation company, processing facility, or silvicultural or harvest contractor may manage or utilise wood from plantations located some distance from their office (often up to 200km, and further in some cases), these results do not provide an adequate understanding of expenditure relative to the location of the plantation estate.

How do the impacts vary?

Not enough is known about the changes to local and regional economic activity resulting from plantation expansion to identify the likely impacts of these changes, and how they may vary in different circumstances. Broadly speaking, any net loss of spending in local economies can impact negatively while an increase can impact positively. In reality it is likely that some types of spending increase, and some others decrease, as a result of land use change to plantations. Local businesses that provide services to the plantation industry will benefit from the land use change, while those who lose business are likely to be impacted negatively.

What more do we need to know?

More specific studies which compare expenditure by the plantation industry with the expenditure generated by alternative land use industries are needed to adequately answer this question. These studies need to be carefully designed to ensure they have appropriate definitions of what constitutes 'local' spending, that they identify how to compare spending across different industries, and they consider issues such as whether to measure spending relative to where a plantation business office is located, or relative to the actual plantation estate it manages, which may be spread over a large area.

How does plantation expansion affect rural population levels?

There is considerable debate about the impact of plantation expansion on rural population levels. The seemingly simple question 'how does plantation expansion change rural population levels' can be surprisingly complex to answer, as is explained below. It is important to consider how a mature plantation industry, as well as the establishment of new plantations, influences population levels.

What are the different views?

Concerns have been raised in many rural communities that plantation expansion may be accompanied by rural population decline. This is typically believed to result from the farmers who used to live on plantation properties shifting away when the property is established to plantation, and from changes to availability of jobs resulting from the land use change. Others argue that population decline occurs for reasons other than plantation expansion, or that plantation expansion simply accelerates an existing trend to rural depopulation for a short time:

> There are a number of regions in the south west of Western Australia where the conversion of private land to plantation has gone along with accusations of depopulation. The Rocky Gully area … is the one that probably has been raised with me most often as an example of that and yet when I talk to people who used to live in Rocky Gully they say 'no, the economic returns from agriculture were so low in that area because of climatic conditions, poor soils and other things and also distance from markets that the population was dropping anyway and the blue gum plantations that have come in in recent years haven't really made that much of a difference'. —Interview participant, Margaret River

> I think the main negative change has been the reduction in population. I would like to see it go back to the traditional farming area, no tree farms at all—Interview participant, Boyup Brook

> If you look out in the wetter country there, where there used to [be] thriving rural communities … basically the population has disappeared, the housing and farm had been demolished, there are squatters in and so the life of the community is gone. The few people who are still there have lost … neighbours and friends who lived close by. That was probably happening anyway but it has been accelerated by plantations—Interview participant, Mount Barker

On the other side of the argument, some argue that establishing a plantation industry will provide new industry and hence new employment opportunities, and may therefore help reduce rural population decline through diversifying rural economies.

Williams (2009) found that in WA, the proportion of people who believed an increase in plantations would lead to an increase, decrease or no change in rural population differed for different regions:

- In the Great Southern area, 15% felt population would increase while 39% believed it decreased when the area of plantations expanded.
- In the South West area, 11% believed population would increase, 21% believed it would decrease, and 53% believed there would be little or no change associated with plantation expansion.
- In Esperance, only 9% of survey respondents believed there would be an increase in population while 45% felt there would be a decrease if plantation expansion occurred.

What evidence is needed to answer this question?

Identifying the impact of plantation expansion on rural population levels requires assessing whether establishment of plantation estate and associated industry leads to changes in population that are different to those that would have occurred in the absence of plantation expansion.

This means it is necessary to identify the 'baseline', or typical, rate of population change that would be expected in a rural area in the absence of plantations. Many rural areas in WA with no plantations have experienced rural population decline in recent decades, and it is important to avoid the false assumption that population decline and plantation establishment are necessarily causally related if both occur at the same time, as other factors are likely to be contributing to population decline.

A range of evidence is needed to build an understanding of the impacts of the plantation industry on rural population, including examining:

- People living on rural properties: Does the number of people living on rural properties change as a result of plantation expansion, and is this change different to that which would have occurred if properties had not been established to plantations?
- Employment generation in rural regions: Does the plantation industry generate different levels/types of employment compared to alternative land uses, which might lead to decline or growth in population on rural land or in towns?
- Comparing population change in plantation and non-plantation areas: Do local government areas where rapid plantation expansion is occurring, or which have a mature plantation industry, experience different population trends to other regions?

Each of these three approaches provides a different 'angle' on the potential population impacts of plantations which, when combined, can provide a detailed understanding of these impacts.

What does the evidence tell us?

Each of the three approaches described above is used in turn below to examine the impacts of plantation expansion on rural population.

People living on rural properties

In 2007, a survey was undertaken in south-west Victoria and south-east South Australia of 158 landholders who had either leased their property to a plantation company for blue gum establishment, sold their property to a plantation company for blue gum establishment, or established their own farm forestry. Data was also gathered from plantation companies in the region, providing information on a further 584 properties that had been sold or leased to plantation companies. Survey respondents were asked how many people lived on the property before land use change to plantations, whether existing residents shifted away as a result of the land use change and, if previous residents left, whether new residents shifted onto the property (full results of the study are reported in Schirmer et al. 2008b).

The results, summarised in Table 6, indicate that the impacts of plantation expansion on the number of people living on the properties involved depend on how the plantation is established.

When landholders sell properties to plantation companies, 75% of previous residents shift away from the property that has been sold to a plantation company. In south-west Victoria and south-east SA, where subdivision of housing from plantation properties is common, the majority of these properties are then reoccupied by new residents who shift into the housing. Once these new residents are taken into account, there is a net loss of population of between 7% and 19%.

When landholders lease part or all of their property to a plantation company, there is a much smaller net loss of population (around 3%), as most landholders remain living on the property after it is leased.

When landholders establish their own farm forestry (through using their own labour and funds to establish a woodlot on their property), there is no change to the number of people living on the property.

Table 6: Does plantation establishment change the number of people living on rural properties?

	Landholders who established own farm forestry	Landholders who leased part/all of property to plantation company	Landholders who sold property to plantation company
What percentage of properties were inhabited before land use change?	50–55%[1]	60–70%[1]	44–52%[1]
If properties were inhabited: On what percentage of properties did residents shift away as a result of land use change?	0%	10%	75%
If people shifted away: On what percentage of properties did new people shift in?[2]	N/A	Short term: 45% Long term: 55%[3]	Short term: 50% Long term: 80%[3]
Net population impact	No change	–3%	–7% to –19%

[1] The variation in these figures reflects differences in the data provided by landholders versus plantation companies, which are discussed in detail in Schirmer et al. (2008b).

[2] These results apply only to regions where subdivision of housing from plantation properties is common practice. Different results would be likely in regions where subdivision is not permitted.

[3]The variation between short-term and long-term figures reflects differences in the answer to this question based on the length of time considered. For properties sold to plantation companies, in the six months after the property is sold around 50% of properties will be reoccupied if previous residents left. In the longer term—one to two years after sale—around 80% were reoccupied.

Data source: Schirmer et al. (2008b) (see this report for a detailed description of the methodology used).

These results show that there is a small net loss of people living on rural properties as a result of plantation expansion. The next question is, would a similar level of population loss have occurred in the absence of plantation expansion? Unfortunately there is little specific data available to help answer this question, limited to knowledge about the broader trends affect rural population levels.

Hugo (2005: 63) has shown that rural areas within commuting distance of major cities and in high rainfall coastal areas of the south-west and east coast of Australia tend to be experiencing higher population growth than the Australian average. At the same time, '… in the heartland dryland farming and pastoral areas of rural and remote Australia absolute population decline is common …'.

Plantations in WA are established in both high rainfall coastal zones, some within commuting distance of major regional cities, and also in areas that would be included in Hugo's 'heartland dryland farming and pastoral areas'. This suggests that in the absence of plantation expansion, some rural properties in these regions would have lost population while others would not, or may have experienced population growth where rural residential properties are popular.

