Impacts of land use change to farm forestry and plantation forestry: a survey of landholders

Report prepared for the *Socio-economic impacts of land use change in the Green Triangle and Central Victoria* study

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Executive Summary

Introduction

Land and its uses are essential to all human communities. Every person is shaped in a range of ways by the landscape in which they live, and the products and resources produced on the land. Changes in land use can have a profound impact on the personal, family, work and social lives of people living in rural communities, as well as those living in rural and regional towns.

Many rural regions across Australia have experienced rapid land use change in recent decades. The region extending from the ‘Green Triangle’ in South Australia and western Victoria through to Colac in central Victoria is no exception, with multiple types of land use change occurring in recent decades, including expansion of plantation forestry, and increases in the area of land use for rural residential living and cropping. These land use changes can lead to profound shifts in the region’s communities and economy. They provoke ongoing debate amongst those living in the region, who are affected in different ways by land use change.

To better understand the impacts of land use change in the Green Triangle and Central Victoria over the past 15 years, a new study was developed and launched in August 2006. The *Socio-economic impacts of land use change in the Green Triangle and Central Victoria (Land Use Change)* study builds on and extends a study undertaken in 2000 by the University of Melbourne (Petheram *et al.* 2000). The goal of the Land Use Change study is to provide a comprehensive understanding and quantification of land use, industry and socio-economic change across the region since 1991, and how different people experience these changes.

This report documents the results of one component of the Land Use Change study, which focused on understanding the impacts of land use change to plantation forestry and farm forestry in the region. Data were gathered via a survey of 158 landholders who changed land use to plantation forestry and farm forestry during the last two decades, interviews with landholders, and from plantation companies.

Aims and methods

A key type of land use change occurring in the Land Use Change study region is land use change to plantation and farm forestry. Many questions are asked about the social impacts of this land use change.

This study aimed to understand the impacts of this type of land use change on the landholders who make this land use change; the population and social infrastructure of the local communities in which this land use change is occurring; and the agricultural sector in terms of the types of land use and infrastructure changes involved. A secondary goal was to better understand the factors influencing the decision to change land use to plantation and farm forestry. These issues were focused on as they are common topics of debate about land use change to plantation forestry in the region.

Landholders in the region have changed land use to plantation or farm forestry in three different ways: by selling land to a plantation company, leasing land to a plantation company, or establishing their own farm forestry. These three modes of
plantation and farm forestry were analysed and compared to each other, to enable identification of how the impacts of each differ.

Data were gathered via (a) a survey of landholders who had changed land use to plantation and farm forestry, and (b) data from plantation companies who provided information on the plantation properties they manage. In addition, qualitative semi-structured interviews were undertaken with eight landholders who had changed land use to plantation or farm forestry. The interview data were used to guide design of the landholder survey, and to assist interpretation of the quantitative data gathered through the landholder survey and from plantation companies.

The landholder survey was delivered to 262 landholders of whom 158 responded, with an overall response rate of 60.3%. The sample of those who sold properties was biased towards those who have sold properties in recent years; no other bias was identified in survey responses.

Plantation companies provided data for properties they had purchased or leased from landholders (these companies have no direct involvement with farm forestry). Data were provided for 78% of the estimated 590 properties sold to plantation companies, and 79% of the estimated 155 properties leased to plantation companies in the study region between the mid 1990s and 2007.

Results

The study identified key characteristics of the plantation and farm forestry established, and of the properties established; motivations for the land use change; impacts of the land use change on property infrastructure, the number and type of people living on rural properties, and community and service group membership; benefits and costs of the land use change for the landholders involved; and landholder’s future intentions regarding plantation and farm forestry.

Characteristics of plantation and farm forestry

When characteristics of plantation and farm forestry were examined, it was found that larger areas of land were established to trees when land was sold to a plantation company than when it was leased, or when a landholder established their own farm forestry. Those who sold and leased land typically established blue gums (Eucalyptus globulus), while those who established farm forestry established a wider range of species, although they often established blue gums.

Land was predominantly used for sheep or cattle grazing prior to the land use change, for all types of plantation and farm forestry. Less commonly, land was cropped, and very rarely used for dairy farming.

The proportion of the farm enterprise established to plantation or farm forestry was highest for those who sold properties, with an average 61% of the enterprise established to trees. The proportion of enterprise established to trees was smaller for those who leased land (average 29%), and smallest for those who established farm forestry (less than 5% on average).

Sale process

When land was sold to a plantation company, it was sold directly to the plantation company in 68% of cases. Where land was placed on the market for sale prior to being sold to a plantation company, it typically stayed on the market for less than three months before being sold.
Motivations

Landholder’s motivations for changing land use to plantation and farm forestry varied. A desire to achieve a financial return, to reduce workload and to plan for immediate or future retirement were the most common reasons landholders reported for selling land to a plantation company. Those who leased land also commonly reported financial motivations and a desire to reduce workload, but were also likely to be motivated by a desire to improve property management. Those who established their own farm forestry were typically motivated by a desire to improve the environmental and aesthetic characteristics of their property, and achieve improved property management through diversification of their enterprise and better use of difficult or marginal land.

On-property infrastructure

In most cases, land use change to plantation and farm forestry resulted in relatively little change to infrastructure on the property involved. Those who sold land were most likely to report a decrease in infrastructure, with removal of fences and sheds/storage infrastructure the most common decreases reported. It was rare for housing to be removed or demolished as a result of establishment of any type of plantation or farm forestry, although houses were removed in 4% of cases where a property was sold or leased to a plantation company. These results reflect practice in recent years, and may not be representative of practices in earlier years of plantation establishment in the region.

Population

The establishment of farm forestry has no impacts on the number of people living on rural properties, while leasing of land to a plantation company results in a reduction of population in a small number of cases, and the sale of land to a plantation company results in change in the population living on a property in a majority of cases. In many cases, the overall number of people living on a property doesn’t change, but the people living on the property do change, with previous residents shifting away and new residents shifting onto a property.

When properties are sold, in approximately 44–52% of cases they have residents living on them before the land is sold to a plantation company. Where residents were living on the property before sale, about 75% of the time they shift away when the property is sold to a plantation company. Of those cases where the previous residents shift away, new residents then shift onto the property in anywhere from 50-80% of cases, depending on the timeframe examined – sometimes it takes some time for new residents to shift in, and hence it may take one or two years before some properties are occupied; additionally, some new residents may be temporary so that properties are sometimes inhabited and sometimes not.

In the study region this means that, based on an estimate of 590 properties established to plantation via land sale to a plantation company over 1995–2007, there were:

- approximately 820 people living on these properties before the sale of land to plantation companies
- of these, about 615 shifted off the property as a result of the sale
- between 300–485 new residents shifted onto these properties
• there was a net loss of anywhere between 130 and 315 people living on rural properties across the 17 local government areas of the study region. Some of these remained living in local areas (for example going to live on another farming property or retiring into a local town), while some shifted away to other regions.

This represents ongoing social change, with some type of change in resident population occurring in 75% of cases in which a property with residents living on it is sold to a plantation company.

When properties are leased, in approximately 60–70% of cases they have residents living on them before the land use change. Where residents were living on the property before it was leased to a plantation company, they shift away in about 10% of cases as a result of the land use change, and in 45–55% of cases new residents then shift onto the property. This would result in a net loss of population of around 20 people in total in the study region between 1995 and 2007, with approximately 40 people shifting off properties, 20 new residents shifting onto the properties, and a net loss of around 20 people.

When farm forestry is established, in just over half of cases the property was lived on in the five years prior to the land use change. All respondents to the survey reported that these residents remained on the property after land use change to farm forestry. Therefore no change in population results from the establishment of farm forestry.

Overall, the study region experienced a loss of just under 8,000 residents living on rural land or in towns with less than 200 residents, over the period 1996 to 2006 (the period when almost all plantations were established). In the local government areas (LGAs) in which plantation expansion occurred (all rural LGAs except Horsham, Northern Grampians, Ararat, Kingston and Robe had at least 1,000ha of plantation established over this period), there was a decline of 1,495 in the rural population. Given that plantation expansion led to a net loss of between 150 to 335 people living on rural properties in these regions – although some of the people who shifted off plantation properties did remain living in the local region – plantation expansion is likely to have influenced at most 10–20% of the net loss of rural population experienced in plantation regions. In other regions with little plantation expansion, rural population also declined at similar or higher rates to the decline seen in plantation areas. This issue is explored in more detail in other reports forming part of the Land Use Change project.

On-property employment

People stopped working on the property in a majority of cases where a property was sold (59%), 33% of cases where a property was leased, and very rarely (only 5.9% of cases) when farm forestry was established. Where people did stop working on the property, between 1.6 and 2.3 people typically stopped working. More people were reported to stop working on properties that were sold compared to those that were leased. Of those who stopped working on a property, the majority either went to work on another property forming part of the farm enterprise, or retired.

Community and service group membership

Land use change to farm forestry was not associated with any change in membership of community and service groups. Leasing of land to a plantation company was associated with changes in membership in approximately 10% of cases, and sale of land to a plantation company in just over 50% of cases.
Membership of rural fire fighting services and sporting groups were most commonly reported to be affected by land use change to plantation forestry. In about half of cases where the land use change affected membership, the landholder ceased membership of the group altogether, while in the other half they changed the location of their group membership.

Overall, sale of land led to cessation of membership of rural fire fighting groups, sporting groups, or other community and service groups in approximately 25% of cases, and led to a change in location of membership in 25% of cases. In the other 50% of cases, membership of these groups was not affected by the land use change.

It was not possible to identify whether new residents who shift onto plantation properties join community and service groups, so the ‘net’ impact of the land use change to plantations on community and service group membership could not be estimated.

Benefits of the land use change for different landholders

Different types of landholders described different benefits of the land use change to plantation or farm forestry. Those who had sold properties most commonly described increased resources, personal financial benefits, retirement, enterprise financial benefits, lifestyle and reduced workload as benefits of their decision to sell their property. Other benefits were less frequently reported by this group of landholders. This indicates that benefits of selling a property primarily involve a mix of financial benefit and benefits related to workload and lifestyle, particularly for those who are selling land in order to retire.

Those who had leased properties also listed personal financial benefits and reduced workload as key benefits of the land use change. Many also described environmental and stock management benefits, issues which were rarely raised by those who had sold properties.

Those who had established farm forestry most commonly reported environmental benefits, benefits for stock, aesthetic benefits and lifestyle benefits, with financial benefits much less commonly reported than for the other two types of respondent.

The large majority of respondents were satisfied or very satisfied with the decision to change land use, whether it involved sale of land, lease of land, or farm forestry.

Costs of the land use change for different landholders

Of landholders who sold a property to a plantation company, 37.5% reported that the land use change had no costs for themselves or their families. Those who did report some negative effects listed family and community impacts, pests and weeds, land prices and land management challenges as the most common costs of the land use change.

Landholders who leased a property were also likely to report there were no costs involved, but did so in only 17.8% of cases, compared to 37.5% for those who sold properties. In general, a wider range of costs were reported by this group of landholders, with no one topic reported by more than 20% of respondents. The negative effects identified were somewhat similar to those who sold properties, with pests/weeds and family/community impacts commonly reported. Those who leased land also reported some issues not typically raised by those who sold properties, with negative interactions with plantation companies (relating to issues such as stock management or property access), fencing costs, financial costs and risk, land
management difficulties, and concerns about cost of reverting land to agriculture, all reported by some respondents in this category.

Landholders who established their own farm forestry, meanwhile, were more likely than other survey respondents to report that the land use change involved financial costs and risks (38.9% of respondents). Other costs reported by farm forestry respondents included the hard work involved, pest and weed problems, negative interactions with the plantation industry (about issues such as finding a market for timber being grown in a farm forest), fencing and land management costs.

**Discussion and conclusions**

Overall, the study results indicate that establishment of trees for commercial wood production has different effects on landholders, communities and infrastructure depending on the way it is undertaken. Changes to the population living and working on the property, and to community and service group membership, are most likely to occur when land is sold to a plantation company, and less likely to occur when land is leased to a plantation company or farm forestry is established. Sale of land also involved establishment of larger areas of trees, and of a larger proportion of the enterprise, than leasing or farm forestry.

Understanding the impact of the sale of land to plantation companies on local communities requires not just counting the numbers of people who shift off and onto the property, but identifying the extent of change, or ‘turnover’, in the population. In 75% of cases where the land sold to a plantation company had people living on it prior to the sale, there is either a shift to a new person living on the property, often someone who works in a nearby town rather than a farmer, or a loss of population. This represents an important social change for rural communities. The social impacts of this change depend on how the new residents who shift into housing on the property are able to integrate into the local community. If the new residents are temporary or ‘weekenders’, they may have relatively little interaction with the local community compared to previous residents; conversely they may be people who live and work in the local area and who join many local groups. The impact of the change also depends on how existing residents of the community view the new residents – are they welcomed, or viewed as outsiders who are not given opportunities to integrate into the community?

The results of this study are consistent with perceptions reported in previous studies, in which the sale of properties has been singled out as particularly likely to have impacts on the population living on properties and to lead to social change (eg Petheram *et al.* 2000, Schirmer 2002, Schirmer *et al.* 2008). Farm forestry, meanwhile, is commonly perceived as having few or no impacts on rural population (Schirmer 2007).

The data presented here confirm these perceptions, but also identifies that the magnitude of the net change is lower than the perceptions reported in previous studies would suggest, both in terms of the loss of population living on rural properties, and reduction in membership of community and service groups. This provides some context to perceptions that land use change to plantation forestry will lead to ongoing and large-scale decline in rural population. The results of this study do not support this suggestion, but do support that there is some loss of rural population from rural properties, and some decline in community and service group membership, as well as changes in location of membership.
However, it is important to emphasise that the population changes identified in this report occurred in a context where plantation companies have generally been able to subdivide a small parcel of residential land from a plantation property and sell it; this has been facilitated by both having a regulatory and planning environment which permits this subdivision, and high demand for rural residential properties in the region. It is likely that the population impacts of plantation expansion would be quite different in situations where subdivision was not possible, and in regions where there is less demand for residential housing.

More importantly, the results of this study suggest a need to focus attention on the social impacts of the population turnover that results from sale of land to plantation companies, and to identifying ways of assisting integration of new residents into the communities they have shifted into.
The Land Use Change study

This report forms one of several reports from the *Land Use Change* study, and should be read in conjunction with other reports. The project reports are summarised in the following table, and are available on the project website, [www.landusechange.net.au](http://www.landusechange.net.au).

<table>
<thead>
<tr>
<th>Publication</th>
<th>Description</th>
<th>Publication date</th>
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<tbody>
<tr>
<td><strong>Living with land use change: different views and perspectives</strong></td>
<td>This report presents the results of the group interviews undertaken in the region in late 2006. It highlights the diversity of way people in the region have been impacted by land use change.</td>
<td>Mar 2008</td>
</tr>
<tr>
<td><strong>Understanding resident views on land use change</strong></td>
<td>Reports results of the ‘resident views on land use change’ survey.</td>
<td>Aug 2008</td>
</tr>
<tr>
<td><strong>Impacts of land use change to farm forestry and plantation forestry: landholder survey results</strong></td>
<td>Analyses the impact of changing land use to plantation forestry or farm forestry on rural populations and on those who decide to make the change.</td>
<td>Nov 2008</td>
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</tbody>
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| **Employment and spending: comparing the activity generated by different primary industries** | Quantifies how much employment and spending different industries generate in the community. | Summary: Dec 2008  
Full report: Mar 2009 |
| **Socio-economic impacts of land use change: what do the statistics tell us?** | Analyses the changes in land use, and social and economic characteristics across the region over time. | Summary: Dec 2008  
Full report: Mar 2009 |
| **Socio-economic of land use change: Integration report & Summary report** | Integrates and summarises findings across the whole project | Dec 2008 |
1 Introduction

1.1 Introduction

Land and its uses are essential to all human communities. Every person is shaped in a range of ways by the landscape in which they live, and the products and resources produced on the land. Land and its uses are particularly important for rural communities, where many people depend on land for their livelihood, and the way land is used has a central role in defining the identity of an area and its community.

Changes in land use change can have a profound impact on the personal, family, work and social lives of people living in rural communities. Many rural regions across Australia have experienced rapid land use change in recent decades. The region extending from the ‘Green Triangle’ in South Australia and western Victoria through to Colac in Central Victoria is no exception, with multiple types of land use change occurring in recent decades. These have included expansion of plantation forestry, increasing numbers of rural residential properties, growth in the area of land use for cropping, decreasing in wool production in some areas, increasing prime lamb production, and a range of changes to the dairy industry in different parts of the region.

These land use changes have the potential to lead to profound shifts in the region’s communities and economy. They provoke ongoing debate and sometimes conflict amongst residents of the region, who are affected in different ways by land use change. Land use change may create positive change in one person’s life — for example, by providing employment opportunities or the chance to develop new social networks. The same change, however, may have negative impacts on another person, who may lose a farming opportunity, or experience loss of social networks as friends or family shift out of their community. Change is commonly described as ‘inevitable’, but it is essential to understand its impacts, and how these impacts differ for different people in a community. This understanding can help people better understand and plan for change, and inform debate about the types of change that are desirable in rural regions.

This report documents the results of a study of the impacts of land use change to plantation forestry and farm forestry during the last two decades, and of plantation companies. The goal of the study was to better understand the social impacts of land use change to plantation and farm forestry, which are commonly debated in the region. The research focused on identifying how this type of land use change affects the landholders involved, the population of the local community in which they live, and the agricultural sector in terms of infrastructure on rural properties and changes in land use. These issues were focused on as they are commonly raised as topics of debate about land use change to plantation forestry in the region.

1.2 Background: the Land Use Change project

This report forms one of a series produced as part of the Land Use Change project. A range of land use and socio-economic changes have occurred across the Green Triangle and Central Victoria over the past 15 years. In 2000, a University of
Melbourne research team examined the socio-economic impacts of land use change in south west Victoria, and identified extensive land use change from grazing to cropping, dairying and blue gum plantations (Petheram et al. 2000). Land use changes have continued since 2000, with the area under plantations, cropping and dairying continuing to expand, and increasing use of rural land for residential and ‘lifestyle farming’ purposes.

To better understand the ongoing impacts of these changes, a new study was developed and launched in August 2006. The *Socio-economic impacts of land use change in the Green Triangle and Central Victoria (Land Use Change)* research project builds on and extends the 2000 study. The goal of the *Land Use Change* study is to provide a comprehensive understanding and quantification of land use, industry and socio-economic change across the region since 1991, and how different parts of the community experience these changes.

The *Land Use Change* study region is shown in Figure 1. It covers a larger area than the original study, extending from Colac-Otway, in central Victoria, to Robe in the lower south east of South Australia, and from West Wimmera south to the coast. It also examines changes occurring in the region in greater detail than was possible in the 2000 study.

![Figure 1: The *Land Use Change* study region](image)

Three organisations are undertaking the *Land Use Change* study research: the Australian National University, the University of Melbourne, and the Victorian Government Department of Primary Industries. The following organisations are contributing cash or in-kind funding to the project (in alphabetical order): Central Victorian Farm Plantations, Cooperative Research Centre for Forestry, Corangamite Catchment Management Authority, Forest and Wood Products Australia, Glenelg Hopkins Catchment Management Authority, Glenelg Shire Council, Green Triangle Regional Plantation Committee, Moyne Shire Council, Southern Grampians Shire...

More information about the project, project methods and governance, and project progress can be found on the project website at [http://www.landusechange.net.au](http://www.landusechange.net.au).

This document reports the results of one part of the Land Use Change study, a survey of landholders who changed land use to plantation and farm forestry during the last two decades, and of plantation companies who purchased or leased land for plantation forestry.

