



**Australian Government**

**Bureau of Rural Sciences**

# **Benchmarking community attitudes towards natural resource management in the Lachlan Catchment**

---

Ian Byron, Allan Curtis and Jacinta MacKay



**Natural Heritage Trust**

*Helping Communities Helping Australia*

An Australian Government Initiative



**Lachlan**

**CMA** CATCHMENT MANAGEMENT AUTHORITY

© Commonwealth of Australia 2006

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Commonwealth available from the Department of Communications, Information Technology and the Arts. Requests and inquiries concerning reproduction and rights should be addressed to the Commonwealth Copyright Administration, Intellectual Property Branch, Department of Communications, Information Technology and the Arts, GPO Box 2154, Canberra ACT 2601 or at <http://www.dcita.gov.au/cca>.

The Commonwealth of Australia acting through the Bureau of Rural Sciences has exercised due care and skill in the preparation and compilation of the information and data set out in this publication. Notwithstanding, the Bureau of Rural Sciences, its employees and advisers disclaim all liability, including liability for negligence, for any loss, damage, injury, expense or cost incurred by any person as a result of accessing, using or relying upon any of the information or data set out in this publication to the maximum extent permitted by law.

Postal address:  
Bureau of Rural Sciences  
GPO Box 858  
Canberra, ACT 2601

Email: [salesbrs@brs.gov.au](mailto:salesbrs@brs.gov.au)

Internet: <http://www.brs.gov.au>

# Acknowledgements

---

The authors would like to thank Peter Sparkes for his important contributions to this work as project leader for the Lachlan CMB/CMA.

We would also like to thank the Steering Committee that guided the project and provided important feedback. Steering Committee members were: Robert Gledhill (Lachlan CMB), Robert Drury (Environmental Consultant), Nick Rigby (National Parks and Wildlife Service), Peter Sparkes (Lachlan CMA), John Johnston (local landholder), Belinda Shannon (Community Support Officer), and Kaara Kleeper (NSW Agriculture).

Many thanks to the following local landholders for participating in the survey pre-test workshops and their important contribution to the development of the survey instrument: Kerry Russell (Monteagle), Jenny Bryant (Cowra), Colin Kerr (Bribbaree), Paul Magee (Boorowa), David Hilhorst (Boorowa), Ken Keith (Parkes), Helen Vere (Parkes), Laurel Hull (Forbes), Grant Dunn (Mandagery), Bill Archer (Parkes), Eric Horsburgh (Condobolin), Andy Leo (Tullamore), Margaret Geeves (Condobolin), and Karen Ridley (Condobolin).

Staff from the following local governments also provided valuable support in preparing the mailing list for this research project: Bland, Blaney, Cowra, Crookwell, Forbes, Gunning, Oberon, Parkes, and Young.

We would also like to acknowledge Sarah Shelly and David Marsh for their considered and constructive feedback in reviewing an earlier version of this report.

Finally we would like to thank all the landholders who took the time to complete the survey.

## List of acronyms

ABS – Australian Bureau of Statistics

BRS – Bureau of Rural Sciences

CMA – Catchment Management Authority

CRP – Current Recommended Practices

GIS – Geographic Information System

LCMB – Lachlan Catchment Management Board

NHT – Natural Heritage Trust

NRM – Natural Resource Management

# Executive summary

---

## Introduction

This report presents a summary of key findings from a mailed survey to 1000 landholders in the Lachlan Catchment in 2003. The survey focussed on gathering base-line information regarding the key social and economic factors affecting landholder decision-making about the adoption of practices expected to improve the management of natural resources in the Lachlan Catchment.

## Assessment of issues

Social issues such as the availability of important services, decline of small towns and reduced employment opportunities were rated amongst the most important issues affecting respondents' local district. The cost of managing weeds and pest animals was the highest rated natural resource management issue with two thirds of respondents reporting this was an important issue in their district.

The majority of respondents also said that the right to harvest or purchase water for agriculture was an important issue.

Despite being identified as priority issues in the Lachlan Catchment Blueprint, dryland salinity, removal of native vegetation, water quality and lack of awareness about Aboriginal cultural heritage were not rated as important issues by most landholders.

While targeted education and awareness raising activities may help raise the profile of natural resource management issues, efforts to engage landholders in the Lachlan Catchment should draw on innovative approaches that not only outline the environmental and/or economic advantages of new practices and production systems but highlight links to the social wellbeing of rural communities.

## Values attached to property

Survey findings highlighted that respondents attached a very wide range of social, environmental, and economic values to their property.

Lifestyle values such as providing the lifestyle respondents wanted, being an attractive place to live, being a great place to raise a family, the freedom of being self employed, and being part of a rural community were amongst the highest rated values of respondents' properties.

Landholders in the Lachlan Catchment also appeared to have a land stewardship ethic with the vast majority of respondents indicating that being able to pass the property on in better condition and contributing to the environmental health of the region were important values they attached to their property.

Most respondents also said that building/maintaining a viable business, providing most of the household income, and being an asset that will fund retirement were important aspects of their property.

Attempts to appeal to landholders in the Lachlan Catchment region need to consider the broad range of social, economic and environmental values attached to property. In particular there needs to be careful consideration about the potential impacts to landholders' lifestyle when promoting or developing natural resource management practices and strategies. Even where

actions can be demonstrated to be economically rational and/or environmentally friendly, they are less likely to be implemented if they are perceived as having an adverse impact on the desired lifestyle of landholders. On the other hand, where practices are perceived as not adversely impacting lifestyle, or in fact actually improving it, as well as providing environmental and economic benefits, the chance of generating support for that practice is likely to be greatly increased.

## **Knowledge**

There was only one natural resource management topic where at least half of the respondents said they had sound knowledge. That topic was the benefits of ground cover on grazing and cropping paddocks to maintain or improve soil health.

Respondents reported more moderate knowledge about the benefits of ley pasture and crop rotation, ability of perennial vegetation to prevent rising water tables, how to recognise salinity, how to interpret soil test results, and the effects of unrestricted stock access on waterways and native vegetation

The survey highlighted limited knowledge about Aboriginal land management activities, who to contact for advice about managing Aboriginal cultural heritage sites, the major priorities/targets of the LCMB, links between soil acidity and dryland salinity, area affected by salinity, value of woody debris in rivers/streams, and how to identify sodic soils.

Low levels of knowledge about many natural resource management issues appear to be explained by the earlier finding that most landholders were not highly concerned about the impact of these issues. Education and awareness raising activities should attempt to provide more convincing evidence of the current and potential risks and the need to undertake mitigating action before a crisis point is reached. These activities should also highlight the benefits of remedial action across the broad range of social, economic and environmental values.

## **Attitudes towards natural resource management**

Overall survey data highlighted very positive attitudes across a range of natural resource management topics. While acknowledging a wide range of issues, most respondents were confident that action at the property level could improve the environmental health of the district.

Most respondents said they thought landholders should be paid for providing environmental services. At the same time, respondents in Lachlan Catchment also appeared willing to make a significant individual contribution with over half of all respondents agreeing that a short-term loss in production could be justified by long-term improvements to the environment.

## **Interest in revegetation incentives**

Almost half of all respondents said they would be likely to apply for revegetation incentives that included stronger cost-sharing to establish native species or actively manage remnants.

Estimates provided by landholder suggested that stronger cost sharing would allow the establishment of 16,120 ha of trees and shrubs and the management of 32,557 ha of remnants covering approximately 7% of the area surveyed.

## **Stage of life and long-term plans**

The average age of landholders in the Lachlan Catchment was 51 years. The common perception that age represents an important barrier to the adoption of improved practices was not supported by survey findings in the Lachlan Catchment.

Most respondents said it was likely that they would continue to live on their property and that ownership of the property was likely to stay within the family.

Over a third of respondents said that their long-term plans were likely to involve expanding the area of land they managed. These respondents already owned/managed significantly larger properties than other respondents. At the same time, less than one third of respondents said that they were likely to sell or lease all or most of their property in the long-term.

Of those properties that are likely to be sold, the median year that the transfer was likely to occur was 2010. The median year of likely transfer for all properties surveyed was 2018 with 38% likely to change hands in the next decade.

## **Involvement in planning processes**

Just under half of all respondents were involved in property planning and less than one fifth had a completed or on-going property plan. Larger property owners were more likely to be involved or further advanced in property planning.

In contrast, over three quarters of respondents said they had a plan or vision about the improvements they would like to make on their property, and over a quarter of these respondents said they were well advanced in implementing those changes on their property.

Despite the finding that most landholders said ownership of their property was likely to stay within the family, most respondents had not begun to plan the transfer of their property to the next generation. However, it is encouraging to note that those who said ownership of the property was likely to remain in the family were significantly more likely to have started to plan, yet even just under half of these respondents had not started the planning process.

On-going promotion and greater support to assist landholders to implement plans appears likely to facilitate greater uptake of property and succession planning in the future. In particular, there appears to be a need for greater attention to promoting and supporting property planning with managers of smaller properties.

## **Involvement in government funded programs**

This research highlighted that the vast majority of landholder in the Lachlan Catchment had not had work undertaken on their property in the past five years that was at least partially funded by government programs.

Just under a third of respondents said they were currently a member of a Landcare group and less than 10% were a member of a local TopCrop or other best management practice group.

## **Property size and farming as an occupation**

The median property size for landholders surveyed in the Lachlan Catchment was 319 ha. Only 13% of respondents owned or managed a property of at least 2,000 ha, yet this small group of respondents managed over three quarters of the total area surveyed. Fifty-nine percent of respondents said that farming was their primary occupation and these respondents managed approximately 92% of the total area surveyed.

## **Levels of income and property equity**

Just over half of all respondents in the Lachlan Catchment made an on-property profit for the 2001/2002 financial year and the average on-property income was \$22,000.

Almost three quarters of respondents reported an off-property profit for the 2001/2002 financial year and the average total household income for all respondents was \$49,000. Less than half of respondents reported a combined income in excess of the \$50,000 threshold considered necessary to maintain the natural and capital assets of a property (Rendell *et al.* 1996). The combined total household income for all respondents was approximately \$20 million. Of this, off-property income was just over \$11 million or 54% of the total income for the 2001/2002 financial year.

## **Constraints to change**

Responses to the mail survey highlighted a wide range of economic, environmental and social constraints likely to influence landholder decision making about changing management practices on their property. At least three quarters of respondents said that cash flow, suitability of soils, cost of machinery and the existence of long-term markets were or would be important constraints to changing management practices on their property.

Water storage capacity and access to on-going professional advice were also among a range of other factors considered important by the majority of respondents.

The only two factors that were not considered important factors influencing respondents' decision making about changing management practices were: there not being many people undertaking the new practice in the district, and the returns available from off-property investments.

## **Adoption of current recommended practices (CRP)**

Survey data highlighted encouraging levels of adoption for many CRP. Over half of all respondents (with the relevant land use/enterprise) had adopted the CRP only watered stock from a trough or tank, conducted pest animal and non-crop weed control, cropped using a rotation with ley pasture, used minimum tillage, planted trees and shrubs, and sown perennial pasture.

Only three CRP were adopted by less than 40% of respondents (with the relevant land use/enterprise): fenced waterways to manage stock access, fenced to manage stock access to native bush, and used low pressure overhead or drip irrigation systems.

## **Confidence in CRP**

Survey questions exploring the efficacy of CRP provided some mixed results. The majority of survey respondents agreed that fencing waterways was an important part of the work required to revegetate these areas. At the same time, some respondents also acknowledged that fencing makes these areas more difficult to manage.

Just under half of all respondents indicated that the time and expense of watering stock off-stream was justified by improvements in bank stability and water quality.

There was less certainty regarding the benefits and costs of stubble retention, with almost half of all respondents uncertain if the benefits of stubble retention outweighed problems with disease and the difficulties/costs of seeding through stubble.

Only a small minority of respondents said they were confident with the scientific advice that 30% of their region needs to be under native vegetation.