Employment generation in rural regions

If the plantation industry generates a different amount or different types of employment compared to alternative land uses, this may lead to change in the number of people living in rural regions, as people shift to where employment opportunities are available. Based on the employment data presented earlier in this report, land use change from traditional agriculture to plantations may be accompanied by:

- a shift of jobs from small towns and rural properties to larger regional towns and cities—this may be accompanied by a shift in population, although it depends on the extent to which workers change where they live in order to work in the plantation sector versus commuting to take on a job in a new location
- growth, decline or relatively little change in the number of jobs generated, depending on (a) the previous land use, and (b) the extent to which downstream processing is established and the location of processing facilities. Softwood plantations generate more employment than most alternative land uses, with most jobs located where processing facilities are located. Blue gum plantations generate less employment to the farm gate than alternative land uses, but when harvesting and woodchipping activities are included, they generate more employment than sheep grazing, beef cattle grazing or cropping, but less than dairy farming or grape growing.

In other words, the impacts on population depend on the type of plantation established, the previous land use, the extent to which downstream processing is established to produce wood and paper products, and where that downstream processing is located. For example, if a sheep farm is established to plantation, with a processing facility located within 10km, employment opportunities in the local area will likely increase as a result of plantation establishment. If a dairy farm changes land use to hardwood plantation, and the nearest woodchipping facility is located 150km away, then there will likely be a net decline of employment in the locality of that plantation and an increase in employment near the woodchipping facility.

Comparing population change in plantation and non-plantation areas

While a small net loss of population occurs at the individual property scale as a result of plantation establishment, this change in population is too small to be observable at a larger scale. To identify if the trends identified at the individual property level were 'visible' at larger scales, ABS data on the rural population of different LGAs was analysed over time, and the rate of change in areas experiencing high rates of plantation expansion was compared with that in regions with fewor no plantations. Rural

population—defined as people living on rural properties or in towns with a population of less than 200—was focused on, as concerns raised about plantations and population typically focus on whether rural population declines as a result of plantation expansion.

From Figure 9 it can be seen that there is no consistent relationship between the rate of plantation expansion and rural population change. Areas with high expansion of plantations experienced greater population growth than those with medium rates of plantation expansion, while those with low plantation expansion experienced the highest overall population growth. Meanwhile, areas with no or negligible hardwood plantations experienced greater population decline than regions with plantations.

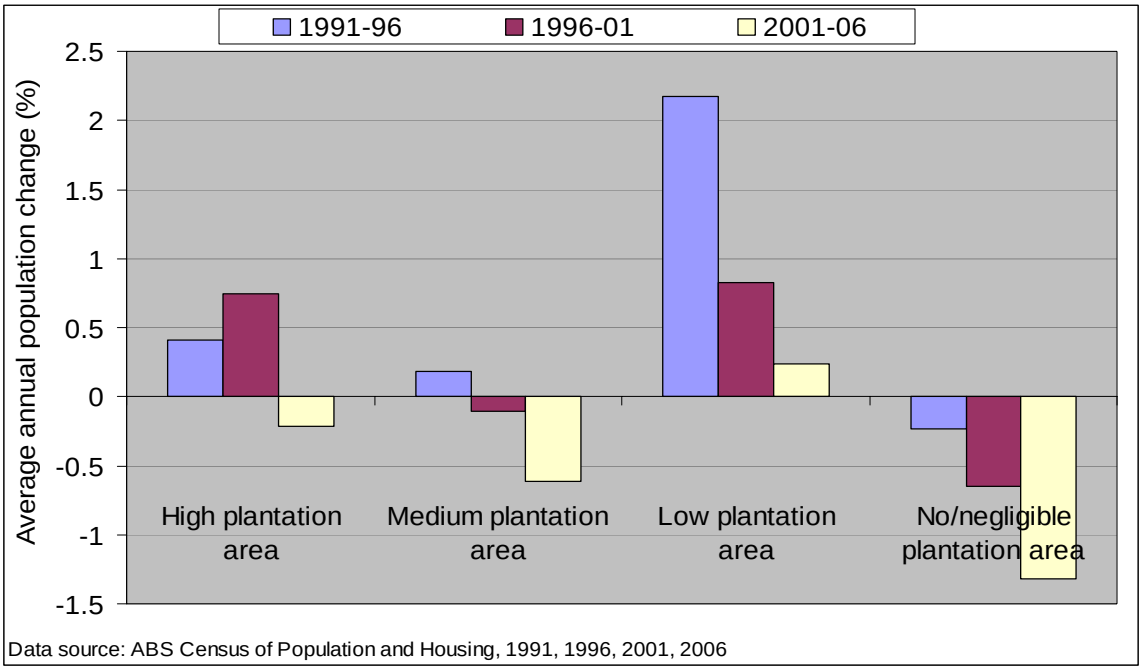

Figure 9: Rural population change in areas experiencing different amounts of hardwood plantation expansion, 1991–2006

The lack of any consistent relationship between plantation expansion and rural population at the LGA scale suggests plantations have a much smaller influence on rural population trends than other factors affecting rural population. When LGAs are classified according to the factors Hugo (2005) identified as influencing population change—commuting distance to metropolitan areas and regional cities, and distance from the coast—more consistent patterns can be seen (Figure 10). Population growth is highest in rural regions within commuting distance of regional cities, or located on the coast, while population decline is most common in inland areas. This suggests that these factors are more important than the presence or absence of plantations in determining overall rural population change.

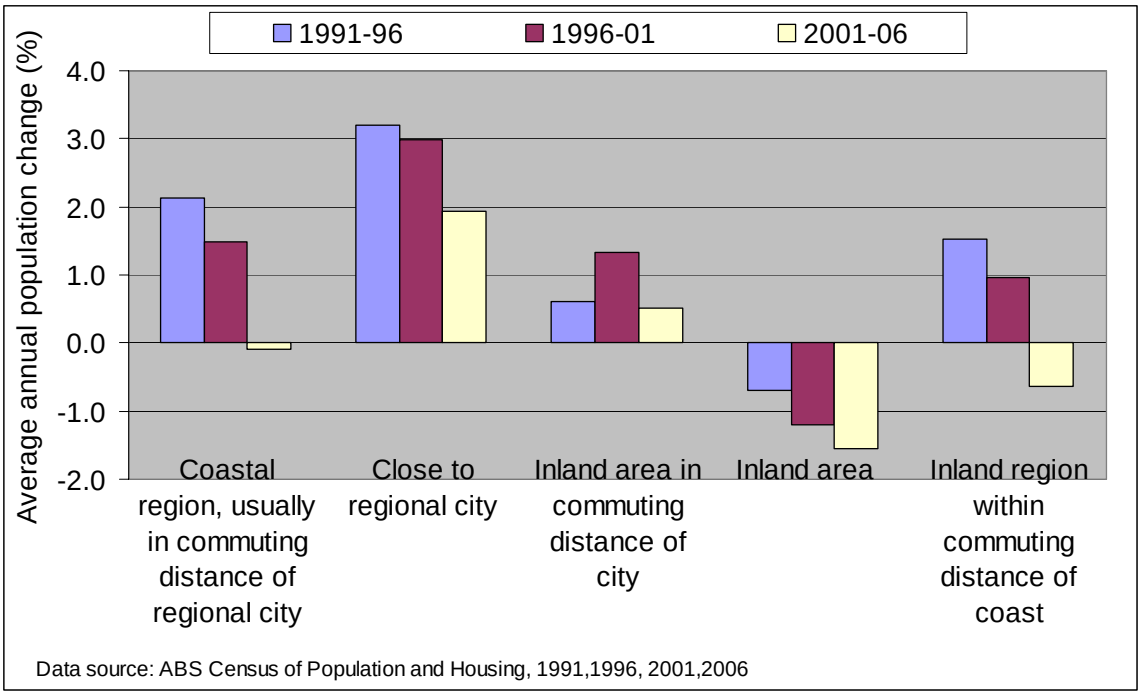

Figure 10: Rural population change in cities, coastal areas, and inland areas

To exclude the influence of distance to cities and coast, rates of rural population change in areas with differing rates of plantation expansion were analysed for rural regions located on or near the coast, inland, and within commuting distance of cities (Figure 11).

Areas near regional cities experiencing high rates of plantation expansion—Albany and Esperance—typically experienced slower population growth than non-plantation areas near regional cities and metropolitan centres. This reflects that plantations have been established around the more remote regional cities of Albany and Esperance, which have experienced slower population growth than regional cities and coastal areas closer to Perth, such as Bunbury and Mandurah. It is possible that it also reflects some impact of plantation expansion on rural population growth; however, data from inland areas suggests this may not be the case. Inland areas with few plantations experienced greater decline in population than those with a medium or high area of plantations, suggesting no consistent relationship between plantation expansion and rural population change even once distance to cities and the coast is taken into account.