### 1.3 Aims and scope of the survey

The principle goals of this part of the Land Use Change study were to understand the impact of land use change to plantation and farm forestry on:

- landholders who make this land use change
- the population and social infrastructure of the local communities in which this land use change occurs
- the agricultural sector in terms of the land use and infrastructure changes involved in the shift to plantation and farm forestry.

A secondary goal was to better understand the factors influencing the decision to change land use to plantation and farm forestry.

These goals were developed after an initial review of land use change issues in the region (see Schirmer et al. 2008), and of recent studies examining land use change. This review identified that concerns over the impacts of plantation forestry were a key issue being debated in the study region and more broadly in other regions around Australia. Perceptions that plantation expansion leads to rural population decline, changes in rural infrastructure, and changes to membership of community and service groups, have been reported in several Australian studies over the past decade, including Kelly and Lymon (2000), Petheram et al. (2000), Tonts et al. (2001), Schirmer (2002), Pickworth (2005), and Schirmer et al. (2005). However, almost all these studies documented perceptions, and did not also undertake work which could quantify the population changes associated with land use change to plantation forestry. Schirmer et al. (2005) analysed statistical data on population change and found no evidence that plantation expansion had led to rural population decline at the local government area (LGA) scale in the Great Southern region of Western Australia. This study, however, did not examine the farm-level scale to identify the exact population changes that occurred – while it identified that any population loss in the particular region studied was too small to show an identifiable effect at the LGA scale, it did not identify the direct population shifts associated with plantation expansion. There is a need for more direct evidence regarding population change resulting from land use change to plantation forestry.
In group interviews held in August 2006 for the Land Use Change study, expansion of plantation forestry was identified in every interview as an important land use change that should be examined as part of the study. A range of perceptions were reported about the social impacts of plantation expansion, including concerns about its impacts on (Schirmer et al. 2008):

- rural population levels
- participation in local community and service groups
- land available for traditional agriculture
- rural infrastructure, such as housing on rural properties.

The decision to study land use change to plantation and farm forestry via a specific study of landholders and plantation companies was made for two reasons.

Firstly, as described above, plantation forestry was identified as the highest priority land use change to be studied in the group interviews reported in Schirmer et al. (2008), and concerns over the impacts of plantation forestry on population, community group membership and property infrastructure have been reported in a number of studies.

Secondly, the resources available for this part of the study were relatively small, and it was decided they would be best invested examining a single type of land use change. It was most feasible to survey landholders who have changed land use to plantation forestry as their contact details could be obtained, while it is more difficult to identify a sample frame of landholders involved in many other types of land use change, such as a shift from sheep to beef cattle grazing. In the case of land use change to plantations and farm forestry, the change typically involves interaction with an external group such as a plantation company or a farm forestry network, which can be used to help identify the landholders involved. Other types of land use change are often made by individual farmers without the involvement of an external group.

### 1.4 Types of plantation and farm forestry studied

When designing this study, the first step was to identify what types of plantation or farm forestry should be included.

Tree planting on agricultural land takes many forms in the study region. Trees are planted for both commercial and non-commercial purposes. This study focuses on the planting of trees for commercial wood production, as in group interviews held in 2006, participants typically viewed tree planting for non-commercial purposes as having no significant negative social impacts, while tree planting for commercial wood production was often believed to have a range of potentially negative impacts (Schirmer et al. 2008).

In the study region, establishment of trees for commercial wood production occurs via:

- purchase of agricultural land by plantation forestry businesses
- lease of agricultural land by plantation forestry businesses
- self-funded farm forestry - landholders establishing commercial tree crops on their property independently of the plantation industry. Some of these
landholders may receive some financial grants or other assistance to help them establish their farm forestry.

Additionally, a small number of joint ventures were established between plantation companies and landholders in the 1980s\(^1\). These have not typically been used in the region over the past 10 to 15 years.

A similar argument to that used to exclude non-commercial tree planting could be used to exclude self-funded farm forestry from the study. Perceptions of self-funded farm forestry are generally that it involves no change in farm population. This perception has been reported in several previous studies including Mutch and Hutchison (1979) in Scotland; CFPLM (1989), Tonts et al. (2001) and Schirmer (2002) in Australia; and Cossalter and Pye-Smith (2003) in an international review of plantation forestry issues. Farm forestry and plantation forestry were described as distinct and differing land uses in the group interviews held in the study region in September 2006 (Schirmer et al. 2008).

However, self-funded farm forestry is undertaken for the purpose of commercial wood production. Further, it is sometimes argued that farm forestry may be preferable to large-scale plantation forestry, because it is believed to have fewer negative impacts on rural population levels (Schirmer 2007). It is therefore presented as an alternative option to purchase or lease of land by plantation companies.

It was decided to include farm forestry in the study as well as larger scale plantation forestry, to test the common perception that farm forestry has a smaller impact on rural population than larger-scale plantation forestry.

Therefore the study focused on three types of land use change to plantation and farm forestry:

- purchase of land by plantation companies
- lease of land by plantation companies
- farm forestry – both self funded and undertaken with financial assistance from government or industry.

Joint ventures were also included, but as noted previously, a very small number have occurred. As many of these involved farmers undertaking most of the physical work of tree planting and management themselves, they were included in the farm forestry category.

\(^1\) Joint ventures involve agreements in which the plantation company and landholder each take a share of returns on harvesting of the tree crop.
2 Methods

2.1 Introduction

This study aimed to quantify the impacts of land use change to plantation and farm forestry on the landholders making the change, the population living on rural properties, and agricultural land use.

Qualitative interviews were used to identify key issues and topics to examine, and provide context for better understanding how different landholders have made the decision to change land use. A postal questionnaire was then used to survey a sample of landholders who have changed land use to plantation and farm forestry in recent years. Finally, data were collected from plantation companies to further quantify the population change resulting from leasing and selling land for plantation companies.

The following sections describe:

- the methods used to design and carry out the landholder survey, including:
  - qualitative interviews
  - survey question design
  - sample frame design and sample
  - survey delivery
  - response rate and data analysis
- the data collection from plantation companies.

Ethical issues are then discussed.

2.2 Landholder survey

The landholder survey was designed by conducting qualitative interviews, which were used to assist in designing a questionnaire delivered to a sample of landholders who had changed land use to plantation or farm forestry.

2.2.1 Qualitative interviews

Qualitative semi-structured interviews were undertaken with land managers on eight enterprises prior to designing the survey. Landholders were identified through recommendation of members of the Land Use Change project Advisory Group and
Steering Committee\(^2\), and assistance from the coordinators of local agroforestry networks\(^3\).

The interviews were undertaken with three landholders who had established their own farm forestry, two who had leased land to a plantation company, and three who had sold land to a plantation company.

The purpose of the interviews was to identify key issues and topics to be included in the questionnaire, and provide context for better understanding how different landholders have made the decision to change land use. Interview questions were designed based on topics raised in group interviews conducted earlier in the project in which land use change in the study region was discussed (Schirmer et al. 2008).

Landholders were asked to discuss:

- Their history of involvement with plantation and farm forestry.
- What made them decide to change land use to plantation or farm forestry?
- How establishment of plantation or farm forestry changed property management.
- Whether the land use change resulted in changes to the housing and infrastructure on the property and, if yes, what changes occurred.
- Whether the land use change resulted in any changes in the number of people living or working on the property and, if yes, what changes occurred and what impacts they had.
- If the landholder had shifted off a property when land use change occurred, where they shifted to and why, and what they had done since the shift.
- How satisfied they were with the decision to change land use, and what the benefits and costs had been.
- If they still owned land, what they planned to do with the land after the trees have been harvested.
- Any other aspects of their land use change experience they wanted to discuss.

Interviews were audio recorded, fully transcribed, and analysed to assist design of the questionnaire for the landholder survey. The results of the interviews were further analysed in conjunction with the survey results, to help provide context for the patterns seen in the results of the survey.

\(^2\) The Advisory Group is made up of 15 local residents with experience in the different land uses being studied in the project, and with links to a range of regional organisations. The members were able to provide links to a range of landholders who had undertaken plantation and farm forestry via either their work, social and professional networks. The Steering Committee includes representatives of project funding agencies, some of whom also had contacts that enabled them to assist in identifying landholders for interview.

\(^3\) All landholders were rung by the person who recommended them for interview and asked if they were willing to be contacted by researchers before their details were given to the researchers.
2.2.2 Survey question design

The questionnaire was designed by:

- Analysing results of the semi-structured interviews and using the content to guide development of an initial draft survey,
- Asking members of the Land Use Change Advisory Group and Steering Committee to provide feedback, after which questions were revised. Several members of these groups had direct experience with changing land use to plantation and farm forestry, so they provided a useful initial review point for draft questions, and
- Asking six people who have experience with changing land use to plantation and farm forestry to test the survey. This involved completing the full survey and returning it to the researchers. Following the test, the survey was revised to produce the final questionnaire.

The final questionnaire asked questions on the following aspects of the land use change to plantation or farm forestry:

- Types and area of plantation or farm forestry established
- Proportion of the farm enterprise established to trees
- Types of trees established
- The sale process for those who sold a property
- Motivations for changing land use
- Previous land uses
- Changes to on-property infrastructure
- Changes to the number of people living on the property
- Changes to the number of people working on the property
- Changes to membership of community and service groups
- Benefits and costs of the land use change
- Overall satisfaction with the decision to change land use
- Future intentions with regard to plantation or farm forestry.

A copy of the final questionnaire is provided in Appendix 1.

2.2.3 Sample frame

The sample frame included all people in the study region who have established their own farm forestry, leased land for plantation establishment, or sold land on which a plantation was subsequently established. The study focused on those who had changed land use to farm or plantation forestry since 1995, as this is the timeframe within which almost all large-scale plantation establishment of hardwood plantations has occurred in the region. While some agricultural properties were purchased in the region for pine plantations in earlier years, initial discussions indicated it would be difficult to identify and survey these landholders.
For this study, the following information was needed to establish an appropriate sample frame:

- The number of properties purchased, leased or established to farm forestry between 1995 and late 2007 (when the survey was distributed), ideally by the year in which land use change occurred to enable analysis of response bias by time.

- The number of landholders who changed land use, by type of farm/plantation forestry. The number of landholders may be different to the number of properties, as some landholders may have leased or sold more than one property. Again, information on the year in which land use change occurred should be identified if possible.

- If possible, the location of properties and landholders involved, in case location influences the type of impact. Ideally, the number of properties/landholders involved in changing land use would be identified to the statistical local area (SLA) scale. This would enable spatial variance to be analysed as part of the survey. As discussed below, the location data identified was limited, so that it was not possible to undertake analysis of spatial variance across the study region.

The sample frame was identified through obtaining data from (a) local agroforestry networks that operate throughout the region, and (b) plantation companies operating in the study region.

Coordinators of local agroforestry networks provided lists of their members, which were consolidated and used to estimate total numbers of landholders who have established farm forestry. While not all farm foresters are members of agroforestry networks, this was the only approach possible for estimating the total number of landholders who have established farm forestry in the region. Information gathered included the location of properties and, where known, year/s of establishment and area established. However, this information on location and area was provided for only a small proportion of the total number of properties identified.

Plantation companies operating in the region were asked to provide information about the individual properties on which they have established plantations, including the year of establishment, whether the property is leased or owned by the company, and the location of the property. This enabled identification of the total number of individual properties established to plantation. Of the plantation companies, all but one small company provided information on the total number of properties managed and whether properties were leased or owned. The majority provided information on the year in which properties were acquired. Fewer provided information on location of the properties.

Table 1 summarises the sample frame identified, and the sample of landholders who were sent questionnaires. The sample frame is presented by number of properties and number of landholders. The latter was estimated after the survey was completed, when it was possible to identify the proportion of landholders who had established farm forestry, or leased or sold land to a plantation company, on more than one property. Of the respondents to the survey, almost 25% had undertaken farm or plantation forestry on more than one property they managed, or sold more than one property to a plantation company. Therefore while the total number of properties across the study region established to plantation or farm forestry is approximately
1300 (with some uncertainty about numbers of farm forestry properties), the number of landholders involved is estimated to be approximately 1100 (plus or minus 70 due to uncertainty in estimates).

Table 1: Sample frame by type of landholder, and sample surveyed

<table>
<thead>
<tr>
<th>Sample frame (properties)</th>
<th>Sample frame (landholders)</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm forestry</td>
<td>500–600</td>
<td>500–600 (390 contactable)</td>
</tr>
<tr>
<td>Plantation – property purchased</td>
<td>590</td>
<td>440–460</td>
</tr>
<tr>
<td>Plantation – property leased</td>
<td>155</td>
<td>110–130</td>
</tr>
<tr>
<td>Total</td>
<td>1295 (±50)</td>
<td>1100 (±70)</td>
</tr>
</tbody>
</table>

2.2.4 Survey sample

The sample to which the questionnaire was sent is shown in Table 1, and was determined by:

- identifying the number required to achieve representative results from the survey, assuming a 50% overall response rate
- the number of landholders who were contactable.

A key constraint was contactability of landholders; this limited the sample size significantly in the case of those who had sold properties to plantation companies.

Different types of landholders were identified and contacted using the methods described below.

Farm foresters: Agroforestry networks forwarded surveys on the researcher’s behalf to a randomly selected sample of 129 of the 390 contactable farm foresters identified in the region. To ensure confidentiality, the researchers never had access to the contact details of these farm foresters – researchers were provided a list of landholders which included details on the locality of their property, and where available the year and area of planting, but with contact details removed and replaced with an ID number. Researchers assigned a random number to each record, and this was used to determine the landholders who were sent surveys, with the first 129 in the randomised order sent surveys by the agroforestry networks.

Landholders who had leased land to a plantation company: Three major plantation companies agreed to contact landholders who leased land to them, and ask if they were willing to have their contact details passed to the researchers. To ensure no bias in this process, researchers assigned random numbers to a list of leased properties provided by the companies (which included all details except name and contact details of the landholder), and requested landholders be contacted in

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4 Note: If a property was purchased by an investor, then leased to a plantation company, this is included in the ‘properties purchased’ category as there was a property sale involved for the purpose of establishing plantation forestry, even though a lease arrangement was subsequently involved.
descending order using the random numbers. Of the landholders contacted by plantation companies, only one refused to have their contact details passed on to researchers. The key constraint was difficulty identifying current addresses of leaseholders, as companies often did not hold current phone numbers for leaseholders and had difficulty contacting them to ask permission. In total, 65 landholders who had leased land to a plantation company were sent surveys by researchers.

**Landholders who had sold land to a plantation company:** Three major plantation companies identified contactable landholders who had sold them land. This was done through (a) personal knowledge of the landholders, with plantation company representatives often staying in contact with previous landowners for some time after the sale; and (b) through any records of forwarding addresses for landholders left with companies. The plantation companies contacted landholders and asked permission to pass on their contact details; none refused. To ensure no bias in this process, researchers assigned random numbers to the list of properties provided by the companies (which included all details except name and contact details of the landholder), and requested landholders be contacted in descending order using the random numbers. A total of 68 landholders were sent surveys. A higher number would have been preferred but was not possible due to difficulty identifying contact details for landholders who had sold properties.

The process of contact described above had potential for bias. In particular, it was possible that those who had sold properties would be more contactable if they had remained in the local area rather than shifted away. This is discussed further in the ‘Survey response bias’ section.

### 2.2.5 Survey delivery

The survey delivery process used an adapted form of the Dillman Total Design Method (Dillman 2007). This Dillman approach has consistently achieved 50-70% response rates from Australian landholders and natural resource managers in the agricultural, fishing and forest industries (e.g. Byron *et al.* 2004a,b; Schirmer and Pickworth 2005). In this study, the survey was:

- printed in an A4 booklet with the questions designed to be easy to interpret and answer (see Appendix 1 for format)
- mailed together with a stamped self-addressed envelope for survey return
- accompanied by a personalised letter encouraging survey return
- accompanied by a 1800 free-call number survey recipients could call to receive advice and assistance with completing the survey
- followed by posting of a reminder survey one month after the initial survey was sent. As most landholders had received a phone call asking if they were willing to have a survey posted to them before receiving it, this meant there was a total of three contact points.

This is a modified form of the process recommended by Dillman (2007). It differed in that instead of having a pre-survey letter followed by a survey, both were posted together as most landholders had already been contacted by phone to ask permission to pass their contacts details to researchers; and fewer reminders were posted than recommended by Dillman. This was because response rates were high after the initial
reminder was sent, and because of difficulties in timing of survey delivery over the Christmas/New Year break of 2007-08 (see Byron et al. 2004a,b).

Two methods were used to post surveys:

- for farm foresters, survey packs were prepared by researchers, and addressed and posted via a third party, the landholder’s local agroforestry network
- for landholders who had leased/sold a property, surveys were posted directly by the researchers.

This was guided by practical considerations, as agroforestry networks were not permitted to pass landholder contact details on to researchers, while plantation companies indicated a preference for the researchers to post surveys and handle all survey delivery once they had gained permission from landholders for their contact details to be passed on. Other than being posted by different people, the survey packs were identical. In both cases, the methods used ensured the sample obtained was as random as possible, albeit with limitations for the sample of landholders who had sold properties due to difficulty in obtaining their contact details.

### 2.2.6 Survey response rate and data analysis

The overall response rate to the survey was 60.3%, and is detailed in Table 2. The ‘response rate’ column contains two figures:

- the number of responses from landholders who were identified as undertaking farm forestry, leasing land, or selling land prior to delivery of the survey
- the total number of respondents who had done each of these things.

These numbers differ as, in several cases, a person who was sent a survey because they were a member of an agroforestry network indicated they had also leased or sold land to a plantation company, and provided details about this in their survey response. This meant that a single landholder might represent multiple cases of land use change to plantation or farm forestry.

**Table 2: Survey response rate from different types of landholder**

<table>
<thead>
<tr>
<th>Sample frame (landholders)</th>
<th>Sample</th>
<th>Response rate (number surveys returned)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farm forestry</strong></td>
<td>500–600 (390 contactable)</td>
<td>129</td>
</tr>
<tr>
<td></td>
<td>Total number of respondents engaged in farm forestry: 70</td>
<td></td>
</tr>
<tr>
<td><strong>Plantation – property purchased</strong></td>
<td>440–460</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Total number of respondents who had sold land: 52</td>
<td></td>
</tr>
<tr>
<td><strong>Plantation – property leased</strong></td>
<td>110–130</td>
<td>65</td>
</tr>
<tr>
<td></td>
<td>Total number of respondents who had leased land: 59</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1100 (±70)</td>
<td>262</td>
</tr>
</tbody>
</table>
In total, data were gathered from 158 landholders, of which:

- 70 landholders had established farm forestry or a joint venture. Several of these respondents had established several different plantings, some with financial assistance and some without
- 52 had sold land to a plantation company
- 59 had leased land to a plantation company.

2.2.7 Survey response bias

It was possible to undertake some analysis of survey response bias for those landholders who sold or leased properties to plantation companies, using data provided by plantation companies for the properties they manage (see Section 2.4 for details of the data provided by plantation companies). It was not possible to analyse potential response bias from landholders who had undertaken farm forestry, as too little information was available to adequately analyse representativeness of responses from this group.

Responses from landholders who had leased or sold properties to plantation companies were analysed to identify if they were biased in relation to:

- year of lease/sale, comparing survey responses to data provided by plantation companies (see Section 3.1.2 for further detail)
- population change, with the survey responses regarding impacts of the land use change on population living on the property compared to data provided by plantation companies (see Section 3.5 for further detail).

It was not possible to analyse other aspects of potential response bias, as these were the only data available for most of the sample frame. In particular, it was not possible to analyse location-based response bias, for two reasons: location data was not known for the entire sample frame; and landholders had sometimes changed land use to plantation or farm forestry in more than one location, with the different locations not identified as part of the survey. This was a limitation of the survey design; in future, surveys of this type should clearly identify the location of each property a landholder has sold or leased to plantation companies, or established farm forestry on.