### **Differences across survey sub-regions**

This project used four survey sub-regions to explore the variation in landholders' natural resource management attitudes and practices across the Lachlan Catchment. Analyses across these survey sub-regions highlighted considerable differences and reinforce the need to incorporate sub-regional differences in catchment planning and management activities. Differences between landholders from the survey sub-regions included:

- property size;
- occupation;
- on-property profitability;
- perceived importance of issues;
- values attached to property;
- knowledge about natural resource management;
- factors affecting their decision making about changing management practices;
- membership of a TopCrop group;
- Succession planning;
- adoption of CRP; and
- Confidence in CRP

# Contents

---

<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. REPORT STRUCTURE .....</b>	<b>2</b>
<b>3. BACKGROUND.....</b>	<b>3</b>
<b>4. METHODOLOGY .....</b>	<b>5</b>
Background to this research.....	5
Need to conduct the survey.....	7
Topics and questions included in the mail survey .....	8
Current Recommended Practices (CRP) .....	8
The mail survey process.....	9
Data Analysis .....	11
Limitations of this research.....	13
<b>5. FINDINGS BY RESEARCH TOPIC.....</b>	<b>14</b>
Assessment of issues .....	14
Landholder perception of salinity .....	18
Values attached to property .....	19
Knowledge.....	22
Attitudes towards natural resource management .....	24
Interest in revegetation incentives .....	27
Stage of life and long term plans.....	29
Involvement in planning processes .....	34
Involvement in government funded programs .....	38
Property size and farming as an occupation .....	40
Land use and enterprise mix .....	47
Constraints to change.....	50
Adoption of current recommended practices .....	53
Confidence in CRP .....	63
Other social and demographic variables.....	66
<b>DIFFERENCES BETWEEN FARMERS AND NON-FARMERS.....</b>	<b>67</b>
<b>CONCLUSIONS AND IMPLICATIONS .....</b>	<b>74</b>
<b>REFERENCES .....</b>	<b>77</b>
<b>APPENDIX 1 – DIFFERENCES ACROSS SURVEY SUB-REGIONS .....</b>	<b>79</b>
<b>APPENDIX 2 – DIFFERENCES BETWEEN LANDHOLDER WITH PROPERTIES OVER 2,000 HA AND ALL OTHER RESPONDENTS .....</b>	<b>81</b>

## List of figures and tables

---

FIGURE 1: SURVEY AREA .....	3
FIGURE 2: SURVEY SUB-REGIONS .....	4
FIGURE 3 - SURVEY RESPONSE RATE .....	10
FIGURE 4 – ASSESSMENT OF ISSUES AFFECTING THE DISTRICT.....	16
FIGURE 5 – ASSESSMENT OF ISSUES AFFECTING RESPONDENTS’ PROPERTY .....	17
FIGURE 6 – RESPONDENTS’ ASSESSMENT OF SALINITY ACROSS SUB-CATCHMENTS .....	18
FIGURE 7 – VALUES ATTACHED TO PROPERTY .....	21
FIGURE 8 – KNOWLEDGE ABOUT NATURAL RESOURCE MANAGEMENT .....	24
FIGURE 9 – ATTITUDES TOWARDS NATURAL RESOURCE MANAGEMENT .....	27
FIGURE 10 – INTEREST IN REVEGETATION INCENTIVES .....	28
FIGURE 11 – LONG-TERM PLANS.....	32
FIGURE 12 – PROPERTY TRANSFER.....	34
FIGURE 13 – INVOLVEMENT IN PROPERTY PLANNING .....	35
FIGURE 14 – LONG TERM PLAN OR VISION FOR IMPROVEMENTS TO PROPERTY ....	36
FIGURE 15 – INVOLVEMENT IN SUCCESSION PLANNING .....	38
FIGURE 16: MEDIAN PROPERTY SIZE ACROSS SUB-CATCHMENTS.....	41
FIGURE 17: FARMEING AS PRIMARY OCCUPATION ACROSS SUB-CATCHMENTS .....	43
FIGURE 18 – LEVEL OF EQUITY .....	47
FIGURE 19 – PPOPORTION OF REPSONDENTS WITH LANDUSES/ENTERPRISES .....	49
FIGURE 20 – CONSTRAINTS TO ADOPTING NEW LAND MANAGEMENT PRACTICES .	52
FIGURE 21 – CONFIDENCE IN CURRENT RECOMMENDED PRACTICES .....	65
TABLE 1: PLANS TO INCREASE OR SELL LAND HOLDINGS ACROSS SURVEY SUB-REGIONS .....	30
TABLE 2: PROPORTION OF RESPONDENTS BY PROPERTY SIZE FOR EACH SUB-CATCHMENT .....	42
TABLE 3: LANDHOLDER OCCUPATIONS.....	44
TABLE 4: ADOPTION OF CURRENT RECOMMENDED PRACTICES.....	59
TABLE 5: ADOPTION OF CURRENT RECOMMENDED PRACTICES ACROSS SURVEY SUB-REGIONS.....	60
TABLE 6: PERCEPTION OF ISSUES ON PROPERTY BY FARMER/NON-FARMER .....	67
TABLE 7: PERCEPTION OF ISSUES IN REGION BY FARMER/NON-FARMER.....	68
TABLE 8: VALUES ATTACHED TO PROPERTY BY FARMER/NON-FARMER .....	69
TABLE 9: LONG-TERM PLAN BY FARMER/NON-FARMER.....	69
TABLE 10: ATTITUDES TO NRM BY FARMER/NON-FARMER .....	70
TABLE 11: KNOWLEDGE ABOUT NRM BY FARMER/NON-FARMER .....	71
TABLE 12: CONSTRAINTS TO CHANGE BY FARMER/NON-FARMER .....	72
TABLE 13: BACKGROUND SOCIO-ECONOMIC DATA BY FARMER/NON-FARMER .....	73

# 1. Introduction

---

## Research context

This report presents a summary of key findings from a mail survey of 1000 landholders in the Lachlan Catchment in 2003. The survey focussed on gathering base-line information on the key social and economic factors affecting landholder decisions about the adoption of practices expected to improve the management of natural resources in the Lachlan Catchment.

This project drew heavily on the methodology of similar projects completed in the Goulburn Broken Dryland in 1999 (Curtis *et al.* 2000), the Ovens Catchment in 2001 (Curtis *et al.* 2002) and the Wimmera region in 2002 (Curtis and Byron 2002). The Lachlan Catchment Management Board (LCMB) and the Bureau of Rural Sciences (BRS) were key project partners. Funding for this project was sourced through a mix of national, state and regional programs, including the National Heritage Trust Extension (NHT).

## Research objectives

1. To provide baseline data for key social and economic conditions/trends at the Land Management Unit scale that is required for effective catchment planning (1:25,000)
2. To gain a better understanding of the limitations/barriers/constraints to the adoption of recommended practices (sustainable agriculture and biodiversity conservation).
3. To evaluate landholder attitudes towards current tools and potential alternative tools for improved land management, and predict landholder responses to a limited number of policy options.
4. To provide information that will allow assessment of NHT program outcomes across intermediate objectives (e.g. awareness of issues, knowledge, business and succession planning, confidence in recommended practices and adoption of practices, for sustainable agriculture and biodiversity conservation).
5. To be used in conjunction with parallel BRS projects to provide a national overview of key trends and NHT program outcomes.

## 2. Report structure

---

The next chapter provides some background to the Lachlan Catchment. The subsequent methodology chapter includes a summary of the literature the research team drew upon to identify the variables included in the survey. A brief description of the mail out process and the approach to data analysis is also included.

Research findings are presented in Section 5 of this report and are arranged around major topics explored in the mail survey, namely:

1. assessment of issues;
2. values attached to property;
3. knowledge;
4. attitudes towards natural resource management;
5. stage of life and long-term plans;
6. interest in a lease plan to facilitate property transfer;
7. involvement in planning process;
8. involvement in government funded programs;
9. property size and farming as an occupation;
10. levels of income and property equity;
11. land use and enterprise mix;
12. constraints to change;
13. adoption of current recommended practices (CRP); and
14. confidence in current recommended practices.

Each topic has been written so that it can be read and understood without having read previous sections of the report. To aid in helping each section stand alone there is a short summary of key findings at the beginning of each section and a box at the end that highlights any links between variables in each topic and the adoption of CRP.

Based on these findings the concluding chapter highlights key issues and strategies for efforts to improve natural resource management in the Lachlan Catchment.

### 3. Background

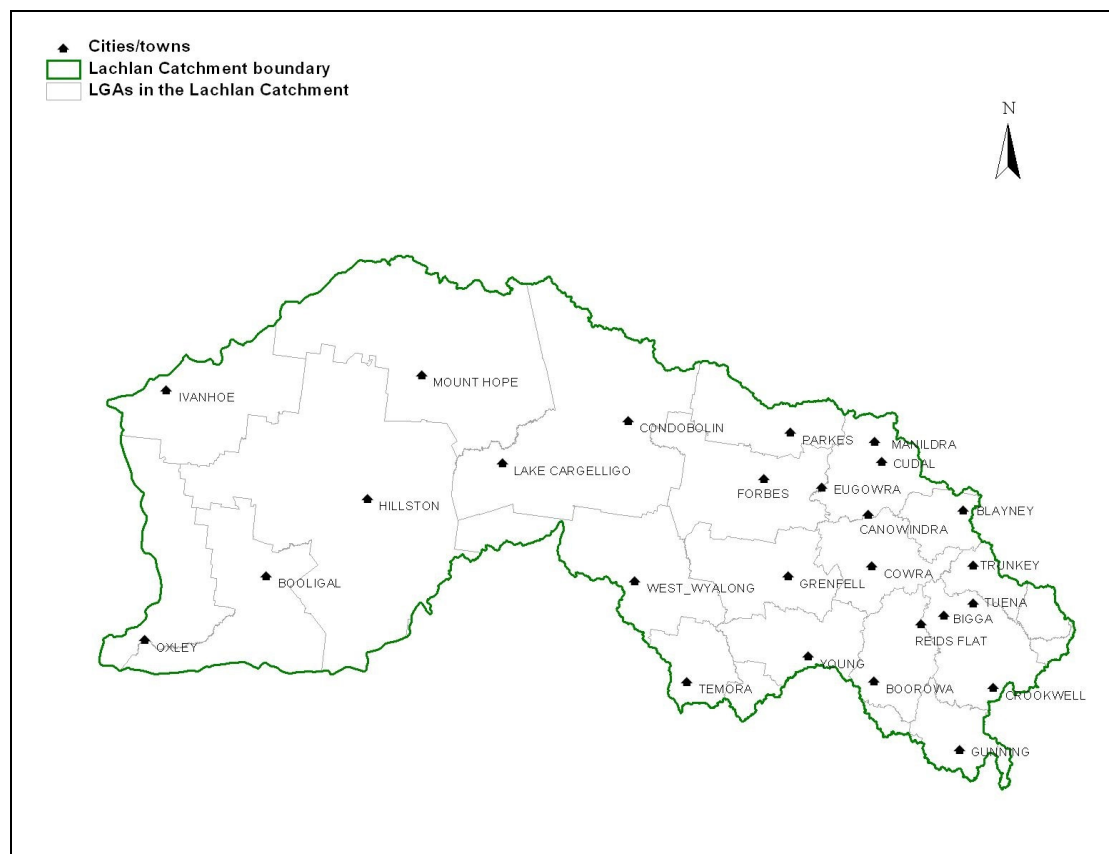
#### The location and character of the Lachlan Catchment

The Lachlan Catchment is located in central New South Wales and spans an area of almost 85,000 square kilometres (10% of the state of New South Wales) [Figure 1]. The Lachlan Catchment is characterised by great diversity ranging from sub-alpine areas in the east to semi-arid areas in the west of the catchment. The catchment has a population in excess of 100,000 people and contributes approximately 14% of annual agricultural production in New South Wales. Major agricultural enterprises include a variety of crops (both irrigated and dryland), horticulture, viticulture and grazing (LCMB 2003).

Major cities and townships in the region include Cowra, Parkes, Forbes, Condobolin, Boorowa, Gunning, Oxley and Ivanhoe.

