Socio-economic impacts of land use change
in the Green Triangle and Central Victoria

Understanding residents' views on land use change

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

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Executive summary

Aim

This document reports research conducted to understand residents' views of selected land uses in the Green Triangle and Central Victoria region.

The report:

- describes and compares residents' views of four land uses increasing in the study region: blue gum plantations, cropping, dairying and rural residential development
- explores the reasons for residents' views using a psychological framework to examine residents' valued outcomes and beliefs about valued outcomes.

The study region includes local government areas (LGAs) in both South Australia (Mt Gambier, Grant, Wattle Range, Naracoorte and Lucindale, Kingston, Robe) and Victoria (West Wimmera, Glenelg, Horsham, Southern Grampians, Moyne, Pyrenees, Corangamite, Colac Otway, Ararat, Northern Grampians, Warrnambool).

Methods

Two surveys of residents were conducted during 2007. The first survey used postal questionnaires to examine the views of 899 adult residents selected at random from telephone directories. The second survey used short face-to-face interviews to examine the views of 414 residents aged 18–45 intercepted in main streets of towns across the study area.

In the first survey, a lower than expected response rate and sampling frame inadequacies resulted in a bias toward older, male residents and residents of regional centres. Respondents to the second survey were reasonably similar to the population of interest (residents aged 18–45) in regard to age, gender and residence but may be unrepresentative in other ways. Despite these limitations, when viewed together, the surveys provide considerable information about residents' views on land use change.

Key findings

Attitudes towards the land uses were investigated using two approaches. In the first approach, participants in Survey 1 were asked about the overall impacts of each land use. In general, participants reported that the overall impacts of increased cropping, dairying and rural residential development were positive. Views on blue gum plantations were much more diverse. Many people in the region considered blue gum plantations to have a negative impact on the region. Residents' views tended to be 'split', with people seeing

the overall impacts as either positive or negative and fewer seeing the impacts of the land use as neutral.

Patterns of beliefs differed across some respondent groups. Participants living in South Australia were more likely to be positive about blue gum plantations than participants from other areas. Participants from the south-eastern part of the study (Colac, Warrnambool area etc) tended to be more positive about increased dairying than respondents from other areas. Older and younger participants tended to be more neutral about blue gum plantations than participants in other age groups. Residents of regional centres tended to be more positive about rural residential development than respondents living in small towns and rural areas.

The second approach to measuring attitudes involved asking participants of both surveys whether they agreed each land use was good for rural areas and regional centres. Most respondents agreed that increased rural residential development was good for both rural areas and regional centres, and the majority agreed that increased dairying and cropping is good for both rural areas and regional centres, though support was slightly less strong. There was again much greater diversity of views regarding the benefits of increasing blue gum plantations. For each land use, respondents were more likely to report benefits for regional centres than for rural areas. In both surveys, respondents living in regional centres were more likely than respondents living outside regional centres to agree that an increase in blue gum plantations would be good for small towns and rural centres.

Questions regarding specific impacts were used in Survey 1 only. Patterns of beliefs about impact of land uses were similar for a number of different social outcomes including employment, population, community involvement outcomes, and regional and local economic outcomes. The following general patterns were observed:

- Increased rural residential development was the only land use change considered by most respondents to have a positive impact on social and economic outcomes.
- For dairying and cropping, views about impacts on social outcomes were diverse. The most frequent view was that increased dairying and cropping have a neutral impact on these outcomes.
- For plantations, views were also very diverse. For employment, economic and population indicators, the most common responses were that plantations have a positive impact on regional centres and a negative impact on rural areas. Most respondents considered plantations to have a negative impact on involvement in community groups.
- Overall, respondents tended to believe that all land uses had more negative impacts on smaller towns and rural areas than on regional centres.

There were less consistent trends among beliefs about physical environmental risks of land uses:

- Most participants indicated concern about the impact of increased plantations and rural residential development on road infrastructure, but concerns were also expressed regarding road impacts of cropping and dairying.
- For all land uses, an increase was most often considered to result in less water available for all uses. The view was expressed most commonly in regard to blue gum plantations and rural residential development.
- Cropping was the land use most frequently associated with increased soil erosion. Views on the soil impacts of plantations were very diverse.
- A large majority of respondents considered increased blue gum plantations to result in increased risk of wildfire.
- All land uses were relatively strongly associated with loss of native vegetation, although 20 per cent of participants considered increased plantations and rural residential development to result in more native vegetation.

The psychological basis for diverse attitudes towards blue gum plantations was explored by considering the relationship between beliefs about the overall impacts of land uses and other factors measured. The first factor considered was the outcomes of land use that participants considered important. These values were found to be generally similar across respondents regardless of their views about blue gum plantations, and therefore provide little explanation of variation in attitudes towards blue gum plantations. A regression analysis was used to examine the importance of three variables in predicting attitudes towards blue gum plantations: a summary score of beliefs about socio-economic impacts of plantations; a summary score of beliefs about physical environment risks and plantations; and beliefs about the social importance of the products of plantations. Together these variables explained 47 per cent of the variance in views on plantations, suggesting other factors must be considered. However, the analysis points to the particular importance of beliefs about socio-economic impacts, which have the strongest relationship with overall attitudes towards plantations.

Conclusions

The study suggests residents of the study region tend to view blue gum plantations very differently from other land uses examined. They are much more likely to report negative overall and specific outcomes of blue gum plantations than other land uses. Perceived impacts must be compared with independently observed impacts of land uses to identify where there is need for mitigation of negative impacts, and where there is need for better communication about costs and benefits of blue gum plantations.

The study also demonstrates that views on land uses differ within the region. While there is some variation in views on other land uses, the greatest variation relates to blue gum plantations. This may reflect differences in experienced impacts of change, as evidenced by differences between views of respondents living in regional centres and those living in small towns and rural areas. Differences may also reflect broader socio-psychological variation within the region, for example differences in value orientation. The findings do not support the latter interpretation, since values appear generally shared and there is little relationship between valued outcomes and attitudes towards blue gum plantations. Instead, the findings point to the importance of diversity of beliefs about socio-economic impacts of land uses. In the absence of reliable information about socio-economic impacts, it is unsurprising that people have formed diverse views. Obtaining independent, trustworthy information about socio-economic outcomes of plantation forestry should be a high priority.

Researchers have raised the possibility that attitudes towards plantations might change over time as outcomes become clearer and industries develop within a region. While no direct comparison is possible, qualitative comparison with work by Williams et al. (2003) suggests that since 2000, at best, there has been no decrease in the proportion of people who consider blue gum plantations to have an overall negative impact on the region. This suggests that, to date, government and industry responses to community concerns about plantations have not been successful in changing general public opinion.

1 Introduction

1.1 Context

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 many different land use changes occurring in recent decades. The changes have included expansion of plantation forestry, an increase in rural residential properties, increases in cropping, a decrease in wool production in some areas, an increase in prime lamb production, and a range of changes to the dairy industry in different parts of the region. These changes have been associated with considerable public debate. Landholder concerns about increased blue gum plantations have been regularly reported in local media. Rural residential development has also come under public scrutiny. New cropping technologies have been debated and changes in the dairy industry both lamented and hailed.

During 2006, a number of agencies joined forces to better understand the impacts of land use change for the region. The project '*Socio-economic impacts of land use change in the Green Triangle and Central Victoria*' was developed to better understand a broad range of social and economic impacts of land use change in this region. The project has three components: investigating community attitudes towards land use change; using independent data to quantify and analyse land use industry and socio-economic change in the region; and surveying landholders to examine shifts in the landholder population associated with changing land use to farm forestry and plantation forestry. Further details about the project can be found on the project website at http://www.landusechange.net.au.

This report describes one component of this project. It examines the views of residents of the region regarding selected land use changes, describing the outcomes of two surveys undertaken to explore resident attitudes towards increasing blue gum plantations, cropping, dairying and rural residential development.

Understanding residents' views on land use change can assist those concerned with regional land use in many ways. First, many people concerned with land use planning are alert to the possibility of unintended outcomes of land use change. Some impacts of land use change may be hard to observe, or may be experienced by only small sections of a community. Research on residents' views can be used as part of a social impact assessment to help make any such impacts visible. In doing so, it can provide greater insight to the impacts of land use change being experienced by residents, and to differences in the ways residents are experiencing change. Second, land managers are

sometimes confused by public reactions to land management decisions. Land uses they consider to be beneficial to a region may receive unexpected negative media attention while others they consider less benign may appear to be ignored by the public. Social surveys of residents' views can assist first by revealing attitudes in ways that better represent the cross-section of views within a region. This can provide those concerned with land use planning with a better understanding of the extent of concern within a community. In so doing, social research can 'scratch below the surface' to explore the reasons for public concerns. A better understanding of the basis of public concerns can provide a starting point for improved communication and for management change.

1.2 Aims

The aim of this research is to understand residents' views of new and existing land uses in the Green Triangle and Central Victoria region. Specifically, the researchers sought to:

- describe and compare residents' views of four land uses increasing in the study region: blue gum plantations, cropping, dairying and rural residential development
- explore the reasons for residents' views using a psychological framework to examine residents' valued outcomes and beliefs about impacts of valued outcomes.

1.3 Background

1.3.1 Existing understanding of resident views on land use change

Much of the work to date on residents' views on land use change has focused on visual impacts, particularly using photographic methods to assess the scenic beauty impacts of changing land use (Hunziker and Kienast 1999; Swaffield and Fairweather 1996). Past research has also tended to focus on specific change events. For example, Moller (2006) investigated reactions to the establishment of wind turbines in a particular landscape. There has been a focus of attention on some particular land use changes. For example, there have been a number of other studies exploring perceptions of plantation forestry (reviewed in Schirmer 2005a, 2005b). Initially, these were qualitative in nature, describing the range of views on plantation forestry rather than quantifying these attitudes (Kelly and Lymon 2000; Schirmer 2000; Spencer and Jellinek 1995). More recently a number of surveys have been conducted that provide a more representative understanding of the prevalence of particular views on plantation forestry (Pickworth 2005; Tonts et al. 2001; Western Research Institute 2005). While such studies indicate a range of beliefs about likely impacts of plantation forestry, plantation forestry is more likely to be associated with perceptions of negative rather than positive economic, social and physical

impacts (Tonts et al. 2001). For example, in a survey exploring community perceptions of pine plantations, while the majority of respondents identified both positive and negative impacts associated with pine plantations, most respondents felt the disadvantages of plantations outweighed the advantages (Pickworth 2005). Similarly blue gum plantations have been associated with perceptions of loss of community and traditional rurality, manifest amongst other things as loss of population, feelings of powerlessness, and changes in the physical appearance of landscapes and traditional production activities (Barlow and Cocklin 2003).

Few studies have considered the relative attitudes towards different land uses. In the context of the present study, the most relevant study is a survey conducted in south-west Victoria in 2000 and reported by Williams et al. (2003; Petheram et al. 2000).The survey investigated community attitudes towards three land uses in south-west Victoria: plantation forestry, dairy farming and cropping. A telephone survey was conducted with 551 residents. The study suggested participants evaluated land uses differently according to beliefs about social and economic impacts, and that evaluations were not simply a matter of reacting to the change in land use. At the time dairy farming and crop growing were viewed more favourably than plantation forestry. While dairying tended to be viewed as having positive impacts, cropping was less often recognised as being a land use change and was often seen as having neutral impacts. Residents of larger towns were more likely to view blue gum plantations positively. Residents of smaller townships and rural areas were more likely to believe plantation forestry had an overall negative impact on their area. Their concerns related most strongly to beliefs about impacts on local employment and population retention.

1.3.2 Exploring views on land use change

During September 2006, group interviews were conducted in the Green Triangle and Central Victoria study region. A detailed description of these interviews can be found in Schirmer et al. (2008). Results from the interviews informed the design of the survey described in the current report.

Eight group interviews were held in different locations across the region with a total of 57 participants. During the interviews participants were asked to discuss land use changes in the region over the previous 10 to 15 years. The most significant land uses (as prioritised by participants) were discussed in more detail to understand impacts (positive, negative and neutral). The terminology used for different land uses was also discussed to understand how participants defined them.

A wide range of changing land uses were identified in group interviews. Participants were asked to select the land uses which they believed were most significant for their region. Reasons given for selecting particular land uses were: the land uses were seen as

having a negative impact; there had been a large-scale conversion to the land use; or the land use needed further exploration in the study. Among those highlighted were increasing blue gum plantations, rural residential development, cropping and dairying. These four land use changes, being both specific and comparable, are the focus of the survey of residents' views on land use. Two other land use changes, changes in water availability, and farm amalgamation, were ranked as highly important by interview group participants, but views on these changes were not further investigated. Water availability, its use and regulation, can be viewed as influencing land use change as well as being an impact of land use change, while farm amalgamations are found across a range of land uses rather than representing a specific land use change. These characteristics mean these land uses are not readily compared with others. The group interviews also helped to define the selected land uses and to select the terms used for each land use.

Group interview participants discussed impacts differently for each land use. Among participants there were varying beliefs (positive, negative and neutral) about some impacts. Overall, beliefs about impacts can be grouped into the following categories:

- local and regional economic activity
- community interaction and cohesion
- services and community groups
- employment availability and types
- other industries
- population and demographics
- environmental conditions
- water use and availability
- who manages land
- land prices and markets
- infrastructure condition and use.

The group interviews provided insight into beliefs about impacts, and these have been incorporated into the design of the surveys of residents' views on land use change.

1.3.3 Framework for exploring attitudes towards land use change

This study aimed to explain as well as describe views of land uses in the region. One way to understand people's views is to explore underpinning psychological factors. In this study, two key factors were investigated:

- what outcomes residents value from land use in the study region
- how they believe land uses affect these valued outcomes.

In exploring these factors, the project drew on recent studies of acceptable forest practices (Ford et al. 2005) and on broader cognitive hierarchy theories concerning social attitudes (Stern and Deitz 1994). These studies and others have suggested that a framework using values and beliefs to explain particular attitudes can contribute to understanding those attitudes. Cognitive hierarchy theories suggest that people hold different sets of values that are relatively stable. Their attitude is then a function of their values and beliefs about how the object (land uses) might affect the things they value.

2 Methods

Two surveys were conducted to identify and quantify the views of a representative cross-section of adult residents of the Green Triangle and Central Victoria regions. An initial survey was conducted during June and July of 2007, using postal questionnaire methods to survey a cross-section of adult residents of the region. Preliminary analysis of survey results indicated that respondents were more likely to be male and older residents of the region living in regional centres. The apparent bias toward older, male residents and residents of regional centres could influence results. For example, gender differences have been observed in environmental orientation (Steger and Witt 1989) and attitudes towards pine plantations (Pickworth 2005), while preferences for forest related goods and services have been found to differ according to age and gender (Farreras, Riera and Mogas 2005). Residents living in rural and regional centres are more likely to report land use change as having a positive impact than those living in rural areas (Petheram et al. 2000), while perceptions of pine plantations vary depending on place of residence (Pickworth 2005).

To address sample inadequacies, a second survey using intercept interview methods was conducted during December 2007. This survey was designed to capture the views of residents aged 18–45 years. Both surveys examined views on four land uses: blue gum plantations, cropping, dairying, and rural residential development.

Both surveys provided a cross-section of views of adult residents of the Green Triangle and Central Victoria regions. The study area is shown in Figure 1 and includes local government areas (LGAs) in both South Australia (Mt Gambier, Grant, Wattle Range, Naracoorte and Lucindale, Kingston, Robe) and Victoria (West Wimmera, Glenelg, Horsham, Southern Grampians, Moyne, Pyrenees, Corangamite, Colac Otway, Ararat, Northern Grampians, Warrnambool).