The response bias analysis indicates that there was some bias in the sample of landholders who had sold properties to plantation companies towards those who sold properties in recent years. Few who had sold properties in the early years of blue gum plantation expansion (1995 to 1999) responded to the survey. This means responses are likely to reflect characteristics of landholders who sold in recent years; it is possible there are differences between these landholders and those who sold land in earlier years.

It was more difficult to identify if the survey responses were biased towards particular types of landholders in terms of whether they had stayed living on their property, or left. This is discussed in detail in Section 3.5 of the results.

2.3 Data collection from plantation companies

The landholder survey achieved a relatively small sample of one particular group: landholders who had sold a property to a plantation company. To obtain further data
for this group, and also for those who leased properties, plantation companies in the region were asked to provide the following information for each property they manage:

- Location of the property
- Date of purchase/lease
- Date of plantation establishment
- Area of property and area of trees established
- Whether anyone was resident on the property prior to land use change to plantations
- If the property was occupied, whether anyone shifted off the property as a result of the land use change
- If the previous residents shifted away, whether new residents subsequently shifted onto the property
- What happened to housing on the property, if any was present.

The question asking whether anyone resided on the property prior to plantation establishment was not asked in an identical manner to the question asked in the landholder survey. In the survey, landholders were asked if anyone had lived on the property in the five years prior to the land use change to plantation or farm forestry. Many plantation company staff, however, only have knowledge of whether someone was living on the property at the point immediately before sale or lease of the land, and do not have knowledge extending back five years. They could therefore only answer this question for a shorter timeframe.

Whether a new resident had shifted on was defined as whether the property has had a new resident living on it for any of the time since the land use change, regardless of whether the residential part of the property was subdivided at some point during or after the process of lease or sale.

Not all plantation companies provided these data, and staff at plantation companies had limited knowledge regarding some properties. Those who did respond to the request were able to provide the information requested for 94% of the properties they managed. In total, information was provided for:

- 461 of the estimated 590 properties sold to plantation companies since the mid-1990s in the region (78%)
- 123 of the estimated 155 properties leased by plantation companies since the mid-1990s (79%).

Reasons for inability to provide information on some properties were explored, in case they were likely to lead to bias in the data. The following reasons were given by plantation companies for having limited knowledge of some properties:

- Some properties had been purchased from another plantation company which had established the plantation, reducing links to knowledge about the previous residents of the property before land use change to plantation.
- Change in staff sometimes meant that the person who managed purchase or lease of the property had left the company, and occasionally there were no
records of whether anyone was resident on the property prior to the land use change.

These issues represented a small number of cases, and are unlikely to have led to bias in the data.

2.4 Data analysis

Data from the landholder surveys and plantation companies were entered into a Microsoft Excel spreadsheet, and checked for errors after initial data entry. Survey data was analysed using Microsoft Excel and the Statistical Package for Social Sciences (SPSS).

Tests of statistical significance were undertaken where appropriate. Non-parametric tests were used in all cases as the sample size was typically <50, and the distribution of responses non-normal. The Mann Whitney U-Test was used to test significance of difference between two means, and the Kruskal-Wallis H Test to test significance of difference between three or more means. Results of significance testing are presented throughout the results. Where sample sizes were very small, no significance tests were undertaken.

Confidence intervals were calculated for single variables in some cases, to identify the extent to which there was confidence in the accuracy of the results. This was particularly important for some of the data from the landholder survey, where the small sample size meant there is a wide confidence interval at the 95% level.

2.5 Ethical issues

The interviews and survey were approved by the Australian National University Human Research Ethics Committee (HREC). The key ethical issues addressed were:

- ensuring confidentiality of participants: No individual landholders are identifiable in the results reported here
- ensuring participation is voluntary: Landholders participating in the survey were clearly informed that their participation was voluntary and they could withdraw from the study at any stage before publication of results
- ensuring participants were adequately informed: An information sheet explaining the nature of the project was sent to participants together with the survey, and participants were given a 1800 Freecall number they could call if they wanted further information.
3 Results

The results of the study are described in the following sections:

- Characteristics of plantation and farm forestry (Section 3.1)
- Characteristics of properties established to plantation and farm forestry (section 3.2)
- Motivations for changing land use to plantation and farm forestry (Section 3.3)
- Impacts of land use change on infrastructure (Section 3.4)
- Impacts of land use change on number and type of people living on the property (Section 3.5)
- Impacts of land use change on number and type of people working on the property (Section 3.6)
- Impacts of land use change on membership of community and service groups (Section 3.7)
- Benefits and costs of land use change to plantation or farm forestry (Section 3.8)
- Future intentions – will landholders change land use again? (Section 3.9).

In each of these sections, results of the landholder survey are presented. Plantation companies were only able to provide data for a small number of the questions asked of landholders, as they have limited knowledge of the landholders and land uses undertaken on properties prior to plantation establishment. These data are presented in Sections 3.1.2, 3.4.1 and 3.5, and results compared to the landholder survey. Results from qualitative interviews are also presented where they assist in interpreting results of the survey of landholders and the data provided by plantation companies.

3.1 Characteristics of plantation and farm forestry established

Survey respondents were asked to provide information on the type of plantation or farm forestry they had established, the area of trees established, the tree species established, and when the land use change occurred.

This information enabled some analysis of whether the sample achieved was representative of the plantation and farm forestry known to occur in the region, and an understanding of differences in the characteristics of trees established via sale, lease and farm forestry.

3.1.1 Type of plantation and farm forestry established

Respondents to the survey had been involved in a range of types of plantation forestry and farm forestry. Figure 2 shows the types of plantation and farm forestry respondents had undertaken. Of the 158 total respondents, 39 had undertaken more than one type of plantation or farm forestry.
Figure 2: Number of respondents undertaking different types of plantation and farm forestry

The survey achieved responses from landholders who had undertaken a wide range of types of plantation and farm forestry, which included the key types identified in qualitative interviews at the start of the project. As expected, few people had engaged in a joint venture, and those who had established farm forestry sometimes received financial aid to assist them in this land use change. Several had established farm forestry at multiple points in time, sometimes with financial assistance and sometimes without.

3.1.2 Area of trees established

The average area of trees established by different types of landholders is shown in Figure 3. The total area of enterprise established to trees was highest – 331ha on average - when properties were sold to a plantation company. The median area (203ha) was lower than the mean due to the high proportion of respondents (31%) who indicated that 100% of their farm enterprise was sold. Those who leased land established a smaller mean area of 184ha, with a median of 95ha.

When farm forestry or a joint venture were established, the area established to trees was typically much smaller than when a property was leased or sold to a plantation company. The average hectares established was similar whether the trees were established under joint venture (average 34ha), financially aided farm forestry (average 26ha) or self-funded farm forestry (32ha). The median hectares established was quite low (15ha for joint venture, 11ha for financially aided farm forestry and 17ha for self-funded farm forestry), as a majority of respondents had established less than 17ha while a much smaller proportion – overall less than 15% across the joint venture and farm forestry respondents – had established more than 50ha of trees.

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5 This characteristic meant that it was not possible to analyse farm foresters to identify if they had different characteristics depending on when the adopted farm foresters, although a brief analysis was undertaken in which it was assumed the year of their first planting was their point of adoption; no significant differences were identified between those who adopted at different points in time.
The area of trees established was significantly different for different types of plantation and farm forestry. The area of trees established when properties were sold was significantly higher than the area established under either lease (p<0.00) or the different types of farm forestry (joint venture, financially aided and self-funded farm forestry were grouped for this analysis) (p<0.00). The area of trees established when properties were leased was significantly higher than the area established by those undertaking different types of farm forestry (p=0.007).

Figure 4 shows the proportion of respondents who established different areas of trees, by type of plantation and farm forestry. Those who had leased properties had established a widely varying area of trees, with between 15-25% of respondents who leased establishing 20–49ha, 50–99ha, 100–199ha, or 200–499ha. In contrast, when a property was sold, in almost all cases over 50ha of trees were established, and more than 200ha in the majority of cases, while farm forestry plantings were most commonly less than 20 ha in area.
3.1.3 Tree species established

The tree species established by different types of landholders are shown in Figure 5. When land was sold or leased, the predominant tree species established was *Eucalyptus globulus* (blue gums), which reflects that most respondents had sold or leased land within the last 15 years, a period in which most plantation expansion in the region has involved blue gum plantations. Respondents who had established joint ventures or farm forestry, meanwhile had established a wide range of tree species, including pine trees, blue gums, sugar gum and mixed species plantations.

![Figure 5: Tree species established by survey respondents](image)

3.1.4 Timing of land use change to plantation or farm forestry

Survey respondents were asked to indicate when they changed land use to plantation or farm forestry.

Farm foresters had typically planted trees over multiple years, with 60.7% of respondents who had established farm forestry reporting they had planted trees in more than one year (n=61). In contrast, 23.5% of respondents who had leased land to a plantation company had done so in more than one year (n=51), and 6.3% of those who had sold land to a plantation company had done so at more than one point in time (n=48).

Figures 6 and 7 show the years in which landholders and plantation companies reported selling/purchasing and leasing land. Each figure shows the proportion of properties leased or sold in each year for (a) those who responded to the survey, and (b) the properties managed by plantation companies who provided data for the study. It is not possible to make the same comparison for those who have established farm forestry, as the only source of data available on farm forestry is that from survey

6 The category ‘mix/don’t know’ refers to the tree species established by respondents who had undertaken more than one type of plantation and farm forestry, or who had not indicated in their responses what type of plantation or farm forestry they had undertaken.
respondents and, with 60% of farm forestry respondents planting in multiple years, it is difficult to present graphically.

Figures 6 and 7 both indicate that there was a large spike in the area of plantations established in the year 2000, and to a lesser extent in 1999 and 2004. This is consistent with data from the Bureau of Rural Science’s National Plantation Inventory (Parsons et al. 2006), which shows similar spikes in the area of hardwood plantations (which are predominantly made up of eucalypt plantations) established nationally in these years. This indicates that the data provided by plantation companies are reasonably representative of the distribution of planting over different years.

![Figure 6: Percentage of properties sold to plantation companies, by year](image)

From Figure 6, it appears that survey responses from landholders who sold land to a plantation company are biased towards those who sold land in 2006 and 2007, with a lower proportion of survey respondents having sold properties in earlier years compared to the data reported by plantation companies. This bias occurred because it was easier to identify and contact those who have sold land in recent years than those who sold land in earlier years.

From Figure 7, it appears there is a slight bias in landholder survey responses towards landholder who leased land in earlier years compared to the data provided by plantation companies, and towards those who leased in 2006 and 2007. There is, however, a wide spread of survey responses across all years in which leasing of land has occurred, enabling analysis of differences between landholders who leased land at different points in time to be undertaken.
3.1.5 Identifying key landholder groups to compare in survey analysis

There are important differences in the characteristics of plantation and farm forestry undertaken via sale of property, lease of property, or establishment of farm forestry. The characteristics of those who undertook joint ventures, financially aided farm forestry, and self-funded farm forestry are highly similar, and many respondents who had undertaken one type of farm forestry had also undertaken another – e.g. part of their farm forestry was self-funded and part financially aided. It is therefore most appropriate to analyse these respondents as a single group rather than splitting them into three separate groups.

Therefore from this point onwards, respondents who undertook joint ventures, financially-aided farm forestry or self-funded farm forestry are usually analysed as a single ‘farm forestry’ group.

There is some bias in survey responses related to the year of planting, and the results reported that relate to sale of land to a plantation company should only be considered representative of those who sold land in recent years.
3.2 Characteristics of properties established to plantation and farm forestry

All survey respondents were asked what the land established to plantation or farm forestry was used for prior to the land use change, and the proportion of their farm enterprise established to plantation or farm forestry. In addition, landholders who had sold a property were asked how long they had owned their property before it was sold, and for information about the land sale process.

This information helps to identify the types of agricultural activities typically replaced by plantation or farm forestry, the extent to which farming enterprises are altered by the land use change, and how properties are sold.

3.2.1 Land uses prior to establishment of plantation or farm forestry

The agricultural activities landholder survey respondents had undertaken in the five years prior to the change to plantation or farm forestry are shown in Figure 8. Data are shown for those who sold land, leased land, established their own farm forestry, and for those respondents who undertook a mix of these activities, or who did not indicate which they had undertaken. Respondents were able to report multiple land uses if they had undertaken more than one.

Figure 8: Land uses undertaken in the five years prior to land use change (n=172)

The most common use of land subsequently established to plantation or farm forestry was grazing for sheep and cattle. Cropping, dairy farming and other uses were much less common. Of the survey respondents (n=172):

- 37.8% reported only one land use in the five years before land use change, with a wide mix of land uses reported
- 29.7% reported two land uses, most commonly sheep and cattle grazing, or sheep grazing for both wool and meat, with a small number reporting mixed grazing and cropping
32.5% reported three or more land uses, most commonly a mix of grazing and cropping, prior to land use change to plantation or farm forestry.

There were no significant differences in the prior land uses reported by landholders who sold land, leased land, or established their own farm forestry.

The data indicate that a majority of plantation and farm forestry in the study region is established on land previously used for grazing of sheep and cattle, and more rarely on land previously used for cropping or dairy farming.

### 3.2.2 Area of enterprise established to plantation or farm forestry

Survey respondents were asked what proportion of their enterprise was established to plantation or farm forestry (Figure 9). These data are shown for all types of respondents in Figure 9, with different types of farm forestry separated to identify if they show any differences.

![Figure 9: Average proportion of farm enterprise established to trees under different types of plantation and farm forestry](image)

Of respondents who had sold a property, 69% indicated that the land sold did not include all the land in their farm enterprise. Data from the interviews indicates that this is most likely because many farmers selling land manage more than one property as part of their farm enterprise, and sell one property to a plantation company while either retaining their other property/properties to manage as a farm enterprise, or selling them for other purposes.

When a property was leased, a smaller proportion of the total farm enterprise was typically established to trees than when a property was sold, with an average of 29% of the farm enterprise established to trees, and a median of 20%.

When farm forestry or a joint venture were established, the proportion of the enterprise established to trees was typically smaller than when a property was leased or sold to a plantation company. The mean proportion of enterprise established to trees was most commonly less than 5% for farm foresters, with over half of all joint venture and farm forestry respondents having established less than 5% of their enterprise to trees.

The proportion of enterprise established to trees under different types of plantation and farm forestry was significantly different in most cases.
The proportion of enterprise established to trees when properties were sold was significantly higher than the proportion established to trees under either lease ($p<0.00$) or the different types of farm forestry ($p<0.00$). The proportion of enterprise established to trees under leasing arrangement and farm forestry were not significantly different at the 0.05 level however, with $p=0.077$. This reflects the slightly higher areas established under joint ventures compared to other types of farm forestry; when joint venture properties were excluded from the farm forestry category the difference between leased properties and those with farm forestry was significant ($p<0.00$).

These results indicate that in many cases land use change to plantation or farm forestry does not involve cessation of farming by a landholder. The only type of plantation or farm forestry in which a significant proportion of landholders indicated 100% of their enterprise was established to trees was the sale of land for plantation forestry; even in this case, only 31% of landholders indicated the land use change to plantation forestry involved their entire enterprise. This indicates that in recent years, most sale of land for plantation forestry involves sale of only part of the total farm enterprise. This may represent a change from earlier years, with some interviewees and plantation company representatives believing sale of whole farm enterprises was more common in the mid to late 1990s.

### 3.2.3 Length of ownership of land prior to sale

Landholders who sold land were asked how long they had owned their property before it was sold. This question was not asked of other respondents, as it was aimed at understanding whether those who sell their property are likely to have owned their property for a particular length of time. In future surveys of this type, it would be useful to ask this question of all respondents, to enable comparison of different types of landholders.

Landholders who sold land had owned their property for a mean period of 25 years, with a median of 20 years. While a small majority of respondents had owned their land for 20 years or less, respondents were widely distributed (Figure 10), having owned the property that was sold for anything from three years to several family generations.

![Figure 10: Length of time property was owned prior to sale](image-url)
The median length of time a property was owned was slightly less than that found in recent surveys of rural landowners in the Corangamite region (Curtis et al. 2006), which found properties had been owned for a median of 22 years; and in the Wimmera region (Curtis et al. 2008), in which property had been owned for a median of 25 years. This suggests it is possible landowners with a shorter history of land ownership of the property may be more willing to sell that land to a plantation company, but the data gathered for this study were not sufficient to confirm or reject this hypothesis, and the comparison data presented here are relevant to the last two to three years, while landowners who responded to the survey had sold land up to 10 years ago.

3.2.4 Land sale transaction period prior to sale to a plantation grower

A perception reported in some previous studies, and to a lesser extent in the group interviews held for this project in August 2006, was that properties sold to plantation companies are typically sold directly to plantation companies rather than being placed for open sale on the market. This was associated with some expressions of concern about whether all people with an interest in purchasing these properties had the opportunity to do so (Schirmer 2002, Schirmer et al. 2008).

For example, one of the landholders interviewed for this study explained that when she and her husband sold their property to a plantation company:

[It] was a direct sale, it wasn’t advertised or anything like that, but we could just see that the plantations were paying substantially more than what you could get for grazing and so yeah, we just made the decision to take the highest money that we thought we could get and buy elsewhere. – Landholder #6 (sold land)

To explore how commonly land is sold directly to a plantation company, versus being placed for open sale on the market, respondents who had sold land to a plantation company were asked whether their property was placed on the market prior to sale, and if it was, how long it remained on the market.

Of the 47 respondents to this question:

- 68% sold their property directly to a plantation grower
- 32% (15 respondents) placed their property on the market:
  - One-third of these reported that the property remained on the market for one month or less before it was sold
  - One-third reported that the property was on the market for two to three months before sale
  - 20% had the property on the market for six to 12 months before it was sold
  - Two respondents (13.3%) reported it took more than 12 months to sell their property.

The large majority of properties sold to plantation companies were therefore either sold directly to the company without being advertised for open sale, or remained on the market for a fairly short period of time prior to sale. This confirms perceptions that properties are commonly sold directly to companies.
3.3 Motivations for changing land use to plantation and farm forestry

Landholders were asked what motivated them to change land use to plantation or farm forestry. They were provided with a list of potential motivations, and asked to tick all those which applied to them.

Motivations for changing land use fell into five broad categories, which have some overlap:

- managing workloads and planning for retirement
- encouragement from, or action of, other landholders or plantation companies
- farm enterprise benefits and land suitability, such as a desire to diversify the farm enterprise, using marginal land productively, reducing property management costs, or providing opportunities to improve management in other ways
- financial returns, including whether returns were believed to be higher than would be obtained from other enterprises, and the price offered for land
- improving environmental and aesthetic qualities of the land.

Results for each of these categories are shown in Figures 11 to 15. Responses are presented on the same scale in all graphs, to enable comparison across the figures.

3.3.1 Motivations relating to workload and retirement planning

In qualitative interviews with landholders, some indicated a key motivation for the land use change to plantation or farm forestry was the benefits it provided in terms of workloads and/or planning for retirement:

… in the long term, say in 30 years or whatever when I could be looking at retiring, I thought well, maybe a harvest at retirement just might help us, set us up. – Landholder #1 (farm forestry)

Because I’m nearing retirement age, I saw it as a chance to scale down active farming. And getting back to the price and the value again, it was a good opportunity then to put funds away into super as I’m nearing retirement. – Landholder #3 (sold land)

… from my point of view as a farmer who is getting older, [it was] an opportunity to get income off the land without a lot of extra work and … if we did retire off the land, the income from those plantings on our land could become part of our retirement income. – Landholder #4 (leased land)

Survey respondents were asked three questions relating to retirement and workload planning (Figure 11). Survey respondents who had sold a property were more likely than other types of respondents to indicate that a desire to reduce workload, retire, or plan for future retirement motivated their decision to change land use. Those who leased land reported being motivated by a desire to reduce workload almost as often as those who had sold land.
I wanted to retire immediately
I wanted to reduce my workload
I wanted to create a retirement/superannuation fund

Figure 11: Motivations for changing land use related to current and future workload and work planning

When landholders were compared, the following significant relationships were found:

- Those who sold land were more likely to be motivated by wanting to retire immediately than other either those who leased land or farm foresters ($p=0.01$ and $p=0.00$ respectively).