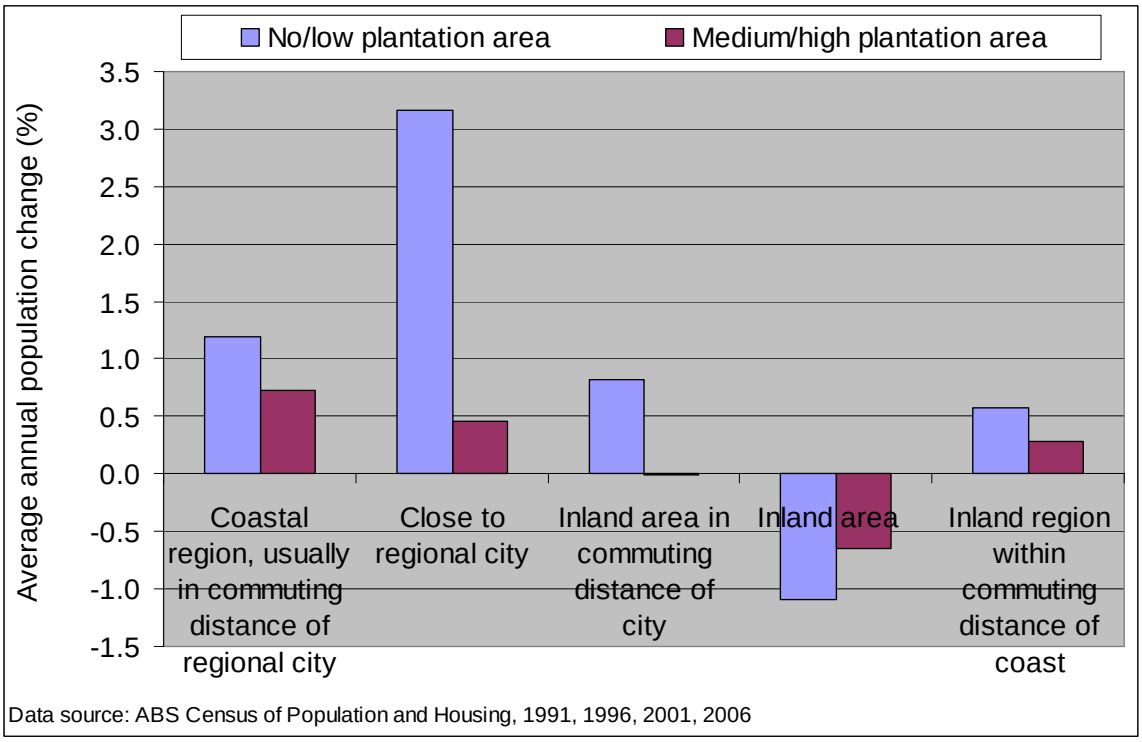

Figure 11: Rural population change in areas with differing rates of plantation expansion, in inland, coastal and city commuting regions, 1991–2006

In other studies, towns in which substantial plantation timber processing facilities have been established have been found to experience either less population decline than average for a town of their size, or greater population growth (Dwyer Leslie Pty Ltd and Powell 1995, Schirmer 2005a). This indicates that the establishment of substantial downstream processing of plantation timber may support regional population growth, which is centred on the towns where processing facilities are located.

What does all the evidence mean?

The information presented here suggests that expansion of plantations leads to a small net loss of rural population at the individual property level. This net loss is not necessarily greater than the loss of population already occurring as a result of trends such as amalgamation of farms and increasing farmer productivity, which lead to fewer people being needed to work on farms and an associated loss of population. At larger scales, there is no consistent evidence of an association between plantation expansion and rural population decline. Conversely, plantation expansion is only associated with an increase in population in rural areas where substantial downstream processing is established.

How do the impacts vary?

Plantation expansion leads to some change in population at the individual property level. The impacts of this change on those who shift away from properties they have sold or leased to plantation companies, or on others in their community, will differ depending on a range of factors. This includes things as simple as whether someone whose neighbour shifts off a property sold to a plantation company liked or disliked their neighbour—if they liked them, the change will most likely have negative impacts; if they had been involved in an ongoing dispute the change will more likely have positive impacts for both. The impacts also depend on how satisfied landholders who shift away from a property sold to a plantation company are. Schirmer et al. (2008b) found that 73% of

landholders reported they were satisfied or very satisfied with their decision to sell their property to a plantation company, while only 10% were dissatisfied. This indicates that impacts have been largely positive for those who sold their land to a plantation company.

What more do we need to know?

More work is needed to identify if these results apply in all situations. For example, in areas where subdivision of housing from plantation properties is not permitted there may be greater population loss than indicated here, as it may be more difficult to encourage new residents to shift into houses on plantation properties. It would also be useful to have more specific studies of changes to the population living in the small towns and rural areas located closest to large areas of plantations, as they may experience different trends to those shown here. Finally, more work is needed to identify if changes in the location of jobs associated with land use change to plantations lead to people shifting their place of residence—in some cases, people may simply commute to take these job opportunities, rather than shifting to live in the larger towns where plantation jobs are typically located.

How does plantation expansion influence the type of people living in rural communities?

The previous section considered only how plantation expansion may affect the *number* of people living in rural communities. However, it is just as important to consider how it may influence *who* lives in rural communities.

What are the different views?

Some participants in group interviews expressed concerns about the type of people shifting onto plantation properties, arguing that they did not always integrate well into the community or join local service and sporting groups or the volunteer fire brigade. Others described more positive experiences, describing new residents living on plantation properties or working in the plantation industry as having a positive influence and bringing benefits to their community:

> … they get new people in and a lot of people do not understand the vagaries of living here and they want to change it… —Interview participant, Boyup Brook

> I think the positive side of that is that it is bringing new blood, new thinking, into the vocational, the job area, and I think the spin off on that is that we will see a change—Interview participant, Mount Barker

What was perhaps common to all these points of view was that each person was describing plantation expansion as leading to a change in who lived in rural areas, with that change sometimes experienced positively and sometimes negatively.

What evidence is needed to answer this question?

There are many ways to examine how plantation expansion influences the type of people living in rural communities. Firstly, it is important to measure the extent of population turnover associated with land use change to plantations—how often is establishment of plantations associated with a change in the people living in rural areas? Once this is known, the socio-demographic characteristics of new residents should ideally be compared with the characteristics of the people who lived in the region prior to plantation establishment. This might involve comparing their ages, professions, income, and membership of community and service groups.

It would also be useful to know whether the type of people shifting onto plantation properties differs depending on where the plantation is located, as plantation companies have reported some difficulty in finding residents to rent or purchase houses located on more remote plantation properties, while finding it easier to find tenants or purchasers for houses on plantation properties located nearer towns and cities.

What does the evidence tell us?

Available information provides some understanding of the rate of turnover of population associated with plantation expansion, but very little about the socio-demographic characteristics of new residents living on plantation properties compared to previous residents.

Based on data from the previously discussed survey of landholders who had sold or leased properties to plantation companies in south-east South Australia and south-west Victoria, when a property is leased for plantation establishment there is up to a 5% turnover in population (with 10% of previous residents shifting away when the property

is leased and new residents shifting onto the land in about 50% of those cases). When a property is sold to a plantation company, however, there is up to a 60% turnover in population, with 75% of previous residents shifting away, and new residents shifting onto these properties in 80% of cases in the long-term (Schirmer et al. 2008b).

Given that the many new plantations are currently established on land purchased by plantation companies, this means that many new people are shifting onto plantation properties. Unfortunately, no studies have identified the socio-demographic characteristics of these new people and whether and how they differ from the residents who previously lived in the same region.

How do the impacts vary?

The impacts of a change in the type of people living in rural communities will depend on how well the new residents integrate into that community. If new residents are able to join local social networks, including community and sporting groups, and contribute to that community's sense of wellbeing, the change will likely be positive. If new residents remain isolated from others, both they and others residents may feel the change has been negative as they experience a lack of meaningful social networks.

What more do we need to know?

A better understanding is needed of whether and how the new people shifting into housing on plantation properties, or employed in the plantation industry, differ from other residents in the rural communities they are shifting into. It would also be useful to know if different types of people shift into different types of plantation property housing—for example, do different types of people shift into plantation houses located in remote rural areas compared to houses on plantation properties located near rural towns and services. Having this information would enable a better assessment of the social impacts of land use change to plantations.

How does plantation expansion influence service provision and community groups in rural communities?