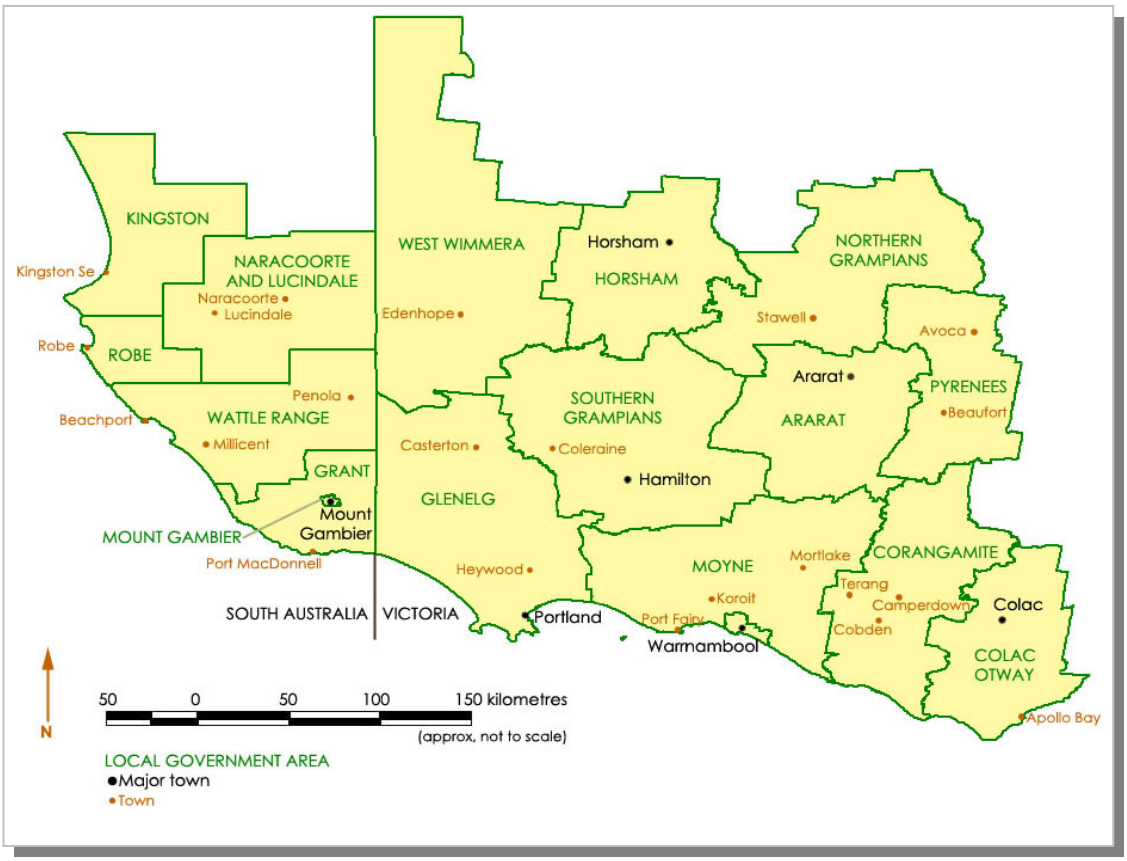

Figure 1: Project area for the '*Socio-economic impacts of land use change in the Green Triangle and Central Victoria*' research project

2.1 Questionnaire development

2.1.1 Survey 1

The questionnaire explored views on four land use changes:

- increased blue gum plantations
- increased cropping
- increased rural residential development
- increased dairying.

These land uses and the terms used to describe them were selected based on analysis of group interviews with 57 residents of the region conducted during September 2006 (Schirmer et al. 2008). Brief definitions of land uses were provided in the questionnaire.

The questionnaire was eight pages long, with five sections:

- an introductory letter and information about the project
- questions on attitudes towards increased rural residential development, cropping, blue gum plantations and dairying including:
    - whether the respondent had noticed a change in area of land use
    - beliefs about the relative impacts of land uses on small and large towns specifically
    - overall attitudes toward an increase in land uses
- questions on valued outcomes of land use (rate the importance of a list of outcomes)
- strength of views on land use generally and on the specific land use changes
- demographic information such as age, sex, place of residence.

Measurement of overall attitudes towards land uses was broadly consistent with that used in the 2000 study in south-west Victoria (Williams et al. 2003).

Preliminary testing of the questionnaire was carried out at several stages to ensure questions within the survey operated well as a whole (Bryman 2004). Copies of the draft questionnaire were initially distributed to around 30 people using a convenience sample (i.e. associates, friends and relations). Those involved in the preliminary testing were asked to comment on whether the questions used reflected the intended concepts. Participants were observed completing the questionnaire to determine whether response options were understood and used as expected.

Following the preliminary test, the survey was revised and a small pilot or pre-test study carried out among residents of the study region. Participants in the pre-test study were selected using convenience-sampling drawing on the resources of the project Advisory Group (15 members). Advisory Group members were contacted to participate in the pilot study and asked to suggest two other suitable participants from among their family or neighbours. Questionnaires were posted or emailed to this group (45 respondents). Wherever possible, respondents were contacted by telephone to discuss the clarity and relevance of the questionnaire. The questionnaire was revised on the basis of findings from the pilot study prior to finalisation.

2.1.2 Survey 2

An abridged version of the main questionnaire was developed for Survey 2. Questions were modified for verbal delivery. The interview consisted of four sections:

- introduction and clarification of respondents' eligibility to participate, based on age and residence in area
- questions on attitudes towards increased rural residential development, cropping, blue gum plantations and dairying including:
    - whether the respondent had noticed a change in area of each land use
    - beliefs about the relative impacts of land uses on small and large towns specifically
- strength of views on land use generally and on the specific land use changes
- limited demographic information about participants.

A full copy of both questionnaires can be found in appendices 1 and 2.

2.2 Procedure

2.2.1 Survey 1

In line with the Total Design Method suggested by Dillman (2007), Survey 1 utilised five points of contact with potential participants:

- *a brief pre-notice letter*: potential respondents were sent an initial personalised letter alerting them to the research and requesting their participation
- *questionnaire mail out*: the postal questionnaire and invitation to participate was forwarded to potential participants one week later

- *a thank you/reminder postcard*: a postcard was sent to all recipients of the questionnaire thanking those who had returned the survey and reminding those who had not yet done so
- *replacement questionnaire*: a second copy of the questionnaire and invitation to participate was sent to all non-respondents
- *final contact*: non-respondents were sent a final reminder postcard.

The questionnaire took approximately 20 minutes to complete and was completed at a time and place of the respondent's convenience. At each stage potential participants were invited to contact the researchers if they wished to be removed from the mailing list. To encourage participation a small incentive was offered to respondents in the form of entry in a lucky draw for a chance to win a hamper of regional produce.

2.2.2 Survey 2

Interviews were conducted between 12 and 15 December 2007 by four teams of two researchers (eight researchers in total) in twenty-one towns across the study region: Warrnambool, Colac, Hamilton, Mortlake, Portland, Heywood, Hamilton, Coleraine, Edenhope, Casterton, Kaniva, Horsham, Avoca, Beaufort, Stawell, Ararat, Mount Gambier, Naracoorte, Penola, Kingston, and Millicent. Individual researchers approached potential participants in the main streets of each town. A short explanation of the project, including the aims of the project, was outlined and eligible residents given the opportunity to participate in the survey. To encourage participation, participants were offered the opportunity to enter a draw to win an iPod. A brief definition of the four land uses (blue gum plantations, cropping, dairying and rural residential development) was outlined verbally prior to the survey being conducted. Interviews took approximately five minutes. Questions were read by the interviewer using a script and answers recorded by the interviewer using a standard form. Training was conducted with all researchers before entering the field. Each team consisted of two researchers, with communication between teams at the end of each day to endeavour to maintain consistent approaches in recruitment and interviewing.

2.3 Participants

2.3.1 Survey 1

Full details of the participant sample are presented in Appendix 3.

Participants were selected using random sampling of 2003–04 telephone directory listings for local government areas within the study region. While this is not a complete listing of all residents, the Australian Privacy Act prevents access to preferred sampling frames

such as the electoral rolls. Data matching processes were used to ensure the sample only included residents for whom a current address listing was available. Initial contact letters were posted to 3,000 residents. Letters were addressed personally (to the first named person where more than one name was listed) for each listing.

Of the 3,000 initial letters, 229 were returned marked 'no longer at this address' or 'unknown'. A further 40 phone calls were received informing researchers a person was deceased or had moved permanently away from the area, suggesting a total of 260 non-contacts. The survey was completed by 899 participants. The valid response rate (excluding those deceased or moved away from the area) was therefore 33 per cent. Possible explanations for the lower than expected response rate are discussed in Appendix 3.

Around 8 per cent of non-respondents (146 people) contacted the researchers to withdraw from the study; being elderly or invalid was the most common reason for requesting withdrawal from the study.

Participant characteristics

Respondent characteristics were compared with known population parameters. Respondents in Survey 1 were more likely to be male, older and residents of regional centres (towns with a population of greater than 10,000: Colac, Horsham, Hamilton, Mt Gambier, Portland and Warrnambool) than the population of interest.

The percentage of males in the sample was higher than in the population of interest. This is likely to reflect the make up of the telephone listings, which were often under the name of the male adult in shared households. Younger age groups were underrepresented in the sample. While this is likely to be an outcome of the sampling process (bias towards longer term residents also biases toward older residents) it is also consistent with wider reports of lower response rates among younger cohorts (de Leeuw and de Heer 2002).

The majority of respondents had lived within their region for a number of years, with over 90 per cent of respondents reporting having lived in the region for at least 11 years. Of these, more than three-quarters of the sample (75.8 per cent) had lived in the region for more than 20 years.

The majority of respondents were not dependent on rural properties for their income. Respondents who were rural property owners were asked to indicate their reliance on income derived from their property. Consistent with the higher proportion of respondents living in regional centres, less than half the sample (40 per cent) responded to this question. Of those responding, only a small proportion (11.7 per cent) reported relying on income derived from their property as their main source of income.

Just over 40 per cent of respondents reported having either a personal or professional association with at least one of the land uses in the survey. Associations with three of the land uses, cropping, dairying and rural residential development, were fairly evenly spread, with the most frequent association being with rural residential development. Only 16 per cent of respondents to this question indicated having any association with blue gum plantations.

Participants in Survey 1 can not be considered representative of the population of interest. While the views of older males were well represented, the survey provides little insight to the views of younger and female residents.

2.3.2 Survey 2

The sampling approach used in Survey 2 must be considered convenience sampling, however a quota system was used to try to better match the respondents with population characteristics in regard to age, sex and residence in regional centre or rural areas. Interviews were conducted in the main streets of towns in the weeks prior to Christmas 2007, when shopping areas were particularly busy. This timing was chosen to maximise the range of people intercepted by researchers. All large towns were visited at least twice by researchers at different times of the week, while smaller towns were visited once.

A total of 414 surveys were completed. Sampling was effective in capturing the desired balance of 18–45 year olds within regional centres and small towns/rural centres, corresponding to expected proportions by around 2 per cent.

The percentage of females in the sample was slightly higher than males, although gender break up of the sample corresponded (within 2 per cent) to that within the total population (all age groups, not just ages 18–44 years) (see Appendix 3).

While all three age groups were generally well represented within the sample, the age group 18–24 years was slightly underrepresented (by 6 per cent), while the two older age groups, 25–34 years and 35–45 years, were overrepresented (by 2 per cent and 4 per cent respectively).

Respondents in the second survey were less likely to have lived in the study region for a long period of time than respondents in the first survey. Less than half (45.9 per cent) of the respondents in the second survey reported living within their region for more than 20 years, compared to just over three-quarters (75.4 per cent) of respondents in the first survey reporting having lived within their region for over 20 years. The younger age group represented in the second survey were more likely to have arrived in the region fairly recently, with 17 per cent of respondents in the second survey reporting having lived in the region for less than five years, compared to only 1.3 per cent of respondents in the first survey. Respondents in the first survey living in regional centres were more

than twice as likely to have lived within the region for over 20 years as respondents living in regional centres in the second survey.

While the respondents of Survey 2 provide a reasonable match with the population of interest with regard to age, sex and residence, it would be incorrect to suggest that the sample is therefore representative of the population. The sample is likely to be biased by other factors that may be relevant to views on land use change. For example, most interviews were conducted during business hours, which might have created a bias towards people not in full time employment. Researchers also noted that it was difficult to approach women with young children while busy in shopping areas, so it is likely some social groups are underrepresented in the sample.

2.4 Data analysis

Data for both surveys were coded for analysis. Data entry was checked for accuracy and the distribution of variables assessed. For both surveys, the major data analyses involved simple descriptive statistics and percentages, for example, the percentage of respondents within a given category who expressed a given point of view, or comparison of views across the four land uses depending on various population characteristics such as place of residence or gender.

Results obtained in Survey 2 were compared to results obtained for corresponding items in Survey 1. When the questionnaire was modified for verbal presentation in the second survey, a ‘don’t know’ response option was added to the question regarding ‘noticing land use change’ and ‘impact of land uses’. To allow comparison between surveys the ‘don’t know’ response in Survey 2 was treated as missing.

For Survey 1, a small number of analyses were weighted to try to correct for the inadequate representation of the views of younger and female residents. A frequency variable was created to re-weight cases according to age and gender. The weighted analyses are provided primarily to recognise some of the uncertainties regarding this data and caution should be applied in inferring from these weighted analyses (which in any case do not vary widely from unweighted analyses). Weighted analyses cannot correct for the low response rate among females and younger residents, since the views of these groups have been observed in relatively small numbers (and so there may be a relatively high level of error in data collected).

Where appropriate, the statistical tests Chi-squared, Mann-Whitney U and Kruskal-Wallis H were used to test for statistical significance of differences. Pearson correlation was used to examine association between variables.

Linear multiple regression analysis was carried out to investigate whether attitudes to blue gum plantations could be predicted from belief factors and social importance of

products and land use change. Principal component analysis (PCA) was performed in an exploratory way to identify underlying components in beliefs about the impact of the four land uses and valued outcomes for regional centres and smaller towns or rural areas. PCA is a multivariate technique used to identify and summarise variable subsets where patterns of correlations within highly correlated variables suggests the presence of underlying constructs (Tabachnick and Fidell 2007). Factor scores derived from PCA were used in subsequent regression analyses.

2.5 Limitations of approach

Both surveys have a number of limitations. The self-completed postal questionnaire used in Survey 1 is limited by the lack of control over who completes the survey and the subsequent effect this has on the ability to generalise results across the population. In this study older males were over-represented while younger adults and females were underrepresented. Similarly, a self-completion questionnaire can present difficulties to some sections of the community, for example those with limited English or literacy skills. Self-completion questionnaires also face the problem of including a sufficient number of questions while maintaining the interest of respondents to encourage survey completion and return (Bryman 2004). Low rates of return introduce potential bias as there is no way of determining whether responses obtained are representative of those within the whole population.

Recruitment by intercepting potential participants on the street introduces a possible source of bias in the intercept interviews used in Survey 2. For example, bias may arise by limiting the sample to those attending towns, and shopping centres in particular, during the day; bias may also have been introduced unintentionally by the way researchers selected and approached potential participants. The face-to-face interview situation can potentially influence responses, for example introducing social desirability bias (Bryman 2004). The use of multiple interviewers may also introduce a level of variability in interviewing methods. To maintain consistency interviewers were trained in the delivery of the questionnaire and instructed to closely follow the set format regarding the way participants were approached, the explanation given for the purpose of the interviews, and the presentation of the questionnaire items. All interviewers had had previous experience in the use of social research methods.