- Those who sold land were more likely to want to create a retirement/superannuation fund than those who leased land ($p=0.03$).

- Those who sold land and those who leased land were more likely to be motivated by a desire to reduce workload than those who established farm forestry ($p=0.00$ in both cases).

More than a quarter of respondents who had established their own farm forestry reported establishing a retirement/superannuation fund motivated their adoption of farm forestry. Farm foresters did not, however, typically identify reducing workload or immediate retirement as motivators for land use change. These results are likely related to the different nature of the work involved in adopting farm forestry and the time before receiving a return, with farm forestry typically involving a higher workload and longer wait for financial return compared to leasing or selling land to a plantation company.
3.3.2 Motivations arising from actions of other people

One landholder who participated in qualitative interviews for this study indicated his decision to adopt farm forestry was influenced by talking to someone who had already adopted:

There was a fellow … who planted his whole farm out [to farm forestry] … So I went and had a chat with him and decided that it would be a good idea to try some [farm forestry] ourselves – Landholder #1 (farm forestry)

When survey results were analysed, however, encouragement from other people, or actions taken by others, were less common than other factors in motivating land use change to plantation or farm forestry (Figure 12).

Figure 12: Motivations for changing land use related to influence of other people

A small number of respondents were motivated to change land use after observing a neighbour or friend establish plantation or farm forestry, but this was relatively uncommon, with less than 6% of respondents falling into this category. Those who sold land were more likely than others to report that they either made no active choice to change land use to plantations (17% of respondents), or that they changed land use after an active approach from a plantation company (14% of respondents). Where no active choice occurred, it is likely that land was put on the market for sale, with the landholder selling to any interested buyer and not actively seeking a plantation company to purchase the land.

When landholders were compared, the following significant relationships were found:

- Landholders who sold land were more likely to be motivated by a plantation company asking to evaluate the land than farm foresters ($p=0.00$).
- Landholders who sold land were more likely to indicate they played no active part in the choice than other types of landholder ($p=0.00$).
3.3.3 Motivations relating to farm enterprise benefits and land suitability

Some landholders who participated in qualitative interviews indicated they changed land use because they had suitable land, or for the farm enterprise benefits:

There is an advantage, a definite advantage with stock management and off shears sheep and that sort of thing. If we get into strife we can just open the gate and throw them into the trees. – Landholder #4 (leased land)

Some ten years ago, I suppose, they started um buying land in this area or vicinity, for blue gums and I didn’t think that this particular land … would be suitable, but then all of a sudden [plantation company] came in buying a lot of land around [the local area] and I thought ‘oh beauty, my land might be suitable here’, and it was. – Landholder #3 (sold land)

A number of factors related to farm management planning motivated land use change for survey respondents (Figure 13).

Over 25% of all types of landholders indicated that having suitable land for planting trees was a factor motivating land use change to plantation or farm forestry. Over 35% of those who established farm forestry or leased land indicated that a desire to diversify the farm enterprise was one of the factors motivating the land use change.

![Figure 13: Motivations for changing land use related to farm management priorities](image)

Farm foresters were much more likely than others to indicate that shelter benefits for stock, or wanting to find a better use for marginal/difficult land, motivated land use change, with more than 35% of farm forestry respondents ticking these categories. In contrast, less than 20% of those who leased land, and 5% of those who sold land, reported that these factors influenced their decision.

Fewer respondents reported that wanting to try a new enterprise, reduce property management costs, or purchase a farming property motivated their decision. However, 13% of farm foresters did report that wanting to try a new enterprise influenced their decision, while those who leased land were more likely than others to report that reducing property management costs motivated their decision (12% versus less than
4% for other types of landholders). Those who sold land were more likely to be motivated by wishing to purchase another enterprise (8% versus less than 2% of leaseholders, and no farm foresters).

When landholders were compared, the following significant relationships were found:

- Those who leased land and farm foresters were more likely to be motivated by a desire to diversify the farm enterprise than those who sold land ($p=0.00$ in both cases).
- Farm foresters were more likely to be motivated by a desire to provide shelter for stock than those who leased ($p=0.04$) or sold land ($p=0.00$); those who leased land were more likely than those who sold to report this motivation ($p=0.01$).
- The same patterns were evident with regard to those who were motivated by wanting to use marginal/difficult land, with farm foresters more likely than those who leased ($p=0.02$) and those who sold ($p=0.00$), and those who leased more likely than those who sold ($p=0.00$), to report this motivation.
- Those who sold land were more likely to be motivated by wanting to purchase another property than those who established farm forestry ($p=0.02$).
- Those who leased land were more likely to be motivated by a desire to reduce property management costs than farm foresters ($p=0.05$).

### 3.3.4 Motivations relating to financial return

Several landholders who participated in qualitative interviews at the beginning of this study indicated that achieving a financial return had been a key motivation for changing land use to plantation or farm forestry:

They’re offering a good price [to buy land], about twice what you would normally get from neighbouring farmers that would want to buy it – Landholder #3 (sold land)

…and … the lease rates became more attractive I think it steered us more towards the blue gum. – Landholder #4 (leased land)

We get a cheque every quarter without having to work for it. – Landholder #5 (leased land)

Financial return was also a strong motivator for many landholders who responded to the survey (Figure 14). Financial motivations differed for different landholders. Achieving financial returns from the plantation or farm forestry was a strong motivator for over 24% of farm foresters and more than 30% of those who leased land, but only 8% of those who sold land. This is not surprising, as those who sell land typically do not achieve a return from sale of trees; those who ticked ‘yes’ may have interpreted the question as referring to financial returns from selling land for plantation forestry. Those who sold land reported being motivated by being offered a good price for their land in 48% of cases, while being offered a good lease price motivated 27% of those who leased land. Sixteen per cent of farm foresters were motivated by a desire to increase land value of their property, while very few landholders who leased or sold land reported this motivated their decision.
When landholders were compared, the following significant relationships were identified:

- Farm foresters were more likely to be motivated by potential carbon trading opportunities than those who sold land ($p=0.00$); those who leased land were more likely than those who sold to report this motivation ($p=0.05$).
- Those who leased land and established their own farm forestry were more likely to be motivated by the potential returns from plantation/farm forestry than those who sold land ($p=0.00$ and 0.02 respectively).
- Farm foresters were more likely to be motivated by a desire to increase the land value of their property than those who leased land ($p=0.02$) and those who sold land ($p=0.01$).

### 3.3.5 Motivations relating to environmental and aesthetic benefits

Improving environmental and aesthetics values of the farming property was a common motivator for those who established their own farm forestry, less common for those who leased land, and rare for those who sold land (Figure 15). Similarly, in the qualitative interviews, landholders who discussed environmental and aesthetic benefits were typically those who had adopted farm forestry:

If we can contribute … with the planting of a few more trees that’s a good thing to do for the environment and if it should happen that greenhouse or I mean carbon emission benefits come through them, great – Landholder #1 (farm forestry)

While 39% of farm foresters indicated that enhancing birds and wildlife or improving aesthetics influenced their decision to change land use, only 15% of those who leased land reported enhancing birds and wildlife, and 8% improving aesthetics, as motivators, and less than 2% of those who sold land.
Fewer respondents reported addressing salinity and erosion as motivating factors; again this was more common for those who established their own farm forestry than for those who leased or sold land.

![Figure 15: Motivations for changing land use related to environmental and aesthetic aspects of plantation and farm forestry](image)

When landholders were compared, the following significant relationships were found:

- Farm foresters were more likely to be motivated by a desire to improve aesthetics of the property than those who sold and leased land ($p=0.00$ in both cases).
- Farm foresters were more likely to be motivated by a desire to address salinity problems than those who sold land ($p=0.02$) and those who leased land ($p=0.01$).
- Farm foresters were more likely to be motivated by a desire to enhance birds and wildlife on the property than those who sold or leased land ($p=0.00$ in both cases).
- Those who leased land were more likely to be motivated by a desire to enhance birds and wildlife on the property than those who sold land ($p=0.02$).

Table 3 compares the ‘top six’ most common reasons for changing land use for each type of landholder. Differences in the factors motivating land use change for the three types of landholders can be clearly seen. Financial return and reducing workload or planning for future retirement were the most common reasons respondents reported selling land, while those who leased land were more likely to report these and property management priorities/needs influenced their decision. Those who established their own farm forestry were more likely to be motivated by a desire to improve aesthetics and environment on their property, and to achieve improved property management through diversification of their enterprise and better use of marginal land.
<table>
<thead>
<tr>
<th>Type of landholder</th>
<th>Most common reasons for changing land use (listed from most to least common)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sold property</strong></td>
<td>A plantation company offered a good price to buy my land (n=25)</td>
</tr>
<tr>
<td></td>
<td>I had land suitable for tree planting (n=17)</td>
</tr>
<tr>
<td></td>
<td>I wanted to reduce my workload (n=16)</td>
</tr>
<tr>
<td></td>
<td>I wanted to create a retirement/superannuation fund (n=15)</td>
</tr>
<tr>
<td></td>
<td>Other (n=10)</td>
</tr>
<tr>
<td></td>
<td>I didn’t make an active choice (n=9)</td>
</tr>
<tr>
<td><strong>Leased property</strong></td>
<td>To diversify the farm enterprise (n=22)</td>
</tr>
<tr>
<td></td>
<td>Financial returns from farm/plantation forestry (n=18)</td>
</tr>
<tr>
<td></td>
<td>I was making poor returns from the land (n=17)</td>
</tr>
<tr>
<td></td>
<td>A plantation company offered a good price to lease land (n=16)</td>
</tr>
<tr>
<td></td>
<td>I wanted to reduce my workload (n=16)</td>
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<td></td>
<td>I had land suitable for tree planting (n=15)</td>
</tr>
<tr>
<td><strong>Established own farm forestry</strong></td>
<td>To improve the aesthetics of the property (n=27)</td>
</tr>
</tbody>
</table>
3.4 **Impacts of land use change on infrastructure**

Landholder survey respondents were asked to identify whether the land use change to plantation or farm forestry led to changes in any of the following types of infrastructure on their property:

- Housing
- Fencing
- Sheds/storage facilities
- Dams
- Other infrastructure (e.g., windmill, bores).

These questions were asked as previous studies have recorded concerns that plantation expansion may result in a reduction of agricultural infrastructure on rural properties, making it more difficult to re-establish traditional agriculture on this land in future (Schirmer 2002).

Most of the eight landholders who took part in qualitative interviews reported that few or no changes occurred to infrastructure as a result of the land use change to plantation or farm forestry, with the exceptions of one farm forester who had increased fencing around trees to keep stock out, one landholder who observed a decrease in internal fencing resulting from land being sold to a plantation company, and one who reported removal of some sheds and workshops from a property after it was sold to a plantation company:

No, no there hasn’t been any [changes to infrastructure] other than just um, rip the land up and planted the blue gums and pulled down internal fencing … there’s no internal fencing as all they require is a boundary fence. – Landholder #3 (sold land)

[The] cattle yards had to go … a lot of sheds, workshop and machinery sheds, that sort of thing – Landholder #6 (sold land)

We put up fences to keep the stock out – Landholder #1 (farm forestry)

Three of the landholders interviewed discussed how sale of properties to plantation companies by other landholders in their community had affected housing infrastructure. One believed housing infrastructure was often removed from the land, while the other two reported that most housing remained but was lived in by different people after plantations were established:

[Referring to housing on a property sold to a plantation company] Taken away. Whole farms, the woolshed, the whole box and dice gone. – Landholder #1 (farm forestry)

Well most of the land that’s bought in this area, the um blue gum company, they sell off the houses with a small portion of land. So the houses are still there and ah there are still people in the houses. So I don’t think that it should impact greatly on the community as far as numbers of people in the area go. – Landholder #3 (sold land)

They’re actually not pulling the houses down, in fact the last one there they’ve subdivided it off and put it for resale … – Landholder #7 (sold land)

The infrastructure changes reported by landholder survey respondents are shown in Figures 16 to 20, which identify changes to housing, fencing, sheds and storage, dams and other on-property infrastructure.
3.4.1 Housing infrastructure

In almost all cases, land use change to plantation and farm forestry resulted in no change to housing infrastructure on the property involved. Only a small number of respondents (four) reported that a house was demolished as part of land use change to plantation forestry (Figure 16). In all cases this occurred when a property was sold or leased to a plantation company. In total, houses were removed in 4% of cases where a property was sold or leased to a plantation company.

![Figure 16: Housing changes resulting from land use change to plantation or farm forestry](image)

This differed from perceptions reported in group interviews and in previous studies, which indicated more change in infrastructure was likely to occur.

Of the four houses reported demolished by survey respondents, two did not report when the land use change happened, while in the other cases the land use change occurred in 2004 and 2007. Given that the sample of those who sold properties is biased towards those who sold in more recent years, it is possible that when blue gum plantation expansion began in the region in the mid to late 1990s, a higher proportion of houses were demolished than is currently the case, although it is not possible to confirm this. One member of the project Advisory Group indicated that in the area they live in, more houses were demolished in the ‘early’ years of bluegum plantation establishment in the region, particularly the mid 1990s, than in more recent years. Based on data from this survey, it appears that it is now very rare for houses to be demolished when land is purchased or leased by a plantation company.

Plantation companies were asked to provide information on changes to housing infrastructure on the properties they manage. This information was provided for 223 properties, of which 44 were leased and 179 were properties sold to plantation companies. Of these properties, only six were established to plantation before 1999; as such, the data can only be considered representative of practices since 1999.
Of the properties that were leased directly from a landholder, plantation companies reported that:

- In 84% of cases there was no housing on the property or part of the property being leased, and so no changes occurred to housing.
- In 16% of cases existing housing on the property was subdivided and sold.

Of the properties sold to a plantation company, the data provided by these companies indicates that:

- In 42% of cases, there was no housing on the property and hence no change occurred to housing infrastructure as a result of the land use change to plantation forestry. There is a possibility that in some cases houses were demolished immediately prior to sale to a plantation company, leaving some properties without housing. Based on discussions with both plantation companies and landholders interviewed for the project, this would occur in a small proportion of land transactions.
- In three cases (2%), houses were demolished – in two cases this occurred in 1999 and one in 2000.
- In the remaining 46% of cases, housing was retained. Retained housing was usually subdivided and sold together with a small area of land surrounding the housing. The only exceptions were eight cases where the housing was rented out directly by the plantation company, and six cases where housing was used in other ways, such as the original landholder continuing to live in the housing on the property without formal subdivision.

These data support the findings of the survey that very few houses are removed from properties as a result of the land use change to plantations. In many cases no housing exists on the property prior to land use change to plantation forestry. Where housing is present, the most common practice when land use changes to plantation forestry appears to be subdivision and sale of the house and a small area of existing land.

However, the sample of 223 properties provided by plantation companies is biased towards more recently purchased or leased properties. It is therefore still possible that removal of housing occurred more commonly prior to 1999. It does confirm that in recent years the large majority of housing infrastructure has remained unchanged when plantations have been established.

### 3.4.2 Fencing

A majority of respondents reported that the amount of fencing on their property changed as a result of land use change to plantation or farm forestry (Figure 17).

The type of fencing changes depended on the type of plantation or farm forestry. Those who sold a property or leased land were significantly more likely than farm foresters to report there had been a decrease in fencing on the property, with 71% of respondents who sold and 59% of those who leased land reporting a decrease \( p=0.00 \) in both cases.)
Of those who had leased a property, 59% reported that the amount of fencing decreased on the property, while 22% reported that it increased. Based on data from interviews, it is likely that where a plantation was established on most or all of a property, some internal fencing was removed. When leasing involved establishing a plantation on a small part of a property, this sometimes required construction of new fencing to separate the plantation from grazing/cropping areas on the property.

Farm foresters were significantly more likely than those who sold or leased land to report there had been an increase in fencing on the property ($p=0.00$ in both cases), with 70% reporting the amount of fencing increased when they established farm forestry. Based on interview data, this is likely because the establishment of areas of trees on part of a property required additional fencing to separate trees and stock.

### 3.4.3 Sheds and storage infrastructure

A majority of all types of respondents reported that the establishment of plantation or farm forestry involved no change to sheds or other storage infrastructure on the property (Figure 18). However, while removal of storage infrastructure does not occur in the majority of cases, it is more likely to occur when a property is sold (33% of cases), and to a lesser extent when a property is leased (11% of cases). Those who sold land were significantly more likely to report a decrease in shed and storage infrastructure than those who leased land ($p=0.03$) and those who established farm forestry ($p=0.00$). Those who leased land were significantly more likely to report a decrease in shed and storage infrastructure than those who established farm forestry ($p=0.01$).
3.4.4 Dams

Similarly to sheds and storage infrastructure, a minority of respondents reported that land use change to plantation or farm forestry was associated with changes to dams on the property (Figure 19). A small percentage of those who leased and sold properties reported a decrease in dams on the property (15% and 8% respectively), and a very small percentage of those who established farm forestry or leased a property reported an increase (6% and 2% respectively). No significant differences were identified between different types of landholders. Overall, it appears there is relatively little change to dams on properties as a result of land use change to plantation or farm forestry.
3.4.5 Other infrastructure

A majority of respondents indicated there were no changes to other types of infrastructure on the property as a result of land use change to plantation or farm forestry (Figure 20). The notable exception was those who had sold a property, with 38% indicating there had been some decrease in other infrastructure, while less than 14% of other types of respondents reported this.

![Figure 20: Changes to other types of infrastructure resulting from land use change to plantation or farm forestry](image-url)
3.5 Impacts of land use change on number and type of people living on the property

Survey respondents and plantation companies were asked to answer questions about the number and type of residents living on the property before and after the land use change to plantation or farm forestry. This data enables analysis of the changes in the number of people living on rural properties resulting from this type of land use change. It does not provide information on indirect effects on rural population that may result from land use change to plantation or farm forestry, such as changes resulting from altered employment opportunities in local communities.

Having data on the direct impacts of land use change to plantation and farm forestry on the number of people living on rural properties is essential to understanding the overall impacts of this land use change on rural population levels. Perceptions about the impacts of plantation expansion on rural populations reported in Schirmer et al. (2008) typically focused on how change in the residents living on a rural property may lead to a ‘chain effect’ on the broader community:

You are taking family farms out of production … For every family that leaves it causes an adverse impact on four others, so there is already a downward spiral in so many of these communities and if you are taking family farms out of the picture, you are going to exacerbate … the decline in rural population. (Group interview participant quoted in Schirmer et al. 2008: 47).

Landholders who participated in qualitative interviews for this study commonly described population change as beginning with changes to the number of people living on properties established to plantation forestry:

Whole farm plantings … definitely did remove three or four families from over in [a nearby area] – Landholder #1 (farm forestry)

We haven’t noticed a major population decrease, especially where I live it’s predominantly all blue gums now except for a few [properties]. But what has actually happened is that a younger generation has decided that they either want to have kids or have more pets, [and] have moved into the [plantation property] houses with their ten acres … – Landholder #5 (leased land)

I know around [locality] they have left some of the houses [on plantation properties] and you know at some stages there’s people living in them and then people move out and there’s no one for a while and then you get someone back in. You get more of a floating population I think in those houses than there was before, because they were more just permanent people, farming and living there. – Landholder #6 (sold land)

Landholder survey respondents were asked to provide detailed information on the residents living on properties prior to and after land use change, including the number and type of people and their working patterns, while plantation companies were asked to provide data on a small number of key questions relating to people living on properties. Landholder survey respondents were asked to provide detailed information on the residents living on properties prior to and after land use change, including the number and type of people and their working patterns, while plantation companies were asked to provide data on a small number of key questions relating to people living on properties. Data from the landholder survey is presented in Section 3.5.1, and then compared to data provided by plantation companies in Section 3.5.2.