One question commonly raised about plantation expansion and population change is that of whether plantation expansion leads to a decrease in service provision and community group membership in rural areas. Groups and services such as community and sporting groups, local schools and volunteer fire brigades are often focal points which contribute greatly to people's sense of being part of a community. In recent decades, concern has been expressed about decline in membership of these types of groups in many parts of rural Australia (see for example Johnston et al. 2005, who examined this issue in parts of rural WA).

What are the different views?

Some have argued that plantation expansion may provide a stable employment base that helps support growth in local services and community groups, while others believe that any loss or turnover of population associated with land use change to plantations may lead to a decline in membership of local community, sporting and volunteer groups, or declining enrolment in local schools:

> There is not a lot of younger generation continuing on [in agriculture] anyway because the attraction is much better elsewhere, so when the farms come to the point of being too hard to work they are selling them to the plantations as well and so we are actually losing, I feel, the identity of, well, the history I suppose, of the place to a large extent. But worse than that is the fact that the schools are probably only running about 50% of capacity currently and our school buses are on the knife's edge as to whether they are going to continue.—Interview participant, Boyup Brook

> [discussing the impacts of plantation expansion] …our fire brigade and the school bus run and mail runs … well the fire brigade in particular you know, fairly dramatic … reduction of volunteers in it … [and] the two school bus runs got amalgamated into one bus run—Interview participant, Kojonup

Williams (2009) found that in Western Australia, just over 30% of survey respondents believed that an increase in plantations would lead to a decrease in involvement in local community groups, while around 12% believe there would be an increase in involvement, and the remainder felt there would be either little or no change, or weren't sure how plantation expansion would affect membership of community groups.

What evidence is needed to answer this question?

Identifying the impacts of plantation expansion on local community groups and service provision requires comparing the rate of change in membership of community groups and provision of services in regions experiencing change in the plantation industry (either growth in area of plantations, or in activities associated with plantations such as harvesting and haulage and processing) with similar regions not experiencing change in the plantation industry. This enables identification of whether expansion of the plantation industry is associated with different trends in community groups and service provision compared to other changes affecting rural communities.

The types of community groups and services most commonly discussed in group interviews were:

- volunteer fire fighting brigades
- local schools
- volunteer groups such as the Country Women's Association

- service groups such as the Lions Club, Rotary and Apex
- sporting groups of all types, but particularly football clubs.

Analysing the impacts of plantations on these groups and services requires data on the level of membership in these groups over time in individual towns or local government areas (or, in the case of schools, school enrolment data). This type of 'small area data' is needed as it is necessary to be able to compare membership/enrolment in areas with and without plantations. It is also necessary to ensure data is 'controlled' for other factors likely to influence changes in group membership or school enrolment. For example, enrolment in small schools in rural areas with relatively small populations in many cases has declined faster than enrolment in large rural towns or regional cities in recent decades, and any analysis needs to take this into account.

Another way to approach this question is to directly survey residents living on plantation properties before and after a land use change to plantations occurs, to compare levels of community group membership and use of services prior to and after plantation establishment. This approach is useful for exploring whether establishment of new plantation estate leads to a change in community group membership and use of local services, but doesn't take into account changes in employment and how these may also influence membership and utilisation of community groups and services.

What does the evidence tell us?

Accurate data on membership over time is not available for most community and service groups. Sporting groups, service groups and rural fire brigades were contacted in WA, and it was not possible to obtain the type of detailed data on membership over time needed to analyse the impacts of plantations for any of these groups.

It was, however, possible to obtain accurate data on school enrolment over time for each individual school in WA, and to compare the rate of change in school enrolment in regions with differently sized populations experiencing no/negligible, low, medium or high plantation expansion (Figure 12). Regions with different population levels were separated as these typically experience different trends in school enrolment—as can be seen from Figure 12, regions with smaller population were much more likely to experience falling school enrolment than those with larger populations, irrespective of the extent of plantation expansion.

Regions experiencing medium or high rates of hardwood plantation expansion typically experienced slightly higher decline in school enrolments, or slower growth, than regions with similar populations over 1996 to 2001, and to a lesser extent 2001 to 2006. This coincides with the period in which rapid plantation expansion was occurring, with a relatively small proportion of hardwood plantations established prior to the mid-1990s, and the highest proportion between 1996 and 2001.

This suggests a possible relationship between plantation expansion and decline in school enrolments. Does this relationship mean that plantation expansion caused decline in school enrolment? This is one possibility, although it is also possible that some other mediating factor explains the trends seen in Figure 12. For example, some have suggested plantations are typically established where there is an ageing population, as it is in these areas that more rural properties are on the market. An ageing population is also typically associated with fewer school-aged children. Further work is needed to better explore the relationship between plantation expansion and school enrolment.

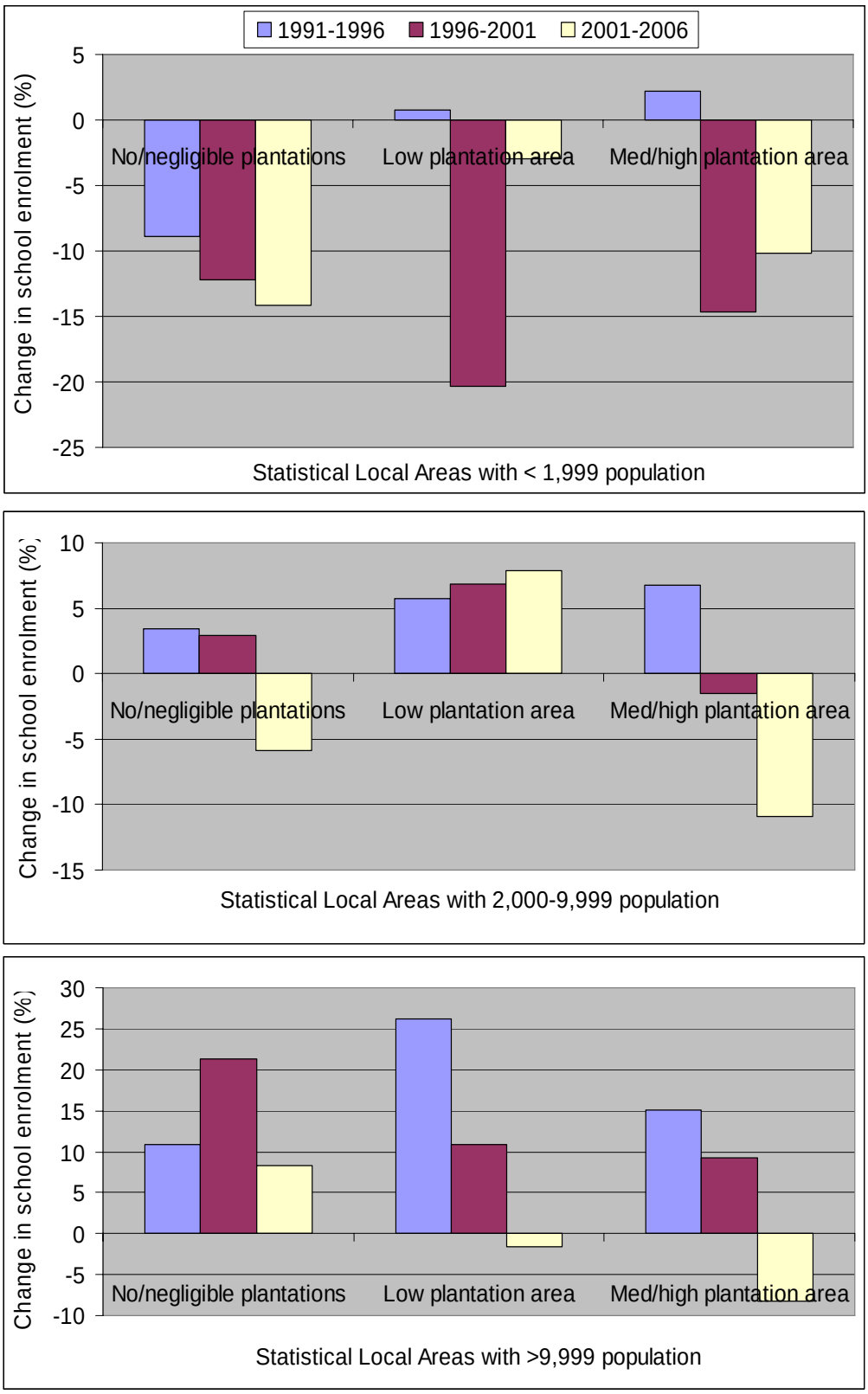

Figure 12: Change in school enrolment in regions experiencing different levels of hardwood plantation expansion, 1991 to 2006 (*Data source:* WA Department of Education and Training. Data is provided for 'Statistical Local Areas' (SLAs). Each local government area is made up of between one and three SLAs.)