Both surveys, though especially Survey 2, were limited in the number and range of questions that could be asked. For example, while the group interviews conducted in the region identified a wide range of changing land uses occurring within the study region, the survey format permitted only a small number of land uses to be included in this study. Although the land uses selected for the survey were identified by group interviewees to

be the most significant for their region, other land uses could be considered significant by members of the general population.

Because the methods used to recruit participants differed in Survey 1 and 2, the two surveys have different limitations. This means that when considered together the surveys provide considerable insight into residents' views on land use change.

3 Results

3.1 Noticing land use change

Respondents to both surveys were asked whether they had noticed a change in the area of land used for blue gum plantations, cropping, dairying and rural residential development in the rural areas close to where they lived. Table 1 shows that in Survey 1 over 70 per cent of respondents had noticed an increase in blue gum plantations and rural residential development, with very few respondents noting a decrease in these land uses. In contrast, much smaller proportions of respondents had noticed an increase in cropping and dairying. The majority of respondents had noticed no change in these land uses, while a large proportion (around 20 per cent) believed these land uses to have decreased. It should also be noted that a higher number of respondents did not answer the questions regarding cropping and dairying than failed to answer the questions regarding blue gum plantations and rural residential development.

Table 1: Noticing land use change: Survey 1

	Decrease		No change		Increase	
Land use	Count	Per cent **/Weighted per cent***	Count	Per cent **/Weighted per cent***	Count	Per cent **/Weighted per cent***
Blue gums (n=862)	17	2.0% **1.7%**	173	20.1% **20.9%**	672	78.0% **77.5%**
Cropping (n=824)	181	22.0 **21.2%**	463	56.2% **56.7%**	180	21.8% **22.1%**
Dairying (n=828)	285	34.4% **32.3%**	393	47.5% **50.1%**	150	18.1% **17.6%**
Rural residential (n=857)	49	5.7% **5.8%**	183	21.4% **18.6%**	625	72.9% **75.6%**

- Weighted per cent indicates figures calculated to provide some indication of possible distribution of results, were the respondents more representative of the population in regard to age and sex
- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

The majority of respondents to Survey 2 noted an increase in the area of land used for rural residential development (79 per cent) and blue gum plantations (63.3 per cent), with only a small proportion of respondents noting the area of land for these activities to have decreased (Table 2).

Respondents were more evenly spread in reporting noticing a change in the area of land used for cropping, while the majority of respondents reported dairying to have either decreased or remained unchanged in their region.

Table 2: Noticing land use change: Survey 2

Land use	Decrease		No change		Increase		Don't know	
	Count	Per cent	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=414)	14	3.4%	88	21.3%	262	63.3%	50	12.1%
Cropping (n=412)	105	25.5%	129	31.3%	121	29.4%	57	13.8%
Dairying (n=414)	127	30.7%	182	44%	64	15.5%	41	9.9%
Rural residential (n=414)	18	4.3%	55	13.3%	327	79.0%	14	3.4%

- Maximum confidence interval is +/–4.8% calculated at 95% confidence level
- Note: Survey 2 sample adults aged 18–45 years

With some exceptions, respondents in Survey 1 living in regional centres tended to notice similar changes in land use as residents of smaller towns or rural centres (Table 3). Respondents living in regional centres were more likely to notice an increase in rural residential development than respondents living in small towns or rural areas (Pearson chi square df(2) = 30.45, $p<0.005$), but less likely to report an increase in cropping (Pearson chi square df(2) = 11.41, $p<0.05$). Twice as many residents of small towns and rural areas reported noticing no change in the area of rural residential development than those living in regional centres.

Table 3: Noticing land use change by place of residence: Survey 1

Place of residence		Decrease		No change		Increase	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=491)	9	1.8%	95	19.3%	387	78.8%
	Cropping (n=470)	108	23%	279	59.4%	83	17.7%
	Dairying (n=477)	170	35.6%	216	45.3%	91	19.1%
	Rural residential (n=493)	23	4.7%	74	15%	396	80.3%
Small town/rural area	Blue gums (n=306)	8	2.6%	64	20.9%	234	76.5%
	Cropping (n=293)	57	19.5%	154	52.6%	82	28%
	Dairying (n=289)	96	33.2%	143	49.5%	50	17.3%
	Rural residential (n=302)	20	6.6%	92	30.5%	190	62.9%

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Respondents in the second survey noticed a similar pattern of land use change (Table 4), however when the option 'don't know' was omitted from the analyses, the observation of land use change by respondents living in regional centres was not significantly different to those living in small towns or rural areas (Pearson chi square df(2), $p>0.05$). In Survey 2 respondents living in regional centres were more likely to be unsure (don't know) about change in the area of blue gum plantations and cropping (Pearson chi square df(2) = 16.4, $p<0.005$, Pearson chi square df(2) = 8.92, $p<0.05$ respectively) than respondents living outside regional centres. However respondents in Survey 2 living in both regional centres and small towns and rural areas were less likely to report noticing an increase in blue gum plantations than those in Survey 1.

Table 4: Noticing land use change by place of residence: Survey 2

Place of residence		Decrease		No change		Increase		Don't know	
		Count	Per cent	Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=196)	9	4.6%	38	19.4%	115	58.7%	34	17.3%
	Cropping (n=195)	57	29.2%	55	28.2%	47	24.1%	36	18.5%
	Dairying (n=196)	58	29.6%	86	43.9%	31	15.8%	21	10.7%
	Rural residential (n=196)	8	4.1%	9	4.6%	172	87.8%	7	3.6%
Small town/rural area	Blue gums (n=218)	5	2.3%	50	22.9%	147	67.4%	16	7.3%
	Cropping (n=217)	48	22.1%	74	34.1%	74	34.1%	21	9.7%
	Dairying (n=218)	69	31.7%	96	44.0%	33	15.1%	20	9.2%
	Rural residential (n=218)	10	4.6%	46	21.1%	155	71.1%	7	3.2%

- Note: Survey 2 sample adults aged 18–45 years

Table 5 compares the views of respondents in surveys 1 and 2 on the questions regarding noticing land use changes. For Survey 2 the percentages differ from those shown in Table 4 as 'don't know' responses have been coded as missing data to allow ready comparison. The comparison shows considerable similarity in trends. The most noticeable difference between the two surveys related to cropping. Respondents in Survey 2 were more likely to report noticing a change in the area of land used for cropping than respondents in Survey 1.

Table 5: Noticing land use change: comparison of Survey 1 and Survey 2

Land use		Decrease		No change		Increase	
		Survey 1	Survey 2	Survey 1	Survey 2	Survey 1	Survey 2
Blue gums	* n=862 ^ n=364	2.0%	3.8%	20.1%	24.2%	78.0%	72.0%
Cropping	* n=824 ^ n=355	22.0%	29.6%	56.2%	36.3%	21.8%	34.1%
Dairying	* n=828 ^ n=373	34.4%	34.0%	47.5%	48.8%	18.1%	17.2%
Rural residential	* n=857 ^ n=400	5.7%	4.5%	21.4%	13.8%	72.9%	81.8%

- * Survey 1
- ^ Survey 2

3.2 General attitudes towards land use change

3.2.1 Beliefs about overall impact

Respondents in Survey 1 were asked to indicate whether they thought the overall impacts of the four land uses were negative, neutral or positive. Table 6 shows reasonably similar perceptions of dairying, cropping and rural residential development. Most respondents considered the overall impact of these land uses to be positive or neutral. Very few people considered these land uses to have overall negative impacts for the area.

Beliefs about blue gum plantations contrast strongly in two ways. First, a relatively large proportion of respondents (greater than 40 per cent) considered the overall impact of blue gum plantations to be negative. Second, perceptions were quite split: participants tended to describe the impacts as either positive or negative with fewer choosing to describe the impacts as neutral.

Some participants indicated the land use was 'Not applicable' to their area, assumed to indicate no impact due to absence of any such land use in their area. Very few chose this option for rural residential development. Dairying was considered 'not relevant' to their region by 68 participants.

Table 6: Beliefs about overall impact of land use changes: Survey 1

	Negative impact		Neutral impact		Positive impact	
Land use: overall impact	Count	Per cent **/Weighted per cent***	Count	Per cent **/Weighted per cent***	Count	Per cent **/Weighted per cent***
Overall impact of blue gum plantations (n=815; N/A= 51)	367	45.2% **41.3**	191	23.5% **25.0**	254	31.3% **33.6**
Overall impact of cropping (n=814; N/A=43)	87	10.7% **9.2**	391	48.0% **49.9**	336	41.3% **40.9**
Overall impact of dairying (n=791; N/A= 68)	79	10.0% **9.8**	334	42.2% **43.3**	378	47.8% **46.9**
Overall impact of rural residential (n=842; N/A= 22)	113	13.4% **13.0**	227	27.0% **26.8**	502	59.6% **60.2**

- Weighted per cent indicates per cent calculated when cases are weighted to correct the sample bias toward older respondents
- N/A: Participants were provided with the option of indicating the question was not applicable to their area, where the land use was not relevant
- Maximum confidence interval is +/–3.5% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

The relationship between beliefs about overall impacts of land uses and the demographic characteristics of age, sex and residence was tested. Sex of respondent and beliefs about overall impacts were not related (Pearsons chi square (df 2) = 3.4, p>0.05).

A comparison of the views of Survey 1 respondents who were resident in regional centres with those resident in small towns and rural areas suggested residents of regional centres also tended to view rural residential development more positively (Pearsons chi square (df 2) = 9.2, p<.05) (Table 7). However, in both groups the majority of respondents considered the overall impact to be positive.

Table 7: Beliefs about overall impact of land use change by place of residence: Survey 1

Respondent place of residence	Land use	Negative impact		Neutral impact		Positive impact	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums	200	43%	112	24%	156	33%
	Cropping	50	11%	214	45%	209	44%
	Dairying	39	8%	186	40%	240	52%
	Rural residential ^	57	12%	115	24%	315	65%
Small town/rural area	Blue gums	146	52%	58	21%	78	28%
	Cropping	29	10%	148	53%	100	36%
	Dairying	33	12%	115	43%	118	44%
	Rural residential ^	47	16%	87	30%	156	54%

^ p<0.05

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

The relationship between age group and beliefs about overall impacts of land use changes was examined. For analysis of Survey 1, respondents aged 18–44 years were grouped together to provide relatively even age classes. No significant effects were found for cropping (Pearsons chi square (df 10)= 8.6, p>0.05), dairying (Pearsons chi square (df 10)= 8.9, p>0.05) or rural residential development (Pearsons chi square (df 10)= 7.5, p>0.05). For blue gum plantations, the relationship between age and beliefs about impacts was not independent (Pearsons chi square (df 10)= 19.8, p<0.05), however there is no simple relationship observable. Both the youngest and oldest age classes tended to express more neutral views on the overall impact of plantations (Table 8).

Table 8: Age and beliefs about overall impacts of blue gum plantations: Survey 1

	Negative impact		Neutral impact		Positive impact	
Age (years)	Count	Per cent	Count	Per cent	Count	Per cent
18–44	55	33%	48	29%	62	38%
45–54	95	49%	37	19%	64	33%
55–64	96	50%	39	20%	57	30%
65–74	76	52%	35	24%	35	24%
75+	47	39%	31	28%	35	32%
Total	**369**		**190**		**253**	

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Finally, beliefs about overall impacts of land uses were compared across four geographical sub-regions, defined in Table 9.

Table 9: Geographical clusters – included LGAs

South Australia cluster	Victoria northern cluster	Victoria south-western cluster	Victoria south-eastern cluster
Mt Gambier (SA) Grant (SA) Wattle Range (SA) Naracoorte and Lucindale (SA) Kingston (SA) Robe (SA)	West Wimmera (Vic) Ararat (Vic) Northern Grampians (Vic) Horsham (Vic) Pyrenees (Vic)	Southern Grampians (Vic) Moyne – North west and North east SLAs (Vic) Glenelg (Vic)	Corangamite (Vic) Colac Otway (Vic) Warrnambool (Vic) Moyne – South SLA (Vic)

Beliefs about the overall impacts of three of the four land uses varied depending on residential region. Significant differences were found between LGA clusters in beliefs about the overall impact of blue gum plantations (Kruskal-Wallis chi square df(3)=16.41, $p<0.005$), dairying (Kruskal-Wallis chi square df(3)=73.39, $p<0.005$) and rural residential development (Kruskal-Wallis chi square df(3)=13.80, $p<0.005$). Beliefs about impact tended to reflect the dominant land use (and possibly land capability) in the region. Respondents from the South Australian LGA cluster were more likely to believe blue gums would have a positive impact on the local region, while over half of the respondents living in the south-eastern Victorian LGA cluster believed blue gum plantations to have a negative impact on the local region (Table 10). Less than one-third of respondents in each of the Victorian LGA clusters believed blue gum plantations would have a positive overall impact on the local region. Respondents in the south-eastern Victoria LGA cluster were more than three times as likely to believe dairying would have a positive impact on the local region as respondents living in the northern Victorian LGA.

No significant difference was found between LGA clusters regarding the overall impact of cropping on local towns and rural areas (Kruskal-Wallis chi square df(3)=6.91, p>0.05).

Table 10: Beliefs about overall impact of land use by LGA cluster: Survey 1

Land use	LGA cluster	Negative impact		Neutral impact		Positive impact	
		Count	Per cent	Count	Per cent	Count	Per cent
Blue gums	South Australia (n=192)	76	39.6%	33	17.2%	83	43.2%
	Victoria northern (n=128)	49	38.3%	41	32.0%	38	29.7%
	Victoria south-western (n=177)	102	57.6%	26	14.7%	49	27.7%
	Victoria south-eastern (n=253)	119	47.0%	70	27.7%	64	25.3%
Cropping	South Australia (n=190)	20	10.5%	102	53.7%	68	35.8%
	Victoria northern (n=148)	12	8.1%	60	40.5%	76	51.4%
	Victoria south-western (n=165)	17	10.3%	84	50.9%	64	38.8%
	Victoria south-eastern (n=248)	30	12.1%	116	46.8%	102	41.1%
Dairying	South Australia (n=193)	19	9.8%	94	48.7%	80	41.5%
	Victoria northern (n=114)	14	12.3%	76	66.7%	24	21.1%
	Victoria south-western (n=165)	14	8.5%	73	44.2%	78	47.3%
	Victoria south-eastern (n=259)	25	9.7%	58	22.4%	176	68.0%
Rural residential	South Australia (n=195)	28	14.4%	58	29.7%	109	55.9%
	Victoria northern (n=150)	21	14.0%	48	32.0%	81	54.0%
	Victoria south-western (n=171)	17	9.9%	51	29.8%	103	60.2%
	Victoria south-eastern (n=261)	38	14.6%	45	17.2%	178	68.2%

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

3.3 Beliefs about relative impact of land uses on rural areas and regional centres

Participants in both surveys were asked to indicate whether they agreed with statements that an increase in the land uses was good for regional centres and for rural areas and small towns. Responses in Survey 1 were recoded into three categories to match the response options of Survey 2.

Tables 11 and 12 summarise the responses for Survey 1. The responses are generally consistent with views on the overall impacts. In general, respondents agreed that increased rural residential development was good for both rural areas and regional centres, and the majority agreed that increased dairying and cropping was good for both rural areas and regional centres, though support was slightly less strong. There was again much greater diversity of views regarding the benefits of increasing blue gum plantations. For each land use, respondents were more likely to report benefits for regional centres than for rural areas.