The LCMB Catchment Blueprint identified major natural resource issues as dryland salinity, water quality, native vegetation decline, degradation of riparian areas, and declining soil health (LCMB 2003).

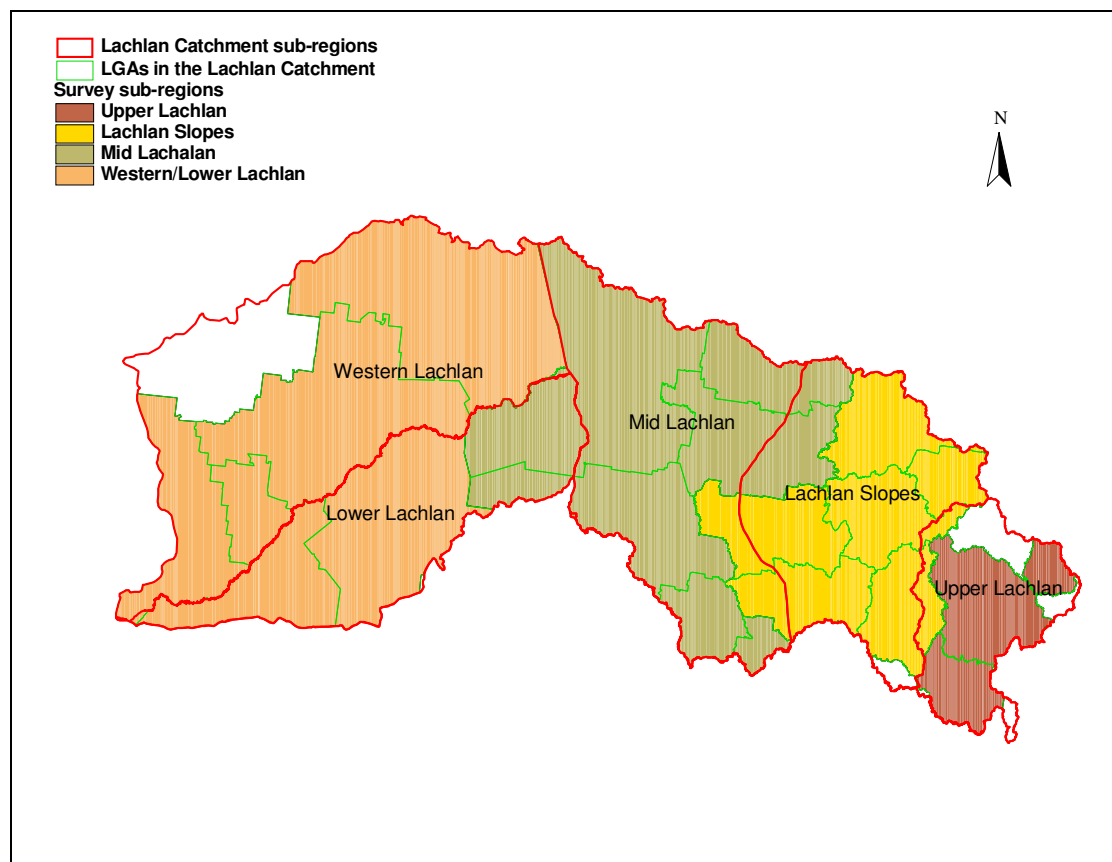
FIGURE 1: SURVEY AREA



## Survey sub-regions in the Lachlan Catchment

One of the key aims of this study was to provide some baseline information that would allow the exploration of sub-regional differences in community attitudes towards natural resource management across the Lachlan Catchment. As the survey used rural ratepayer databases held at the Shire or Statistical Local Area (SLA) level, SLA boundaries were used to identify survey sub-regions within the Lachlan Catchment. These SLA boundaries were combined on the basis of alignment with identified sub-catchment boundaries and the number of survey respondents, to form four survey sub-regions. These survey sub-regions form the basis of all analyses conducted to explore the extent of variation across the Lachlan Catchment [Figure 2].

FIGURE 2: SURVEY SUB-REGIONS



## 4. Methodology

---

### Background to this research

Catchment groups in Australia are required to develop regional plans that set out how the land, water and biodiversity of the region are to be managed. Each catchment plan is to be endorsed by State and Australian government agencies prior to their implementation. While there are State and regional differences, these catchment groups are typically asked to:

- articulate their vision and objectives (Where do we want to go?);
- describe their catchment condition and identify the key regional challenges (Where are we now?);
- explain how they will implement their strategy (How do we go forward?); and
- identify targets for the implementation of management actions and for improvements in resource condition that will enable the assessment of progress towards plan objectives (How do we know what we have achieved and learned?).

Clearly, there are opportunities for social research to play an important role at each stage of the planning phase identified above. Cavaye (2003) has recently prepared a practical guide outlining how catchment groups might integrate social and economic issues into their regional plans. Potential roles for social research could include:

- contributing to processes that capture the range of stakeholder perspectives about possible futures for catchments;
- drawing on secondary and primary data sources to describe the social structure and trends across a catchment;
- employing processes that enable stakeholders to explore potential trade-offs inherent in many resource allocation decisions across different issues and parts of a catchment;
- drawing on a range of research that would enhance the communication activities of catchment groups, the uptake of recommended practices for managing land and water degradation, and the efficacy of investment through community education;
- assisting groups to develop measures of progress that can be attributed to investments and actions undertaken through their catchment plans; and
- employing social impact assessment tools to predict and minimise the negative social impacts of proposed interventions, including changes to land use or resource access.

It is increasingly obvious that there are limits to the capacity of landholders to voluntarily affect required change at the landscape scale (Curtis 2000). Affecting behavioural change in private landholders is a complex task and experience suggests that no single instrument will address the underlying reasons for non-adoption (Vanclay 1997; Lockwood *et al.* 2002). As Dovers (1995) and Dovers and Mobbs (1997) emphasised, the challenge is to develop integrated packages that may include:

- legislation or regulations to create the institutional framework for management, set aside areas of land, and enforce standards and prohibitions;
- self regulation;

- research to clarify problems, develop solutions, and monitor environmental conditions;
- education to convince people of the need to change behaviour, gain support for policies, and ensure the ability to apply policy instruments; and
- economic measures such as charges, subsidies, penalties, and tradeable permits to assist efficient allocation of resources and equitable distribution of costs and benefits.

This research also recognised that regional catchments are, increasingly, the scale at which natural resource management occurs in Australia. As recent research in the Goulburn Broken Dryland (Curtis *et al.* 2000), Ovens Catchment (Curtis *et al.* 2002), and Wimmera Region (Curtis and Byron 2002) illustrated, there are also considerable differences at the sub-regional scale. To the extent that there are significant differences at the sub-regional scale, there will also need to be sub-regional differences in the policy mix implemented by the regional groups and other organisations (Curtis *et al.* 2001a).

Governments have assumed that, at least in part, poor adoption rates for recommended practices arose because landholders were unaware of important land degradation issues; lacked sufficient knowledge and skills; or had attitudes that emphasised short-term economic returns over maintaining the long-term health of the land (MDBC 1990; ASCC 1991). There has been a large investment of resources over the past decade in awareness raising and education programs, including those carried out by Landcare groups. There is credible evidence that these activities do contribute to increased awareness and understanding, and that these changes enhance landholder capacity to adopt recommended practices (Vanclay 1992; Curtis and De Lacy 1996; Curtis *et al.* 2001a).

Some landholders have lifestyles and values that limit their response to approaches that focus on increasing agricultural production and profit maximisation (Barr *et al.* 2000; Curtis *et al.* 2001b). Non-farmers and retirees may respond less quickly to economic signals; be more averse to risking off-property income in on-property enterprises; and will probably have less time for property management (Barr *et al.* 2000). On the other hand, non-farmers may bring new ideas, skills and financial resources that contribute to the renewal of local communities and they may be more likely to respond to appeals for biodiversity conservation (Curtis and De Lacy 1996).

There is now abundant evidence that part of the explanation of low adoption is that many of the current recommended practices or enterprises are either unprofitable and/or unsustainable. Amongst other things, some of the recommended plant-based management systems 'leak' water and contribute to ground water flows that mobilise salt (Stirzacker *et al.* 2000; Walker *et al.* 1999). Lack of confidence in recommended practices has been identified as an important constraint affecting adoption (Curtis *et al.* 2001b).

Low on-property income will constrain the capacity of landholders to respond to new opportunities. Over the past decade, many broad acre farming enterprises have been unprofitable using the FM 500 project benchmark of financial sustainability (Barr *et al.* 2000). The FM 500 benchmark assumed that a disposable family income exceeding \$50,000 per year was required to sustain a household and fund investment in a farm's natural and capital resources (Rendell *et al.* 1996). There is increasing evidence that many rural landholders have limited on-property incomes and that this is a critical constraint to adoption (Barr *et al.* 2000; Curtis *et al.* 2001a). Poor returns from grazing have meant that landholders could not afford the remedial lime and fertiliser regimes required to maintain pastures and prevent the downward spiral in grass production that affects water uptake and eventually, farm income (Millar and Curtis 1997).

It is also unlikely that many dryland landholders will generate substantial income from new enterprises such as olives, wine grapes and farm forestry (Stirzacker *et al.* 2000; Curtis *et al.* 2000). Landholders are very reluctant to take on new enterprises that will involve them entering long-term agreements with powerful industry partners (Curtis and Race 1996). Problems also arise if recommended practices or new enterprises are complex, are perceived as being risky, do not fit with existing enterprises, or conflict with existing social norms (Vanclay 1992; Curtis and Race 1996; Barr and Cary 2000).

Landholders are also increasingly aware that they are being asked to implement work that has community benefits in terms of biodiversity conservation, improved public health, and protecting export income (agriculture and tourism) and infrastructure. They also understand that many of the problems that they are being asked to address have in part resulted from previous government policies. Establishment of the Natural Heritage Trust (NHT), with the Federal Government sharing the costs of large-scale on-ground work on private land, was an acknowledgment of the legitimacy of these arguments (Curtis and Lockwood 2000).

Discontinuity between the source and impact of issues, particularly those related to water degradation, adds a further complication. Many landholders in the upper reaches of catchments are either not experiencing these problems, believe they can live with them, or are unaware or unconcerned about contributing to downstream impacts (Curtis *et al.* 2001a).

Australia has an ageing rural population with life expectancy increasing and younger people drifting from rural areas to the more prosperous and attractive lifestyles in urban centres (Haberkorn *et al.* 1999). We can no longer assume that a substantial proportion of the inter-generational transfer of properties will occur within families. Where family succession is unlikely, property owners may be less willing to invest in recommended practices or new enterprises. With increasing life expectancy, this trend could delay inter-generational property transfer. These elderly property owners may also be less willing to invest in recommended practice or new enterprises. Guerin (1999) and Curtis *et al.* (2001a) found that there was no clear correlation between landholder age and adoption, and suggested this was an important area for future investigation.

Such pressures were expected to lead to the amalgamation of some smaller grazing properties into larger units. While some amalgamation has occurred, there has not been large-scale consolidation of properties, and the trend has not been uniform (Barr *et al.* 2000). Within commuting distance of larger regional centres, there has been considerable conversion and subdivision of existing holdings into lifestyle farming enterprises for retirees and people with off-farm work. Land prices based on rural residential use will work against the aggregation of smaller and less viable holdings and closer settlement may impose additional environmental controls on broad acre farming.

## **Need to conduct the survey**

Research profiling regional communities has usually included attributes that measure some aspect of the four capitals: human capital (e.g. skills and education), produced-economic capital (e.g. financial resources and infrastructure), social capital (e.g. networks and links), and natural capital (e.g. landforms, plants and animals) (Webb and Curtis, 2002; Cavaye, 2003). Barr *et al.* (2000) used Census and other national data-bases to combine social and economic data to explore the structure of agriculture over time in the catchments of the Murray-Darling Basin. Using local government areas as the unit of analysis, Barr *et al.*'s (2000) seminal study examined attributes such as farm size, farm family income, farmer age, entry and exit from farming, and changes in farming family numbers, and clearly demonstrated that these attributes had changed over time.