Other than school enrolment data, the only other recent information comes from the survey of landholders who had changed land use to plantations (undertaken by Schirmer et al. 2008b) in south-west Victoria and south-east South Australia. In that study, landholders who lived on rural properties prior to plantation establishment were asked if the land use change to plantations affected their membership of rural fire fighting groups, service groups, sporting groups or other community groups.

Landholders who sold a property to a plantation company reported that they commonly changed their membership of these groups:

- While 40% of those who were members of volunteer fire brigades reported no change in membership, 30% changed the location of their membership, and 30% ceased membership as a result of selling their property to a plantation company.
- 68% of those who were members of service groups such as Rotary reported no change to their membership, while 32% ceased their membership when they sold their property to a plantation company.
- 45% of those who were members of sporting groups before the land use change to plantation reported no change in membership, while 33% changed the location of their membership and 22% ceased membership when they sold their property to a plantation company.

When a property was leased to a plantation company, few landholders reported any changes to membership of sporting and community groups, with generally less than 10% reporting any type of change. Most of those that did report a change had changed the location of their membership rather than ceased membership of a group.

This study was not able to identify the extent to which new residents shifting onto plantation properties joined local community groups, and so provides only a partial understanding of impacts.

How do the impacts vary?

Expansion of plantations does appear to lead to some change in membership of local services and groups, primarily when properties are sold to plantation companies. How these changes impact rural communities will depend at least in part on whether new residents who shift into housing on plantation properties join community and sporting groups, something which is currently unknown. Anecdotally, group interview participants reported some cases where new residents did not join local sporting and community groups, and some where they did. Whether or not new residents join local groups, the establishment of plantations does appear to be associated with a period of change in which previous members leave or change the location of their membership which may be disruptive and difficult for local groups. Similar disruptions may result from rapid turnover of farming land or farm amalgamation not involving plantations.

What more do we need to know?

More needs to be understood about how rural community groups and services are changing irrespective of plantation expansion, in order to identify if the changes that plantation expansion leads to are different to those caused by ongoing changes such as farm amalgamation in many rural communities. More data is also needed on the extent to which new residents who shift into housing on plantation properties join local groups and access local services.

How does plantation expansion affect rural land prices?

A majority of new plantations established in recent years have been established on privately owned land purchased by plantation companies, although almost half of WA's hardwood plantations are still on land leased from landholders, rather than purchased outright. The presence of plantation companies in the land market has led some to ask: what effect does this have on rural land prices?

What are the different views?

A common view expressed in previous studies and in the group interviews undertaken for this project is that high demand for land from plantation companies may lead to higher than average growth in rural land prices.

Some people also discuss a potential 'domino' effect, arguing that land prices rise more than average in regions adjacent to plantation regions, as landowners who have sold land at high prices to plantation companies then seek to purchase land in nearby regions where plantations are not being established (Schirmer 2005a).

Another perception less commonly expressed is that plantation establishment may affect land prices of neighbouring farming properties, with farmers more reluctant to purchase properties bordered by plantations:

> We have found one of the biggest problems with the private plantation companies, they were pushing the price of land up, really, and it was making it very hard for farmers to compete if they wanted to buy it.—Interview participant, Harvey

> I mean there is a positive side to that as well, in that those who sold their farms and got a good price for it maybe when the wool industry was down … possibly did well out of it.—Interview participant, Harvey

> They certainly have paid extremely high prices to get hold of land, to attract people to sell.—Interview participant, Esperance

What evidence is needed to answer this question?

To identify the impact of plantation expansion on rural land prices, we need to know if land prices rise at a higher than average rate in regions where there is high demand for land from plantation companies. Ideally, land prices in plantation expansion regions should be compared to land prices for land of similar productivity but on which plantations are not being established. This can be difficult, however, as plantations are often established in many if not most of the regions where there is suitable land.

If establishment of plantations leads to land price change, this would be indicated by:

- land prices rising more than average during periods when plantations were established (assuming demand from plantation companies does drive land prices up)
- land prices rising more than average in regions near plantation regions, during periods when plantations are established and just after (if the 'domino' theory is correct)
- land prices of properties adjacent to plantation properties being lower than for similar agricultural properties not adjacent to plantation properties.

What does the evidence tell us?

Examining land price trends in different regions of WA suggests that expansion of plantations does contribute to rising land prices, although other influences can also contribute to similarly high price growth.

The average price paid per hectare for rural properties larger than 40 hectares was examined for different LGAs in WA[18]. Land price change in LGAs with high, medium and low levels of plantation expansion was compared to adjacent regions with no/negligible areas of plantation, and to regions some distance away with no/negligible areas of plantation. The analysis focused on the period from 1985 onwards, during which almost all of WA's hardwood plantations were established.

Using 1985 as a base year, the rate of land price increase from 1985 to 2008 is shown in Figure 11 for regions with high, medium, low and no/negligible areas of hardwood plantations. Trends in different rainfall regions are separated. High plantation expansion regions all have 600 mm or more average annual rainfall, as do almost all low and medium plantation expansion regions.

Land prices in high plantation areas grew more rapidly than in all other areas except high rainfall coastal regions from the mid-1990s onwards—the period when the majority of hardwood plantations were established. Regions with medium areas of plantation experienced higher land price growth than those with no/low plantation area and rainfall less than 600 mm.

This pattern indicates that there is a consistent pattern of higher rates of land price growth in high rainfall areas, and slower price growth in low rainfall areas, irrespective of plantation development. However, there is some evidence that plantation expansion may have contributed to this price rise with the rate of land price increase in plantation areas higher at times of rapid plantation expansion. This suggests that rapid plantation expansion accelerates land price growth for short periods.

This analysis is limited in that it compares average prices for all rural land sales >40 hectares in the regions examined, rather than specifically comparing prices paid for land sold to plantation companies versus land not sold to plantation companies. It therefore provides an understanding of whether plantation expansion affected overall price trends in these regions, but does not indicate whether higher prices are paid when a property is sold to a plantation company versus when it is sold to other buyers.

[18] Land sales over 40 hectares in size were examined as the large majority of plantations are established on land parcels of 50 hectares or larger, whereas land parcels smaller than this are often sold for rural residential purposes—a land use which has experienced very rapid land price rises in recent years. Irrigated and horticultural land were also excluded, as plantations are predominantly established on dryland areas, and prices for irrigated and horticultural land have typically followed different trends to dryland prices over time.

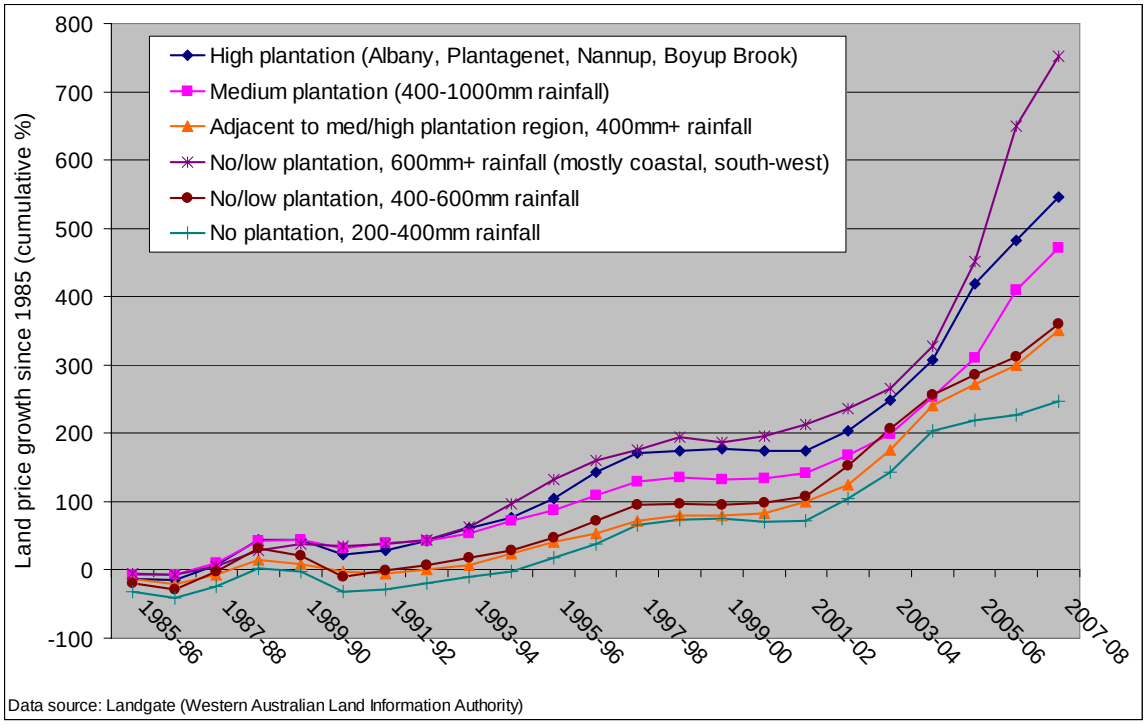

Figure 13: Rate of land price increase in regions with differing rainfall and hardwood plantation area, 1985–2008

Schirmer (2005a) examined prices paid for individual properties in the local government areas of Albany, Cranbrook and Plantagenet over 1994 to 2004, comparing the price paid for land sold to plantation companies versus the price paid in other land sales. This analysis identified that plantation companies typically paid anywhere from 20% to 65% more per hectare than other land purchasers during this period, as can be seen in Figure 14. This confirms that demand for land from plantation companies increases land prices for at least some types of land in these regions.