Table 11: Beliefs about the impact of land use change on small towns and rural areas: Survey 1

Degree of agreement with the statement that an increase in land use would be good for small towns and rural areas

	Disagree		Neither agree/disagree		Agree	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=863)	418	48.4%	157	18.2%	288	33.4%
Cropping (n=859)	105	12.2%	296	34.5%	458	53.3%
Dairy (n=857)	91	10.6%	240	28.0%	526	61.4%
Rural residential (n=870)	102	11.7%	166	19.1%	602	69.2%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 12: Beliefs about the impact of land use change on regional centres: Survey 1

Degree of agreement with the statement that an increase in land uses would be good for regional centres

	Disagree		Neither agree/disagree		Agree	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=869)	360	41.4%	170	19.6%	339	39.0%
Cropping (n=860)	103	12.0%	280	32.6%	477	55.5%
Dairying (n=858)	84	9.8%	227	26.5%	547	63.8%
Rural residential (n=866)	75	8.7%	165	19.1%	626	72.3%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Tables 13 and 14 summarise responses obtained in Survey 2 regarding beliefs about the impact of land use change. As in Survey 1, respondents were asked to indicate whether they agreed with statements that an increase in the land uses would be good for regional centres and for rural areas and small towns. The distribution of responses in Survey 2 was generally consistent with those in Survey 1. Again, most respondents agreed that an increase in rural residential development, dairying and cropping would generally be good for both rural areas and regional centres. Again, there is much greater diversity of views regarding benefits of increasing blue gum plantations.

Table 13: Beliefs about the impact of land use change on small towns and rural areas: Survey 2

Degree of agreement with the statement that an increase in land uses would be good for small towns and rural areas

Land use	Disagree		Neither agree/disagree		Agree	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=384)	131	34.1%	56	14.6%	197	51.3%
Cropping (n=398)	37	9.3%	36	9.0%	325	81.7%
Dairy (n=397)	32	8.1%	39	9.8%	326	82.1%
Rural residential (N=406)	37	9.1%	42	10.3%	327	80.5%

- Maximum confidence interval is +/–5% calculated at 95% confidence level
- Note: Survey 2 sample adults aged 18–45 years

Table 14: Beliefs about the impact of land use change on regional centres: Survey 2

Degree of agreement with the statement that an increase in land uses would be good for regional centres

Land use	Disagree		Neither agree/disagree		Agree	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=384)	106	27.6%	46	12.0%	232	60.4%
Cropping (n=397)	44	11.1%	34	8.6%	319	80.4%
Dairy (n=399)	35	8.8%	38	9.5%	326	81.7%
Rural residential (n=404)	29	7.2%	20	5.0%	355	87.9%

- Maximum confidence interval is +/–5% calculated at 95% confidence level
- Note: Survey 2 sample adults aged 18–45 years

There were differences between the two surveys however. First of all, respondents in Survey 2 were less likely to choose the neutral 'neither agree/disagree' option than the corresponding age groups in the first survey. They were also more positive about all land uses, and more often agreed that an increase in all the land uses would be good for both rural areas and regional centres. This pattern is complex to interpret. It is possible the pattern reflects differences in the structure of the questionnaire, and particularly the verbal presentation of response options, which may have discouraged use of the neutral option. Alternatively, it may reflect differences in attitude associated with the different biases within the two groups surveyed. The respondents in Survey 2, more often younger, female, and rural, may express different attitudes from respondents to Survey 1.

Whatever the reason, the general consistency between Survey 1 and 2 suggests the relative perceptions of the land uses are robust.

Tables 15 and 16 compare beliefs of respondents living in regional centres with those of respondents living in small towns and rural areas. There are some noticeable differences. In the first survey, where respondents lived did not tend to influence beliefs about the impact of land use changes on regional centres (Pearson chi square df(4), $p>0.05$ for all land uses). Differences in beliefs between residents of regional centres and small towns

and rural centres were more marked in the second survey. In Survey 2 respondents living in regional centres were more likely to believe an increase in blue gum plantations would be good for regional centres than those living in small towns or rural areas (Pearson chi square df(2) = 10.94, $p<0.05$).

Table 15: Beliefs about the impact of land use change on regional centres by place of residence: Survey 1

Degree of agreement with the statement that an increase in land uses would be good for regional centres

Respondent place of residence		Disagree		Neither agree/disagree		Agree	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=497)	204	41%	88	17.7%	205	41.2%
	Cropping (n=492)	63	12.8%	153	31.1%	276	56.1%
	Dairying (n=492)	50	10.2%	124	25.2%	318	64.6%
	Rural residential (n=497)	45	9.1%	82	16.5%	370	74.4%
Small town/rural area	Blue gums (n=308)	134	43.5%	65	21.1%	109	35.4%
	Cropping (n=305)	30	9.8%	107	35.1%	168	55.1%
	Dairying (n=304)	27	8.9%	88	28.9%	189	62.2%
	Rural residential (n=307)	24	7.8%	64	20.8%	219	71.3%

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 16: Beliefs about the impact of land use change on regional centres by place of residence: Survey 2

Degree of agreement with the statement that an increase in land uses would be good for regional centres

Respondent place of residence		Disagree		Neither agree/disagree		Agree	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=175)	34	19.4%	22	12.6%	119	68%
	Cropping (n=185)	25	13.5%	17	9.2%	143	77.3%
	Dairying (n=187)	16	8.6%	22	11.8%	149	79.7%
	Rural residential (n=191)	18	9.4%	10	5.2%	163	85.3%
Small town/rural area	Blue gums (n=209)	72	34.4%	24	11.5%	113	54.1%
	Cropping (n=212)	19	9%	17	8%	176	83%
	Dairying (n=212)	19	9%	16	7.5%	177	83.5%
	Rural residential (n=213)	11	5.2%	10	4.7%	192	90.1%

- Note: Survey 2 sample adults aged 18–45 years

In both surveys respondents living in regional centres were more likely to agree an increase in blue gum plantations would be good for small towns and rural centres than those living outside regional centres (Survey 1: Pearson chi square df(4) = 9.8, $p<0.05$; Survey 2: Pearson chi square df(2) =15.72, $p<0.005$) (Tables 17 and 18). In Survey 2 respondents living in regional centres were more likely to believe an increase in rural

residential development would be good for small towns and rural areas (Pearson chi square df(2) = 6.37, $p<0.05$) than those living outside regional centres.

Table 17: Beliefs about the impact of land use change on small towns and rural areas by place of residence: Survey 1

Degree of agreement with the statement that an increase in land uses would be good for small towns and rural areas

Respondent place of residence		Disagree		Neither agree/disagree		Agree	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=492)	224	45.5%	87	17.7%	181	36.8%
	Cropping (n=492)	59	12%	163	33.1%	270	54.9%
	Dairying (n=492)	54	11%	127	25.8%	311	63.2%
	Rural residential (n=501)	57	11.4%	91	18.2%	353	70.5%
Small town/rural area	Blue gums (n=309)	169	54.7%	54	17.5%	86	27.8%
	Cropping (n=305)	38	12.5%	110	36.1%	157	51.5%
	Dairying (n=305)	31	10.2%	94	30.8%	180	59%
	Rural residential (n=306)	32	10.5%	58	19%	216	70.6%

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 18: Beliefs about the impact of land use change on small towns and rural areas by place of residence: Survey 2

Degree of agreement with the statement that an increase in land uses would be good for small towns and rural areas

Respondent place of residence		Disagree		Neither agree/disagree		Agree	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	Blue gums (n=181)	40	22.1%	25	13.8%	116	64.1%
	Cropping (n=183)	17	9.3%	16	8.7%	150	82%
	Dairying (n=186)	14	7.5%	14	7.5%	158	84.9%
	Rural residential (n=189)	20	10.6%	16	8.5%	153	81%
Small town/rural area	Blue gums (n=203)	91	44.8%	31	15.3%	81	39.9%
	Cropping (n=215)	20	9.3%	20	9.3%	175	81.4%
	Dairying (n=211)	18	8.5%	25	11.8%	168	79.9%
	Rural residential (n=209)	72	34.4%	24	11.5%	113	54.1%

- Note: Survey 2 sample adults aged 18–45 years

3.4 Strength of views on land uses

In both surveys respondents were asked to describe how strong their views were on land use change generally and on the specific land uses. Responses in Survey 1 were measured on a five-point scale but were collapsed to match the three response options for Survey 2

(not strong, quite strong, extremely strong). Very few respondents chose the 'extremely strong' option in Survey 2. This may have been because of the strong wording, which was not so apparent when presented as part of a five-point scale.

For Survey 1, views on cropping and dairying tended not to be strong (Table 19). Views on blue gum plantations and land use generally were somewhat stronger, while the majority of respondents considered their views on rural residential development to be very or extremely strong. In Survey 2 most respondents tended to feel quite strongly about land use change in general (51 per cent), although almost 39 per cent reported not to have strong feelings about land use change in general (Table 20). Some individual land uses, in particular blue gum plantations and rural residential development, tended to elicit stronger views than others.

With the exception of cropping, respondents in the second survey (Table 20) were less likely to report feeling extremely strongly about any of the land uses than respondents in Survey 1 (Table 19). This may be related to the effect of collapsing the five-point scale in the first survey to correspond to a three-point scale, however differences are evident between surveys in the 'quite strong' response even though this response (a '3' on the five-point response scale) was not collapsed. It is possible discrepancies reflect age-related differences in strength of views regarding land use.

Table 19: Strength of view about land use: Survey 1

Land use	Not strong		Quite strong		Extremely strong	
	Count	Per cent	Count	Per cent	Count	Per cent
In general (n=859)	279	32.3%	341	39.5%	243	28.2%
Blue gums (n=861)	323	37.3%	205	23.7%	337	39.0%
Cropping (n=859)	369	42.8%	314	36.4%	180	20.9%
Dairying (n=854)	398	46.4%	271	31.6%	189	22.0%
Rural residential (n=855)	75	8.7%	165	19.1%	626	72.3%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 20: Strength of view about land use: Survey 2

Land use	Not strong		Quite strong		Extremely strong	
	Count	Per cent	Count	Per cent	Count	Per cent
In general (n=414)	160	38.6%	211	51.0%	43	10.4%
Blue gums (N=413)	184	44.6%	146	35.4%	83	20.1%
Cropping (n=411)	184	44.8%	180	43.8%	47	11.4%
Dairying (n=412)	193	46.8%	163	39.6%	56	13.6%
Rural residential (n=414)	129	31.2%	206	49.8%	79	19.1%

- Maximum confidence interval is +/–4.8% calculated at 95% confidence level
- Note: Survey 2 sample adults aged 18–45 years

The pattern of strength of feeling about land use change does not appear to be influenced by the place of residence of the respondent (Survey 1: Pearson chi square df(4), p>0.05; Survey 2: Pearson chi square df(2), p>0.05 for all land uses) (Tables 21 and 22). However, in both surveys, respondents living outside regional centres tended to feel more strongly about increases in blue gum plantations than those living in regional centres. Respondents living in regional centres were less likely to feel strongly about land use change in general than those living in rural areas or small towns.

Table 21: Strength of view about land use by place of residence: Survey 1

Respondent place of residence	Land use	Not strong		Quite strong		Extremely strong	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	In general (n=493)	168	34.1%	184	37.3%	141	28.6%
	Blue gums (n=493)	192	38.9%	117	23.7%	184	37.3%
	Cropping (n=492)	220	44.7%	171	34.8%	101	20.5%
	Dairying (n=488)	222	45.5%	1160	32.8%	106	21.7%
	Rural residential (n=493)	147	29.8%	195	39.6%	151	30.6%
Small town/rural area	In general (n=307)	83	27%	136	44.3%	88	28.7%
	Blue gums (n=311)	109	35%	71	22.8%	131	42.1%
	Cropping (n=310)	122	39.4%	120	38.7%	68	21.9%
	Dairying (n=309)	148	47.9%	91	29.4%	70	22.7%
	Rural residential (n=306)	102	33.3%	116	37.9%	88	28.8%

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 22: Strength of view about land use by place of residence: Survey 2

Respondent place of residence	Land use	Not strong		Quite strong		Extremely strong	
		Count	Per cent	Count	Per cent	Count	Per cent
Regional centre	In general (n=196)	91	46.4%	90	45.9%	15	7.7%
	Blue gums (n=196)	92	46.9%	75	38.3%	29	14.8%
	Cropping (n=196)	91	46.4%	87	44.4%	18	9.2%
	Dairying (n=195)	85	43.6%	85	43.6%	25	12.8%
	Rural residential (n=196)	61	31.1%	98	50.0%	37	18.9%
Small town/rural area	In general (n=218)	69	31.7%	121	55.5%	28	12.8%
	Blue gums (n=217)	92	42.4%	71	32.7%	54	24.9%
	Cropping (n=215)	93	43.3%	93	43.3%	29	13.5%
	Dairying (n=217)	108	49.8%	78	35.9%	31	14.3%
	Rural residential (n=218)	68	31.2%	108	49.5%	42	19.3%

- Note: Survey 2 sample adults aged 18–45 years

3.5 Beliefs about future overall impacts of land uses

In Survey 1, participants were asked to indicate their beliefs about the future overall impact of land uses. Many participants selected the 'don't know' option provided for this question, with a slightly higher proportion selecting this in regard to blue gum plantations than for the other land uses.

On average, participants appeared less optimistic about the future impacts of blue gum plantations than of other land uses (Table 23).

Table 23: Beliefs about future impact of land use changes: Survey 1
The mean rating of future impact of four land uses on five-point scale, where 5=positive, 1=negative). 'Don't know' option also offered

Future impact of land uses	Don't know (count)	Mean	Standard error of mean	Std deviation
Blue gums (n=784)	85	2.63	.05	1.52
Cropping (n=804)	64	3.62	.04	1.17
Dairying (n=798)	66	3.76	.04	1.14
Rural residential (n=819)	51	3.76	.04	1.23

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

3.6 Beliefs about specific impacts of land uses

Respondents in Survey 1 were asked to indicate their perceptions of the impact of land uses on a number of specific outcomes.

Rural and regional centre population

Tables 24 and 25 show the distributions of opinions expressed about the impact the land uses have on population in small towns and rural areas, and on population in regional centres such as Mt Gambier, Warrnambool and Horsham.

Increased rural residential development was the only land use change considered by most respondents to have a positive impact on numbers of people living in rural areas and regional centres. Views on other land use impacts were more mixed, but the most common view was that increased dairying and cropping has no impact on rural and regional centre populations. For plantations, views expressed were also diverse, but the most common responses were that plantations have a positive impact on regional centre population and a negative impact on rural population.

Overall respondents tended to believe that all land uses have more negative impacts on smaller towns and rural areas than on regional centres. The differential impact of blue gums on rural areas and regional centres appeared the most significant.

Table 24: Beliefs about impacts of land use changes on population in regional centres: Survey 1

Land use	Fewer people living in regional centres		No change		More people living in regional centres	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=850)	251	27.9%	249	27.7%	350	38.9%
Cropping (n=844)	159	17.7%	506	56.3%	179	19.9%
Dairying (n=839)	157	17.5%	414	46.1%	268	29.8%
Rural residential (n=859)	87	9.7%	153	17.0%	619	68.9%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 25: Beliefs about impacts of land use changes on population in small towns and rural areas: Survey 1

Land use	Fewer people living in small towns and rural areas		No change		More people living in small towns and rural areas	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=848)	389	45.9%	224	26.4%	235	27.7%
Cropping (n=842)	210	24.9%	477	56.7%	155	18.4%
Dairying (n=852)	246	28.9%	378	44.4%	228	26.8%
Rural residential (n=863)	177	20.5%	184	21.3%	502	58.2%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Results Views of residents aged 18–35 years are underrepresented in Survey 1

Employment in rural areas and regional centres

The pattern of beliefs regarding the impact of land uses on employment was very similar (Tables 26 and 27). Here however, the differential impact of rural residential development on regional centres and rural areas was probably greater.