The analysis of data collected through farm and household censuses can provide useful information, but as Schultz et al. (1998) and Curtis et al. (2001) demonstrated, these data are unlikely to satisfy catchment managers who need to understand the behaviour of the private landholders who control most of the land in their catchments. In the first instance, these national data collection processes are unlikely to address most of the topics for which data are needed. Furthermore, data are only available to the public in aggregated form, the smallest scale being census collector districts that combine data for about 200 households. Aggregation reduces the usefulness of data, particularly when sub-regional contexts are important, as for the Lachlan Catchment.

## **Topics and questions included in the mail survey**

Drawing on the above literature and given the constraints of a mailed survey (mainly space and the type of questions that can be effectively posed), the authors, in collaboration with industry partners, identified the topics listed below for inclusion in the survey. A copy of the survey is attached as an Appendix to this report. Response options and any additional background information are also provided in the relevant sections of the report.

- Assessment of issues affecting property and district.
- Self-assessment of knowledge for different topics.
- Awareness of on-property salinity.
- Views about balancing production and resource conservation.
- Views about the importance of factors affecting decision making about changing management systems.
- Response to lease scheme to facilitate property succession.
- Involvement in planning related to family succession, property and business.
- Long-term plans for the property.
- Adoption of recommended practices.
- Other property data, including: property size, broad enterprise mix, remnant bush, and area under specific enterprises.
- Background socio-economic data, including: age, gender, education, occupation, on and off-property workload, on and off-property household income, Landcare membership, funding through government programs, time lived in district, level of equity in property.

## **Current Recommended Practices (CRP)**

A key purpose of collecting survey data in the Lachlan Catchment was to explore the impact of factors expected to explain variance in the adoption of current recommended practices (CRP).

Considerable energy was expended in identifying and operationalising (establishing the format of statements to be asked in the survey) the CRP to be included in the survey. This process took into account the:

- key NRM issues identified by the Lachlan Catchment Management Board's Lachlan Catchment Blueprint.

- views of industry partners;
- practicalities of a mail survey; and
- the results of pre-testing the survey with peers, agency partners and landholders.

There were 13 CRP included in the survey.

1. Time controlled or rotational grazing.
2. Varying crop rotation according to soil test results.
3. Cropping using a rotation with ley pasture.
4. Application of lime.
5. Using low-pressure overhead or drip irrigation systems.
6. Fencing waterways to manage stock access.
7. Fencing native bush to manage stock access.
8. Encouraging regrowth of native vegetation.
9. Cropping using minimum tillage practices.
10. Sowing introduced perennial pasture.
11. Planting trees and shrubs.
12. Stock watered from a trough or tank.
13. Time spent to control non-crop weeds and pest animals.

### **The mail survey process**

The following points briefly outline the sampling method used in the mail survey sent to landholders in the Lachlan Catchment.

- LCMB approached 18 municipalities to cooperate and provide landholder details within the survey region using their local government rural property lists. Some local councils were not willing to participate in the project and in these instances information was collected using the electronic white pages.
- Local government property data was provided to LCMB and BRS on the provision that it be used for this survey only and that the lists be destroyed at the conclusion of the survey process.
- Tables containing rural property information were then entered into a Geographic Information System (ArcView GIS).
- All properties less than 10 ha were excluded from the potential survey sample.
- These names and addresses were forwarded on to BRS, where duplicate names were identified and removed from the sample.

- A random sample (spread evenly across the region) of 1,000 landholders was obtained from the remaining names and addresses.

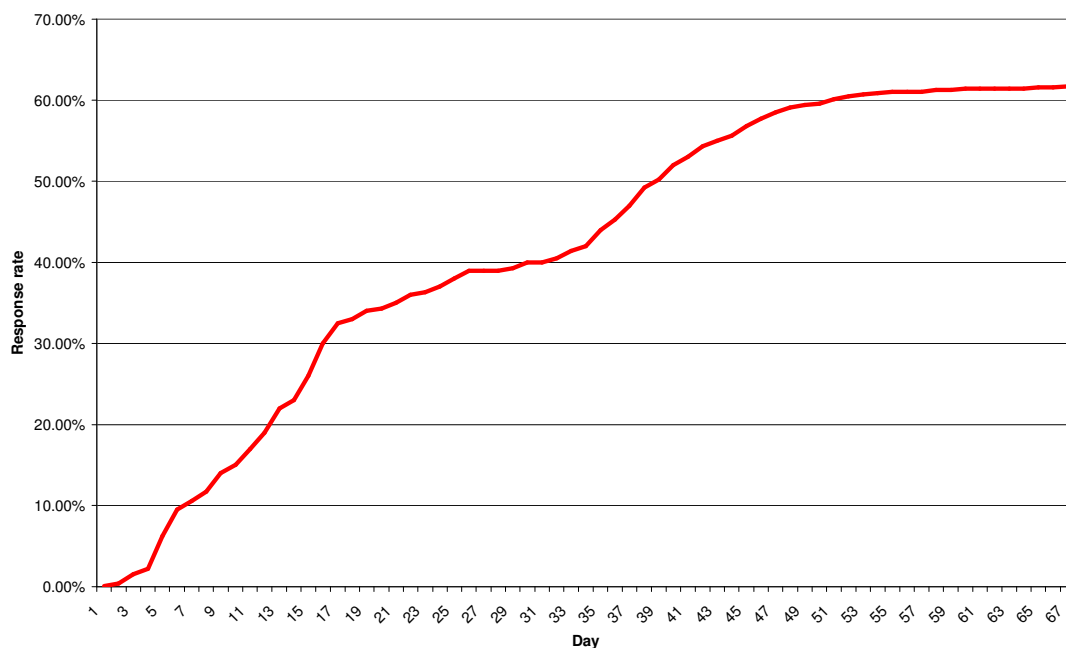
The survey design and mail out processes were undertaken using Dillman’s (1979) *Total Design Method*. The survey was pre-tested by peers and a project steering committee comprised of community representatives and board members from the LCMB. A draft version of the survey was pre-tested with three focus groups comprised of representatives from a cross section of Lachlan Catchment landholders. Feedback from the workshop sessions resulted in some important refinements to the survey instrument.

The total design method for mail surveys involves using a series of survey mail outs and reminder cards over a period of almost two months. The first mail out of surveys is followed by a reminder card sent out one week later, with a second and third reminder card mailed out each consecutive week. Four weeks after the initial survey mail out, another copy of the survey and a brief letter are sent to landholders that have not responded. The second mail out is followed by another reminder card one week later.

Surveys were addressed to property owners identified on the local government rural property owner lists. In the majority of cases only a surname and an initial were provided. It was therefore impossible to tell the gender balance in the survey sample.

After a period of approximately 10 weeks a final survey response rate of 62% was achieved [Figure 3]. Of the 1,000 surveys sent out to landholders in the Lachlan Catchment, 80 were returned to sender as the addressee was no longer living on the property and 183 were returned incomplete as the person no longer owned or managed the property, was deceased or could not reasonably be expected to complete the form (e.g. were seriously ill or were away from the property for an extended period). This left an effective sample of 737, with 456 surveys completed and returned. The combined area of all properties surveyed was 700,000 ha or just over 8% of the entire Lachlan Catchment.

FIGURE 3 - SURVEY RESPONSE RATE



## Data Analysis

Findings in this report have been presented so they can be interpreted without understanding the statistical methods used. However, for those who are interested to know how the data was analysed, a brief explanation of the statistical methods used is given below.

Statistical analysis included in this report consists of descriptive statistics, Spearman rank order correlations, Gamma correlations, non-parametric chi-square tests, binary logistic regression, alpha estimation, and paired samples T test. All statistical analyses used the SPSS software package.

Spearman rank order correlations were used to identify hypothesised relationships between variables. For example, higher on-property profitability was hypothesised as being linked to larger property size. Spearman rank order correlations place respondents on each variable from highest to lowest and determine the extent that there is a relationship between ranks on the two variables. For cases exploring the relationship between ordinal variables, Gamma correlations were used. A negative correlation coefficient or  $r_s$  indicates that a higher score on one variable is linked to a lower score on the other. The value of  $r_s$  can range from 1 to -1 with higher values (either negative or positive) indicating a stronger relationship.

Kruskal-Wallis chi-square tests were used to determine the presence of significant differences across continuous variables for two or more independent groups. For example, the Kruskal-Wallis chi-square was used to determine if there were any significant differences in property size between those adopting a CRP and non-adopters. The value of the chi-square statistic or  $\chi^2$  indicates the strength of the difference between groups on a given variable with a higher value indicating a larger difference. However, the  $\chi^2$  value does not indicate the direction of the relationship. The Pearson chi-square test was used to determine the presence of differences across ordinal or binomial data for two or more independent groups. For example, the Pearson chi-square test was used to determine if there were significant differences between Landcare members and non-Landcare members on the adoption of CRP.

Binomial logistic regression was used to better determine the extent to which a number of independent variables or factors identified by correlation or chi-square tests contributed to the presence or absence of a dependent variable, in this instance adoption of CRP. The Wald statistic provides a measure of the effect of each independent variable on the dependent variable, with higher scores indicating a greater effect. The Exp(B) or odds ratio represents the change in the odds of adoption given a unit increase in the independent variable. Odds ratios above one indicate a positive relationship, while scores below one represent a negative relationship or decreased likelihood of adoption.

In all analyses the p statistic represents the significance level where a value below 0.05 is considered to be statistically significant. A p value below 0.05 means that it is unlikely (probability of less than 5%) that the observed relationship or difference has occurred purely by chance.

## Guide to interpreting results from binary logistic regression

Example of results:

*Using binary logistic regression, adoption of the CRP planted trees and shrubs was significantly linked to respondents who:*

- *said their property was important as it was an attractive place to live (Wald=9.041,  $p=0.003$ ,  $Exp(B)=1.930$ );*
- *agreed that clearing had substantially reduced the existence and diversity of native plants and animals in the district (Wald=6.690,  $p=0.008$ ,  $Exp(B)=1.602$ );*
- *said they had work funded by government undertaken on their property in the last 5 years (Wald=12.433,  $p<0.001$ ,  $Exp(B)=17.180$ ); and*

*These three variables accounted for approximately 30% of the variation in adoption of the CRP planted trees and shrubs (Nagelkerke pseudo  $R^2=0.303$ ).*

1. Wald (or the Wald statistic) represents the strength of the relationship between two variables with higher values indicating a stronger relationship. That is, the variable that is most strongly linked to adoption of a particular CRP is the one with the highest Wald statistic.
2.  $p$  (or the probability) represents the probability that the observed relationship occurred purely by chance. For example, a  $p$  value of 0.001 indicates that the observed relationship has a one in a thousand chance of occurring purely by chance. Typically a  $p$  value of below 0.050 (or a 95% confidence interval) is used to indicate a significant relationship.
3.  $Exp(B)$  (or the odds ratio) represents the odds of a one unit change in the binary variable (in this instance non-adoption to adoption) given a one unit increase in the other variable. A value above one reflects an increased likelihood of adoption while a value below one indicates a reduced likelihood of adoption. For example, respondents who had government funded work on their property were 17.180 times more likely to adopt the CRP planted trees and shrubs. That is, the odds of adoption increased by 1,618%. Where the other variable has more than two levels (e.g. ranges from strongly agree to strongly disagree) the odds ratio reflects the likelihood of adoption versus non-adoption for each unit change on the other variable. For example, respondents who agreed that clearing had substantially reduced the existence and diversity of native vegetation were 1.602 times more likely to report adopting the CRP fenced to allow management by land classes than those who gave a neutral response. In turn, the odds of adoption for those who agreed strongly were  $1.602^2$  or 2.567 times higher than those who gave a neutral response.
4. The Nagelkerke pseudo  $R^2$  value is an approximation of combined explanatory power of all the individual variables in the model to the adoption of a CRP. In the example above the three variables account for approximately 30% of the difference between respondents who adopted the CRP and those that did not.