However, the higher prices recorded were only paid for properties suitable for plantation establishment. Not all land in any given region is suitable for plantations, with factors such as soils, distance to port and rainfall influencing suitability. The extent to which the high prices paid for land suited to plantations leads to price growth on other types of land in the same region is not known.

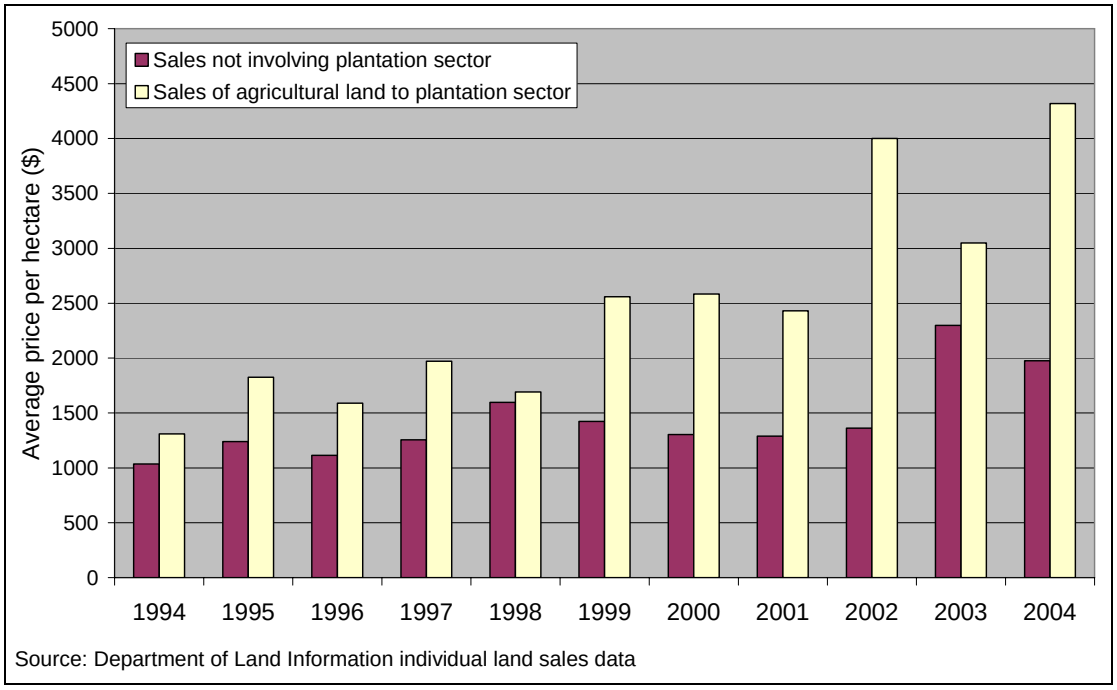

Figure 14: Average price paid by plantation companies and other land purchases in the Great Southern region, 1994 to 2004 (Data originally analysed in Schirmer et al. 2005a has been re-analysed for this report)

How do the impacts vary?

A change in land prices such as the increase observed here will have different impacts depending on the current interests and needs of landholders in the region. Land price growth is likely to have positive impacts for landholders wishing to sell land in a plantation region, but may make it more difficult for landholders who wish to purchase land for purposes such as expanding their farm enterprise, as they have to pay higher prices for that land.

What more do we need to know?

Further work is needed to identify if properties bordering a plantation, which are sold to a buyer other than a plantation company, attract a different average price per hectare compared to properties not bordering plantations. The extent to which the premium paid for land suitable for plantations leads to an increase in prices of nearby land not suitable for plantation establishment also needs further exploration. Finally, further analysis is needed to identify whether a premium is always paid for plantation properties or, if in years of lower demand by the plantation industry, the price paid for land is closer to the market average.

How does plantation expansion affect traditional agricultural industries?

New plantations are established on cleared land previously used for traditional agriculture. This raises the question of what impact plantation expansion has on the agricultural industries that previously utilised the land on which plantations have been established.

What are the different views?

A wide range of views are expressed on this subject. Some people feel the area of plantations is so small as a percentage of total agricultural land that it will not have a negative impact on production of traditional agricultural commodities. Others argue that in some local regions, plantation establishment may lead to a fall in production of some commodities, and that this may have flow-on effects for viability of industries dependent on these commodities. Some appear to view food production as being more important than production of wood and paper products, and as a result believe production of traditional agricultural products should be given priority over plantations:

> … the area that we call priority agriculture is where you have got land that is suitable for horticultural crops but has water available to grow crops and that is a very small area of our shire … what we have said is that within that priority agricultural area that we would not have tourism that closes down farmers working at night, and we would not have plantations where it was going to dry up the water or take out of production the land that we think would show us a better return.—Interview participant, Moora

> … I would like to see more land go back to agriculture in prime lamb, cattle and … grain growing … it is a darn shame that all this good country has gone so much to blue gum.—Interview participant, Mount Barker

What evidence is needed to answer this question?

Identifying the impacts of plantation expansion on agricultural production requires firstly specifying the scale at which the question should be answered. Is the question whether plantation establishment is affecting production of agricultural commodities at the national or state scale, or at a more localised scale? Once the issue of scale is resolved, answering this question requires data on:

- The products produced on the land prior to plantation establishment—what types of agricultural production are potentially changed as a result of plantation expansion?
- What proportion of local, state or national production is affected by plantation expansion?
- The other trends affecting production of that commodity. For example, across Australia sheep flocks have fallen substantially since 1991. While plantations have been established on some of the land which used to be used for sheep farming, there has also been a shift from sheep grazing to cropping, and to beef grazing, in many areas.
- The downstream processing dependent on that commodity, and the 'threshold' changes at which viability of processing in a local area may be threatened. This is important in order to identify whether any changes in commodity production resulting from plantation expansion lead to flow-on impacts down the processing chain.

What does the evidence tell us?

There is currently very little exploration of this question beyond speculation. Some work has examined the proportion of Australia's agricultural land on which plantations have been established. This type of data, however, is often of limited use as in regions such as WA plantations are typically established on high rainfall land which is more productive for some particular types of agriculture than lower rainfall areas. Ideally, data is needed that examines the proportion of different types of land established to plantations, based on land productivity classes.

In WA as a whole, the 414050 hectares of plantations established by 2008 took up approximately 0.37% of the agricultural land in the State. However, this figure is not particularly useful as it does not take into account that the majority of WA's agricultural land is low rainfall, whereas plantations have been established predominantly in the limited region of high rainfall agriculture. In these high rainfall areas, the area of plantations sometimes represents a high percentage of the agricultural land in the region, with hardwood plantations established on[19]:

- over 50% of agricultural land in Nannup
- 25% of agricultural land in Albany (once softwood plantations are included)
- 20% of agricultural land in Plantagenet
- 11% of agricultural land in Boyup Brook
- between 5% and 10% of land in Boddington, Denmark, Collie, Williams, Manjimup and Bridgetown-Greenbushes.

In all other LGAs in WA, hardwood plantations make up less than 5% of agricultural land. Softwood plantations typically make up a smaller proportion of land in any given LGA, with a smaller area established than for hardwood plantations.

These figures suggest that there are a relatively small number of LGAs in which a high proportion of agricultural land has been established to plantation. It is in these LGAs that attention should focus on how agricultural production is changing.