Table 26: Beliefs about impacts of land use changes on employment in regional centres: Survey 1

Land use	Less employment in regional centres		No change		More employment in regional centres	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=845)	267	31.6%	240	28.4%	338	40.0%
Cropping (n=839)	142	16.9%	473	56.4%	224	26.7%
Dairying (n=854)	134	15.7%	375	43.9%	345	40.4%
Rural residential (n=853)	81	9.5%	223	26.1%	549	64.4%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 27: Beliefs about impacts of land use changes on employment in small towns and rural areas: Survey 1

Land use	Less employment in small towns and rural areas		No change		More employment in small towns and rural areas	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=851)	325	38.2%	249	29.3%	277	32.5%
Cropping (n=842)	192	22.8%	430	51.1%	220	26.1%
Dairying (n=841)	167	19.9%	373	44.4%	301	35.8%
Rural residential (n=866)	175	20.2%	269	31.1%	422	48.7%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Involvement in community groups

Plantation expansion was viewed as having a more negative impact on involvement in community groups than other land uses (Table 28). Increased rural residential development was the only change considered by most participants to have a positive impact on involvement in community groups.

Table 28: Beliefs about impacts of land use changes on involvement in community groups: Survey 1

Land use	Fewer people involved in community groups		No change		More people involved in community groups	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=845)	393	46.5%	292	34.6%	160	18.9%
Cropping (n=839)	205	24.4%	496	59.1%	138	16.4%
Dairying (n=842)	202	24.0%	446	53.0%	194	23.0%
Rural residential (n=872)	142	16.3%	252	28.9%	478	54.8%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Economic benefits

Beliefs about the regional and local economic impacts of land uses are shown in Tables 29 and 30. Increased rural residential development was most frequently considered to have positive economic impacts for the region and for local shops and traders. While the majority of respondents considered increased plantations to bring more

benefits for the regional economy, views on the benefits for local shops were more mixed.

Table 29: Beliefs about impacts of land use changes on regional economy: Survey 1

	Fewer benefits for regional economy		No change		More benefits for regional economy	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=862)	241	28.0%	172	20.0%	449	52.1%
Cropping (n=849)	65	7.7%	344	40.5%	440	51.8%
Dairying (n=844)	64	7.6%	287	34.0%	493	58.4%
Rural residential (n=859)	62	7.2%	182	21.2%	615	71.6%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Table 30: Beliefs about impacts of land use changes on business for local shops and traders: Survey 1

	Less business for local shops and traders		No change		More business for local shops and traders	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=853)	320	37.5%	249	29.2%	284	33.3%
Cropping (n=852)	100	11.7%	401	47.1%	351	41.2%
Dairying (n=843)	69	8.2%	347	41.2%	427	50.7%
Rural residential (n=865)	39	4.5%	149	17.2%	677	78.3%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Damage to roads

A strong majority of participants indicated concern about the impact of increased plantations and rural residential development on road infrastructure (Table 31). While most people considered an increase in cropping and dairying to have no impact on road infrastructure, a large proportion of respondents believed these land uses would lead to more damage to roads.

Table 31: Beliefs about impacts of land use changes on road infrastructure: Survey 1

Land use	Less damage to roads		No change		More damage to roads	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=858)	67	7.8%	190	22.1%	601	70.0%
Cropping (n=858)	48	5.6%	462	53.8%	348	40.6%
Dairying (n=848)	54	6.4%	453	53.4%	341	40.2%
Rural residential (n=864)	53	6.1%	294	34.0%	517	59.8%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Availability of water

For all land uses, an increase was most often considered to result in less water available for all uses (Table 32). The view was expressed most commonly in regard to blue gum plantations and rural residential development.

Table 32: Beliefs about impacts of land use changes on water availability: Survey 1

Land use	Less water available for all uses		No change		More water available for all uses	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=856)	528	61.7%	243	28.4%	85	9.9%
Cropping (n=845)	416	49.2%	366	43.3%	63	7.5%
Dairying (n=846)	487	57.6%	285	33.7%	74	8.7%
Rural residential (n=861)	521	60.5%	231	26.8%	109	12.7%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Risk of soil erosion

Cropping was the land use most frequently associated with increased soil erosion (Table 33). Views on the soil impacts of plantations were very diverse.

Table 33: Beliefs about impacts of land use changes on risk of soil erosion: Survey 1

Land use impact	Less risk of soil erosion		No change		More risk of soil erosion	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=857)	320	37.3%	278	32.4%	259	30.2%
Cropping (n=848)	96	11.3%	327	38.6%	425	50.1%
Dairying (n=844)	108	12.8%	476	56.4%	260	30.8%
Rural residential (n=861)	154	17.9%	401	46.6%	306	35.5%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Risk of wildfire

A large majority of respondents considered increased blue gum plantations to result in increased risk of wildfire (Table 34). Other land uses were most often considered to result in no change in wildfire risk.

Table 34: Beliefs about impacts of land use changes on risk of wildfire: Survey 1

	Less risk of wildfire		No change		More risk of wildfire	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gums (n=863)	78	9.0%	151	17.5%	634	73.5%
Cropping (n=846)	111	13.1%	465	55.0%	270	31.9%
Dairying (n=850)	211	24.8%	552	64.9%	87	10.2%
Rural residential (n=854)	193	22.6%	412	48.2%	249	29.2%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Loss of native vegetation

All land uses were relatively strongly associated with loss of native vegetation (Table 35). Many respondents considered increased dairying to have no impact on native vegetation. Around 20 per cent of participants considered increased plantations and rural residential development to result in more native vegetation.

Table 35: Beliefs about impacts of land use changes on native vegetation: Survey 1

	Less native vegetation		No change		More native vegetation	
Land use	Count	Per cent	Count	Per cent	Count	Per cent
Blue gum s (n=857)	534	62.3%	151	17.6%	172	20.1%
Cropping (n=857)	468	54.6%	326	38.0%	63	7.4%
Dairying (n=842)	372	44.2%	406	48.2%	64	7.6%
Rural residential (n=854)	470	55.0%	235	27.5%	149	17.4%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Chemical risk

Increased cropping and blue gum plantations were both associated with increased chemical risk by the majority of participants (Table 36).

Table 36: Beliefs about impacts of land use changes on chemical risk: Survey 1

Land Use	Less chemical risk		No change		More chemical risk	
	Count	Per cent	Count	Per cent	Count	Per cent
Blue gum s (n=857)	96	11.2%	291	34.0%	470	54.8%
Cropping (n=857)	47	5.5%	282	33.3%	519	61.2%
Dairying (n=842)	93	11.1%	508	60.6%	237	28.3%
Rural residential (n=854)	182	21.3%	450	52.8%	221	25.9%

- Maximum confidence interval is +/–3.4% calculated at 95% confidence level
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

3.7 Understanding attitudes towards land use change

To further understand attitudes towards land use change, participants answered questions in relation to how much value they placed on particular outcomes and whether they believed impacts were associated (positively, negatively or neutral) with particular land uses. These responses have been used in this analysis to explore:

- whether valued outcomes and beliefs about impacts can help explain why people expressed diverse views toward blue gum plantations
- whether comparing valued outcomes and beliefs about impacts of different land uses can help explain variations in how people evaluate each land use.

Studies (for example Ford *et al.* 2005) have shown that the importance placed on different valued outcomes of land use can help explain diverse attitudes towards land management. In this study, valued outcomes were measured using fourteen outcome statements, which participants rated with regard to 'importance'. Table 37 shows the mean rating and standard deviation of each outcome on a scale of 1=unimportant to 5=extremely important. Almost all the outcomes are rated very highly by participants, and there is relatively little variation between participants. Instead, valued outcomes appear to be generally shared among participants. This suggests that differences in values may offer little explanation for differences in views on the land uses. To confirm this, correlations between valued outcomes and beliefs about overall impacts of blue gum plantations were examined. These are shown in the far right column of Table 37. Correlations describe the closeness of the relationship between two measurements and are represented by figures that range between –1 and +1. A correlation close to 0 indicates there is little or no relationship between two measurements (they are very different). A correlation close to +1 indicates the measurements are very closely related, possibly measuring the same thing. A correlation close to –1 indicates the measurements are oppositely related – they are measuring two things that are opposed. There is no universal

standard for whether these correlations are considered strong or weak. However, in the context of this research correlations of about +/–0.2 are considered weak, though still of interest. The correlations between participants' ratings of valued outcomes and their ratings of the overall impact of blue gum plantations are very small indeed. This confirms that differences between participants' values do not help explain their different views on land uses, particularly blue gum plantations.

Table 37: Mean importance of outcomes of land use: Survey 1 (measured on a five-point scale where 5=extremely important, 1=unimportant)

Valued outcomes	Mean	Std deviation	Correlation with beliefs about overall impact of blue gum plantations
Water is available for all rural and residential uses (n=884)	4.71	.63	0.01
Road systems are safe and in good condition (n=884)	4.69	.67	–0.05
Soils on rural land are protected from damage (n=883)	4.48	.77	–0.07*
Employment opportunities are growing in regional centres (n=881)	4.43	.82	0.06
Business is prosperous for shops and traders in the region n=883)	4.40	.78	0.02
Environment is free of harmful chemicals (n=880)	4.40	.84	–0.02
Employment opportunities are growing in smaller towns and rural areas (n=883)	4.34	.93	0.01
Everyone in the region benefits from land uses, not just some people (n=881)	4.35	.88	–0.01
Property and people are protected from wildfire (n=880)	4.33	.99	–0.01
Native vegetation is protected from damage (n=838)	4.25	.99	0.00
The regional economy is prosperous (n=879)	4.25	.89	0.03
Community groups such as service and sporting clubs are active and well attended (n=883)	4.23	.96	–0.06
The number of people living in smaller towns and rural areas is increasing (n=880)	3.87	1.08	–0.02
The number of people living in regional centres is increasing (n=875)	3.78	1.12	0.05

- *Correlation is significant at the 0.05 level (2-tailed).
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Values were measured in a second way in the survey. Respondents were asked their views on the importance to society of the products of the four land uses. Results are summarised in Table 38. On average, products of cropping and dairying were considered to have much greater social importance than products of plantations and, to a lesser extent, rural residential development. Views on products of plantations and rural residential development were also more diverse. The right-hand column of the table shows the correlation between rated importance of products with beliefs about the overall impact of each land use. The relationship between these variables is much stronger (correlations of +/–0.5 or higher are considered strong in the context of this study). This means respondents who rated the overall impact of a land use as positive were also quite likely to believe the products of the land use were important. Conversely, people who considered the overall impact to be negative were quite likely to consider the land use product to be unimportant. This suggests the social importance of the product may be helpful in explaining diverse views on land uses.

Table 38: Mean perceived social importance of products of four land uses: Survey 1 (measured on a five-point scale where 5=extremely important, 1=unimportant)

Social importance of land products of land use	Mean	Std deviation	Correlation with beliefs about overall impact of land use
Blue gum plantations (n=874)	2.87	1.32	.509(**)
Cropping (n=876)	4.16	.96	.244(**)
Dairying (n=876)	4.28	.92	.325(**)
Rural residential (n=876)	3.50	1.23	.326(**)

- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

Past research suggests that differences in beliefs about consequences of land management may help explain diverse attitudes towards these (Ford *et al.* 2005). In this study, participants rated each land use on thirteen different specific impacts. Because a large number of impacts were evaluated, a statistical process called Principal Components Analysis was used to simplify the data. This technique identifies whether any of the beliefs about impacts could be grouped as 'sets' of beliefs which participants tend to respond to in similar ways. Details about the process can be found in Appendix 4. Results suggest that beliefs can be categorised into two groups: 'Socio-economic impacts' (comprising population, involvement in community groups, employment and economic benefit) and 'Physical environment risks' (comprising risk of contact with harmful chemicals, risk of less water available for all uses, damage to roads, risk of wildfire, risk of soil erosion). These two sets of beliefs were similar for each of the land uses indicating they may have a similar function for evaluating each of the land uses, perhaps acting as 'criteria' for evaluating land uses.

Table 39 compares mean ratings of beliefs for each land use. As a general pattern, it suggests participants believe the socio-economic benefits of blue gum plantations are less than those of the other land uses. Similarly the risks to the physical environment are generally perceived as being greater for blue gum plantations than for other land uses. In particular blue gum plantations are viewed as leading to greater fire risk and damage to roads. One exception to the general trend is that blue gum plantations are viewed as having less risk of soil erosion. Table 50 shows the mean score (out of a possible 1 to 5) for each belief and each land use in the table below. The far right column also shows the correlation between beliefs about specific impacts of blue gum plantations with beliefs about overall impact of blue gum plantations. Many of these variables are moderately related to beliefs about the overall impact. More simply, where a respondent considered a specific impact of blue gum plantations to be positive, they were also quite likely to consider the overall impact positive. This suggests that impact beliefs may be helpful in explaining diverse views on blue gum plantations. In general socio-economic impact beliefs tend to be more strongly related to beliefs about overall impact of blue gum plantations than are beliefs about physical environment risks.

Table 39: Mean perceived impacts of four land uses: Survey 1 (measured on a five-point scale where 5=increase, 1=decrease)

	Blue gum plantations	Cropping	Dairying	Rural residential	Correlation of beliefs about each impact with beliefs about overall impact of blue gum plantations
'Socio-economic beliefs'					
People living in regional centres	3.2	3.0	3.2	4.0	0.32(**)
People living in rural areas	2.6	2.9	2.9	3.6	0.38(**)
People involved in community groups	2.5	2.9	2.9	3.6	0.44(**)
Employment in regional centres	3.1	3.1	3.3	3.8	0.48(**)
Employment in rural areas	2.8	3.0	3.2	3.4	0.46(**)
Economic benefit for the region overall	3.3	3.6	3.7	3.9	0.57(**)
Business for shops and local traders	2.9	3.4	3.6	4.1	0.59(**)
'Physical environment risk beliefs'					
Risk of contact with harmful chemicals	3.7	3.8	3.2	3.0	–0.22(**)
Water available for all uses	2.1	2.4	2.3	2.3	0.22(**)
Damage to roads	4.1	3.5	3.5	3.8	–0.02
Risk of wildfire	4.1	3.2	2.8	3.1	–0.02
Risk of soil erosion	2.9	3.5	3.2	3.2	–0.14(**)
Impact on native vegetation	2.3	2.2	2.4	2.4	0.28(**)

- ** Correlation is significant at the 0.01 level (2-tailed)
- * Correlation is significant at the 0.05 level (2-tailed)
- Note: Views of residents aged 18–35 years are underrepresented in Survey 1

A regression analysis was conducted to further explore the basis of beliefs about overall impacts of blue gum plantations. This analysis evaluates how well a set of variables predicts beliefs about overall impact of blue gum plantations. Three variables were entered:

- beliefs about socio-economic impacts (a single 'factor' score summarising the set of beliefs derived from the principal components analysis described above) of blue gum plantations
- beliefs about physical environment risk (a similar single 'factor score') of increased blue gum plantations
- beliefs about social value of products of blue gum plantations.

The analysis found that 47 per cent of the variability in people's attitudes could be explained by a combination of these three factors (adjusted R^2=0.47). This means that around 50 per cent of the variance in beliefs about the overall impact of blue gum plantations is not explained by these three factors, suggesting that other, unmeasured factors also influence general attitudes towards blue gum plantations. Of those factors that were measured, the most important predictor of overall attitudes was beliefs about socio-economic impacts of blue gum plantations (Belief Factor 1 Standardised Beta Coefficient = 0.49). The second most important predictor was beliefs about social importance of the products of blue gum plantations (Standardised Beta Coefficient = 0.28). The third most important predictor was beliefs about physical environment risks of blue gum plantations (Belief Factor 2 Standardised Beta Coefficient = –0.18). Details of the regression analysis can be found in Appendix 4.