7 Plantation companies were asked to provide only limited data as they have limited knowledge of the residents of properties, whereas survey respondents could provide more detailed information.
### 3.5.1 Landholder survey

Landholder survey respondents were asked a series of questions about the residents living on the property prior to the land use change to plantation or farm forestry. These characteristics are summarised in Table 4.

Table 4: Characteristics of residents living on properties prior to land use change to plantation or farm forestry – survey respondents

<table>
<thead>
<tr>
<th>Survey question</th>
<th>Sold property (n=42)</th>
<th>Leased property (n=49)</th>
<th>Established own farm forestry (n=54)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Did anyone live on the property in the 5 years before trees were planted?</strong></td>
<td>Yes: 52.4% No: 47.6%</td>
<td>Yes: 59.2% No: 40.8%</td>
<td>Yes: 51.9% No: 48.1%</td>
</tr>
<tr>
<td><strong>If yes, how many people lived there?</strong> (on average during 5 years before trees planted)</td>
<td>Mean: 2.9 people Median: 2 people Range: 1–6</td>
<td>Mean: 4.0 people Median: 4 people Range: 1–7</td>
<td>Mean: 3.4 people Median: 3 people Range: 1–7</td>
</tr>
<tr>
<td><strong>What were the ages of the people living on the property at the time of land use change to trees?</strong></td>
<td>Mean: 42.7 years</td>
<td>Mean: 35.4 years</td>
<td>Mean: 40.2 years</td>
</tr>
<tr>
<td><strong>How many of those living on the property attended a local school at the time of land use change to trees?</strong></td>
<td>Mean: 0.5 people Median: 0 people Range: 0–2 people</td>
<td>Mean: 1.0 people Median: 0 people Range: 0–4 people</td>
<td>Mean: 0.7 people Median: 0 people Range: 0–3 people</td>
</tr>
<tr>
<td><strong>How many of those who lived on the property also worked on the property at the time of land use change to trees?</strong></td>
<td>Mean: 1.7 people Median: 2 people Range: 0–4 people</td>
<td>Mean: 1.9 people Median: 2 people Range: 0–4 people</td>
<td>Mean: 1.9 people Median: 2 people Range: 0–6 people</td>
</tr>
<tr>
<td><strong>How many people who lived on the property had jobs off the property at the time of land use change to trees?</strong></td>
<td>Mean: 0.4 people Median: 0 people Range: 0–4 people</td>
<td>Mean: 1.3 people Median: 1 people Range: 0–4 people</td>
<td>Mean: 0.8 people Median: 0 people Range: 0–2 people</td>
</tr>
</tbody>
</table>

1The mean is the average age of all people living on properties, including children

In between 40–48% of cases, no-one lived on the property in the five years prior to the land use change to plantation or farm forestry. Where there were residents, there were some differences in their characteristics across different types of plantation and farm forestry. Leased properties were more likely to have people living on them prior to the land use change than the other types of properties, and to have younger residents. There were also more children attending school, and more residents who held off-property employment, compared to properties that were sold or on which farm forestry was established, although these differences were not significant.

Properties that were sold were different to others in that they had fewer people living on them prior to land use change than those that were leased or had farm forestry established. The residents of properties sold to plantation companies were typically older than those on other properties, and had fewer children attending school or residents who worked in a job off the property, than other types of properties.

Properties established to farm forestry had a wider range of characteristics, with residents distributed across a wide range of age groups.
The following significant relationships were identified:

- Fewer people lived on the property before the land use change when land was sold compared to when land was leased ($p=0.01$).
- Those who sold land were older than those who leased land ($p=0.03$).
- Landholders who leased land were more likely to report that residents living on the property had off-property employment compared to those who sold land ($p=0.00$) and those who established their own farm forestry ($p=0.04$).

Survey respondents were asked how the number of people living on properties changed as a result of land use change to plantation or farm forestry. Responses are summarised in Table 5.

Table 5: Changes in population living on properties as a result of land use change to plantation or farm forestry – survey respondents

<table>
<thead>
<tr>
<th>If people lived on the property at the time of the land use change…</th>
<th>Sold property</th>
<th>Leased property</th>
<th>Established own farm forestry</th>
</tr>
</thead>
</table>
| Did anyone shift off the property as a result of trees being established? | Yes: 65.0%  
No: 35.0%  
(n=20) | Yes: 11.1%  
No: 88.9%  
(n=27) | Yes: 0%  
No: 100%  
(n=31) |
| If yes, how many people shifted away? (n=20)* | Mean: 3.1 people  
Median: 3 people  
Range: 0–6 people | N/A |
| Where did they shift to? (n=19)* | Local farm: 15%  
Non-local farm: 45%  
Local town: 30%  
Non-local town: 5%  
Don’t know: 5% | N/A |
| Did new people come to live on the property? (n=20)* | Yes: 45%  
No: 55%  
Don’t know: 0% | N/A |
| → If yes, how many? (n=8)* | Mean: 3 people  
Median: 2 people  
Range: 2–6 people | N/A |
| → If yes, were the new residents from the local area? (n=9)* | Yes: 56%  
No: 44%  
Don’t know: 0% | N/A |

* As only a small number of respondents indicated that people shifted away from properties, including only three respondents who leased land, the responses to these questions were analysed as a single group, rather than by whether land was sold or leased. When the two types of respondent were analysed separately, responses fell within the same range on all questions, indicating it is appropriate to undertake combined analysis.

Based on Table 5, it appears that land use change to:

- plantation forestry via sale involves previous residents shifting away from the property in a majority – 65% - of cases
- plantation forestry via leasing involves previous residents shifting away from the property in a relatively small number of cases
- farm forestry involves no change in the population living on the properties involved.
Those who sold land were significantly more likely to report previous residents shifted away from the property than those who leased land or those who established farm forestry \( (p=0.00 \text{ in both cases}). \)

With only a small proportion of respondents reporting people had lived on the property and subsequently shifted away when the property was sold or leased for plantation forestry, data on where residents shifted to, and whether new residents came to live on the property, is based on a small sample of 20 respondents. Some caution is therefore needed in interpreting results. The results reported below apply for these 20 cases, but the mix of outcomes may be different if a larger sample was obtained.

Where previous residents shifted away, in 60% of cases they were reported to have shifted to another farming property, in 30% of cases to a local town, and in 5% of cases to a non-local town\(^8\).

In 45% of cases where the previous residents shifted away, new residents then shifted onto the property. In five of the eight cases reported by survey respondents, these residents came from the local area.

### 3.5.2 Plantation company data

Plantation companies were asked to identify for each property they manage (a) whether anyone lived on the property prior to land use change, (b) if anyone shifted away from the property as a result of the land use change and (c) if anyone new shifted onto the property. This data was provided for properties leased and sold by plantation companies; the only data gathered on farm forestry was via the landholder survey.

This information was provided based on knowledge of plantation managers. It was not possible to ask questions exactly the same way they were asked of survey respondents. In particular:

- Plantation managers could generally only comment on whether a person was living on the property immediately prior to land use change, whereas survey respondents were asked if anyone had lived on the property in the five years prior to the land use change. This is likely to result in plantation managers estimating fewer properties had people living on them prior to the land use change compared to survey respondents.

- Plantation managers were asked if anyone new had shifted onto the property since the land use change. They could answer this question based on knowledge of the entire period since the plantation was established, whereas many survey respondents could only respond based on their knowledge of the period immediately after a property was sold or leased. This means plantation managers are likely to identify a higher proportion of properties as having new residents shift onto them, compared to survey respondents who could often only answer this question based on a short period of time.

\(^8\) ‘Local’ was defined as a town or farm located in the same local government area as the property established to plantation or farm forestry.
The following figures compare data from the landholder survey and from plantation companies for the questions:

- Was anyone living on the property prior to the land use change? (Figure 21)
- If yes, did the land use change result in anyone shifting off the property? (Figure 22)
- If someone shifted off the property, did new residents shift in? (Figure 23).

Figure 21: Did anyone live on the property prior to land use change? Comparison of survey responses and plantation company data

From Figure 21 it can be seen that plantation companies reported that only 46% of properties they purchased had people living on them prior to the land use change (with a 95% confidence interval of ±2.13%), while in responses to the survey, 52.4% of properties had people living on them before the property was sold (with a 95% confidence interval of ±14.4%). This difference is within the confidence intervals identified for both samples.

If there is an actual difference, it may be a result of the timeframes for which the question was answered – plantation companies often only had knowledge of the period immediately prior to land use change, and it is likely that in some cases landholders had shifted away from a property prior to selling it, meaning companies identified fewer properties as having landholders resident on them at the time of land use change. Survey respondents, however, were asked if anyone had lived on the property in the five years prior to land use change, and the higher proportion of positive responses reflects the longer timeframe they considered when answering the question.

It can be confidently stated that, depending on the timeframe examined, in between 44% and 52% of cases the property established to plantation is occupied at the time of sale.

A slightly different picture emerges when examining properties leased to plantation companies. Here plantation companies reported that 70.7% of properties had people residing on them at the time of leasing (with a 95% confidence interval of ±3.67%).

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while survey respondents reported 59.2% of properties had people residing on them (with a confidence interval of ±11.42%), a difference of 11.5%. The difference is possibly explainable with reference to confidence intervals, but the confidence intervals only just overlap.

The concept of leasing was defined in the same way for both groups, so differences are not due to different time periods or concepts of what constituted lease of a property.

One potential explanation is that some plantation companies considered a property to have a resident landholder if the landholder owning the property lived on either the property being leased, or an adjacent property they also owned, whereas landholders may have responded to the question based on precise property boundaries – meaning they reported no-one lived on the property if they lived on a neighbouring property with a different land title. This distinction should be carefully identified in future surveys of this type, to avoid potential differences in response.

It can confidently be said that a larger proportion of properties that are leased have people resident on them at the time of land use change compared to properties sold to plantation companies. The exact difference cannot be precisely identified, given the differences between the two sources of data, but is highly likely to be between 50–74%, and most likely in the higher bounds of this estimate.

Data from plantation companies indicates that in 76.9% of cases residents who lived on a property prior to its sale shifted off the property as a result of land use change to plantation, compared to 65.0% of survey respondents (Figure 22)⁹.

The difference of 11.9% may be due to bias in the sample of landholders surveyed, arising from the difficulty in contacting some landholders. Landholders who remaining living on the property are generally easier to contact after the land use change, especially some years after it has occurred, than those who left the property, and this is likely to have resulted in some bias in the landholder survey towards landholders who remained living on the property. The plantation companies who provided landholder contact details indicated that they had difficulty contacting many who had sold properties, and this type of bias is therefore highly likely in the sample.

It is likely that the data from plantation companies is more reliable in this instance than data from survey respondents. This indicates that, when a property is sold, some or all residents leave the property in over 75% of cases.

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⁹ It is difficult to calculate the 95% confidence interval for these data, as the total population on which the confidence interval should be calculated is the number of properties with resident landholders prior to land use change. The differences in the landholder survey and plantation company data mean this number is not certain. Using the midpoint estimate of the proportion of properties with resident landholders, the 95% confidence interval is ±2.99% for plantation company data, and ±20.1% for landholder survey data. The latter is unlikely to be reliable due to the bias issues discussed in the text.
When properties that were leased to plantation companies are examined (Figure 22), there is close agreement between data from survey respondents and plantation companies. This is consistent with the argument of bias in the ‘sold property’ sample, as those who have leased properties receive regular payment from plantation companies, and as a result are easier to contact than those who sold a property (although companies still reported difficulties contacting some landholders who leased land to them). This means the sample of landholders who leased land is less likely to be biased towards landholders who stayed living on the property than the sample of those who sold, as some contact is maintained for the purpose of making lease payments whether or not the landholder remains resident on the property. Approximately 90% of those who were living on a property before it was leased remain living on the property after land use change, while approximately 10% shift away when part or all of the property is leased for plantation forestry.10

When plantation company data were analysed for significant relationships, it was found that landholders were significantly more likely to shift off properties when land was sold to a plantation company than when land was leased to a company (p=0.00), consistent with results of the landholder survey.

There is a large difference between the responses of plantation companies and those of landholders on the question of whether new residents shifted onto properties in cases where the previous resident had left (Figure 23). Plantation companies reported that new residents shifted onto the property in 81.7% of cases where properties were

10 Similarly to calculating confidence intervals for data on properties sold to plantation companies, it was difficult to calculate accurate confidence intervals for data on leased properties. Using the midpoint estimate of proportion of properties with landholders resident on them prior to the land use change, the landholder survey data has a 95% confidence interval of ±9.81%, and the plantation company data a confidence interval of ±2.65%.
sold, and 55.6% of cases where properties were leased. Of the 20 survey respondents who responded to this question, however, only 45% reported that new residents shifted onto the property.

Figure 23: If a resident shifted off the property, did a new resident shift in? Comparison of survey responses and plantation company data

What has led to the large difference in reports? The following are possibilities:

- The landholder survey sample was very small and confidence intervals are, as a result, quite wide. They could not be accurately calculated due to the very small sample size and uncertainty about total population size. There is a possibility the small sample of landholders was not representative of the population; and equally a possibility that the sample of properties provided by plantation companies is biased towards those where new residents have shifted onto the property.

- Landholders based their responses on the short time period after land use changed, and it took some time for a new resident to shift in, leading them to state that no new resident had shifted in.

- Plantation companies based their responses on the entire period since land use changed, and reported new residents shifted in if there has been a person resident at any time since the land use change, resulting in a higher proportion of new residents being reported than were reported by landholders.

Based on discussion with plantation companies, it appears that some properties have remained vacant for a period of time before being subdivided and sold to a new resident, or rented. This is likely to have resulted in some – possibly most - of the difference in response, as plantation companies based their responses on identifying if a new resident has shifted in at any point in the time since the land use change, whereas survey respondents typically responded based on their knowledge of the property’s residents immediately after land use change.

Because of this, it is only possible to estimate that in between approximately 50% and 80% of cases, new residents shift onto a property after previous residents leave, with
the time period since the land use change affecting the proportion, as a longer time period results in a higher probability a new resident has shifted onto the property at some point in time.

Overall, the results indicate that:

- When properties are sold, in approximately 44-52% of cases they have residents living on them. Where residents were living on the property, about 75% of the time they shift away when the property is sold to a plantation company; and new residents then shift onto the property in anywhere from 50-80% of cases depending on the timeframe examined.

- When properties are leased, in approximately 60-70% of cases they have residents living on them at the time of the land use change. Where residents were living on the property, they shift away in about 10% of cases as a result of the land use change, and in 45-55% of cases new residents then shift onto the property.

- When farm forestry is established, in just over half of cases the property has residents on it, and these residents do not shift away as a result of farm forestry being established. Therefore no change in population results from the establishment of farm forestry.
3.6 Impacts of land use change on the people working on the property

As well as understanding how land use change to plantation or farm forestry affected people living on the property, the survey asked how the land use change influenced the number of people working on the property. This question was asked as some people may be employed on a property who don’t also live on the property. Land use change to plantation or farm forestry may impact these workers and therefore influence the number of people living in rural communities.

Responses to questions about the number of people working on the property are summarised in Table 6.

Table 6: Changes in number of people working on properties as a result of land use change to plantation or farm forestry – survey respondents

<table>
<thead>
<tr>
<th>Survey question</th>
<th>Sold property</th>
<th>Leased property</th>
<th>Established own farm forestry</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many people worked on the property, on average, in the 5 years before trees were established?</td>
<td>Mean: 1.8</td>
<td>Mean: 1.9</td>
<td>Mean: 1.9</td>
</tr>
<tr>
<td></td>
<td>Median: 2</td>
<td>Median: 2</td>
<td>Median: 2</td>
</tr>
<tr>
<td></td>
<td>Range: 0–4</td>
<td>Range: 1–5</td>
<td>Range: 0–4</td>
</tr>
<tr>
<td></td>
<td>(n=39)</td>
<td>(n=45)</td>
<td>(n=52)</td>
</tr>
<tr>
<td>How many worked part-time and how many full-time (mean)?</td>
<td>Part-time: 1.1</td>
<td>Part-time: 1.0</td>
<td>Part-time: 0.9</td>
</tr>
<tr>
<td></td>
<td>Full-time: 1.2</td>
<td>Full-time: 0.9</td>
<td>Full-time: 1.3</td>
</tr>
<tr>
<td></td>
<td>(n=39)</td>
<td>(n=45)</td>
<td>(n=52)</td>
</tr>
<tr>
<td>Did any of these people stop working on the property as a result of trees being established?</td>
<td>Yes: 59%</td>
<td>Yes: 33%</td>
<td>Yes: 6%</td>
</tr>
<tr>
<td></td>
<td>No: 41%</td>
<td>No: 67%</td>
<td>No: 94%</td>
</tr>
<tr>
<td></td>
<td>(n=39)</td>
<td>(n=45)</td>
<td>(n=52)</td>
</tr>
<tr>
<td>→ If yes, how many?</td>
<td>Mean: 2.3</td>
<td>Mean: 1.6</td>
<td>Mean: 1.7</td>
</tr>
<tr>
<td></td>
<td>Median: 2</td>
<td>Median: 1</td>
<td>Median: 2</td>
</tr>
<tr>
<td></td>
<td>Range: 1–4</td>
<td>Range: 1–5</td>
<td>Range: 1–2</td>
</tr>
<tr>
<td></td>
<td>(n=23)</td>
<td>(n=14)</td>
<td>(n=3)</td>
</tr>
<tr>
<td>→ If yes, where did people who stopped working on the property go?</td>
<td>(n=23)</td>
<td>(n=14)</td>
<td>(n=3)</td>
</tr>
<tr>
<td>→Retired:</td>
<td>34%</td>
<td>26%</td>
<td>0%</td>
</tr>
<tr>
<td>→To work on another property I manage:</td>
<td>30%</td>
<td>42%</td>
<td>60%</td>
</tr>
<tr>
<td>→New job (local):</td>
<td>8%</td>
<td>16%</td>
<td>0%</td>
</tr>
<tr>
<td>→New job (not local):</td>
<td>18%</td>
<td>16%</td>
<td>40%</td>
</tr>
<tr>
<td>→Unemployed:</td>
<td>8%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>→Don’t know:</td>
<td>2%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

*Data in italics are based on a very small sample and hence have a very large confidence interval.*

From Table 6 it can be seen that:

- Properties that were sold, leased and established to farm forestry had very similar numbers of people working on them prior to the land use change, with an average of just under two people working on the property.
- Properties of all types typically had around one person working full-time and one working part-time. The average number of people working full-time was slightly lower for leased properties (0.9 people) compared to sold properties or
farm forestry properties (1.2 and 1.3 respectively). These differences were not significant.

- People stopped working on the property when land use changed in a majority of cases where a property was sold (59%), 33% of cases where a property was leased (significant difference, \( p=0.00 \)), but very rarely (6% of cases, significant difference with \( p=0.00 \)) when farm forestry was established.

- Between 1.6 and 2.3 people typically stopped working on the property in cases where the land use change led to some people ceasing work on the property. Significantly more people were reported to stop working on properties that were sold compared to those that were leased (\( p=0.013 \)).

- Of those who stopped working on a property, the majority either went to work on another property forming part of the farm enterprise, or retired; less commonly they obtained other work locally or non-locally. In a small number of cases workers were unemployed after the land use change. Some care is needed in interpreting these figures as these data are based on a very small sample; no attempt was made to infer whether this is representative of the entire population.

Some respondents may have answered this question based on their entire farm enterprise (often comprising more than one property), and have responded that no-one stopped working on the property because people continued working on other parts of the enterprise when a property was sold to a plantation company.