Changes in agricultural production over 1991 to 2006 were examined in medium and high plantation expansion regions, and compared to broader trends to see if there is a noticeable difference in trends in these plantation regions compared to other areas.

Firstly, the land uses occurring prior to plantation establishment were identified. Schirmer et al. (2008b) found that in south-east SA and south-west Victoria, where a similar area of blue gum plantation has been established in similar rainfall zones to WA, land was predominantly used for sheep or beef grazing before plantation establishment, with some land used for grain and oilseed growing. Less commonly, land was used for dairy farming or viticulture, but this made up a very small percentage of the land established to plantation.

[19] These estimates are based on ABS estimates of total agricultural land in different LGAs. It is important to note that some LGAs have a relatively small area of agricultural land—for example, Denmark and Nannup have small areas of agricultural land as much of the land base of these LGAs is in conservation reserves or other classifications. This means a relatively small area of plantations can represent a high proportion of agricultural land in these LGAs.

Group interview participants in WA similarly reported that the majority of land established to plantations had previously been used for sheep or beef grazing, and less commonly for cropping. Occasionally some suggested that areas of land suitable for viticulture or other forms or horticulture had been established to plantation.

Therefore the rate of change in sheep and lamb numbers, beef cattle numbers, area cropped, grapes grown, and vegetables grown was examined and change over time compared for areas with differing levels of plantation and similar rainfall (Figure 15). Dairy farming was also examined as it also takes place in some of the high rainfall regions in which plantations have been established.

Across WA as a whole, sheep and lamb numbers have fallen in recent decades while beef cattle farming and cropping (grain growing and oilseed growing) has expanded. From Figure 15, it can be seen that high plantation expansion areas experienced a greater drop in the number of sheep and lambs than other regions, and slower growth in beef cattle and cereal grains. They experienced greater growth in horticulture and dairy farming than other regions, and greater growth in grape growing than areas with no/low plantations.

This suggests that plantation expansion may be associated with greater than average decline in sheep and lamb numbers, and potentially slower growth in beef cattle farming, in the small number of LGAs where more than 10% of agricultural land has been established to plantation. Plantation expansion does not appear to have affected expansion of horticulture, dairy or viticulture.

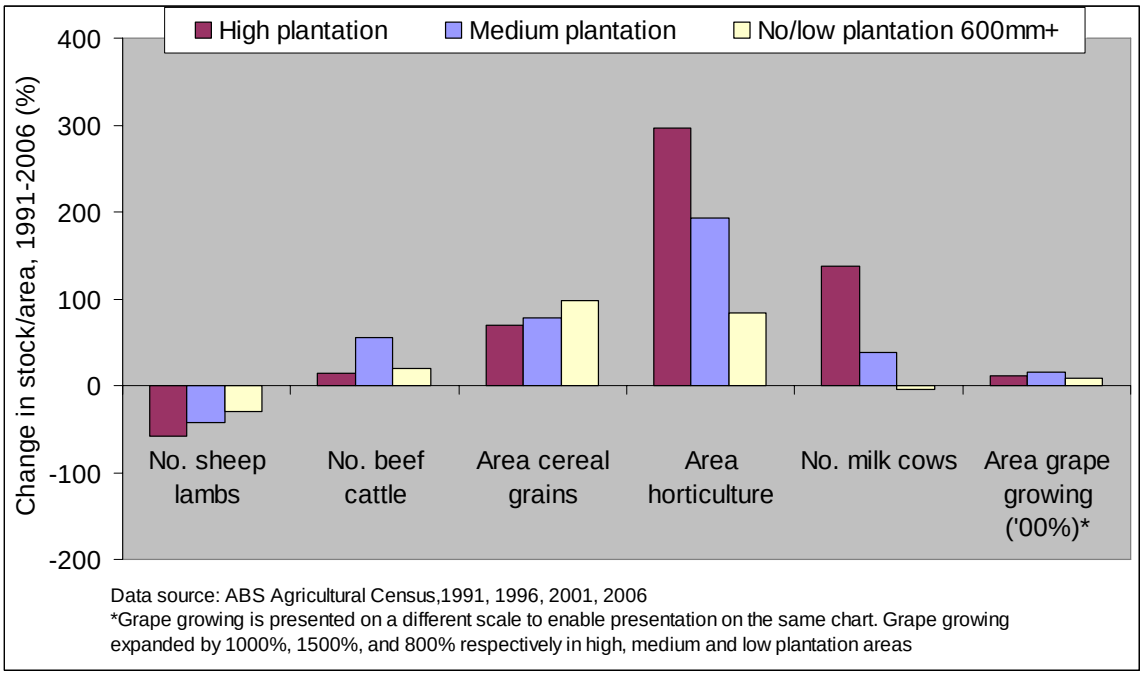

Figure 15: Change in agricultural production in high, medium and low/no plantation areas with rainfall over 600 mm, 1991 to 2006

Relatively similar trends were seen when trends in the number of agricultural enterprises of different types was examined, although with some differences (Figure 16). High and medium plantation regions experienced a greater fall in numbers of sheep, mixed sheep-beef and mixed sheep-beef-grain farms compared to other regions. However, although experiencing slower growth in beef cattle numbers than other regions, they experienced high growth in the number of beef enterprises. This may reflect high growth in small

'lifestyle' beef farms in rural residential regions in high rainfall areas of WA. Numbers of dairy enterprises fell more rapidly in high plantation regions despite numbers of dairy cattle increasing, reflecting extensive restructuring of the dairy industry and consolidation of dairy farms.

Overall, these results suggest that plantations are predominantly established on land used for sheep and beef grazing, and less commonly for cropping, and that where a high area of plantations is established, production of sheep, lambs, cattle and to a lesser extent crops may either decline more or grow less than average. The flow-on effects of this require further examination. The earlier comparison of employment generated by these industries suggests that hardwood plantations, once downstream processing is considered, employ more people per 100 hectares than these enterprises.

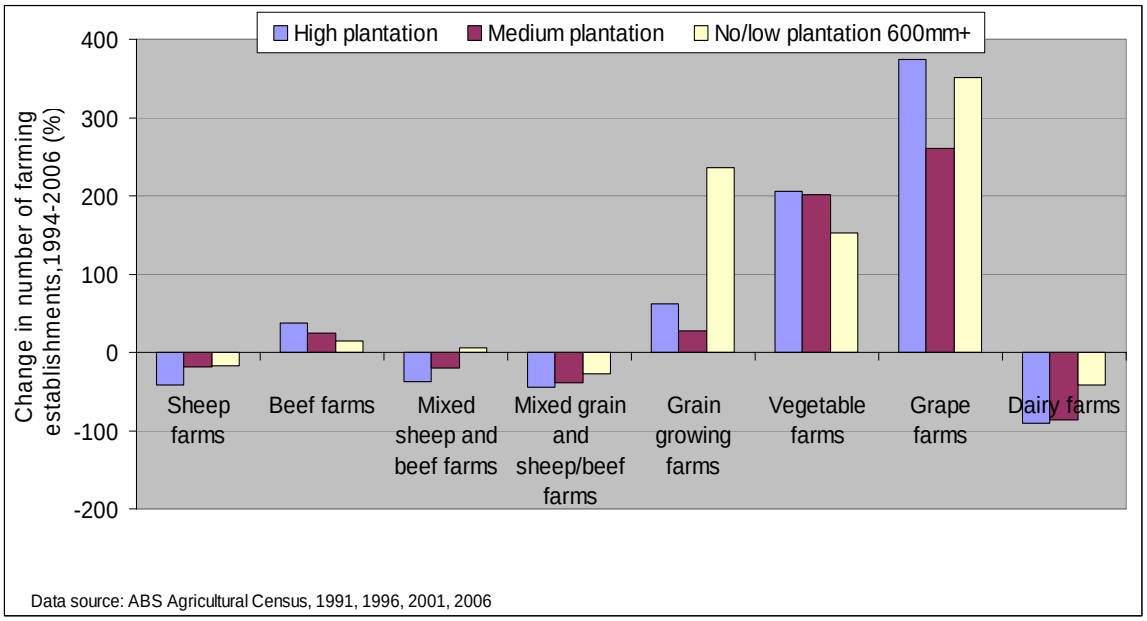

Figure 16: Change in number of agricultural enterprises in high, medium and low/no plantation areas with rainfall over 600 mm

How do the impacts vary?