4 Discussion

Two separate surveys were conducted to investigate resident attitudes towards land use changes in the Green Triangle and Central Victoria. The methods used in the two surveys were distinctly different and characterised by different strengths and weaknesses. While the results of the surveys differed in some ways, the consistency in overall trends suggests findings regarding relative attitudes towards the four land uses are robust. Considered together the surveys provide significant insight into the views of residents. It should be noted, however, that the surveys did not cover the full range of land use issues, for example drivers of land use change such as government policy (including managed investment schemes), raised in earlier qualitative analyses (Schirmer *et al.* 2008). This

section discusses key findings of the study, highlighting implications for land use planning and management in the region.

4.1 Beliefs about impacts of land uses

First, it is clear that the impacts of different land use changes are viewed differently by residents. Increased cropping, dairying and rural residential development were generally viewed as having positive impacts for the region. Views on blue gum plantations were much more diverse. Many people considered blue gum plantations to have a negative impact on the region. Residents' views tended to be 'split', with people seeing the overall impacts as either positive or negative and fewer seeing the impacts of the land use as neutral.

The findings suggest that to understand why people assess these land uses differently, one should pay particular attention to beliefs people hold regarding the socio-economic impacts of the land uses. Participants generally considered the socio-economic benefits of blue gum plantations to be lower than those of other land uses, particularly in regard to economic benefits at a local and regional level, and involvement in community activities. Consideration should also be given to other beliefs about land uses. Less favourable views on plantations can also be understood in the light of beliefs about physical environment risks. Participants tended to consider blue gum plantations to be associated with greater risks to the physical environment than other land uses, particularly roads, wildfire and chemical risk. Beliefs about the social importance of products also varied with overall attitudes towards land uses. Participants tended to view the products of blue gum plantations as being less important than those of other land uses.

The finding that rural residential development is viewed positively by the vast majority of participants will be surprising to some. It would be possible to view rural residential development as removing land from traditional agricultural uses, paralleling some of the concerns raised regarding blue gum plantations (Schirmer *et al.* 2008). However, participants in this research considered the social and economic outcomes of increased rural residential development to be positive.

A useful next step for this research is to compare these perceived impacts with impacts identified through independent sources. In some instances, it is likely that trends in public perceptions will be consistent with observed impacts of land use changes. Where negative impacts of land uses are reported by residents and supported by independent analysis, land management agencies must consider changing practices to mitigate these impacts. In other cases, it is likely that public perceptions and beliefs about negative impacts will not be supported by independent analysis. Alternatively, residents may believe a land use has positive impacts not supported by independent analysis. In both instances, there will be a

requirement for better communication among industries, land use planners and the wider community. Education and information provision may assist in developing more realistic and widespread understanding of the costs and benefits of land uses. There are also likely to be instances where it is not possible to provide clear evidence of independently assessed impacts of land uses. In this case, there is a need to prioritise areas for further research. This research suggests that social and economic impacts of land uses are particularly salient for resident evaluations, and this should be taken into account when prioritising further research.

4.2 Different views on land uses

While there were general trends in the way participants viewed the four land uses, not all participants viewed the land uses in the same way. The diverse views on blue gum plantations have already been noted. There were other differences. For example, people living in regional centres were likely to view the impacts of both blue gum plantations and rural residential development more positively than did residents of small towns and rural areas. Views also differed across geographical areas. Participants living in South Australia were more likely to be positive about blue gum plantations than participants living in Victoria. Participants living in the Corangamite, Colac Otway, Warrnambool and Moyne local government areas were likely to be much more positive about increased dairying than participants living in other areas.

It is possible that these different views reflect differences in experienced impacts of land use changes. For example, many people, regardless of place of residence, considered the benefits of land use change to be greater for regional centres than for small towns and rural areas. This possibility should be explored in analysing independent socio-economic data. It is also possible that differences in views relate to more socio-psychological factors such as social values. Social change across the region has been widespread. The region is becoming increasingly urbanised, with more people living in regional centres and fewer in rural areas. Participants in group interviews also noted increased numbers of ‘seachangers’ or ‘treechangers’ – lifestyle land owners moving into the area. Others noted increased presence in rural areas of ‘townies’ – people with little previous experience of rural living. Such social change may be associated with increased diversity in social values; that is, the ideals or outcomes people seek in life.

The findings reported here suggest that differences in values do not provide a strong explanation for different views on land use changes. Rather, participants appear to have broadly shared values regarding land use outcomes. This means that the diverse views about plantations cannot be explained in terms of conflicting values, as is often the case in land management issues. Social dilemmas characterised by conflicting values have been depicted as ‘wicked’ problems, ones that may not be resolvable (Shindler 1999). For

example, issues associated with native forest harvesting are often underpinned by strikingly different value sets (Ford *et al.* 2005; Steel *et al.* 1994). Some stakeholders will not compromise ecological outcomes for the sake of economic gains, and others may take an opposing stance. Where values are in competition, it is unlikely that compromise solutions will be acceptable. Psychological theory describes social values as enduring, long term orientations that are not open to persuasion and change only very slowly over a person's life time (Rokeach 1973). Where values are in conflict, land management issues are likely to be ongoing. The study suggests this is not the case in regard to views on land use in the study region.

Instead, the findings point to beliefs about social and economic impacts of land uses as the most useful explanation for differences in views. Participants who considered socio-economic impacts of blue gum plantations to be negative were likely to consider the overall impact of plantations to be negative. Other factors, including beliefs about physical environmental risks and the social importance of products were also found to be important, and the researchers note that not all explanatory factors have been identified. However, beliefs about socio-economic impacts of plantations had the strongest relationship with overall attitudes.

This finding raises some important issues for those concerned with land use planning and management. First, it must be acknowledged that there is relatively little independent data available regarding the socio-economic outcomes of the land uses under discussion. One component of the project '*Socio-economic impacts of land use change in the Green Triangle and Central Victoria*' will quantify and analyse land use, industry and socio-economic change in the region to provide this information. This information was not available at the time the survey was conducted. In the absence of reliable information to date, it is unsurprising that residents have formed diverse opinions on the outcomes that exist. Second, psychological models of attitudes suggest that – unlike values – beliefs about the consequences or impacts of land uses are relatively open to change. When people encounter new information about land uses, their views may change a little. It can be argued that over time attitudes towards land uses may change if new information becomes available that challenges existing beliefs. Such information will only be effective however if the source is considered trustworthy and the information independent. This highlights the importance of independent analysis of social and economic data to inform public discourse regarding land use.

4.3 Attitude change over time

Williams et al. (2003) noted the possibility that attitudes towards land uses, particularly plantation forestry, might change over time. They observed that in Victoria views on pine plantations had become more favourable since these were established in the 1970s. It

appeared likely that as social and economic outcomes of land uses became clearer, as commodity prices changed, and as infrastructure for processing of products was developed, attitudes towards blue gum plantations might also become more positive.

The work by Williams et al. (2003) was conducted in south-west Victoria, in a smaller area of the study region from the surveys reported here, and some questions about overall and specific impacts were used in similar ways across the two surveys. This provides an opportunity to observe whether attitudes have changed in the years between the surveys. There are many differences between the two surveys however which mean that the results are not directly comparable. For example, the 2007 survey used a postal questionnaire while the 2,000 survey used telephone interviews. In 2000, residents of rural areas were sampled more intensively than residents of regional centres, while in 2007 respondents were more likely to live in regional centres. Most importantly, survey administration in 2007 was standardised across all participants while the 2000 survey administration was not. In the 2000 study a filter question was asked: '[Land use] has increased in south west Victoria over the past ten years. Has this had any impact on the towns and rural areas closest to your home?' If in response to the filter question participants indicated the land use had had no impact on their district, no further questions were asked regarding this land use. Furthermore, respondents to the 2000 survey were asked about only two land uses, depending on the area they lived in.

It is possible however to make some cautious observations about the findings of the two surveys. In the 2000 survey, 3 per cent of respondents living in the Ararat, Glenelg, Pyrenees and Southern Grampians local government areas indicated an overall negative impact of increased cropping. In the 2007 survey, this percentage increased to 8 per cent of respondents living in the same geographical area. The pattern for dairying is similar. In 2000, 5 per cent of respondents living in the Corangamite, Moyne, and Warrnambool local government areas considered the overall impacts to be negative, while in 2007 this had increased to 9 per cent of respondents in the same geographical area. For both land uses, it is possible more people are concerned about negative overall impacts but these figures remain low (and may also be explained by differences in methods). In contrast, the proportion of respondents indicating negative overall impacts of increased blue gum plantations is relatively high in both 2000 and 2007. In the 2000 survey, 27 per cent of respondents living in the Moyne, Southern Grampians and Glenelg local government areas reported overall negative impacts of blue gum plantations. In the 2007 survey, this had increased to 55 per cent for respondents from the same geographical area. Given the lack of directly comparable data, caution must be applied in inferring change from these figures. Part of the increase may relate to methods used rather than actual differences in concern. It is reasonable however to conclude that there has been *no decrease* in the

proportion of residents who believe that the overall impact of blue gum plantations is negative.

Given the possibility of change anticipated by Williams et al. (2003), this final point requires some consideration. During the past 10 years, plantation companies have made attempts to address negative perceptions of plantation forestry. For example some companies have employed community liaison officers. The industry as a whole has given attention to 'good neighbour' charters and instituted new management practices. At present there is little evidence these initiatives have had a positive influence on public opinion of plantation forestry in this region. There are a number of possible explanations for this. Since many plantation company activities focus on local, neighbourhood issues, it is possible they have improved relations with immediate neighbours but have had little influence on the views of the general population about the industry. Given the focus of survey respondents on socio-economic outcomes of land uses – at both a regional and local level – it is also possible that the activities to date do not effectively respond to community concerns regarding impacts on local employment, business for traders and community involvement. The survey analysis suggests that perceptions about these socio-economic factors are the most important of those studied in predicting public opinion. Future actions by land managers (including potential management change and communication activities) may need to more closely respond to these concerns if they are to have a positive effect on public opinion. Alternatively, it is possible that insufficient time has passed, so that social and economic outcomes of increased plantations are no clearer than in 2000.

5 Conclusion

In summary, two surveys of residents of the Green Triangle and Central Victoria region suggest that many people view blue gum plantations differently from other land uses evaluated. Beliefs about the overall and specific impacts of cropping, dairying and rural residential development were more likely to be positive than were beliefs about blue gum plantations. However, diverse views were expressed regarding blue gum plantations: while many participants considered the overall impact of blue gum plantations to be negative, many others considered the overall impact of the land use to be positive. The findings suggest different views about the overall impacts of plantations are best explained by diverse views regarding the socio-economic impacts of plantations, including impacts on population, employment, business and community involvement.

Further research is required to clarify how these beliefs compare with independent observations of social and economic impacts of the land uses. This comparison will assist in identifying areas where management practices should be changed to minimise negative impacts or increase benefits, and where there is need to foster better understanding of land use costs and benefits among residents of the study region.

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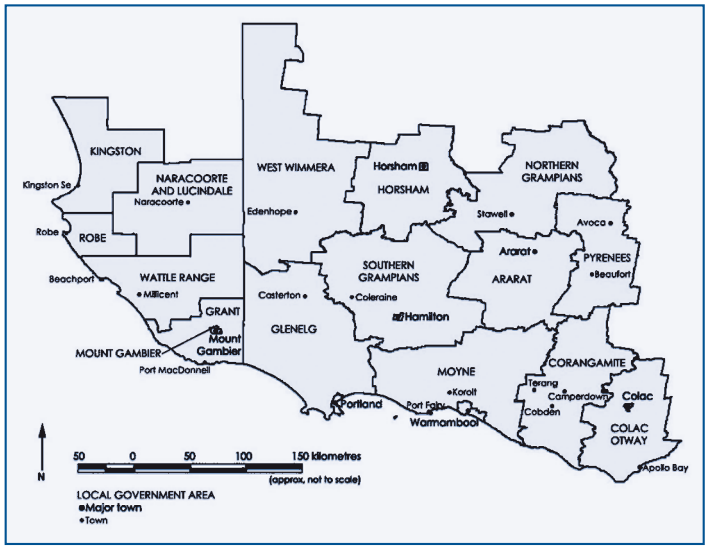
Appendix 1: Survey 1

Survey 1: Resident views on land use change in the Green Triangle and Central Victoria

THE UNIVERSITY OF MELBOURNE

Survey:
Resident Views on Land Use Change in the Green Triangle and Central Victoria

Study region



Project overview

The aim of this project is to understand how people view new and existing land uses in the region, and to understand comparisons residents make between these land uses. The project looks at four land uses (in alphabetical order):

- Blue gum plantations
- Cropping
- Dairying
- Rural residential development

The project is being conducted by Dr. Kathryn Williams and PhD student Caroline Dunn from the School of Resource Management, University of Melbourne, and by Prue Borschmann from the Department of Primary Industries. Questionnaires will be delivered to homes throughout the Green Triangle and Central Victoria region, selected at random from telephone listings for the study region.

Project Funding

The project is funded by the following organizations: Central Victorian Farm Plantations, Cooperative Research Centre for Forestry, Corangamite Catchment Management Authority, Forest and Wood Products Research and Development Corporation, Glenelg Shire Council, Glenelg Hopkins Catchment Management Authority, Green Triangle Regional Plantation Committee, Moyne Shire Council, Southern Grampians Shire Council, Victorian Government Department of Primary Industries, and Wattle Range Council.

How am I being asked to contribute?

Simply fill in the enclosed questionnaire. This should only take around 15-20 minutes to complete. You must be 18 years of age or older to take part in this survey.

How will my confidentiality be protected?

This project is part of a major project to evaluate socio-economic impacts of land use change in the Green Triangle and Central Victoria region. The project has been approved by the University's Human Research Ethics Committee. Participation in this study is completely voluntary. If you want to withdraw from the study at any stage, or withdraw any unprocessed data you have supplied, you are free to do so. The questionnaire will not ask for information that could identify you personally and the results of this study will be reported as group data only. Responses will be stored securely and computer files password protected. The data will be kept securely for five years from the date of publication, before being destroyed.

A summary of the findings of this research will be available to you by contacting researchers at the School of Resource Management.

For more information, or if you have any concerns, please contact the researchers or the Human Research Ethics Committee.

Contact Details

If you require any further information about this research please contact the researchers on the toll free number: 1800 981 499 or use the contact details below:

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University Ethics Research Application No. 0710160.1
Title: Survey of Resident Views on Land use change in the Green Triangle and Central Victoria.

Definitions for the purpose of this questionnaire

Blue gum plantations: Large-scale commercial plantings of eucalypt trees to produce pulpwood for paper products.

Cropping: Large-scale commercial plantings of grains, legumes and oil seeds to produce food products.

Rural Residential Development: Division of rural land into smaller blocks for urban homes and rural living.

Dairying: Farming dairy cows for milk production.

Land use change

1. Over the past 10-15 years have you noticed any change in the area of the following land uses in areas close to where you live? Tick one option for each land use.

Land uses		Decrease	No change	Increase
1.1	Blue gum plantations	○	○	○
1.2	Cropping	○	○	○
1.3	Dairying	○	○	○
1.4	Rural residential development	○	○	○

*For each of the following questions please **tick one option for each land use**. Please note order of land uses changes for each question.*

In your view would an increase in these land uses result in…

2. … fewer or more **people living in regional centres such as Warrnambool, Mt Gambier, Horsham etc**?