## **Limitations of this research**

No single instrument is able to collect data on all possible variables and therefore, some variables were not addressed in this research. Ultimately, professional judgement was used to determine the variables included in the survey.

Every research instrument has its strengths and weaknesses. A mail survey allows researchers to collect information across a large number of respondents and at a much lower cost than would be possible with face-to-face interviews. However, the mail survey does not allow for researchers to use follow-up questions to explore responses in greater detail. Similarly, while a structured mail survey allows researchers to compare results across a wide range of respondents, these comparisons require that responses are made from a set list of options rather than allowing individuals to provide open ended answers. As a result, findings from this mail survey provide an important baseline and overview of landholders' attitudes towards natural resource management. At the same time, while this research highlights important issues and trends, further more detailed studies should be considered to provide a more detailed understanding of important issues identified.

In this research it was not possible to collect information across time. This is an important limitation given the results of Barr *et al.* (2000) that identified important temporal trends. The 2003 Lachlan Catchment survey should be followed by another, say in three to five years time. It would then be possible to identify trends over time.

## 5. Findings by research topic

---

### Assessment of issues

Landholders were asked to assess the importance of a range of social, environmental and economic issues in their local district or on their property. The issues covered in the survey were identified through discussions with the project steering committee and at the survey pre-test workshops. Respondents were asked to rate the importance of each issue listed in the survey as either 'very important', 'important', 'of some importance', 'minimal importance' and 'not important'. To simplify the presentation of this data, these five responses have been collapsed into three categories – 'important' (combining very important and important), 'some' (of some importance) and 'unimportant' (combining not important and minimal importance).

### Issues affecting the local district

Only five of the 19 issues included in the mail survey were rated as important issues affecting the local district by more than half of all respondents.

Findings from the survey highlighted considerable concern about the viability of rural communities in the Lachlan Catchment with three of the top four issues related to community decline. The highest rated issue was the availability of important services followed by the decline of small towns. Over half of all respondents also rated reduced employment opportunities as an important issue. Less than a third of all respondents indicated that the amalgamation of properties was leading to less viable rural communities [Figure 4].

The identification of weeds and pest animals and water allocation as key issues in the Catchment Blueprint was confirmed by survey data. The cost of managing weeds and pest animals and the right to harvest or purchase water for agriculture were rated as important issues affecting the local district by the majority of respondents [Figure 4].

Just under half of all respondents also said that introduced plants and animals affecting native species, decline in soil health, soil acidity reducing the long term productivity of land, and nutrient, chemical and sediment loads affecting the quality of river systems were important issues in their district [Figure 4].

While not rated as important issues by most respondents, at least one third said farming practices contributing to soil erosion, inefficient use of water for agriculture, altered river or stream flows threatening the health of waterways, removal of native vegetation, and dryland salinity undermining production were important issues in the district [Figure 4].

Less than one third of respondents said that changes to river and stream flows impacting recreational experiences, property amalgamation, property subdivision, dryland salinity reducing water quality, and lack of awareness about Aboriginal cultural heritage sites were important issues in their district [Figure 4].

These findings have important implications for efforts to engage landholders from the Lachlan Catchment in natural resource management activities. Firstly, it is important to note that many landholders are unlikely to have a strong interest in activities aimed solely at addressing some of the priority issues identified in the Catchment Blueprint including dryland salinity, water quality, decline in biodiversity and cultural heritage management. Secondly, to

the extent that the decline of rural communities continues, the capacity of landholders within the Lachlan Catchment to implement strategic and coordinated action will be undermined.

While targeted education and awareness raising activities may help raise the profile of natural resource management issues, efforts to engage landholders should draw on innovative approaches that not only outline the environmental and/or economic advantages of new practices and production systems but highlight links to the social wellbeing of rural communities.

There were a number of significant differences in respondents' assessment of issues affecting their local district across the 4 survey sub-regions in the Lachlan Catchment [Appendix 1].

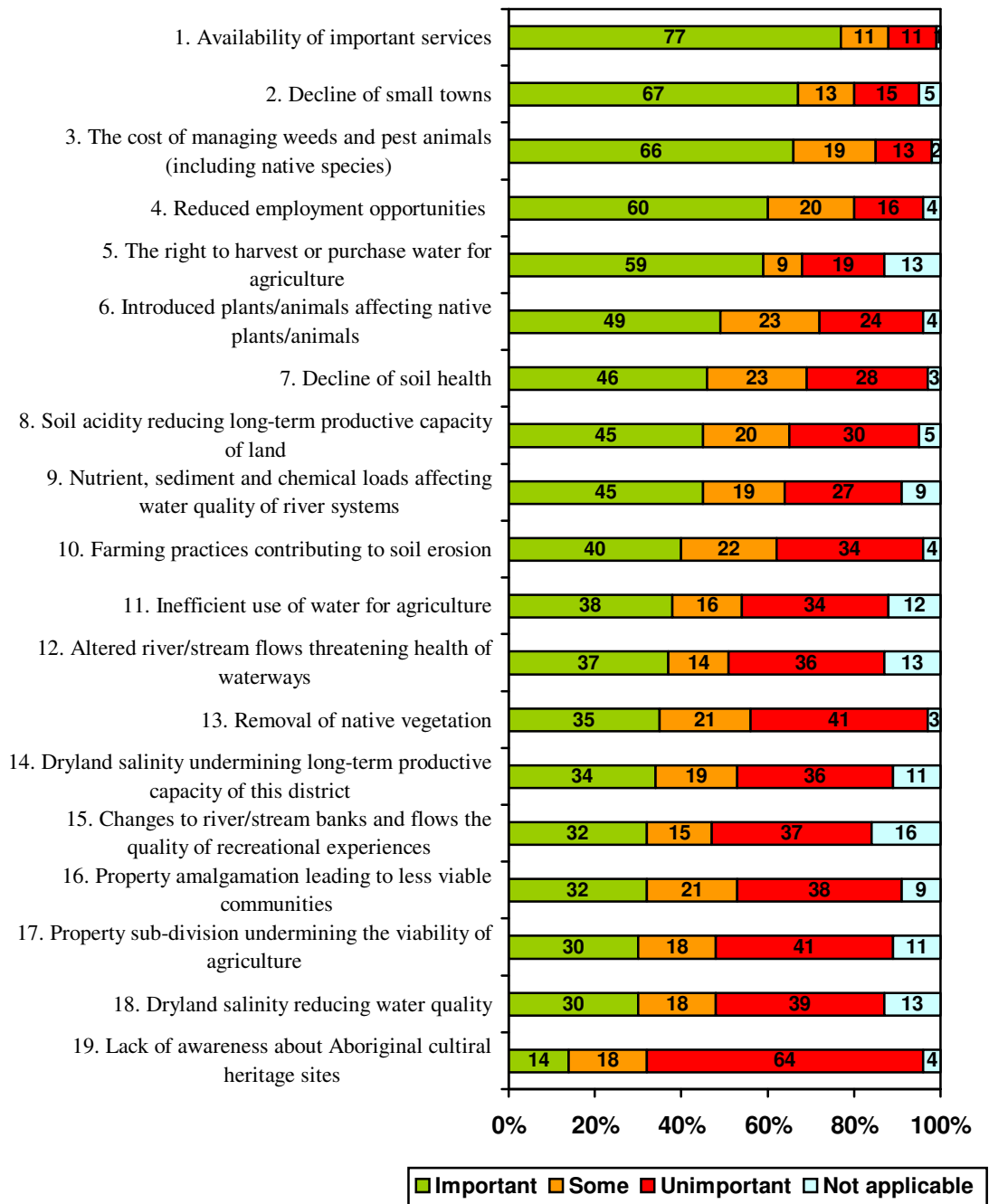
### **Key findings**

- Social issues such as the availability of important services, decline of small towns and reduced employment opportunities were rated amongst the most important issues affecting respondents' local district.
- The cost of managing weeds and pest animals was the highest rated natural resource management issue with two thirds of respondents reporting this was an important issue in their district.
- The majority of respondents also said that the right to harvest or purchase water for agriculture was an important issue.
- Uncertain or low returns limiting investment in the long-term health of their property, and the management of pest plants and animals on Crown land affecting their property, were the only two issues most respondents said were important on their property.
- Dryland salinity, removal of native vegetation, water quality and lack of awareness about Aboriginal cultural heritage were not rated as important issues by most landholders.

### **Box 1 – Assessment of issues in district and adoption of CRP**

There were no significant links between respondents' assessment of issues affecting their district and adoption of CRP.

FIGURE 4 – ASSESSMENT OF ISSUES AFFECTING THE DISTRICT



### Issues affecting respondents' property

When respondents were asked about the issues affecting their property, uncertain or low returns limiting investment in the long-term health of the property was the highest rated issue. Just under half of all respondents also said that government 'red tape' limiting their interest in applying for assistance to undertake onground works was an important issue on their property [Figure 5].

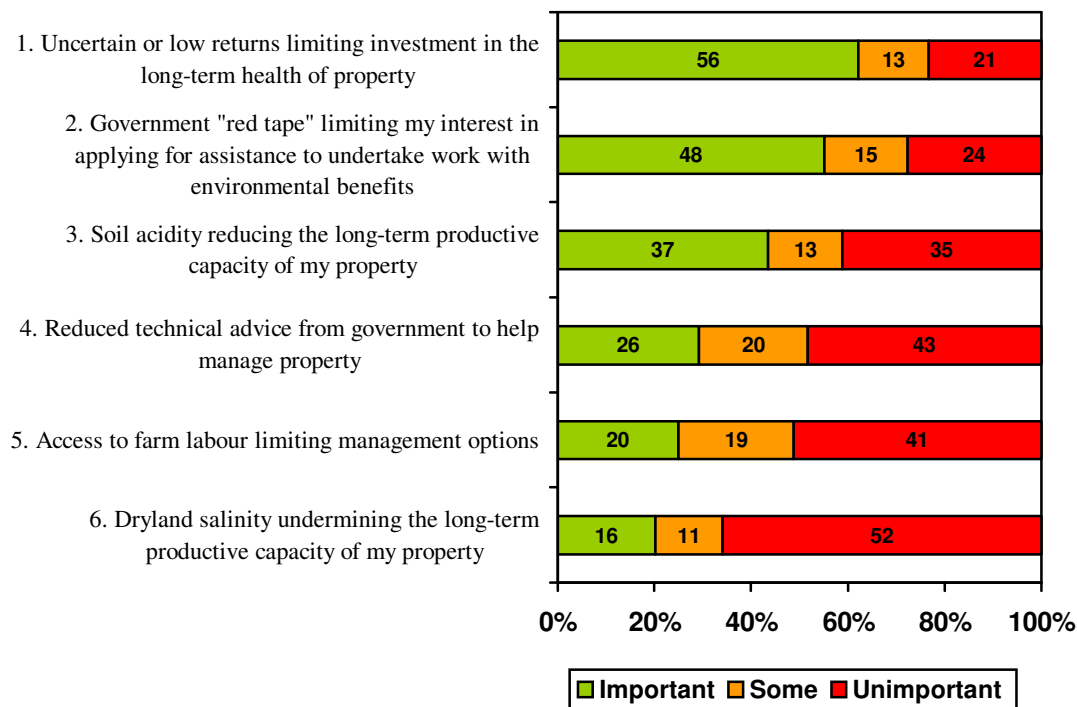
Survey respondents indicated limited concern about the impacts of dryland salinity on the productive capacity of their property, access to farm labour, and reduced technical advice available from government [Figure 5].

There were some significant differences across survey sub-regions with respect to landholders' assessment of issues affecting their property [Appendix 1].

### Box 2 – Assessment of issues on-property and adoption of CRP

Respondents who said that soil acidity was an important issue reducing the long-term productive capacity of their property were significantly more likely to adopt the CRP applied lime.