The expansion of plantations can lead to a change in production of agricultural produce from the land, as that production is replaced by timber and fibre production from the plantation. What are the impacts of this change in agricultural production? As usual, this depends on a range of factors. Firstly, it depends on whether the drop in agricultural production in a plantation region is matched by an increase elsewhere, as farmers who sold a property shift to farm elsewhere. If this is the case, the impact may be a change in where employment opportunities relating to that agricultural industry are located. If there is a net reduction in agricultural production, the impacts will depend on whether the reduction is high enough to affect employment at downstream processing facilities or in industries supplying services such as shearing or veterinary services. If the change is large enough to impact these, there is likely to be a negative impact for those whose business is reduced, while conversely those who are able to take advantage of new business opportunities provided by the plantation industry are likely to benefit.

What more do we need to know?

Further work is needed to examine at what point establishment of plantations may reduce local agricultural production to an extent that downstream processing facilities are affected. More analysis of the trends affecting agricultural production in general is also needed, so that the extent to which plantation establishment versus other influences influence agricultural production is better understood.

Do different types of plantations have different socioeconomic impacts?

A number of types of plantations are currently being established in Australia. Several different species are established, and the end-products also vary, with hardwood plantations most often producing woodchips for paper production (although some are grown to produce other products), while softwood plantations are processed into products such as sawn timber, composite wood products, and others. A question sometimes asked is whether these different types of plantations have different socioeconomic impacts.

What are the different views?

There are a range of views on this issue. When comparing the acceptability of different land uses as part of a survey of residents of Western Australia and Tasmania, Williams (2009) found that eucalypt plantations established for pulp and paper production were on average ranked as less acceptable than pine plantations, while pine plantations in turn were ranked less acceptable than eucalypt plantations established for timber production. This suggests a strong perception that different types of plantations may have different impacts.

What evidence is needed to answer this question?

Answering this question requires comparing the likely impacts of different types of plantations on the range of socioeconomic issues discussed in this report. This can help identify where they are likely to have different impacts, and why.

What does the evidence tell us?

Table 7 compares the impacts of the two types of plantations studies have focused on—eucalypt plantations established for pulp and paper production, and pine plantations which are utilised for sawn timber and a range of related products, as well as pulp and paper production. As no work has examined the impacts of eucalypt plantations grown for timber, they are not included in Table 7.

What more do we need to know?

More work is needed which explicitly compares the socioeconomic impacts of different types of plantations, to identify whether and when they differ.

Table 7: Comparison of socioeconomic changes associated with hardwood and softwood plantations

	Changes associated with hardwood versus softwood plantations
Quantity of employment	Softwood plantations currently generate more employment per 100 hectares than hardwood plantations established for woodchip production, due to differences in the amount and type of downstream processing of the logs harvested from each type of plantation.
Types of jobs	Both types of plantations generate similar levels of full-time, part-time and casual employment.
Location of jobs	Both types of plantation generate more jobs in regional centres and large towns than in rural areas, with jobs often clustered near processing facilities.
Local and regional rural economic activity	Not enough data is currently available to adequately compare the impacts of the two types of plantations.
Rural population levels	Expansion of either type of plantation is likely to lead to similar changes in rural population. The way in which plantations are established will, however, make a difference, with sale of land to a plantation company associated with greater loss of population than lease of land or farmers establishing their own farm forestry. In both cases, net loss of population is small.
Type of people living in rural communities	Not enough data is currently available to adequately compare the impacts of the two types of plantations.
Service provision and community groups	Not enough data is currently available to adequately compare the impacts of the two types of plantations.
Rural land prices	Not enough data is currently available to adequately compare the impacts of the two types of plantations.
Traditional agricultural industries	The two types of plantations are likely to have similar impacts. Impacts will however differ depending on how plantations are established—for example, *Pinus pinaster* plantations established on marginal land on farms are less likely to displace agricultural production compared to establishment of *Pinus radiata* on higher rainfall, more productive land.

Conclusions

Plantation industry expansion is associated with changes to employment, rural population, community groups and land prices. How these changes impact on people living in rural and regional communities where plantations are expanding will differ depending on individual circumstances. For example:

- If employment opportunities shift from small rural towns to larger regional centres as a result of the land use change, this may have negative impacts for some people living in the small towns and positive impacts for some people living in the regional centres.
- If land prices rise due to demand from plantation companies, this will most likely have positive impacts for those who wish to sell land, but may reduce opportunities for other farmers in the area to expand their farm enterprise through purchasing additional properties.
- If sale of properties to plantation companies results in an influx of new residents and loss of previous residents, the impact will depend on how well new residents integrate into the community compared to the previous residents.

While the information presented in this report cannot answer all questions raised about socioeconomic impacts of plantations, it suggests these impacts differ in different situations. There is therefore opportunity to consider how to maximise the positive changes associated with plantation expansion, and minimise negative impacts, through developing strategies that can assist people to adapt to the changes associated with plantation expansion. This may involve strategies that help rural businesses identify new business opportunities they can take advantage of; strategies to assist new residents to build a place in the rural communities they have shifted into; or assisting local residents to develop skills that enable them to seek employment in the plantation industry. Training programs that help develop skills in plantation industry work have already been put in place for several years in some plantation regions in WA.

A key issue to consider when developing strategies to minimise the negative and maximise the positive impacts of plantations is whether the types of change associated with plantations are also likely to occur as a result of other changes, such as ongoing loss of rural population that is happening in many areas of inland WA. Where plantations are only one of the factors contributing to a particular socioeconomic change, an integrated approach is needed to assist communities to adapt to that change, which focuses not only on the impacts of plantations, but the broader changes that are leading to things such as shifting employment opportunities, changes in who lives in rural communities, and changing levels of participation in local community groups.

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Appendix 1: Group interview methods

During 2006 group interviews were conducted with a wide range of residents and stakeholders in Western Australia. The interviews were conducted to explore the variety of views people have about different types of commercial forestry occurring in their regions. The information collected contributed to this report, as well as to other work undertaken by the Communities project of the CRC for Forestry. For this report, the group interviews were utilised to identify the different views people have about the socioeconomic impacts of different types of plantations, and then to use this as the basis for identifying what types of plantations and socioeconomic change to analyse using independent data.

Eight formal group interviews were conducted. Sites of interviews were determined by researchers in consultation with individual advisory group members, and chosen to represent a wide range of geographical location, agro-ecological zones and forestry types. Locations were: Kojonup, Manjimup, Moora, Esperance, Mt Barker, Margaret River, Boyup Brook and Harvey. A further two interviews were conducted more spontaneously in Greenbushes and Porongurup as a result of participant availability or caution about meeting with a larger group of other participants.

Potential participants were identified through community and professional organisations. Around forty groups were contacted inviting participation by one or more member of their group. In each area we selected organisations with a range of interests, for example, agriculture, forestry, community development, local government, tourism, commerce, Indigenous interests, rural fire brigade and conservation interest groups. Groups were provided with information about the project and the interview. Follow-up phone calls were made to encourage and confirm participation.

A total of 56 people participated in group interviews in Western Australia. Group sizes ranged from two to nine, depending on response to invitations; in two cases a separate interview was undertaken with a small number of participants unable to attend one of the eight scheduled interview times. While each group necessarily included a limited range of perspectives, overall participants came from a wide range of backgrounds, as can be seen in Table A1.

Table A1: Types of participants in group interviews

Location	No. participants	Primary affiliations
Kojonup	7	farming, community development
Manjimup	9	developer, farming, Council, community development, NRM
Margaret River	5	conservation, viticulture, farming, political
Moora	6	revegetation, farming-forestry, forest industry, farming, Council, commerce
Boyup Brook	4	Council, commerce, tourism
Esperance	5	community development, farming, Council
Mt Barker	9	farming, community development, Council, education, tourism, viticulture
Harvey	6	Council, state government, NRM, farming-forestry, farming, community development,
Porongurup	3	commerce, conservation
Greenbushes	2	lifestyle farming

Interviews took approximately two hours. Participants were invited to discuss:

- changes they had observed occurring in their region over time, focusing on land use change
- the different types of forestry occurring in their local area
- the different impacts they believed resulted from different types of forestry, including positive, negative and neutral impacts
- their hopes for future management of the region
- what they value about living in the region.

Participants were encouraged to discuss and debate issues, to ensure the full diversity of views about land use change and forestry were identified.

Interviews were fully transcribed for analysis, and identifying information was removed. Transcripts were read for different types of analysis by at least two and often three researchers. Recurring ideas or themes were noted as these related to the key research aims. Researchers discussed and refined these themes for further analysis.