		Fewer 1	2	No change 3	4	More 5
2.1	Cropping	○	○	○	○	○
2.2	Dairying	○	○	○	○	○
2.3	Rural residential development	○	○	○	○	○
2.4	Blue gum plantations	○	○	○	○	○

3. … fewer or more **people living in smaller towns and rural areas**?

		Fewer 1	2	No change 3	4	More 5
3.1	Dairying	○	○	○	○	○
3.2	Rural residential development	○	○	○	○	○
3.3	Blue gum plantations	○	○	○	○	○
3.4	Cropping	○	○	○	○	○

4. … fewer or more **people involved in community groups** such as service and sporting clubs?

		Fewer 1	2	No change 3	4	More 5
4.1	Rural residential development	○	○	○	○	○
4.2	Blue gum plantations	○	○	○	○	○
4.3	Cropping	○	○	○	○	○
4.4	Dairying	○	○	○	○	○

In your view would an increase in these land uses result in… *(continued)*

5. … less or more risk of **contact with harmful chemicals**?

		Less 1	2	No change 3	4	More 5
5.1	Blue gum plantations	○	○	○	○	○
5.2	Cropping	○	○	○	○	○
5.3	Dairying	○	○	○	○	○
5.4	Rural residential development	○	○	○	○	○

6. … less or more **native vegetation**?

		Less 1	2	No change 3	4	More 5
6.1	Cropping	○	○	○	○	○
6.2	Dairying	○	○	○	○	○
6.3	Rural residential development	○	○	○	○	○
6.4	Blue gum plantations	○	○	○	○	○

7. … less or more **employment in regional centres such as Warrnambool, Mt Gambier, Horsham etc**?

		Less 1	2	No change 3	4	More 5
7.1	Dairying	○	○	○	○	○
7.2	Rural residential development	○	○	○	○	○
7.3	Blue gum plantations	○	○	○	○	○
7.4	Cropping	○	○	○	○	○

8. … less or more **employment in smaller towns and rural areas**?

		Less 1	2	No change 3	4	More 5
8.1	Rural residential development	○	○	○	○	○
8.2	Blue gum plantations	○	○	○	○	○
8.3	Cropping	○	○	○	○	○
8.4	Dairying	○	○	○	○	○

9. …less or more **water available for all uses**?

		Less 1	2	No change 3	4	More 5
9.1	Blue gum plantations	○	○	○	○	○
9.2	Cropping	○	○	○	○	○
9.3	Dairying	○	○	○	○	○
9.4	Rural residential development	○	○	○	○	○

10. … less or more **damage to roads**?

		Less		No change		More
		1	2	3	4	5
10.1	Cropping	○	○	○	○	○
10.2	Dairying	○	○	○	○	○
10.3	Rural residential development	○	○	○	○	○
10.4	Blue gum plantations	○	○	○	○	○

11. … less or more **risk of wildfire**?

		Less		No change		More
		1	2	3	4	5
11.1	Dairying	○	○	○	○	○
11.2	Rural residential development	○	○	○	○	○
11.3	Blue gum plantations	○	○	○	○	○
11.4	Cropping	○	○	○	○	○

12. … less or more **risk of soil erosion**?

		Less		No change		More
		1	2	3	4	5
12.1	Rural residential development	○	○	○	○	○
12.2	Blue gum plantations	○	○	○	○	○
12.3	Cropping	○	○	○	○	○
12.4	Dairying	○	○	○	○	○

13. … fewer or more **economic benefits for the region as a whole**?

		Fewer		No change		More
		1	2	3	4	5
13.1	Blue gum plantations	○	○	○	○	○
13.2	Cropping	○	○	○	○	○
13.3	Dairying	○	○	○	○	○
13.4	Rural residential development	○	○	○	○	○

14. … less or more **business for local shops and traders**?

		Less		No change		More
		1	2	3	4	5
14.1	Cropping	○	○	○	○	○
14.2	Dairying	○	○	○	○	○
14.3	Rural residential development	○	○	○	○	○
14.4	Blue gum plantations	○	○	○	○	○

Views on land use change

15. What is your view on the overall impact of these land uses for the towns and rural areas close to where you live? *(Please tick one option for each land use)*

		Negative 1	2	Neutral 3	4	Positive 5	or Not Applicable
15.1	Dairying	○	○	○	○	○	○
15.2	Rural residential development	○	○	○	○	○	○
15.3	Blue gum plantations	○	○	○	○	○	○
15.4	Cropping	○	○	○	○	○	○

16a. Please indicate your **level of agreement** with the following statements: *(for each of the following questions please tick one option for each land use)*

An increase in these land uses is **good** for **rural areas and small towns** in this region.

		Disagree 1	Neither agree nor disagree 2	3	4	Agree 5
16.1	Rural residential development	○	○	○	○	○
16.2	Blue gum plantations	○	○	○	○	○
16.3	Cropping	○	○	○	○	○
16.4	Dairying	○	○	○	○	○

16b. An increase in these land uses is **good** for **regional centres** in this region.

		Disagree 1	Neither agree nor disagree 2	3	4	Agree 5
16.5	Blue gum plantations	○	○	○	○	○
16.6	Cropping	○	○	○	○	○
16.7	Dairying	○	○	○	○	○
16.8	Rural residential development	○	○	○	○	○

17. Thinking about the future, in 5-10 years time do you believe the impacts of these land uses will be positive or negative overall? (Please tick one option for each land use)

Future impact of land uses

		Negative 1	2	Neutral 3	4	Positive 5	or Don't know
17.1	Cropping	○	○	○	○	○	○
17.2	Dairying	○	○	○	○	○	○
17.3	Rural residential development	○	○	○	○	○	○
17.4	Blue gum plantations	○	○	○	○	○	○

18. How strong are your views about the following topics? (please tick one option for each land use)

		Not strong 1	2	Quite strong 3	4	Extremely strong 5
18.1	Land use change in general	○	○	○	○	○
18.2	Dairying	○	○	○	○	○
18.3	Rural residential development	○	○	○	○	○
18.4	Blue gum plantations	○	○	○	○	○
18.5	Cropping	○	○	○	○	○

19. How often have you discussed your views on the following topics with friends and family members? *(please tick one option for each land use)*

		Not often		Quite often		Extremely Often
		1	2	3	4	5
19.1	Land use change in general	○	○	○	○	○
19.2	Rural residential development	○	○	○	○	○
19.3	Blue gum plantations	○	○	○	○	○
19.4	Cropping	○	○	○	○	○
19.5	Dairying	○	○	○	○	○

20. Thinking about a good mix of land uses for your region, **how important are the following outcomes to you**? *(Please tick one option per row)*

		Not important				Extremely Important
		1	2	3	4	5
20.1	The regional economy is prosperous	○	○	○	○	○
20.2	The environment is free of harmful chemicals	○	○	○	○	○
20.3	The number of people living in regional centres is increasing	○	○	○	○	○
20.4	The number of people living in smaller towns and rural areas is increasing	○	○	○	○	○
20.5	Water is available for all rural and residential uses	○	○	○	○	○
20.6	Employment opportunities are growing in regional centres	○	○	○	○	○
20.7	Employment opportunities are growing in smaller towns and rural areas	○	○	○	○	○
20.8	Road systems are safe and in good condition	○	○	○	○	○
20.9	Community groups such as service and sporting clubs are active and well attended	○	○	○	○	○
20.10	Soils on rural land are protected from damage	○	○	○	○	○
20.11	Business is prosperous for shops and traders in the region	○	○	○	○	○
20.12	Property and people are protected from wildfire	○	○	○	○	○
20.13	Everyone in the region benefits from land uses, not just some people	○	○	○	○	○
20.14	Native vegetation is protected from damage	○	○	○	○	○

21. In your view, **how important to society** are products from the following land uses? *(Please tick one option for each land use)*

		Not important				Extremely Important
		1	2	3	4	5
21.1	Blue gum plantations	○	○	○	○	○
21.2	Cropping	○	○	○	○	○
21.3	Dairying	○	○	○	○	○
21.4	Rural residential development	○	○	○	○	○

Information about you

We will use the questions below to report on the kinds of people who took part in the study.

22. What is your age group? *Tick one option*

18-24	○
25-34	○
35-44	○
45-54	○
55-64	○
65-74	○
75+	○

23. What is your sex? *Tick one option*

Male	○
Female	○

24. What is your occupation?

25. How long have you lived in this region? Tick one option

Less than 5 years	○
5-10 years	○
11-20 years	○
more than 20 years	○

26. What is the closest road intersection to your residence (names of the two roads that intersect)? This information will help us understand trends in views across the region without identifying any individual person.

Road name 1: Road 1 Type (Road, street etc):

Road name 2: Road 2 type (Road, street etc.):

Locality/Town:

27. **For rural property owners:** Which of these best describes the income you derive from your property? Tick one option

None	○
Not main source of income	○
Main source of income	○

28. Do you have a personal or professional association with any of the following land uses?

		Please tick as many as apply	Please describe association
28.1	Blue gum plantations	○	
28.2	Cropping	○	
28.3	Dairying	○	
28.4	Rural residential development	○	

Thankyou for completing this questionnaire
Please return it in the reply paid envelope to:

Land Use Change Study,
Reply Paid 83061,
Hawthorn, VIC 3122

Appendix 2: Survey 2

Resident Views on Land Use Change in the Green Triangle and Central Victoria

You are invited to participate in a research project 'Resident Views on Land Use Change in the Green Triangle and Central Victoria'.

The aim of this project is to understand how people view new and existing land uses in the region, and to understand comparisons residents make between these land uses. The project looks at four land uses (in alphabetical order):

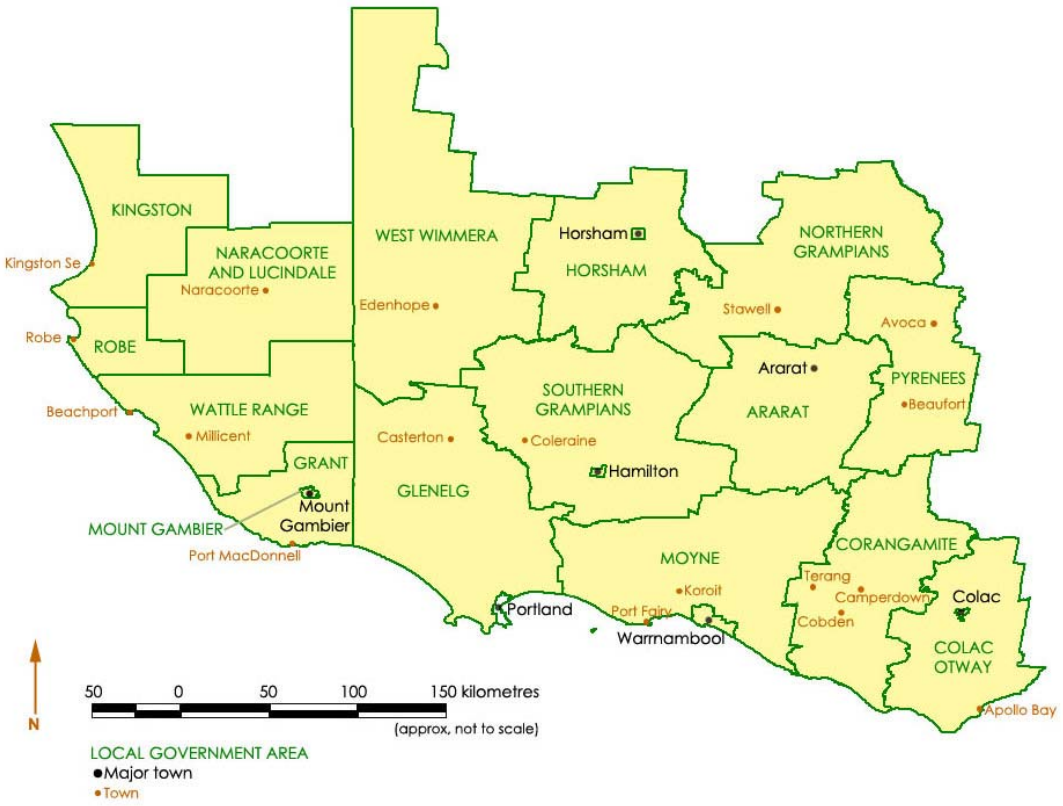
<u>Blue gum plantations</u>: Large-scale commercial plantings of eucalypt trees to produce pulpwood for paper products.

<u>Cropping:</u> Large-scale commercial plantings of grains, legumes and oil seeds to produce food products.

<u>Dairying:</u> Farming dairy cows for milk production.

<u>Rural Residential Development:</u> Division of rural land into smaller blocks for urban homes and rural living.

The project is being conducted by Dr. Kathryn Williams and PhD student Caroline Dunn from the School of Resource Management, University of Melbourne, and by Prue Borschmann from the Department of Primary Industries.



Project Funding

The project is funded by the following organizations: Central Victorian Farm Plantations, Cooperative Research Centre for Forestry, Corangamite Catchment Management Authority, Forest and Wood Products Australia and Development Corporation, Glenelg Shire Council, Glenelg Hopkins Catchment Management Authority, Green Triangle Regional Plantation Committee, Moyne Shire Council, Southern Grampians Shire Council, Victorian Government Department of Primary Industries, and Wattle Range Council.

How am I being asked to contribute?

In this part of the study we are asking people aged 18-45 to complete a brief interview regarding their views on land use change. We are also interested in the views of people aged 45+, but earlier research has already provided insight into the views of these people.

The interview will take no more than five minutes.

How will my confidentiality be protected?

This project is part of a major project to evaluate socio-economic impacts of land use change in the Green Triangle and Central Victoria region. The project has been approved by the University's Human Research Ethics Committee. Participation in this study is completely voluntary. If you want to withdraw from the study at any stage, or withdraw any unprocessed data you have supplied, you are free to do so. The questionnaire will not ask for information that could identify you personally and the results of this study will be reported as group data only. Responses will be stored securely and computer files password protected. The data will be kept securely for five years from the date of publication, before being destroyed.

A summary of the findings of this research will be available to you by contacting researchers at the School of Resource Management.

For more information, or if you have any concerns, please contact the researchers or the Human Research Ethics Committee.

Contact Details

If you require any further information about this research please contact the researchers using the contact details below:

Research Team
School of Resource Management
The University of Melbourne
500 Yarra Boulevard
Richmond 3121
Phone: - (03)9250 6800
Email:
kjhw@unimelb.edu.au (Kathryn Williams)
c.dunn5@pgrad.unimelb.edu.au (Caroline Dunn)

Human Research Ethics Committee
The University of Melbourne
Parkville 3010
Phone: (03) 8344 2073
Fax: (03) 9347 6739
University Ethics Research Application No. 0710160.1
Title: Survey of Resident Views on Land use change in the Green Triangle and Central Victoria.

DATE: LOCATION of interview: INTERVIEWER:

Approach:

Hi I am a researcher from The University of Melbourne. We are in the region this week to interview people aged 18-45 about their views on land use change. I am wondering if I could ask you a few questions about your views. It will take no more than 5 minutes. If you answer the questions you can enter a draw to win an Ipod. [HAND BLUE SHEET Plain Language Statement] **This provides some information about the project.**

ELIGIBILITY CHECK

First I need to check whether you fit the target group of this survey:
Are you aged between 18 and 45?
The map on the blue sheet shows the area we are interested in. Do you live in this region?
If yes to both questions, proceed with interview. If not, thank them for their time.