This section of the landholder survey also asked those who had established farm forestry how much work was generated by the farm forestry over time. Responses to this question are analysed and reported as part of another report of the Land Use Change project, in which the employment and spending generated by different land uses are compared.
3.7 Impacts of land use change on membership of community and service groups

In group interviews conducted for the *Land Use Change* project in 2006, concerns were commonly reported about the perceived impacts of land use change to plantation forestry on membership of community and service groups:

… blue gums have really knocked them [a small rural community] about … population wise, young people leaving and football clubs closing down. When you take a football or netball team out of the community, any community … it’s somewhere where people go at a weekend and towns like [names two small nearby towns], the only time they met was on a Saturday when the girls played netball, the boys played football and met each other… (quote from group interview participant, Schirmer et al. 2008: 47)

Similar perceptions were reported by landholders in qualitative interviews for this study:

They’re actually not pulling the houses down … depending on who comes back into that, you probably do help to maintain your community numbers, but your hall committee, your fire services … your manpower and fire protection I think is, without argument, it’s not just me, it’s definitely reduced your ability to run your hall committee and some of those other things that make a community tick. – Landholder #7 (sold land)

I think probably in some of the areas that it really has made a difference to like, you know, who’s going to man the fire truck … I mean it has been a decline. – Landholder #6 (sold land)

To explore whether land use change to plantation and farm forestry is associated with change in membership of community and service groups, survey respondents were asked to identify whether those who lived on the property changed their membership of the following groups as a result of the land use change:

- rural fire fighting service.
- service groups such as Apex, Rotary or Lions
- sporting clubs
- other types of community and service groups that are based on volunteer or social membership.

This question was only answered by respondents who reported that there were people living on the property prior to establishment of plantation or farm forestry. This was a relatively small sample, and as a result, significance tests are of limited use.

Figure 24 identifies the proportion of respondents who were members of the different types of community and service groups prior to the land use change. A majority of respondents reported being members of the rural fire fighting service, although a lower proportion of farm forestry respondents reported membership compared to others. It was not possible to identify potential explanations for this difference.
Figure 24: Proportion of respondents who were members of different community and service groups prior to land use change to plantation or farm forestry

Around 50% of all types of landholders reported membership of sporting groups, while more of those who leased or established farm forestry were members of service groups such as Rotary than those who sold properties. Interviews and subsequent discussions of results with the project Advisory Group identified no potential explanations for the differences observed between groups, and none were statistically significant with the small sample achieved. Given the small sample, it is not possible to identify if the differences are a result of the small sample, or of real differences between different types of landholders.

Changes to membership of different types of groups resulting from the change to plantation or farm forestry are illustrated in Figures 25 to 27. Data for the ‘other groups’ category are not presented, as a very small number of respondents indicated whether their membership of other types of groups had changed.

Land use change to farm forestry resulted in no change to membership of rural fire fighting groups, while leasing a property very rarely resulted in change (Figure 25). When a property was sold to a plantation company, however, just under 60% of respondents reported their membership changed in some way. This was a significant difference, with those who sold land more likely to report a change in their fire fighting service membership than those who leased land ($p=0.00$) or those who established farm forestry ($p=0.002$).

Of the 60% of those who sold land who reported a change, around half stopped being a member of a rural fire fighting group, while the other half changed the location of their membership. This means that sale of properties is associated with some decline in rural fire fighting group membership, and some relocation of membership.
Fewer respondents were members of service groups than of rural fire fighting or sporting groups. As such, Figure 26, which shows change in service group membership resulting from land use change, is based on data from a relatively small number of respondents. A large majority of those who leased land or established their own farm forestry reported that the land use change was not associated with a change in service group membership. One out of three respondents who sold a property to a plantation company reported they stopped being a member of the service group/s they had previously belonged to.
Of those respondents who reported membership of sporting groups prior to the land use change (Figure 27):

- No landholders who established farm forestry reported any change to membership of sporting groups as a result of the land use change.
- A small proportion of those who leased land either stopped membership of their sporting group or changed the location of their membership as a result of the land use change.
- Fifty five per cent of those who sold land reported their sporting group membership changed, with 22% stopping membership and 33% changing the location of their membership.

Those who sold properties were significantly more likely than those who adopted farm forestry to report a change in membership of sporting groups as a result of the land use change ($p=0.03$). Again, however, these results should be treated with caution due to the small sample involved.

![Figure 27: Change in membership of sporting groups resulting from land use change to plantation or farm forestry](image)

The responses to questions about membership of community and service groups indicate that overall:

- land use change to farm forestry is not associated with any change in community or service group membership
- leasing of land for plantations is associated with a decrease in membership in a small proportion of cases.
- sale of land to plantation companies is associated with a change in membership in a majority of cases, with about half of those who reported a change ceasing membership of one or more groups, and half changing the location of their membership.
3.8 Benefits and costs of land use change to plantation or farm forestry

Survey respondents were asked to describe up to five benefits and five costs they or their family had experienced as a result of the land use change to farm or plantation forestry. They were also asked to rank how satisfied they were with the land use change.

Of the respondents, 138 described one or more benefits they believed were associated with the land use change, while 104 described one or more costs. The number of respondents and responses to the benefits question was greater than for the costs question. A small number of respondents (three) gave more than five answers. All their responses were included in the analysis, as some respondents gave fewer than five responses (hence the analysis was not based on having an equal number of responses per respondent), and the responses were not given in order of importance.

The question about benefits and costs was open ended, and the written responses of survey respondents were analysed and coded into categories. If a respondent listed two benefits which were coded as falling into a single category, they were counted as one response to avoid double counting. This enabled analysis of benefits and costs by number of respondents, rather than total number of responses.

Given the extent of transformation of this data by researchers, it was treated as qualitative, with no significance tests undertaken on the analysed data.

3.8.1 Benefits of plantation and farm forestry

The benefits of the land use change to plantation or farm forestry described by different types of respondents are compared in Figure 28, and briefly described in Table 7.

Those who had sold properties most commonly described increased resources (enabling them to undertake activities such as expanding a farm enterprise), personal financial benefits, retirement, enterprise financial benefits, lifestyle benefits and reduced workload as benefits of their decision to sell their property. Other types of benefit were much less frequently reported by this group of landholders. This indicates that benefits of selling a property involve a mix of financial benefit and benefits related to workload and lifestyle, particularly for those who are selling land in order to retire.

Those who had leased properties also listed personal financial benefits and reduced workload as key benefits of the land use change, but many also described environmental and stock benefits, issues which were rarely raised by those who had sold properties.

Those who had established farm forestry reported different benefits compared to the other two groups. They most commonly reported environmental benefits, benefits for stock, aesthetic benefits and lifestyle benefits, with financial benefits much less

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11 These numbers include some respondents who indicated there were no benefits or costs.
commonly reported than for the other two types of respondent. Farm foresters also reported a wider range of benefits, and had a wider distribution of views about benefits, compared to the other two types of landholder.

Overall, it appears that the benefits arising from different forms of plantation and farm forestry vary. While financial and lifestyle/workload benefits are most important for those who sell land to a plantation company, those who lease land also rank environmental and stock benefits highly, while those who establish their own farm forestry are more likely to report environmental, stock, aesthetic and land management related benefits, and less likely to report direct financial benefits for themselves or their enterprise.

This is consistent with the qualitative data collected in landholder interviews at the start of the study. Those who had established farm forestry typically reported benefits as including environmental and property management improvement, while those who sold land typically discussed financial and workload benefits. Those who leased land reported a mix of all these types of benefits:

The trees while they are standing are a real boon and I can see the environmental benefits of having the trees there. They have improved the biodiversity and they have helped with stock shelter and those sorts of things, but apart from those extra values you wouldn’t even consider farm forestry in my book. – Landholder #4 (leased land and established own farm forestry)

You can lamb down in those paddocks [where farm forestry was established] in very cold weather, and you can also put shornies out into those paddocks with a higher degree of confidence that the sheep will survive, which is good. That’s a hell of a big consideration for piece of mind, no doubt. – Landholder #1 (farm forestry)

There’s no doubt about it, you can drive around and aesthetically it’s terrific. You drive into a new paddock and cruise up through the trees and there’s more birdlife, it’s calm, warm – Landholder #1 (farm forestry)

… a reduced workload is the main benefit, um and the financial benefit of course. – Landholder #3 (sold land)
Figure 28: Benefits of land use change to plantation and farm forestry – survey respondents
Table 7: Types of benefits identified based on survey responses

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal financial benefits</td>
<td>Personal financial benefits were related to money, but rather than being focussed on the property as a business enterprise, were of a more social, or personal nature. For example they were the outcomes of improved business such as financial security, increased, or more regular income, or a statement suggesting the respondent was ‘better off’.</td>
</tr>
<tr>
<td>Enterprise financial benefits</td>
<td>Enterprise financial benefits were money-related benefits linked to the property or business. These benefits included reduced costs due to reduced inputs such as labour and travel costs, increased property value, or potential returns from opportunities such as carbon trading. Key words included profit, capital and equity.</td>
</tr>
<tr>
<td>Environmental</td>
<td>‘Environmental’ refers to the environmental benefits of the establishment of trees on the property. Key themes included increased ‘biodiversity’, ‘birds’ and ‘animals’, ‘shelter’, ‘ecology’ and ‘wildlife’; some respondents simply wrote words such as ‘environment’ or ‘atmosphere’. Note: ‘carbon credits’ were considered to be ‘financial’ benefits.</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>‘Lifestyle’ benefits were benefits that improved the lifestyle of the respondent, such as a reduced level of work, a new interest, an opportunity to learn a new skill, and the enjoyment of the work, for example ‘I enjoy working in the tree lots’.</td>
</tr>
<tr>
<td>Stock</td>
<td>Benefits for stock on properties included increased shelter provided by trees. The terms ‘stock shelter’, ‘shelter’ and ‘protection’ formed a large majority of the responses.</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>‘Aesthetics’ referred to improved appearance of the farm due to the growth of trees. Often the respondent simply used the word ‘aesthetics’. In some responses this was also linked to improved land value (although this was placed in the financial category). Some respondents did not like the appearance of the trees (see section on costs).</td>
</tr>
<tr>
<td>Diversification</td>
<td>‘Diversification’ typically referred to diversification of income sources for the landholder, or diversification of land use, with some answers more explicit than others. It includes responses which included the word ‘diversify’ or ‘diversification’, with one respondent using the words ‘alternative’ and ‘additional’.</td>
</tr>
<tr>
<td>Family/community</td>
<td>The family/community category refers to benefits for members of the landholders’ family, for example, ‘provided security for parents’, or the broader community, for example, ‘put money from the cities back into country areas’.</td>
</tr>
<tr>
<td>Reduced workload</td>
<td>This category included benefits related to workload, for example the use of statements such as ‘less work’ or ‘easy’ in responses.</td>
</tr>
<tr>
<td>Retirement</td>
<td>‘Retirement’ refers to people who used the money gained from the establishment of forestry to retire; as superannuation; or for other investment for use in retirement.</td>
</tr>
<tr>
<td>No benefits</td>
<td>There were some responses indicating that there had been no benefits. Some of the responses included an element of time, for example, ‘too early to see benefits’, suggesting that the respondent believes benefits could eventuate at a later stage.</td>
</tr>
<tr>
<td>Increased resources</td>
<td>This refers to the land use change providing increased resources, which in turn enable respondents to do something new or different, such as becoming involved in other farming activities, moving, or expanding their land to increase their business.</td>
</tr>
<tr>
<td>Land management</td>
<td>Land management benefits often related to soil and, less commonly, pasture improvement, particularly reduction in erosion and salinity and improved soil structure. Some respondents simply wrote ‘better land management’ instead of more specific statements such as ‘helps to combat soil and wind erosion’ or ‘prevent salt affected land spreading’. This has links to the ‘environmental’ category, but involves changes which directly improve property management.</td>
</tr>
<tr>
<td>Use marginal land</td>
<td>The opportunity to use otherwise unproductive, or marginal land was a benefit indicated by some landholders, for example, ‘better use of unprofitable land’. Some responses emphasised the economic gains resulting from use of marginal land, or emphasised the new land use had not reduced the opportunity for other uses of the land.</td>
</tr>
<tr>
<td>Firewood</td>
<td>Some respondents specifically described increased availability of firewood or timber for on-property use as benefits of the land use change.</td>
</tr>
</tbody>
</table>
3.8.2 Costs of plantation and farm forestry

The costs of land use change to plantation or farm forestry described by different types of respondents are compared in Figure 29, with each category briefly described in Table 8.

Of landholders who sold a property to a plantation company, 37.5% reported there were no costs involved with the land use change. Those who did report costs listed family and community impacts, pests and weeds, land prices and land management challenges as the most common costs of the land use change.

Landholders who leased a property to a plantation company were also likely to report there were no costs involved, but did so in only 17.8% of cases, compared to 37.5% for those who sold properties. In general, a wider range of costs were reported by this group of landholders, with no one topic reported by more than 20% of respondents. Of those who did report negative effects, the most common reported were somewhat similar to those who sold properties, with pests/weeds and family/community impacts, commonly reported. Those who leased, however, also reported some issues not typically raised by those who sold properties, with negative interactions with plantation companies, fencing costs, financial costs and risk, land management difficulties, and concerns about cost of reverting land to agriculture, all reported by some respondents who leased land. This indicates that leasing land presents a different set of challenges to selling land, and raises several practical management issues not faced when land is sold, particularly related to managing land during and after the life of the plantation.

Landholders who established their own farm forestry, meanwhile, were much more likely to report that financial costs and risks were a cost of the change in land use, with 38.9% describing these types of issues in their response to the question. Other costs reported by farm foresters included the hard work involved, pest and weed problems, negative interactions with plantation companies, fencing and land management costs. It is unsurprising that ‘hard work’ was only raised as a cost by those who established their own farm forestry, as those who sold or leased land did not generally undertake any work related to establishing and managing the plantation.

Overall, different landholders appear to experience different costs as a result of land use change to plantation or farm forestry. All types of landholders were likely to report that pests and weeds were a cost of the land use change to plantation or farm forestry. Those who sold and leased land were likely to report the decision involved no costs, or had negative impacts on family and community, whereas this was not generally reported by those who established their own farm forestry. Those who leased also reported costs relating to managing the plantation during and after the life of the plantation, and some financial cost/risk. Farm foresters were more likely to

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12 Generally referring to interactions around property access and management during the life of the plantation.

13 Farm foresters typically reported negative interactions with companies they were trying to sell timber to, whereas those who leased were typically referring to interactions occurring during the growth of a plantation established on leased land.
report financial cost/risk as an issue, as well as the work involved in establishing and managing their farm forest.

This is consistent with the qualitative data collected in landholder interviews at the start of the study. Several landholders were concerned about impacts of land sale to plantation companies on rural communities, as described earlier. All types of landholders discussed pest animals as a negative impact of establishment of plantation and farm forestry; one landholder who sold a property said there had ‘only been reduced costs’ as a result of the land use change, and two farm foresters reported concerns about whether they would achieve a financial return from their tree crop:

One downside is ferals, feral animals which we try to control as much as we possibly can – Landholder #1 (farm forestry)

I know a neighbour not far away that’s having a lot of trouble with foxes and he lives near blue gums. … I’m not lambing at the moment but I sort of figure, later in the year when I do start to lamb, that could be quite a problem. – Landholder #3 (sold land)

I mean it’s a bit disappointing that down the track if we harvest these trees we may not get much out of it – Landholder #1 (farm forestry)
Figure 29: Costs of land use change to plantation and farm forestry – survey respondents
Table 8: Types of costs identified based on survey responses

<table>
<thead>
<tr>
<th>Cost</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>No costs</td>
<td>‘None’, ‘NA’, ‘nil’ and ‘no cost difficulties’ were given as responses to the question of costs by several respondents. One respondent answered ‘given up trying to remove smile from my face!’</td>
</tr>
<tr>
<td>Financial cost and risk</td>
<td>The financial costs involved in establishing and managing plantation/farm forestry were listed by some respondents, sometimes linked to the long time taken for returns to be made, for example, ‘cost of planting with no income generation’. Other costs included fire insurance, the ‘lumpy’ nature of income received, and for some a need to find off-farm work to assist income. Forestry was also perceived by some to have inherent risks and uncertainty related to the length of time required to receive a return, the risk of natural disaster, and uncertain markets.</td>
</tr>
<tr>
<td>Land management</td>
<td>The loss of opportunity to use land for other purposes was sometimes viewed as a cost, for example, ‘loss of open paddocks’. Forestry establishment could also affect ‘farm planning’, lead to difficulties related to ‘stock management’, and reduce access to other resources, for example, ‘loss of water from dams’.</td>
</tr>
<tr>
<td>Pests/weeds</td>
<td>Pests and weeds included feral animals that damaged trees (‘increased vermin’), and the requirement for ‘weed control’. There was an economic cost associated with controlling pests and weeds as well as the resulting loss of income and damage.</td>
</tr>
<tr>
<td>Policy/govt funding</td>
<td>Requirements to follow laws and policy were perceived as a cost, particularly if they had changed or were viewed as an unnecessary burden. Some responses were more direct than others, for example, ‘stupid bureaucratic funding mechanisms’.</td>
</tr>
<tr>
<td>Environmental</td>
<td>Environmental costs listed by respondents included reduction in water availability, use of chemicals, damage to the land (soil) and removal of other trees. Some of these costs were also listed as benefits, for example, reduction of the water table.</td>
</tr>
<tr>
<td>Aesthetics</td>
<td>Some respondents indicated that they did not like the appearance of the trees, or had lost views, for example, ‘don’t like the look of trees grown on home farm’.</td>
</tr>
<tr>
<td>Plantation companies</td>
<td>Some respondents indicated difficulties in dealing with plantation companies, citing lack of cooperation, communication and support, for example, ‘people coming onto our property unannounced’.</td>
</tr>
<tr>
<td>Rural identity</td>
<td>Some respondents suggested the land use change negatively affected their rural area and identity, for example ‘seeing all the land go under trees as a lot of work was carried out to clear’.</td>
</tr>
<tr>
<td>Cost of reversion</td>
<td>Some respondents felt that reverting land to traditional agricultural use after harvest would be costly, for example ‘restoration of pastures back to grazing’.</td>
</tr>
<tr>
<td>Increased land prices</td>
<td>Some respondents indicated that plantation expansion had led to higher land prices, making it more difficult to buy land, for example ‘the value of land went up so quickly the money we had couldn’t buy another farm’.</td>
</tr>
<tr>
<td>Hard work</td>
<td>The establishment, maintenance and harvesting of trees required time and effort due to planting, fencing, pruning etc. There were two broad areas within this category: difficulties in finding labour, e.g. ‘recruiting labour for pine pruning’; and the ‘physical work’ required to manage the trees.</td>
</tr>
<tr>
<td>Family/community</td>
<td>Some respondents reported concerns about the wider social implications of increased plantations in the region, for example; ‘increase in isolation for family’ and ‘decreased community services (and utility services)’. Some respondents also suggested that they had been criticised by other landholders, for example, ‘attitude of neighbour’.</td>
</tr>
<tr>
<td>Fencing</td>
<td>The establishment and maintenance of fencing to keep pests and stock out was viewed as a cost. A small number of respondents also indicated these costs were not shared by plantation companies.</td>
</tr>
</tbody>
</table>
3.8.3 Satisfaction with land use change

Landholders were asked how satisfied they were with their decision to sell land/change land use to plantation or farm forestry (Figure 30).

![Figure 30: Landholder’s level of satisfaction with the land use change to plantation or farm forestry](#)

Overall, the large majority of respondents reported being either satisfied or very satisfied with the land use change that occurred, no matter whether it involved sale of land, leasing of land, or establishment of their own farm forestry. Those who leased land were more likely than others to report being unsatisfied with the decision, although the difference was not significant. No significant differences were found between different types of landholders in terms of their level of satisfaction with the land use change.
3.9 Future intentions - will landholders change land use again?

Landholders were asked their future intentions with regard to plantation and farm forestry.