FIGURE 5 – ASSESSMENT OF ISSUES AFFECTING RESPONDENTS' PROPERTY



## Landholder perception of salinity

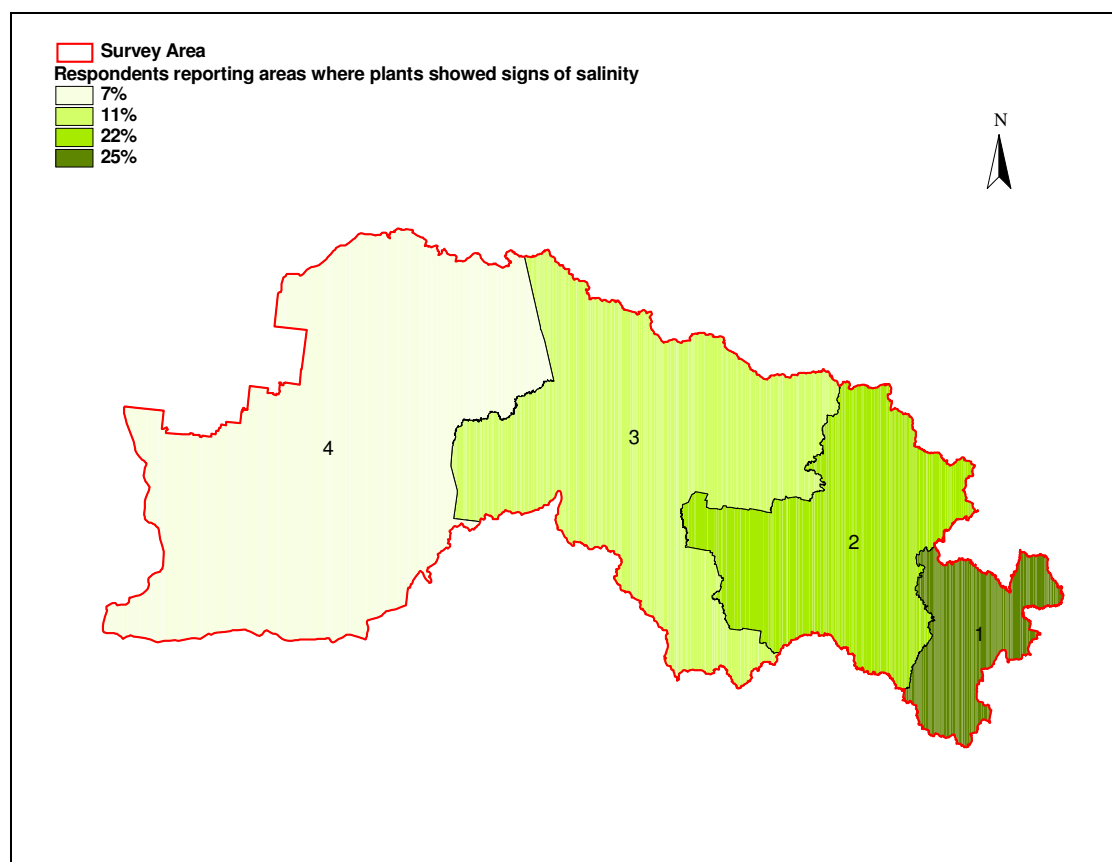
The mail survey asked respondents if they had any areas on their property where plants were showing signs of salinity. Respondents who said there were areas on their property affected by salinity were then asked to indicate the area affected.

Eighteen percent of the landholders surveyed reported areas on their property where plants were showing signs of salinity. The median area reported as showing signs of salinity was 5 ha with a total area of 860 ha or well under 1% of the total area surveyed.

Landholders who identified areas affected by salinity on their property were significantly more likely to report that salinity reducing water quality in their district (46% compared to 31%;  $\chi^2 = 17.145$ ,  $p = 0.002$ ), undermining the productive capacity of their district (49% compared to 34%;  $\chi^2 = 12.617$ ,  $p = 0.013$ ), and undermining the productive capacity of their property were important issues (37% compared to 17%;  $\chi^2 = 30.450$ ,  $p < 0.001$ ).

As highlighted in Figure 6 and Appendix 1, there were significant differences in the proportion of respondents who identified signs of salinity on their property across the four survey sub-regions ( $\chi^2 = 10.017$ ,  $df = 3$ ,  $p = 0.017$ ). The proportion of landholders who identified signs of salinity ranged from 25% in the Upper Lachlan (1) to 7% in the Western/Lower Lachlan (4).

FIGURE 6 – RESPONDENTS’ ASSESSMENT OF SALINITY ACROSS SUB-CATCHMENTS



### **Box 3 – Respondents assessment of salinity and adoption of CRP**

There were no significant links between respondents who identified signs of salinity and adoption of CRP.

## **Values attached to property**

The mail survey included a range of statements exploring the values landholders in the Lachlan Catchment attached to their property. Respondents were asked to indicate the importance of a range of potential values using a five-point scale. The response options were 'very important', 'important', 'of some importance', 'minimal importance' and 'not important'. As in the previous section these options have been collapsed into three categories to simplify presentation – 'important' (combining very important and important), 'some' (of some importance) and 'unimportant' (combining not important and minimal importance).

Landholders in the Lachlan Catchment attributed a wide range of environmental, economic, and social values to their property. The highest rated value to attached to respondents' property was providing their desired lifestyle with over three quarters (86%) of respondents indicating this was important. Eighty-four percent of respondents also said that being an attractive place to live was an important value of their property [Figure 7].

Survey data highlighted that most landholders in the Lachlan Catchment have a stewardship ethic with over three quarters of respondents (82%) saying that being able to pass their property on in better condition was an important value of their property. In addition, 69% of respondents said that their property contributing to the environmental health of the district was an important value [Figure 7].

The lifestyle benefits of living and working on a rural property appear to be one of the most important set of values attached to respondents' properties. Over two thirds of respondents also reported that being a great place to raise a family (78%), the freedom of being self employed (72%), and being part of a rural community (68%) were important values of their property [Figure 7].

A range of economic values were also attached to many landholders' property. Over half of all respondents indicated that being able to build/maintain a viable business (72%), providing a sound long-term economic investment (56%), and providing most of their household income (56%) were important to them [Figure 7].

Providing a break from their normal occupation and being the only job they had ever done were the least important values attributed to respondents' properties in the Lachlan Catchment [Figure 7].

Attempts to appeal to landholders in the Lachlan Catchment region need to consider the broad range of social, economic and environmental values attached to property. In particular there needs to be careful consideration of the potential impacts to landholders' lifestyle when promoting or developing natural resource management practices and strategies. While often the focus of attempts to improve natural resource management will be on the potential benefits to productivity and the environment, findings from this survey highlight that any impacts (either perceived or real) on the lifestyle of landholders are likely to have an important bearing on any decision making process. That is, even if a particular practice is seen as being economically and environmentally advantageous, landholders will be less likely

to implement this practice if they think it will have an adverse impact on their lifestyle. On the other hand, the likelihood of respondent adopting a practice will be enhanced where potential lifestyle benefits of that practice can be demonstrated.

There were a number of significant differences across the survey sub-regions in terms of the values respondents attached to their property [Appendix 1].

## Key findings

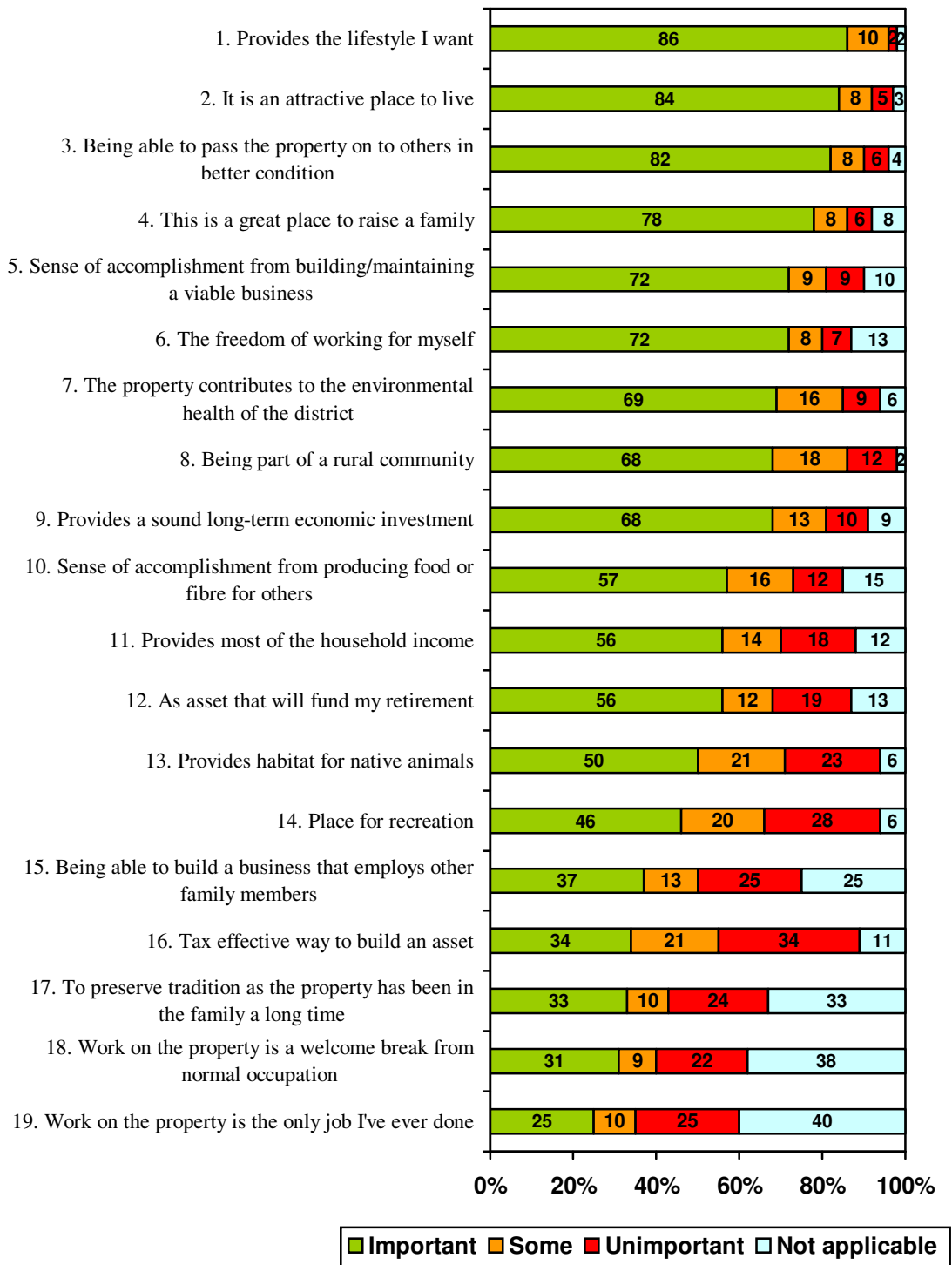
- Respondents attached a very wide range of social, environmental and economic values to their property.
- Providing the lifestyle respondents wanted, being an attractive place to live, and being able to pass the property on in better condition were rated as the most important values of respondents' properties.
- A range of other lifestyle values were highly rated by respondents with over two thirds of respondents indicating that being a great place to raise a family, the freedom of working for themselves, and being part of a rural community, were important values attached to their property.
- Most respondents also said that building/maintaining a viable business, contributing to the environmental health of the district, providing most of the household income, and being an asset that will fund retirement were important aspects of their property.
- Providing a break from their normal occupation and providing the only job they have ever done were not rated as important aspects of their property for most respondents.

## Box 4 – Values attached to property and adoption of CRP

There were a number of significant links between the values respondents attached to their property and the adoption of CRP included in this survey.

- Respondents who said their property was important as it provided most of the household income were significantly more likely to adopt the CRP cropped using minimum tillage practices.
- Respondents who said their property was important as it provided habitat for native animals were significantly more likely to have adopted the CRP encouraged regrowth of native vegetation.
- Respondents who said their property was important as it meant they were part of a rural community were significantly more likely to have adopted the CRP only watered stock from a trough, tank or dam.
- Respondents who said their property was important as it provided an attractive place to live were significantly more likely to have adopted the CRP planted trees and shrubs.
- Respondents who said their property was important as it provided a place for recreation were significantly **less** likely to have adopted the CRP fenced to manage stock access to waterways.