INTERVIEW

This interview is about your views on four land uses. The four land uses we are interested in are described on the blue sheet. [show card and allow to read or read out for them]

---

1. **Thinking about the areas close to where you live, over the past 10-15 years do you think the area of land being used for <u>blue gums plantations</u> has increased, decreased or remained unchanged?**
   ☐ INCREASED ☐ DECREASED ☐ REMAINED UNCHANGED ☐ DON'T KNOW

2. **…. Do you think the area of land being used for <u>cropping</u> has increased, decreased or remained unchanged?**
   ☐ INCREASED ☐ DECREASED ☐ REMAINED UNCHANGED ☐ DON'T KNOW

3. **… Do you think the area of land being used for <u>dairying</u> has increased, decreased or remained unchanged?**
   ☐ INCREASED ☐ DECREASED ☐ REMAINED UNCHANGED ☐ DON'T KNOW

4. **… Do you think the area of land being used for <u>rural residential development</u> has increased, decreased or remained unchanged?**
   ☐ INCREASED ☐ DECREASED ☐ REMAINED UNCHANGED ☐ DON'T KNOW

5. **The next questions are about your views on whether these land uses are good for small towns and rural areas. Would you agree or disagree with the following statement?**

"An increase in <u>blue gum plantations</u> is good for small towns and rural areas in this region". Would you:
☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

6. **Would you agree or disagree with the following statement?**
"An increase in <u>cropping</u> is good for small towns and rural areas in this region".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

7. **Would you agree or disagree with the following statement?**
"An increase in <u>dairying</u> is good for small towns and rural areas in this region".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

8. **Would you agree or disagree with the following statement?**
"An increase in <u>rural residential development</u> is good for small towns and rural areas in this region".
☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE☐ DON"T KNOW

9. **The next questions are about your views on whether the land uses are good for regional centres such as Mt Gambier, Warrnambool and Horsham. Would you agree or disagree with the following statement?**
"An increase in <u>blue gum plantations</u> is good for regional centres in this area".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

10. **Would you agree or disagree with the following statement?**
"An increase in <u>cropping</u> is good for regional centres in this area".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

11. **Would you agree or disagree with the following statement?**
"An increase in <u>dairying</u> is good for regional centres in this area".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

12. **Would you agree or disagree with the following statement?**
"An increase in <u>rural residential development</u> is good for regional centres in this area".

☐ AGREE ☐ DISAGREE ☐ NEITHER AGREE OR DISAGREE ☐ DON"T KNOW

13. **Thinking about land use change in general, how strong are your views are on this topic? Would you say**

☐ NOT STRONG, ☐ QUITE STRONG, OR ☐ EXTREMELY STRONG

14. **How strong your views about blue gum plantations? Would you say**

☐ NOT STRONG ☐ QUITE STRONG OR ☐ EXTREMELY STRONG

15. **How strong your views about cropping? Would you say**

☐ NOT STRONG ☐ QUITE STRONG OR ☐ EXTREMELY STRONG

16. **How strong your views about dairying? Would you say**

☐ NOT STRONG ☐ QUITE STRONG OR ☐ EXTREMELY STRONG

17. **How strong your views about rural residential development? Would you say**

☐ NOT STRONG ☐ QUITE STRONG OR ☐ EXTREMELY STRONG

Can I please have a little information about you to help us in describing the kinds of people who participated in this survey:
Which age group best describes you:

☐ 18-24 ☐ 25-34 OR ☐ 35-45

14. *Tick one box – do not ask*

☐ Male ☐ Female

15. **How long have you lived in this region? (ASK as open question and then guide to =category)**

☐ Less than 5 years ☐ 5-10 years ☐ 11-20 years, OR ☐ more than 20 years

Do you live in a township or on a property outside a town?

☐ Town **Which town?** _____ ☐ Outside a town **Which locality?** _____

THANKYOU FOR YOUR HELP

Appendix 3: Sample details

Survey 1

Response rate

The response rate in Survey 1 was lower than expected given the resources dedicated to maximising response rate. This may simply reflect international trends in non-response (de Leeuw and de Heer 2002), but a number of other factors in the sampling and survey management may help explain the lower than anticipated response. These are:

- Lower than expected quality of sampling frame. It was expected that the data matching process would avoid the likelihood of deceased and outdated addresses, however this was not achieved at the expected levels (expected level of non-contact 5 per cent, compared with 9 per cent based on return to sender and notification that contact was deceased or moved away);
- The data matching process used to ensure contact was a valid address biased the sample toward longer term residents. This may have contributed to low response rates due to elderly or invalid contacts;
- At the first mail out of the questionnaire an error by the distribution company meant that an incorrect return date was printed on the cover letter. This meant many people were asked to return the questionnaire in an unreasonably short time period, and may have also discouraged questionnaire return.

Around 8 per cent of non-respondents (146 people) contacted the researchers to withdraw from the study. Table A1 summarises the reasons given. Being elderly or invalid was the most common reason for requesting withdrawal from the study.

Table A1: Reasons given for withdrawal from survey: Survey 1

Reason given for withdrawal from survey	Frequency
No reason provided	74
Elderly or invalid	46
Deceased	35
Preferred to answer on phone	1
Away from area temporarily	6
Not interested/Not 'qualified'/ No time	22
Moved from area	5
Non English speaking	3
Concerned about biased questions	2
Total	**146**

Participant characteristics

Respondent characteristics were compared with known population parameters. Respondents were more likely to be male, older and residents of regional centres than the population of interest.

The percentage of males in the sample was higher than in the population of interest (Table A2). This is likely to reflect the make up of the telephone listings, which were often under the name of the male adult in shared households.

Table A2: Sex of respondents, sample and population: Survey 1

	Frequency	Per cent	Sample per cent	Target*
Male	542	60.3%	61.7%	49%
Female	337	37.5%	38.3%	51%
Total	879	97.8%		
Missing	20	2.2%		
Total	**899**			

- * Percentage within population of interest based on Australian Bureau of Statistics 2006 Census

Younger age groups are underrepresented in the sample (Table A3). This is likely to be an outcome of the sampling process (bias towards longer term residents also biases toward older residents) but is also consistent with wider reports of lower response rates among younger cohorts.

Table A3: Age of respondents, sample and population: Survey 1

Age	Frequency	Per cent	Sample per cent	Target*
18–24 years	2	.2%	.2%	11%
25–34 years	47	5.2%	5.3%	16%
35–44 years	123	13.7%	13.8%	21%
45–54 years	209	23.2%	23.4%	22%
55–64 years	211	23.5%	23.7%	18%
65–74 years	164	18.2%	18.4%	12%
75+ years	136	15.1%	15.2%	11%
Total	892	99.2%	100.0%	
Missing	7	.8%		
Total	**899**			

- *Percentage within population of interest based on Australian Bureau of Statistics 2006 Census

Respondents in Survey 1 were more often residents of regional centres than would be expected from a random sample of the population of interest. This includes residents of towns with a population of greater than 10,000: Colac, Horsham, Hamilton, Mt Gambier, Portland and Warrnambool (Table A4).

Table A4: Residence of respondents, regional centres and small towns or rural areas: Survey 1

Respondent place of residence	Frequency	Sample per cent	Target*
Regional centres	512	62%	54%
Small towns/rural areas	311	38%	46%
Missing data	76		
Total	**899**		

- * Percentage within population of interest based on Australian Bureau of Statistics 2006 Census

Respondents can also be characterised with regard to length of residence in the region, economic dependence on property, and association with land use industries.

The majority of respondents had lived within their region for a number of years, with over 90% of respondents reported living in the region for at least 11 years (Table A5). Of these, more than three-quarters of the sample (75.8%) had lived in the region for more than 20 years.

Table A5: Length of residence in region: Survey 1

Age	Length of residence							
	Less than 5 years		5–10 years		11–20 years		More than 20 years	
	Count	Per cent	Count	Per cent	Count	Per cent	Count	Per cent
18–24 years	0	0%	0	0%	2	100%	0	0%
25–34 years	1	2.1%	6	12.8%	4	8.5%	36	76.6%
35–44 years	2	1.6%	21	17.1%	32	26.0%	68	55.3%
45–54 years	2	1.0%	19	9.1%	39	18.7%	149	71.3%
55–64 years	1	.5%	18	8.6%	18	8.6%	173	82.4%
65–74 years	4	2.5%	9	5.5%	22	13.5%	128	78.5%
75+ years	1	0.7%	4	3.0%	10	7.5%	119	88.8%
Total	**11**		**77**		**127**		**673**	

Respondents who were rural property owners were asked to indicate their reliance on income derived from their property. Consistent with the higher proportion of respondents living in regional centres, less than half of the sample (40 per cent) responded to this question. Of those responding, only a small proportion (11.7 per cent) of respondents reported relying on income derived from their property as their main source of income (Table A6). The majority of respondents to this question (65.2 per cent) derived no income from their property.

Table A6: Income from property: Survey 1

	Frequency	Per cent	Per cent of those responding to question
No income from property	240	26.7%	65.2%
Not main source of income	85	9.5%	23.1%
Income from property is main source of income	43	4.8%	11.7%
Total	368	40.9%	100.0%
*Not applicable	531	59.1%	
Total	**899**		

- * Did not respond/Not rural property owners

Respondents were asked if they had any personal or professional association with any of the land uses in the survey. Just over 40 per cent or respondents responded to this question. Of those responding, associations with three of the land uses, cropping, dairying and rural residential development, was fairly evenly spread (Table A7). The most frequent association was with rural residential development. Only 16 per cent of respondents to this question indicated having any association with blue gum plantations.

Table A7: Personal or professional association with land uses: Survey 1

Land use	Frequency	Per cent
Blue gum plantations (n=431)	69	16.0%
Cropping (n=431)	104	24.1%
Dairying (n=430)	116	27.0%
Rural residential development (n=429)	122	28.4%
Total	**411**	

Survey 2

A total of 414 surveys were completed. Sampling was effective in capturing the desired balance of 18–45 year olds within regional centres and small towns/rural centres, corresponding to expected proportions by around 2 per cent (Table A8).

Table A8: Sample details by place of residence (regional centre and small town/rural area): Survey 2

Respondent place of residence	Frequency	Valid per cent	Target*
Regional centres	196	47.3%	49.2%
Small towns/rural areas	218	52.7%	51.0%
Total	414		

- * Percentage within population of interest based on Australian Bureau of Statistics 2006 Census

The percentage of females in the sample was slightly higher than males, although gender break up of the sample corresponded (within 2 per cent) to that within the total population (all age groups, not just ages 18–44 years) (Table A9).

Table A9: Sex of respondents: Survey 2

		Frequency	Per cent	Valid Per cent	Target*
Valid	Male	193	46.6%	46.7%	49%
	Female	220	53.1%	53.3%	51%
	Total	413	99.8%	100.0%	
Missing	Missing	1	.2%		
Total		414			

- * Percentage within population of interest (aged 18 – 44 years) based on Australian Bureau of Statistics 2006 Census

While all three age groups were generally well represented within the sample, the age group 18–24 years was slightly underrepresented (by 6 per cent), while the two older age groups, 25–34 years and 35–45 years, were overrepresented (by 2 per cent and 4 per cent respectively) (Table A10).

Table A10: Respondents by age group: Survey 2

Age	Frequency	Per cent	Valid Per cent	Target*)
18 –24 years	120	29.0%	29.0%	22.9%
25 –34 years	130	31.4%	31.4%	33.3%
35 –45 years	164	39.6%	39.6%	43.8%
Total	414			

- * Percentage within population of interest (aged 18 – 44 years) based on Australian Bureau of Statistics 2006 Census

Respondents in the second survey were less likely to have lived in the study region for a long period of time than respondents in the first survey. Less than half (45.9 per cent) of the respondents in the second survey reported living within their region for more than 20 years, compared to just over three-quarters (75.4 per cent) of respondents in the first survey reporting having lived within their region for over 20 years (Table A11). The younger age group represented in the second survey were more likely to have arrived in their region fairly recently, with 17 per cent of respondents in the second survey reporting having lived in their region for less than five years, compared to only 1.3 per cent of respondents in the first survey. Respondents in the first survey living in regional centres were more than twice as likely to have lived within the region for over 20 years as respondents living in regional centres in the second survey.

Table A11: Time lived in region by place of residence: Survey 1 and Survey 2

		Time lived in region							
	Respondent place of residence	Less than 5 years		5-10 years		11–20 years		More than 20 years	
		Count	Per cent	Count	Per cent	Count	Per cent	Count	Per cent
Survey 1	Regional centre (n=505)	1	0.1%	27	3.3%	63	7.6%	414	50.1%
	Small town/rural area (n=321)	10	1.2%	43	5.2%	59	7.1%	209	25.3%
	Total	**11**	**1.3%**	**70**	**8.5%**	**122**	**14.8%**	**623**	**75.4%**
Survey 2	Regional centre (n=196)	40	9.7%	28	6.8%	44	10.6%	84	20.3%
	Small town/rural area (n=218)	32	7.7%	32	7.7%	48	11.6%	106	25.6%
	Total	**72**	**17.4%**	**60**	**14.5%**	**92**	**22.2%**	**190**	**45.9%**

Appendix 4: Details of principal components analysis and regression analysis

Principal components analysis

Principal components analysis was used to explore the structure of the beliefs about impacts. The correlations between variables suggested there was sufficient correlation between specific impact beliefs to be a useful candidate for principal components or factor analysis. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy for the data is 0.84. Bartlett's test of sphericity indicates significant likelihood of correlations between variables. Both indicators suggest the data is suitable for factor analysis, which might be in part due to the large sample size.

Both the eigenvalues and a scree test indicated that two components should be extracted. These two components accounted for 48 per cent of the variance. This is a modest amount of variation accounted for. Given the purpose of the analysis is primarily exploratory, it is considered adequate. The components were then rotated, using varimax rotation. The rotated component matrix is shown in Table A12.

Table A12: Rotated component matrix, beliefs about impacts of blue gum plantations

Impact belief	Component	
	1	2
Population of regional centres	.667	.084
Population small towns and rural areas	.753	–.023
Involvement in community groups	.760	–.093
Chemical risk	–.059	.612
Native vegetation	.375	–.297
Jobs in regional centres	.808	.033
Jobs in small towns and rural areas	.800	–.045
Water availability	.124	–.559
Damage to roads	.168	.697
Risk of wildfire	–.010	.684
Damage to soil	–.052	.505
Region economy	.718	–.064
Business for local shops and traders	.781	–.104

Extraction method: principal component analysis
Rotation method: Varimax with Kaiser normalization
Rotation converged in three iterations

Regression analysis

Correlations suggest that the two belief factors and the importance to society of blue gum plantation products may be the most important factors underlying people's overall attitude to blue gum plantations. A linear multiple regression analysis was carried out with these three variables as independent variables. The regression explained 47 per cent of the variance in people's attitudes. The summary data for this regression is provided below.

Model summary

Model	R	R square	Adjusted R square	Std error of the estimate
1	.690(a)	.476	.474	1.060

a Predictors: (Constant), Social import BG, Factor score Belief component 2, Factor score Belief component 1

ANOVA(b)

Model		Sum of squares	df	Mean square	F	Sig.
1	Regression	756.235	3	252.078	224.517	.000(a)
	Residual	833.085	742	1.123		
	Total	1589.320	745			

a Predictors: (Constant), Social import BG, Factor score Belief component 2, Factor score Belief component 1
b Dependent Variable: Att BG overall impact

Coefficients(a)

Model		Unstandardised coefficients		Standardised coefficients	t	Sig.
		B	Std error	Beta		
1	(Constant)	1.827	.106		17.271	.000
	Factor score Belief component 1	.704	.042	.488	16.588	.000
	Factor score Belief component 2	–.256	.040	–.176	–6.423	.000
	Social import BG	.309	.034	.276	9.172	.000