Of those who leased land (n=65):

- 49.2% expected land would be replanted to trees when the current tree crop was harvested
- 7.7% said land would be returned to agriculture at the end of the rotation
- 30.8% were undecided
- 12.3% said they had other plans for the land.

Of these respondents:

- 69.5% did not plan to lease any further land, while 6.8% would consider it, and 23.7% were uncertain whether they would lease more land for plantations
- 50% would not consider establishing their own farm forestry, while 33.9% would consider it and 16.1% were uncertain whether they would consider it.

Of those who established their own farm forestry (n=73):

- 54.8% expected land would be replanted to trees at the end of the current rotation (ie when the current tree crop is harvested)
- 5.5% said land would be returned to agriculture at the end of the rotation
- 31.5% were undecided
- 8.2% had other plans for the land.

Of these respondents:

- 41.8% planned to establish more farm forestry in the future, while 37.3% did not and 20.9% were unsure
- 62.5% would not consider leasing land to a plantation company for farm forestry in the future, while 15.6% would consider this, and 21.9% were unsure.

Data from the qualitative interviews undertaken at the start of the study provide some further indication of the reasoning behind some of the responses about future intentions. Landholders indicated their decisions about the future depend on economic returns from the trees, as well as the cost of returning land to agriculture:

Those shelterbelts … will remain for as long as I’m around … it would be cost prohibitive to go through and rip out the stumps and put it back into cropping or wool or prime lambs or whatever. There’s not enough money in any one of those to warrant that. It would cost a fortune to do – Landholder #1 (farm forestry)

The fact of a few stumps there doesn’t mean we can’t turn that back to grass pretty quick and turning back to cattle grazing or sheep grazing. … But I think the trees are here for the long haul and as long as we keep getting enough rain to grow the trees from my area of land anyway I’d be quite happy to turn it back into trees, as long as their lease rates are economically sort of sound. – Landholder #4 (leased land)
In other qualitative interviews, the aesthetic and environmental benefits of trees were viewed as reasons to maintain trees on the property, although this was not directly discussed as a factor considered when deciding future intentions with regard to farm forestry and leasing land.

Those who had sold land were not asked if they would consider leasing land or establishing their own farm forestry, as when designing the survey it was assumed that many ceased all agricultural land ownership as a result of the land use change. Given that many of those who sold land indicated they remained in farming, this assumption was not accurate, and future surveys on this topic should ask these questions of all types of respondents.

All respondents were asked if they would consider selling land to a plantation company in the future. Figure 31 shows responses to this question. Those who had already sold land to a plantation company were significantly more likely to indicate they would consider selling land to a plantation grower in the future (58.3%) compared to those who had leased land (27.0%, $p=0.00$) and those who had established their own farm forestry (16.3%, $p=0.00$).

Figure 31: ‘Would you sell land to a plantation grower in the future?’: Survey responses
3.10 Conclusion

The analysis of landholder survey responses and data from plantation companies indicate that land use change to plantation and farm forestry results in important changes to the lives of landholders who make the land use change, the number of people living and working on rural properties, membership of community and service groups, and to a lesser extent, the infrastructure on rural properties. The land use change has a number of benefits and costs for the landholders involved.

There are important differences between landholders who sold land, leased land, and established their own forestry. The impacts of land use change under these different approaches vary significantly for some types of impacts.

The results are discussed in the next section, focusing on their implications for understanding how land use change to plantation and farm forestry impacts the landholders involved, the local communities they live in, and agricultural land use.
4 Discussion

The discussion below focuses on understanding the implications of the results for understanding the impacts of land use change to plantation and farm forestry on:

- the landholders who make the land use change
- the population and social infrastructure of rural communities
- rural property infrastructure and agricultural land use.

The implications of the variance in impacts depending on whether landholders sold land, leased land, or established their own forestry are also discussed.

4.1.1 Impacts on landholders

The large majority of all types of landholders were satisfied or very satisfied with their decision to change land use, whether it involved sale of land, lease of land, or establishment of farm forestry. This indicates the land use change met their needs, and had more benefits than costs.

The motivations of landholders who undertook different types of plantation and farm forestry differed. This indicates that the choice to adopt different types of plantation and farm forestry should be understood in terms of their ability in meeting the diverse goals of landholders. Landholders choose the type of plantation or farm forestry that best suits their needs, and different types of plantation and farm forestry appear to suit different needs and motivations. This means it is not simple to redirect landholders to adopt a different form of plantation or farm forestry if one is viewed as preferable to the others, as other forms are unlikely to meet their needs.

A desire to achieve a financial return, to reduce workload and to plan for immediate or future retirement were the most common reasons landholders reported selling land to a plantation company. It is likely that selling land satisfies these goals more readily than leasing or farm forestry, as it provides an immediate, often large, amount of money which can be invested for retirement, and enables immediate cessation of work on the property.

Those who leased appeared more likely to be planning to continue active management of a farm enterprise, and hence were aiming to take up a form of plantation or farm forestry that could fit in with property management needs as well as fulfil the desire for financial return and planning for future retirement. They commonly reported financial and workload-related motivations, but were also likely to be motivated by a desire to improve property management through actions such as diversifying the farm enterprise. They were less likely to be motivated by a desire to retire immediately than those who sold, but many were planning for future retirement, indicating leasing is considered as an option for achieving this goal as well as selling land.

Landholders who established farm forestry were motivated by different goals, particularly a desire to improve environmental and aesthetic characteristics of their property, and to improve property management through diversification of their enterprise and better use of difficult or marginal land. They did not typically report the financial or workload goals that were important for many of those who leased or sold.
Similarly to motivations, different types of plantation or farm forestry generated different benefits and costs for landholders. The benefits of selling a property primarily involved a mix of financial benefit and benefits related to workload and lifestyle, particularly for those who sold land in order to retire. When compared to their motivations, these landholders appear to experience benefits when they are able to satisfy goals of achieving retirement, reduced workload, or financial return.

Those who had leased properties also listed personal financial benefits and reduced workload as key benefits of the land use change, but many also described environmental and stock benefits, issues which were rarely raised by those who had sold properties. Again, this fits with the motivations reported by these landholders.

The benefits reported by farm foresters (environmental, stock management, aesthetic and lifestyle benefits) were again consistent with the motivations reported by these landholders.

The costs of land use change did not differ as much as benefits across the different types of plantation and farm forestry, although there were some differences.

One similarity stood out when costs of the land use change were described: all types of landholders reported that pests and weeds were a negative impact of the land use change, indicating this is an important issue for all land use change to plantation or farm forestry, no matter how it is undertaken.

Landholders who sold a property to a plantation company typically identified few or no costs for themselves, but did identify costs such as family and community impacts, and changes to land prices, which are experienced by the community more generally, rather than by the landholder themselves. This suggests that negative impacts of this type of land use change are believed to occur at the community, rather than individual landholder, scale.

Landholders who leased a property to a plantation company were also somewhat likely to report there were no costs involved, but several did identify some individual costs relating to managing leased land, including negative interactions with plantation companies, fencing costs, financial costs and risk, land management difficulties, and concerns about cost of reverting land to agriculture. This indicates that leasing land sometimes has financial risks associated with it, whereas this was not reported by those who sold land. It also involves some ongoing management of land and interactions with the plantation company leasing the land, creating potential for negative interaction, whereas sale of land does not involve these types of interaction while the plantation is growing.

Farm foresters were much more likely to report that financial costs and risks were a cost of the change in land use (38.9% of respondents) than others. They also reported a wider range of management related costs such as the hard work involved, fencing and land management costs. Those who adopt farm forestry take on most or all of the financial risk of adoption, usually paying most/all of the costs involved in establishing farm forestry, and waiting a long period of time for a financial return. Those who sell or lease land either receive money immediately, or regularly over the life of the plantation, reducing financial risk substantially.

Overall, the majority of all types of landholders reported being satisfied with the land use change, and reported more benefits than costs of the change. The benefits and costs were closely related to the goals of landholders, and varied by type of plantation and farm forestry. The impact on the landholder is therefore highly dependent on...
whether the land use change met their specific goals, with different types of plantation and farm forestry able to meet different sets of goals.

4.1.2 Impacts on local communities - population, community and service groups

Perhaps the most common criticism of the expansion of plantation forestry is that many believe it has negative impacts on rural population levels and, as a consequence, on membership of local community and service groups and the social cohesion of rural communities. These concerns have been expressed in multiple studies in Australia in recent years (see for example SPIS 1990, Kelly and Lymon 2000, Petheram et al. 2000, Tonts et al. 2001, Schirmer 2002, Barlow and Cocklin 2003, Pickworth 2005, Schirmer et al. 2008). Previous studies indicate that rural population is believed to be affected in two ways: by direct change in the number of people living on rural properties, and by change in employment opportunities in rural regions which lead to changes in the number of people living in these regions.

The landholder survey and data provided by plantation companies identified change in the number of people living on properties on which plantation or farm forestry are established. The landholder survey also examined direct changes in numbers of people working on rural properties on which the trees are established.

This provides quantitative data on the nature of these types of population change for the first time; previous studies have typically recorded perceptions (see references above), or have attempted to assess population change by examining statistical change in the total population living in a defined rural area compared to change in area of plantations over time (Schirmer et al. 2005).

The results of this study do not, however, identify whether and what type of indirect population change occurs as a result of employment changes resulting from establishment of plantation or farm forestry. This type of population change is examined in another part of the Land Use Change study, which compares the employment generated by different land uses in the region.

The results of this study should therefore be considered to provide useful data on how land use change to plantation forestry affects the number of people living and working on rural properties.

The results indicate that:

- establishment of farm forestry has no impacts on the number of people living on rural properties
- leasing of land results in a reduction of population in relatively few cases
- in a majority of cases (an estimated 75%) the sale of land to a plantation company results in change in the population living on a property.

When properties are sold, in an estimated 44–52% of cases they have residents living on them. Where residents were living on the property, about 75% of the time they shift away when the property is sold to a plantation company; and new residents then shift onto the property in anywhere from 50–80% of cases depending on the timeframe examined. This means there is a net loss of approximately 17–28% of the population that previously lived on rural properties, with previous residents leaving and no new residents shifting onto the property; while in another 47–58% of cases the previous residents leave and new residents shift onto the property.
Where previous landholders shift away, they typically shift to either a new farm, or retire or shift to a job in the local area, such that in some of the cases while there is a net loss of population living on the property, the local community does not necessarily experience a population loss.

These results highlight that in many cases, the overall number of people living on a property doesn’t change, but previous residents do shift away and new residents shifting onto a property. The population change in these cases involves a shift in who lives on rural properties, rather than an overall loss of population.

With an estimated 590 properties having been sold to plantation companies in the region, and an average of 2–3 people living on each (mean of 2.9 people), it is estimated that approximately 820 people were living on properties sold to plantation companies between 1995 and 2007. Of these 820 people, about 615 shifted off the property where it was sold to a plantation company, and between 300 and 485 new people shifted to live in the housing on these properties (assuming that an average of 2.5 people shifted back into housing, based on the average household size in the region in 2001 and 2006[14]). This means there was a net loss of anywhere between 130 and 315 people living on rural properties across the 17 local government areas of the study region. Some of these 130–315 people shifted to live elsewhere in local communities, while others shifted some distance away.

When properties are leased, in approximately 60-70% of cases they have residents living on them before the land use change. Residents shift away in about 10% of cases, and in 45–55% of cases new residents then shift onto the property. This would result in around 40 people shifting away from properties (based on the estimate of 155 leased properties in the region with an average of four people living on each of them, and 65% occupied prior to land use change), with approximately 20 new residents shifting onto the properties and a net loss of around 20 people in the study region between 1995 and 2007.

Overall, the study region experienced a loss of just under 8,000 residents living on rural land or in towns with less than 200 residents, over the period 1996 to 2006 (the period when almost all plantations were established)[15]. In the local government areas (LGAs) in which plantation expansion occurred (all rural LGAs except Horsham, Northern Grampians, Ararat, Kingston and Robe had at least 1,000ha of plantation established over this period), there was a decline of 1,495 in the rural population[16]. Given that plantation expansion led to a net loss of between 150 to 335 people living on rural properties in these regions – although some of the people who shifted off plantation properties did remain living in the local region – plantation expansion is likely to have influenced at most 10–20% of the net loss of rural population

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[14] Data on average household size were sourced from the 2006 Australian Bureau of Statistics Census of Population and Housing.

[15] Data on rural population change were calculated from the 1996, 2001 and 2006 Australian Bureau of Statistics Census of Population and Housing, using data on total population by statistical local area and urban centre/locality to identify the ‘rural balance’ population living outside urban centres and localities in each statistical local area.
experienced in plantation regions. In other regions with little plantation expansion, rural population also declined at similar or higher rates to the decline seen in plantation areas. This issue is explored in more detail in other reports forming part of the Land Use Change project.

The population changes identified in this report occurred in a context where plantation companies have generally been able to subdivide a small parcel of residential land from a plantation property and sell it; this has been facilitated by both having a regulatory and planning environment which permits this subdivision, and high demand for rural residential properties in the region. The population impacts of plantation expansion would be likely to differ in situations where subdivision was not possible, and in regions where there is less demand for residential housing.

People stopped working on the property when land use changed in a majority of cases where a property was sold (59%), 33% of cases where a property was leased, but very rarely when farm forestry was established (6% of cases). Between 1.6 and 2.3 people typically stopped working on the property where this was reported to have occurred. More people were reported to stop working on properties that were sold compared to those that were leased. Of those who stopped working on a property, the majority either went to work on another property forming part of the farm enterprise, or retired.

Comparing the results on number of people living and working on the property, and the number who ceased work, it appears that in the large majority of cases those who stopped working also lived on the property. The cessation of work is therefore unlikely to have resulted in additional population loss on top of that reported by those who live on the property.

Landholder’s membership of local community and service groups was impacted by the establishment of plantation forestry in some cases. While land use change to farm forestry was not associated with any change in membership of these groups, leasing of land was associated with changes in membership in approximately 10% of cases, and sale of land in just over 50% of cases. This most commonly involved changes to membership of rural fire fighting services and sporting groups.

In about 50% of cases where land use change affected membership, the landholder ceased membership of the group altogether, while in the other half they changed the location of their group membership.

Membership of community and service groups is therefore affected by land use change, and again, this primarily occurs when land is sold to a plantation company. However, the results of this study indicate that this involves a shift in membership as often as a cessation of membership. Depending on where people shift to, this may result in declining membership of a sporting group or volunteer fire brigade in one area, and increase in another.

It was not possible to identify the total change in membership of community and service groups resulting from land use change to plantation and farm forestry, as the proportion of new residents who join these groups was not identified. Clearly, the impact of the land use change on community and service groups will largely depend on whether new residents who shift into the region join these groups or not – if they don’t, membership of these groups will decline, while if they do, groups may maintain or improve their membership.

Overall, the results of this study indicate that farm forestry has few or no impacts on rural population and community group membership, while leasing of land results in a
decrease in population and group membership in a small proportion of cases. The sale of land, however, results in change in many cases, with 75% of sales involving a change in who lives on the property, 17–28% involving a net loss of population, and 50% involving some change or cessation of membership of community or service groups. This confirms commonly reported perceptions in previous studies, although the magnitude of change is lower than would be expected based on the views reported in these studies.

These results highlight that there is a need to better understand the social impacts of the population turnover resulting from land use change to plantation forestry. While the net change in population is not high, plantation expansion is associated with a high level of change in who lives in rural communities. There is a need to further explore how to assist both previous and new residents to adapt to this change, and identify strategies for improving integration of new residents into rural communities.

4.1.3 Rural properties and agricultural land use

Some of the data collected for this study were designed to assist in answering questions about the impact of establishment of plantation and farm forestry on agricultural infrastructure. Concerns have been expressed that plantation expansion may constrain availability of agricultural land for other uses; reduce opportunities for farmers to expand their farming enterprise; and may reduce infrastructure on rural properties, making it more difficult to re-establish traditional agriculture on this land in future (Schirmer 2002, Schirmer et al. 2008).

Land that was established to plantation and farm forestry was predominantly used for grazing of sheep or cattle prior to the land use change, for all types of plantation and farm forestry. Less commonly, the land had been used for cropping, and very rarely it had been used for dairy farming.

The results of this study indicate that dairy farms make up a small proportion of the properties established to plantation forestry, at least in recent years. However, the sample of landholders who sold was biased towards recent years, and it is possible a more dairy farms were established to plantation in earlier years. However, even considering this potential bias it appears likely that overall only a small proportion of plantations in the region have been established on ex-dairy land.

This result may seem surprising, as public discussions about plantation expansion in the study region have sometimes focused on whether plantations have had a negative impact on the dairy industry. For example, the President of United Dairy Farmers Victoria was recently quoted as stating ‘We believe plantations stifle dairy's development by leading to a loss of dairy family farms which will ultimately shrink local economies, services and social networks’ (Farm Online 2008).

The questions asked in this study focused only on previous land use, and do not reflect land capability. They therefore provide only a limited understanding of the extent to which expansion of plantations has occurred on land which is suitable for different types of farming, such as dairy farming. This is an important issue, as participants in group interviews held for the Land Use Change study have reported ex-grazing properties being converted to dairy farming in some regions, as well as other examples of changes in traditional agricultural land use (Schirmer et al. 2008). This means that even if plantation forestry is not established on ex-dairy properties, it may be established on land capable of being used for dairy farming. That said, participants in group interviews also identified that competition from dairy farmers
restricted expansion of plantations in dairy regions, as did one of the landholders who participated in qualitative interviews. This builds a complex picture of the availability of land in the region, with availability determined by factors including land capability and the extent of competition for land and its effects on land prices.

On the question of on-property infrastructure, the study provided more clear-cut results. In most cases, land use change to plantation and farm forestry resulted in relatively little change to infrastructure on the property on which trees were established. Those who sold land were most likely to report a decrease in infrastructure, with removal of fences and sheds/storage infrastructure the most common decreases reported. It was very rare for housing to be removed or demolished as a result of establishment of any type of plantation or farm forestry, although houses were removed in 4% of cases where a property was sold or leased to a plantation company. These results are consistent with data gathered in group interviews for the Land Use Change study in June 2008\(^{17}\), in which participants reported that most houses remained on plantation properties. While it is possible that in earlier years more housing was removed from properties, for at least the last few years it has been very rare for removal of housing to occur, while removal of fencing and sheds is more common when properties are sold and, to a lesser extent, leased.

These results suggest that concerns reported in earlier studies (see for example Schirmer 2002), which suggested that houses were commonly removed from properties when plantations were established, do not reflect current practice.

The final concern relating to impacts of establishment of plantation and farm forestry on the agricultural sector was whether land sold to plantation companies is able to be purchased by other farmers. In some previous studies, concern has been expressed that land is sold directly to plantation companies with little opportunity for other landholders who may be interested to express an interest or purchase the land (Schirmer 2002). In this study, when land was sold to a plantation company, in 68% of cases it was sold directly to the plantation company. Where land was placed on the market for sale prior to being sold to a plantation company, it typically stayed on the market for less than three months. Data from qualitative interviews indicate that land is often sold directly as it is believed other potential purchasers would not pay as high a price for the land.

These data provide some improved understanding of the extent to which plantation forestry replaces particular types of traditional agriculture, changes on-property infrastructure, and influences land markets. However, it is only a limited picture, and it is difficult to identify whether the changes identified result in any impacts on availability of land or infrastructure for other types of agriculture.

\(^{17}\) These group interviews were undertaken primarily for a different part of the Land Use Change project, but participants commonly discussed their observations on changes resulting from land use change to plantation forestry. The results of the interviews are discussed in report Socio-economic impacts of land use change: what do the statistics tell us? published in March 2009.
4.1.4 Comparing different types of plantation and farm forestry

Establishment of trees for commercial wood production has different effects on landholders, communities and infrastructure depending on the way it is undertaken. Throughout the results, a number of significant differences were found between cases in which plantation and farm forestry were established via sale of land (‘sale’), lease of land (‘lease’), and establishment of farm forestry. These have been highlighted throughout the discussion.