FIGURE 7 – VALUES ATTACHED TO PROPERTY



## Knowledge

Self-assessment is a widely accepted approach to gathering information about people's knowledge of natural resource management (Shindler and Wright 2000). In this study, respondents were asked to rate their knowledge about 20 topics relating to major natural resource management issues in the Lachlan Catchment. For each statement included in the survey, respondents were asked to select the best response option from 'very sound knowledge (could give a detailed description to others)', 'sound knowledge', 'some knowledge', 'very little knowledge' and 'no knowledge'. For presentation purposes, these five options have been assigned into three categories, 'sound knowledge' (combining sound knowledge and very sound knowledge), 'some knowledge' and 'limited knowledge' (combining no knowledge and very little knowledge). A not applicable option was included for instances where knowledge about a specific topic was not relevant to respondents (for example topics related to specific land uses or enterprises).

There was only one topic where at least half of all respondents said they had a sound level of knowledge. That topic was benefits of ground cover on cropping or grazing paddocks to maintain or improve soil health [Figure 8].

Respondents reported more moderate knowledge about the benefits of ley pasture and crop rotation in maintaining soil health and productivity, the ability of perennial vegetation to prevent water tables rising, how to recognise signs of salinity, how to interpret results from soil testing, and effects of unrestricted stock access on waterways and native vegetation [Figure 8].

For all other topics less than one quarter of respondents indicated that they had a sound level of knowledge. Landholders in the Lachlan Catchment reported particularly low levels of knowledge about:

- the land management activities of Aboriginal communities in the district (77% said little or no knowledge);
- who to contact for advice about managing Aboriginal cultural heritage sites on private property (72% said little or no knowledge);
- catchment management targets/priorities identified in the LCMB Blueprint (72% said little or no knowledge); and
- the link between soil acidity and dryland salinity in the Lachlan Catchment (66% said little or no knowledge)
- the area of land where plants are affected by salinity in the district (66% said little or no knowledge)
- the value of woody debris in rivers/streams (54% said little or no knowledge)
- the ability to identify sodic soils in this district (50% said little or no knowledge) [Figure 8].

The finding that there was only one natural resource management issue where at least half of the respondents reported a sound level of knowledge highlights the need for further investment in targeted education and awareness raising activities. This need was further highlighted by very limited knowledge amongst landholders about the catchment management priorities of the LCMB.

In part, low levels of knowledge about many natural resource management issues appears to be explained by only limited concern about these issues for many landholders. As outlined earlier in this report, education and awareness raising activities should attempt to highlight benefits across the broad range of social, economic and environmental values. An important part of these strategies should also be to provide more convincing evidence of the current and potential risks and the need to undertake mitigating action before a crisis point is reached.

There were significant differences in respondents' assessment of their knowledge about a range of natural resource management topics across the survey sub-regions [Appendix 1].

## Key findings

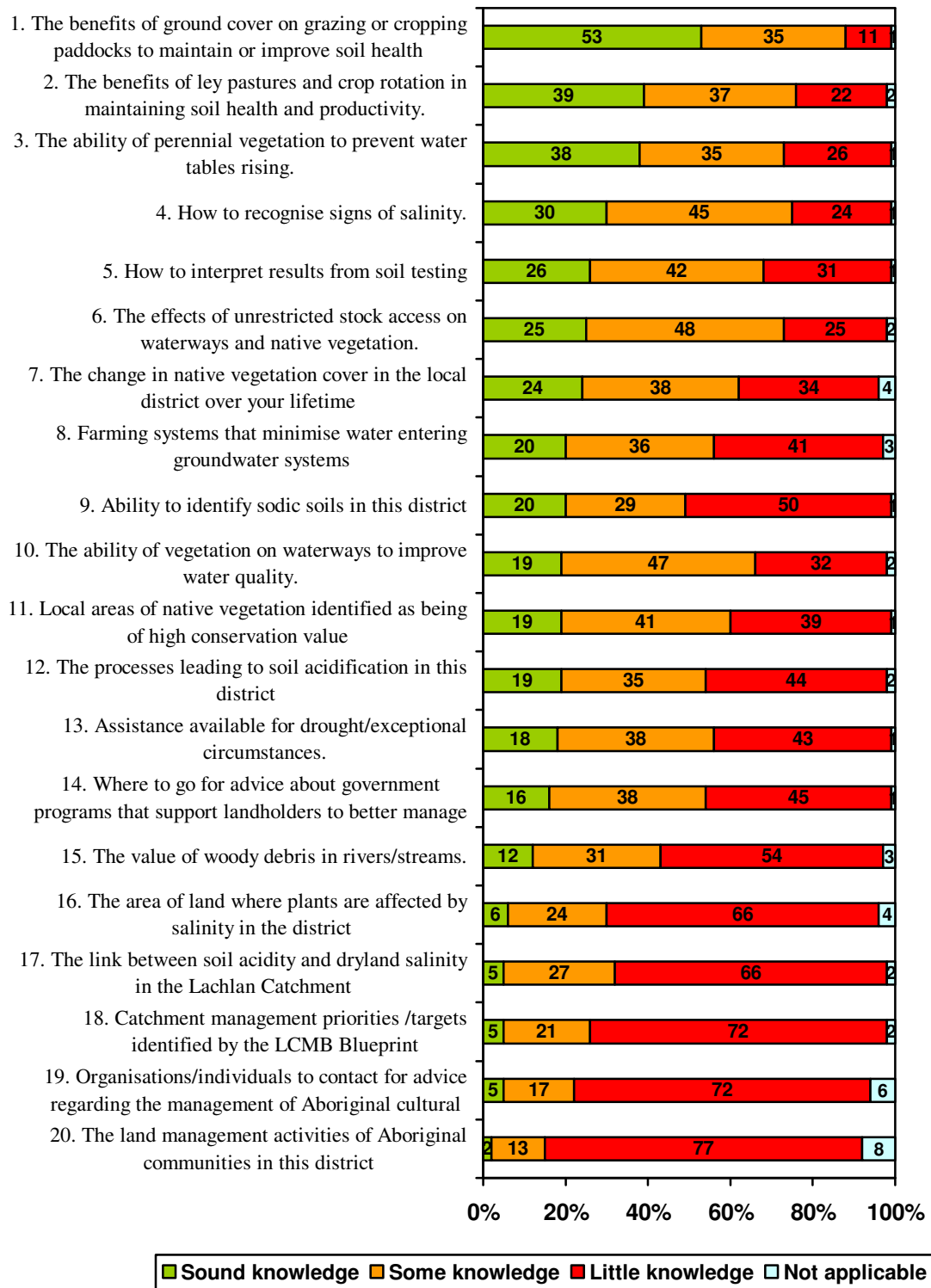
- Most respondents said they had sound knowledge about the benefits of ground cover on grazing and cropping paddocks to maintain or improve soil health.
- Respondents reported more moderate knowledge about the benefits of ley pasture and crop rotation, ability of perennial vegetation to prevent rising water tables, how to recognise salinity, how to interpret soil test results and the effects of unrestricted stock access and waterways on native vegetation.
- The survey highlighted limited knowledge about Aboriginal land management activities, who to contact for advice about managing Aboriginal cultural heritage sites, the major priorities/targets of the LCMB, links between soil acidity and dryland salinity, area affected by salinity, value of woody debris in rivers/streams, and how to identify sodic soils.

## Box 5 – Knowledge and adoption of CRP

Analyses highlighted a number of links between knowledge and adoption of CRP.

- Higher knowledge about how to interpret results from soil testing was significantly linked to adoption of the CRP applied lime.
- Higher knowledge about the processes leading to soil acidification was significantly linked to adoption of the CRP cropped using minimum tillage.
- Higher knowledge about the change in native tree cover in the district was significantly linked to adoption of the CRP encouraged regrowth of native vegetation.
- Higher knowledge about the benefits of ground cover on grazing and cropping paddocks to maintain soil health was significantly linked to adoption of the CRP used time controlled or spell grazing.
- Higher knowledge about the ability of perennial vegetation and standing stubble to improve water quality was significantly linked to adoption of the CRP cropped using minimum tillage.
- Higher knowledge about how to recognise signs of salinity was significantly linked to adoption of the CRP cropped using a rotation based on soil test results.
- Higher knowledge about the benefits of ley pasture in crop rotations in maintaining soil health and productivity was significantly linked to adoption of the CRP cropped using a rotation with ley pasture.
- Higher knowledge about the effects of unrestricted stock access on waterways and native vegetation was significantly linked to adoption of the CRP fenced to manage stock access to waterways.

FIGURE 8 – KNOWLEDGE ABOUT NATURAL RESOURCE MANAGEMENT



### Attitudes towards natural resource management

A series of 10 statements explored landholders' attitudes to the management of natural resources in the Lachlan Catchment. For each statement respondents were asked to choose a

response option from ‘strongly agree’, ‘agree’, ‘not sure’, ‘disagree’ and ‘strongly disagree’. These response options have been collapsed into three groups for presentation of data in Figure 9.

Findings from the survey in the Lachlan Catchment demonstrated a strong acknowledgement of the capacity of individual landholders to contribute to the environmental health of their district. Over 80% of respondents said that they thought action at the property level could improve the health of the environment. While the availability of water for agriculture was rated as an important issue by many respondents (as outlined earlier), over three quarters also acknowledged the potential impacts of diverting flows on other landholders and the environment [Figure 9].

Survey findings also highlighted that landholders in the Lachlan Catchment were aware that they are increasingly being asked to undertake works with wider community benefits. Seventy-four percent of respondents said they thought that landholders should be fully paid for providing environmental services that benefit the wider community. However, it is important to note that the majority of respondents were also prepared to make a significant individual contribution towards improved environmental outcomes, with 56% saying a short-term loss in productive capacity could be justified where there were long-term benefits to the environment [Figure 9].

The majority of respondents also agreed that clearing of native vegetation had substantially reduced the existence and diversity of native plants and animals in their district [Figure 9].

Despite the earlier finding of limited knowledge about managing Aboriginal cultural heritage sites on private property, 39% of respondents said that Aboriginal communities and landholders should work together to protect cultural heritage sites on private property [Figure 9]. These findings suggest that a significant opportunity exists to improve the management of these sites through providing information about the options for managing these sites and important people to contact for advice. This information also needs to highlight the potential for landholders and Aboriginal communities to work together to develop management strategies.

Only a small minority of respondents to the survey said it was difficult to obtain expert advice about natural resource management [Figure 9].

Survey findings also highlighted that few respondents felt that investment by superannuation companies in properties for forestry and the subdivision of rural land would have many benefits for landholders and rural communities in the Lachlan Catchment [Figure 9].

Considered collectively, these findings highlight very positive attitudes towards natural resource management in the Lachlan Catchment and highlight the opportunity for a range of natural resource management strategies and actions.

There were a number significant differences in respondents’ attitudes towards natural resource management across the survey sub-regions [Appendix 1].