When land is sold for plantation forestry, it is more likely to result in changes to the population living and working on the property, and to community and service group membership, than when land is leased or farm forestry is established. It also involved establishment of larger areas of trees on average, and a larger average proportion of the enterprise, than the other types of plantation and farm forestry. It is important to emphasise that understanding the impact of this land use change on local communities requires not just counting the numbers of people who shift off and onto the property, but identifying that a population change occurs. In 75% of cases there is either a shift to a new person living on the property, often someone who works in a nearby town rather than a farmer, or a loss of population. This represents an important social change for rural communities, with the largest change being the number of new people shifting onto properties, rather than the net loss of population.

The results are highly consistent with perceptions reported in previous studies, in which the sale of properties has been singled out as particularly likely to have impacts on the population living on properties and to lead to social change (eg Petheram et al. 2000, Schirmer 2002, Schirmer et al. 2008). Farm forestry, meanwhile, is commonly perceived as having few or no impacts on population and services (Schirmer 2007). The data presented here confirm these perceptions, but also identifies that the magnitude of the change is lower than perceptions reported in previous studies would suggest, both in terms of loss of population living on rural properties and reduction in membership of community and service groups. This provides some context to perceptions that establishment of plantation forestry leads to large-scale decline in rural population. The results do not support this suggestion, but do support that there is some loss of rural population from rural properties, and some decline in membership, as well as change in population and membership.
5 Conclusions

The principle goals of this study were to understand the impact of land use change to plantation and farm forestry on (a) landholders who make this land use change, (b) the population and social infrastructure of the local communities in which this land use change is occurring, and (c) the agricultural sector in terms of the types of land use and infrastructure changes involved in the shift to plantation and farm forestry.

Using data from a quantitative survey of landholders, plantation companies and qualitative semi-structured interviews with eight landholders involved in land use change to plantation and farm forestry, these questions were explored in detail.

The results of the study show that the majority of landholders who change land use to plantation and farm forestry are satisfied with their decision, whether they changed land use by selling land to a plantation company, leasing land to a plantation company, or by establishing their own trees in what is usually termed ‘farm forestry’. They are, however, satisfied for different reasons, as each type of landholder had distinct motivations or goals. Those who sold and leased land were typically motivated by achieving a financial return, reducing workload and planning for retirement. Those who leased were also motivated by a desire to diversity their farm enterprise and improve property management, something rarely reported by those who sold land. Farm foresters, meanwhile, were motivated by the environmental and aesthetic benefits of farm forestry, and its benefits for property management.

Most plantation and farm forestry is established on land previously used for grazing. The land use change results in relatively little change to infrastructure on the property, although infrastructure removal – particularly of internal fencing and sheds – is more common when properties are sold than when they are leased or farm forestry is established. Housing is rarely removed when the land use change occurs.

The sale of land to plantation companies results in greater change in the population living on rural properties, and membership of community/service groups, than leasing of land or establishment of farm forestry. In the 44–52% of cases where people live on a property prior to the land being sold to a plantation company, when land is sold an estimated 75% of previous residents shift away; in 17–28% of these cases there is a net loss of population, while in the remainder new residents shift onto the property. In around 50% of cases where previous residents shift away from the property, people either stop being a member of some community and service groups, or change the location of their membership.

These results confirm commonly reported perceptions that land use change to plantation forestry results in some decline in rural population and community group membership. The magnitude of that change is not as high as commonly perceived, however, and in many cases the change involves a shift in who lives in the community, rather than a net loss of population. They highlight a need to better understand the social impacts of the turnover of population associated with land use change to plantation forestry, as there is a greater change in who lives on rural properties, than in the total number of people living on rural properties.


Appendix 1: Questionnaire

Socio-economic impacts of land use change to plantation and farm forestry

A survey of landholders who have changed land use to plantation or farm forestry via selling land, leasing land or establishing trees themselves

Undertaken as part of the Socio-economic impacts of land use change in the Green Triangle and Central Victoria project
Impacts of land use change to plantation and farm forestry: A survey of landholders

What is this survey about?
This survey asks about your experiences with changing land use to farm forestry or plantation forestry. It forms part of a study that aims to better understand the social impacts of land use change to different types of plantation and farm forestry. If you have leased land to a plantation company, sold a property which was then established to plantation, or if you have established your own farm forestry, I would appreciate it if you would consider completing the survey.

Why have I been sent the survey?
You have been sent this survey as I understand that at some point you have either:
- actively decided to change land use to plantation or farm forestry (by establishing your own trees, leasing land, or selling land), or
- made a decision to sell a property, which was then purchased by a plantation grower.
The letter accompanying this survey explains how your contact details were obtained.

Confidentiality
If you choose to complete this survey, your response will be kept confidential. Only the researchers involved will have access to your survey form and the data you provide will not be passed on to any other party. You will not be individually identifiable in any of the published results of the study.

More information
More detailed information has been provided in a separate Information Sheet accompanying this survey. If you have any questions please call me on 1800 981 499. The survey should take approximately 15-20 minutes to complete.
Thank you for your time,

Dr Jacki Schirmer
Research Fellow
Fenner School of Environment and Society
Australian National University, ACT 0200
Freecall: 1800 981 499
Ph: 02 6125 2737
email: jacki.schirmer@anu.edu.au
### Q1: What type/s of plantation/farm forestry have you been involved in?

**Q1A: Type & area of plantation/farm forestry**

Have you been involved in any of the following types of plantation or farm forestry?  

<table>
<thead>
<tr>
<th>Type of activity</th>
<th>Yes</th>
<th>No</th>
<th>Area (ha)</th>
<th>% of Farm Enterprise</th>
<th>Year of Sale/Lease/Planting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling land on which the subsequent owner established a plantation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leasing part of a property to a plantation grower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leasing all of a property to a plantation grower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entering into a joint venture agreement with a plantation grower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishing your own farm forest with financial assistance, e.g. a grant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Establishing your own farm forest with no financial/other assistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* If you have sold land, leased land or established farm forestry more than once, please include the total hectares of trees established over time; calculate % of your enterprise at the time of the most recent land sale/lease/tree planting  
** Please enter multiple years if you have sold/leased land at more than one point in time, or planted your own trees over several years (e.g. 1997, 2000, 2004)

**Q1B. What types of trees were established?**

Type of tree…  

<table>
<thead>
<tr>
<th>Type</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pine plantation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blue gum plantation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sugar gum</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixed species</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please describe):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q1C. If you sold a property to a plantation grower:**

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>How long had you owned the property before it was sold?</td>
<td></td>
</tr>
<tr>
<td>Did you put the property on the market prior to sale?</td>
<td>Yes</td>
</tr>
<tr>
<td>→ If yes, how long was the property on the market before it was sold?</td>
<td></td>
</tr>
</tbody>
</table>
**Q2: Motivations for changing land use**

**Q2. Why did you change land use to farm/plantation forestry?**  
Tick all that apply

- [ ] To diversify the farm enterprise
- [ ] I didn’t make an active choice, I just wanted to sell or lease my land for any purpose
- [ ] A plantation company asked to evaluate the land and this got me interested
- [ ] A plantation company/agency offered a good price to buy my land
- [ ] A plantation company/agency offered a good price to lease my land
- [ ] I was making poor returns from the land and wanted to find an alternative enterprise
- [ ] A neighbour or friend had established farm/plantation forestry and it had been beneficial for them
- [ ] I believed there may be carbon trading opportunities now or in the future from the trees
- [ ] I wanted to retire immediately
- [ ] I wanted to create a retirement/superannuation fund for my future retirement
- [ ] Farm/plantation forestry enhances birds and other wildlife on the property
- [ ] Farm/plantation forestry provide shelter benefits for stock
- [ ] I wanted to reduce my workload
- [ ] I decided the financial returns from farm/plantation forestry were likely to be good
- [ ] I wanted to try a new enterprise
- [ ] I had land suitable for tree planting
- [ ] I had some marginal/difficult land that I wanted to use for something productive
- [ ] To obtain funds that would enable purchase of another, more productive, farming property
- [ ] To increase the land value of the property
- [ ] To improve the aesthetics of the property (i.e. improve how it looks)
- [ ] To reduce property management costs
- [ ] To stop erosion
- [ ] To address salinity problems
- [ ] Other (please describe): __________________________________________________
  
  __________________________________________________
  
  __________________________________________________
Q3: Changes in land use & infrastructure

If you have leased/sold/established more than one property to trees, please complete the following questions for up to three properties using the spaces provided. If you have sold/leased land or established trees on a single property, leave the Property 2 & Property 3 fields blank.

Q3A: What was land used for in the 5 years before plantation/farm forestry was established?

Tick all that apply

<table>
<thead>
<tr>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area sold/established to trees:</strong></td>
<td><strong>Area sold/established to trees:</strong></td>
<td><strong>Area sold/established to trees:</strong></td>
</tr>
<tr>
<td>[ ] Sheep grazing (wool)</td>
<td>[ ] Sheep grazing (wool)</td>
<td>[ ] Sheep grazing (wool)</td>
</tr>
<tr>
<td>[ ] Sheep grazing (meat)</td>
<td>[ ] Sheep grazing (meat)</td>
<td>[ ] Sheep grazing (meat)</td>
</tr>
<tr>
<td>[ ] Cattle grazing</td>
<td>[ ] Cattle grazing</td>
<td>[ ] Cattle grazing</td>
</tr>
<tr>
<td>[ ] Cropping</td>
<td>[ ] Cropping</td>
<td>[ ] Cropping</td>
</tr>
<tr>
<td>[ ] Dairy</td>
<td>[ ] Dairy</td>
<td>[ ] Dairy</td>
</tr>
<tr>
<td>[ ] Other (please describe):</td>
<td>[ ] Other (please describe):</td>
<td>[ ] Other (please describe):</td>
</tr>
</tbody>
</table>

Q3B: Did the establishment of plantation/farm forestry result in changes to infrastructure?

<table>
<thead>
<tr>
<th>Type of infrastructure</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Houses on property</strong></td>
<td>[ ] No change</td>
<td>[ ] No change</td>
<td>[ ] No change</td>
</tr>
<tr>
<td></td>
<td>[ ] Housing demolished</td>
<td>[ ] Housing demolished</td>
<td>[ ] Housing demolished</td>
</tr>
<tr>
<td></td>
<td>[ ] Housing relocated</td>
<td>[ ] Housing relocated</td>
<td>[ ] Housing relocated</td>
</tr>
<tr>
<td></td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
</tr>
<tr>
<td><strong>Fencing on property</strong></td>
<td>[ ] No change</td>
<td>[ ] No change</td>
<td>[ ] No change</td>
</tr>
<tr>
<td></td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
</tr>
<tr>
<td></td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
</tr>
<tr>
<td></td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
</tr>
<tr>
<td><strong>Sheds/storage facilities on property</strong></td>
<td>[ ] No change</td>
<td>[ ] No change</td>
<td>[ ] No change</td>
</tr>
<tr>
<td></td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
</tr>
<tr>
<td></td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
</tr>
<tr>
<td></td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
</tr>
<tr>
<td><strong>Dams on property</strong></td>
<td>[ ] No change</td>
<td>[ ] No change</td>
<td>[ ] No change</td>
</tr>
<tr>
<td></td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
<td>[ ] Increase</td>
</tr>
<tr>
<td></td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
<td>[ ] Decrease</td>
</tr>
<tr>
<td></td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
<td>[ ] Don’t know</td>
</tr>
</tbody>
</table>

V
Q4: Change in number of people living on the property

If you have leased/sold/established more than one property to trees, please complete the following questions for up to three properties using the spaces provided. If you have sold/leased land or established trees on a single property, leave the Property 2 & Property 3 fields blank.

### Q4A. Number & type of people living on the property before trees were established

<table>
<thead>
<tr>
<th>Did anyone live on the property in the 5 years before trees were planted?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

→ **If yes,** please complete the table
→ **If no,** please proceed to Q5

<table>
<thead>
<tr>
<th>How many people lived there? (on average during 5 years before trees planted)</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>Number:</td>
<td>Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What were the ages of the people living on the property at the time of land use change to trees?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ages:</td>
<td>Ages:</td>
<td>Ages:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many of those living on the property attended a local school at the time of land use change to trees?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>Number:</td>
<td>Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many of those who lived on the property also worked on the property at the time of land use change to trees?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>Number:</td>
<td>Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many people who lived on the property had jobs off the property at the time of land use change to trees? (eg in nearby town)</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>Number:</td>
<td>Number:</td>
<td></td>
</tr>
</tbody>
</table>

### Q4B. Changes in people living on the property as a result of trees being established

<table>
<thead>
<tr>
<th>Did anyone shift off the property as a result of trees being established?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

→ **If yes,** please complete the table
→ **If no,** please proceed to Q5

<table>
<thead>
<tr>
<th>How many people shifted away?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td>Number:</td>
<td>Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where did they shift to?*</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local farm</td>
<td>Local farm</td>
<td>Local farm</td>
<td></td>
</tr>
<tr>
<td>Non-local farm</td>
<td>Non-local farm</td>
<td>Non-local farm</td>
<td></td>
</tr>
<tr>
<td>Local town</td>
<td>Local town</td>
<td>Local town</td>
<td></td>
</tr>
<tr>
<td>Non-local town</td>
<td>Non-local town</td>
<td>Non-local town</td>
<td></td>
</tr>
<tr>
<td>Don’t know</td>
<td>Don’t know</td>
<td>Don’t know</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did new people come to live on the property?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

→ **If yes,** how many?

| Number: | Number: | Number: |

→ **If yes,** were the new residents from the local area?**

<table>
<thead>
<tr>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* If there has been more than one shift since trees were established, please indicate where you/others initially shifted
** Local = the same local government area as the property on which trees were established. Non-local = different local government area.
### Q5: Change in number of people working on the property

If you have leased/sold/established more than one property to trees, please complete the following questions for up to three properties using the spaces provided.

#### Q5A. Number of people working on the property before and after trees were established

<table>
<thead>
<tr>
<th>How many people worked on the property, on average, in the 5 years before trees were established?*</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How many worked part-time and how many full-time?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part-time:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Did any of these people stop working on the property as a result of trees being established?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

→ If yes, how many?

<table>
<thead>
<tr>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

→ If yes, where did people who stopped working on the property go?

- Retired
- To work on another property I manage
- To a new job in local area
- To a new job in different locality
- Unemployed
- Don’t know

Please indicate how many workers retired, went to work on another property you manage, moved to a new job in local area, etc.

* Include workers living on & off the property; owners, employees & contractors. If the number of workers varied over time, report the average number at any one point in time.

#### Q5B. If you manage a farm/plantation forest yourself, how much work has been generated by the farm/plantation forestry on your property?

<table>
<thead>
<tr>
<th>How many weeks of work have been generated at each of the following stages?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the establishment year/s</td>
<td>Weeks:</td>
<td>Weeks:</td>
<td>Weeks:</td>
</tr>
<tr>
<td>Indicate total weeks eg if 2 people each did 2 weeks of work, write ‘4’. If they did this in each of 3 planting years, write ‘12’.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During the life of the plantation</th>
<th>Avg weeks/year:</th>
<th>Avg weeks/year:</th>
<th>Avg weeks/year:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>During harvesting (if applicable)</th>
<th>Weeks:</th>
<th>Weeks:</th>
<th>Weeks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate weeks of work and what area (hectares) was harvested.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area:</th>
<th>Area:</th>
<th>Area:</th>
</tr>
</thead>
</table>

* Include work undertaken by yourself or anyone else (including employees and contractors), whether paid or unpaid.
Q6: Changes to membership of community and service groups

Q6. Changes in community/service group membership as a result of trees being established
If there were people living on the property before the land use change to trees, please complete the following table (if there were no people living on the property, please go to Q7)

<table>
<thead>
<tr>
<th>Before trees were established, were any residents of the property members of the following groups?</th>
<th>Property 1</th>
<th>Property 2</th>
<th>Property 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Rural fire fighting service</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>No</td>
<td>Don’t know</td>
<td>Yes</td>
</tr>
<tr>
<td>→ If yes, did membership change as a result of the land use change to trees?</td>
<td>No change</td>
<td>Stopped membership</td>
<td>Changed location</td>
</tr>
</tbody>
</table>

| 2) Service groups eg Lions, Apex, Rotary | | | |
| Yes | No | Don’t know | Yes | No | Don’t know | Yes | No | Don’t know |
| → If yes, did membership change as a result of the land use change to trees? | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know |

| 3) Sporting clubs | | | |
| Yes | No | Don’t know | Yes | No | Don’t know | Yes | No | Don’t know |
| → If yes, did membership change as a result of the land use change to trees? | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know |

| 4) Other (please describe) | | | |
| Yes | No | Don’t know | Yes | No | Don’t know | Yes | No | Don’t know |
| → If yes, did membership change as a result of the land use change to trees? | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know | No change | Stopped membership | Changed location | Don’t know |

VIII
Q7: Benefits and costs of farm/plantation forestry

Q7A What have been the five most important benefits to you and your family of the land use change to farm/plantation forestry (if there have been benefits)?

1. 
2. 
3. 
4. 
5. 

Q7B What have been the five most important costs/difficulties to you and your family of the land use change to plantation or farm forestry (if there have been costs/difficulties)?

1. 
2. 
3. 
4. 
5. 

Q7C Overall, how satisfied are you with your decision to sell land/change land use to farm/plantation forestry? Please answer for each type of farm/plantation forestry you have been involved with

<table>
<thead>
<tr>
<th>Type of plantation or farm forestry</th>
<th>How satisfied are you with this land use change? (please tick most appropriate answer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very unsatisfied</td>
</tr>
<tr>
<td>Sale of land to plantation grower</td>
<td>□</td>
</tr>
<tr>
<td>Lease of land to plantation grower</td>
<td>□</td>
</tr>
<tr>
<td>Establishing your own farm forestry</td>
<td>□</td>
</tr>
</tbody>
</table>
Q8: Future intentions

Q8 asks questions aimed at understanding how land use may change in the future. Note that, as stated in the Information Sheet accompanying this survey, your answers will be viewed only by the study researchers and will not be passed on to any third party.

Q8A. If you have leased land to a plantation grower

<table>
<thead>
<tr>
<th>What will happen to the land after the trees are harvested?</th>
<th>Land will be replanted to trees</th>
<th>Land will be returned to traditional agriculture</th>
<th>Undecided/don’t know</th>
<th>Other (please describe)</th>
</tr>
</thead>
</table>

Do you plan to lease more land to a plantation grower in the future?  
- [ ] Yes  
- [ ] No  
- [ ] Don’t know/unsure

Would you consider establishing your own farm forestry in the future?  
- [ ] Yes  
- [ ] No  
- [ ] Don’t know/unsure

Q8B. If you have established your own farm forestry:

<table>
<thead>
<tr>
<th>What will happen to the land after the trees are harvested?</th>
<th>Land will be replanted to trees</th>
<th>Land will be returned to traditional agriculture</th>
<th>Undecided/don’t know</th>
<th>Other (please describe)</th>
</tr>
</thead>
</table>

Do you plan to establish more farm forestry in the future?  
- [ ] Yes  
- [ ] No  
- [ ] Don’t know/unsure

Would you consider leasing land to a plantation grower in the future?  
- [ ] Yes  
- [ ] No  
- [ ] Don’t know/unsure

Q8C. If you have sold/leased land, or established your own farm forestry:

| Would you sell land to a plantation grower in the future? | [ ] Yes  
- [ ] No  
- [ ] Don’t know  
- [ ] N/A

Thank you for taking part in the survey

If you would like to be posted a copy of the survey results, please write your name and address below (we will keep your name and address in a separate electronic file to your survey responses)

- [ ] I would like to be sent a copy of the survey results

Name:  

Postal or email address:  

X