## **Key findings**

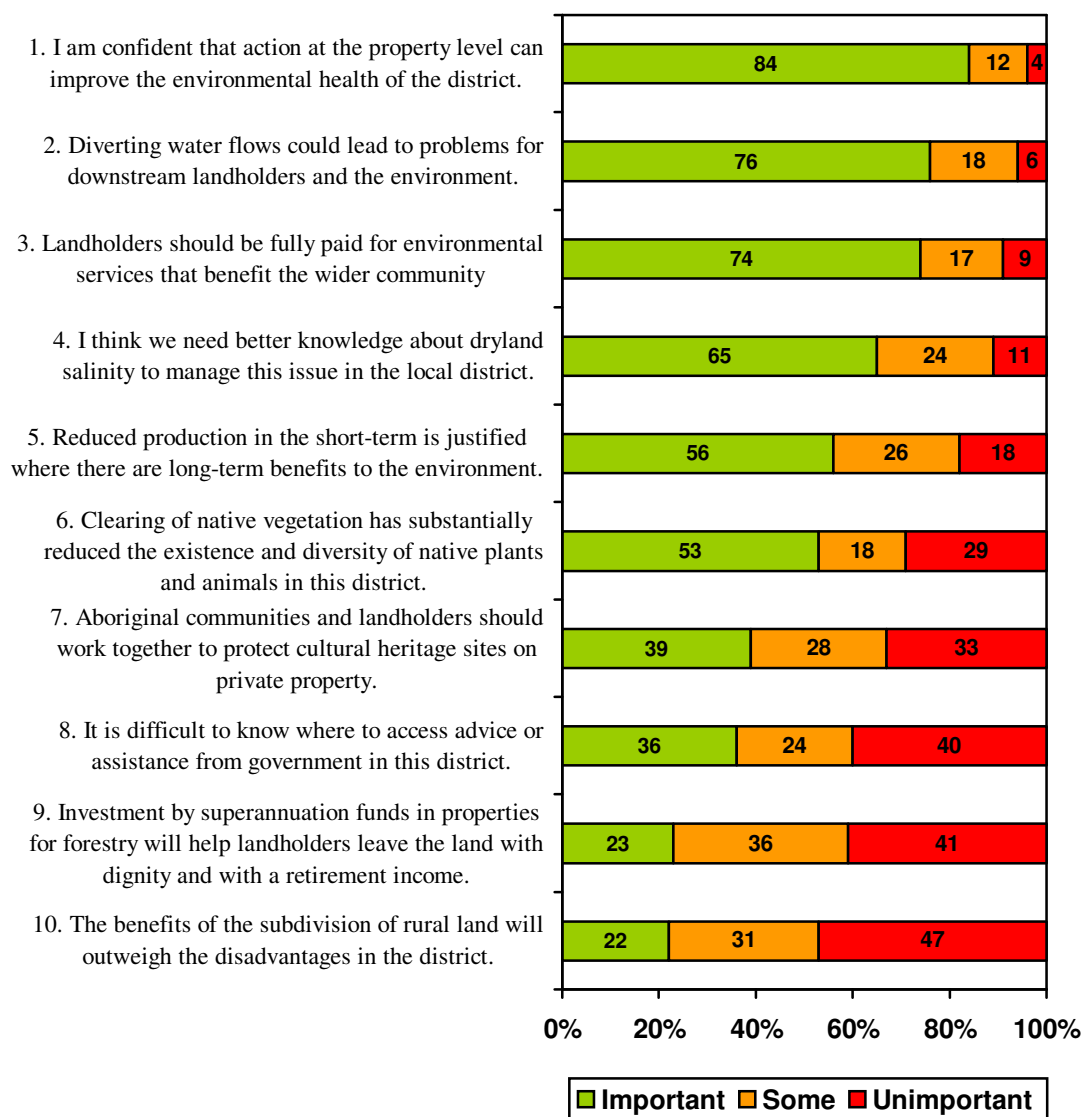
- Overall survey data highlighted very positive attitudes across a range of natural resource management topics.

- The most strongly reflected attitude towards natural resource management was that action at the property level can improve the environmental health of the district (84% of respondents agreed).
- While the availability of water was an important issue (as outlined earlier), over three quarters of respondents also agreed that diverting water flow could cause problems for other landholders and the environment.
- Most respondents said they thought landholders should be paid for providing environmental services. At the same time, respondents in Lachlan Catchment also appeared willing to make a significant individual contribution with over half of all respondents agreeing that a short-term loss in production could be justified by long-term improvements to the environment.
- Survey findings highlighted an opportunity to improve the management of Aboriginal cultural heritage sites on private property, with 39% of respondents agreeing the landholders and Aboriginal communities should work together to manage these sites.

#### **Box 6 – Attitudes to natural resource management and adoption of CRP**

Respondents who said that clearing had substantially reduced the existence and diversity of native vegetation were significantly more likely to adopt the CRP planted trees and shrubs.

FIGURE 9 – ATTITUDES TOWARDS NATURAL RESOURCE MANAGEMENT



### Interest in revegetation incentives

The mail survey asked respondents to indicate their interest in a proposed program to improve the management of vegetation in the Lachlan Catchment. The proposed program would offer interested landholders a substantial component of establishment costs (\$1000 material costs and \$500 labour costs per hectare), and a payment for the ongoing management and opportunity costs equivalent to the gross returns per hectare from grazing (lost income). To be eligible for the proposed reimbursements landholders would need to enter into a written agreement with the LCMB that would set out the nature of the work to be completed and payments to be made. Any agreement made would be binding on anyone who purchased the property and agreements could run for up to 10 years.

Survey recipients were asked to indicate if they would be likely to apply for funding under this type of arrangement to replant native trees and shrubs or to actively manage high value remnants on their property over the next three years. Just under half of all respondents (48%) said that they would be likely or more likely than not to apply for funding under the proposed arrangement [Figure 10]. Of these respondents, 30% said that this scheme would allow them to do more replanting than they had previously planned, and 62% said possibly. Thirty-two percent of respondent also said they scheme would enable them to improve the management of remnants on their property, and 57% said possibly.

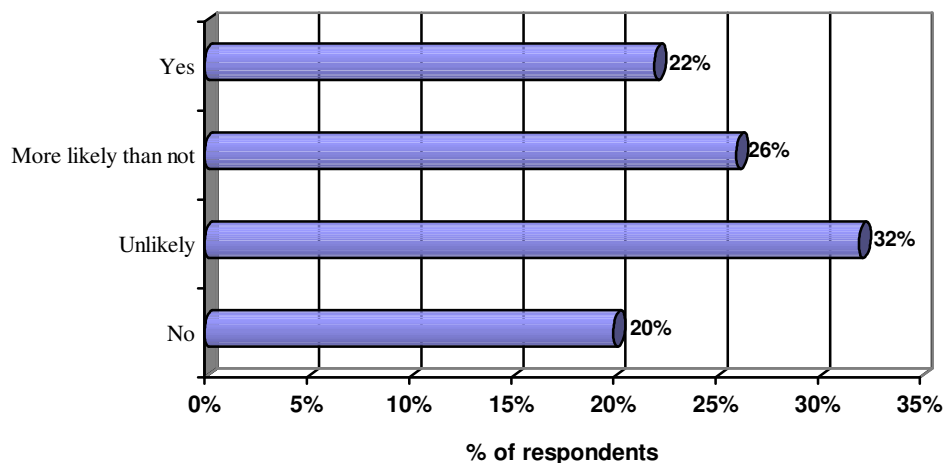
Those respondents who said they were likely or more likely than not to apply for funding under the proposed scheme were also asked to indicate the area of land on their property for which they would apply for funds to replant native trees and shrubs and manage remnants. Respondents indicated that the proposed funding scheme would allow them to replant native trees and shrubs on a median of 10 ha and a combined total of 16,120 ha or about 2.3% of the area surveyed. This median area of remnants respondents said the scheme would allow them to actively manage was 6 ha, covering a combined total of 32,557 ha or approximately 4.7% of the area surveyed. Considered collectively, the proposed funding scheme would enable the establishment or management of just under 50,000 ha or approximately 7% of the area surveyed.

There were no significant differences across survey sub-regions in respondents' interest in the revegetation incentives outlined above.

### Key findings

- Almost half of all respondents said they would be likely to apply for revegetation incentives that included stronger cost-sharing to establish native species or actively manage remnants.
- The proposed funding scheme would allow the establishment of 16,120 ha of trees and shrubs and the management of 32,557 ha of remnants covering approximately 7% of the area surveyed.

FIGURE 10 – INTEREST IN REVEGETATION INCENTIVES



## Stage of life and long term plans

Respondents to the mail survey were asked to indicate their age at the time of the survey. In addition, thirteen statements explored the likelihood that each respondent's long-term plans would involve a range of options [Figure 11].

Together, these data were expected to contribute to a better understanding of the potential for change in the management and ownership of land in the Lachlan Catchment.

### Age

Most of rural Australia has an ageing population and this trend is expected to have important implications for efforts to improve natural resource management.

The mean age of property owners in the Catchment was 51 years. Sixteen percent of respondents were under the age of 40, while 11% were over 65. The over 65 years of age group managed just over 12% of all land surveyed, with a median property size of 350 ha.

There was no significant difference in the age of respondents across the survey sub-regions.

### Box 9 – Age and adoption of CRP

The common perception that age represents an important barrier to the adoption of CRP was not supported by survey findings in the Lachlan Catchment. There were no significant links between age and the adoption of CRP included in this survey.

### Long-term plans

Thirteen statements explored the likelihood that each respondent's long-term plans would involve a range of options. This data was expected to contribute to a better understanding of the potential for change in the management and ownership of land in the Lachlan Catchment. The response options for these statements were 'highly likely', 'likely', 'not sure', 'unlikely', and 'highly unlikely'. These choices were not considered as being mutually exclusive, that is, any single respondent could indicate that more than one option was likely to occur. For presentation purposes, in Figure 11 these response options have been collapsed into three groups – 'likely' (combining highly likely and likely), 'not sure', and 'unlikely' (combining highly unlikely and unlikely).

### Continue to live on property

Responses to the survey question exploring landholders' long-term plans indicated that about half of the rural properties in the Lachlan Catchment are likely to continue under their current management. Over three quarters of all respondents (78%) thought it was either highly likely or likely that they would continue to live on their property in the long-term [Figure 11]. This group of respondents managed approximately 550,000 ha or 78% of all the land surveyed.

### Ownership of the property will stay within the family

Fifty-nine percent of respondents also indicated that it was highly likely/likely that ownership of their property would stay within the family [Figure 11]. These respondents managed approximately 520,000 ha or approximately 74% of land surveyed. Fifty-one percent of those who said the property would remain in the family indicated that it was likely someone else in the family would make management decisions. That is, in just under half of the instances

where family transfer is thought likely to occur, the current property manager is likely to maintain their decision making authority for some period of time.

### Plans for expansion

Just under 40% of respondents said it was likely that their long term plans would involve increasing the land they managed by purchasing, leasing or share farming additional land [Figure 11]. This small group of respondents managed 58% of all the land surveyed. Those who said they were likely to expand owned significantly larger properties than all other respondents with a median property size of 640 ha compared to 195 ha for other respondents ( $\chi^2=27.395$ ,  $df=1$ ,  $p<0.001$ ). One possible explanation for this finding is that larger property owners are more likely to have the equipment needed to operate a large-scale enterprise. These larger landholders are also more likely to have the capital resources needed to purchase additional land or equipment.

### Plans to sell or lease all or most of the property

When analysing survey data from across the Lachlan Catchment, it appears that the proportion of respondents likely to expand their property holding is unlikely to be matched by the properties likely to become available for lease or sale. Twenty-four percent of respondents said that they were likely to sell the entire property. A further 6% thought they were likely to subdivide and sell a large part of their property, and 4% said that they were likely to lease all or most of the property to someone else [Figure 11]. Twenty-nine percent of respondents reported that they were likely to sell or lease all or most of their property in the long-term. These respondents owned approximately 10% of the land surveyed or just under 70,000 ha.

To explore the likely availability and demand for land in greater detail, Table 1 represents a break down across the four survey sub-regions of the proportion of respondents who planned to increase the area of land they managed and those likely to sell all or most of their property. This comparison was made by subtracting the proportion of respondents in each sub-catchment likely to expand from the proportion likely to sell. Adopting this approach a negative figure for a sub-catchment indicates the proportion of respondents planning to expand their holding is greater than those likely to sell their property. A value close to zero indicates the proportion likely to expand matches those likely to sell. A positive value indicates there are more respondents planning to sell than planning to expand.

**Table 1**  
**Plans to increase or sell land holdings across survey sub-regions**

Survey sub-region	% planning to sell land	% planning to increase land	Difference
1. Upper Lachlan	22%	36%	-14%
2. Lachlan slopes	34%	35%	-1%
3. Mid Lachlan	30%	47%	-17%
4. Western/Lower Lachlan	3%	60%	-57%
Total	29%	38%	-9%

There was only one significant difference in respondents' long-term plans for their property across the survey sub-regions [Appendix 1].

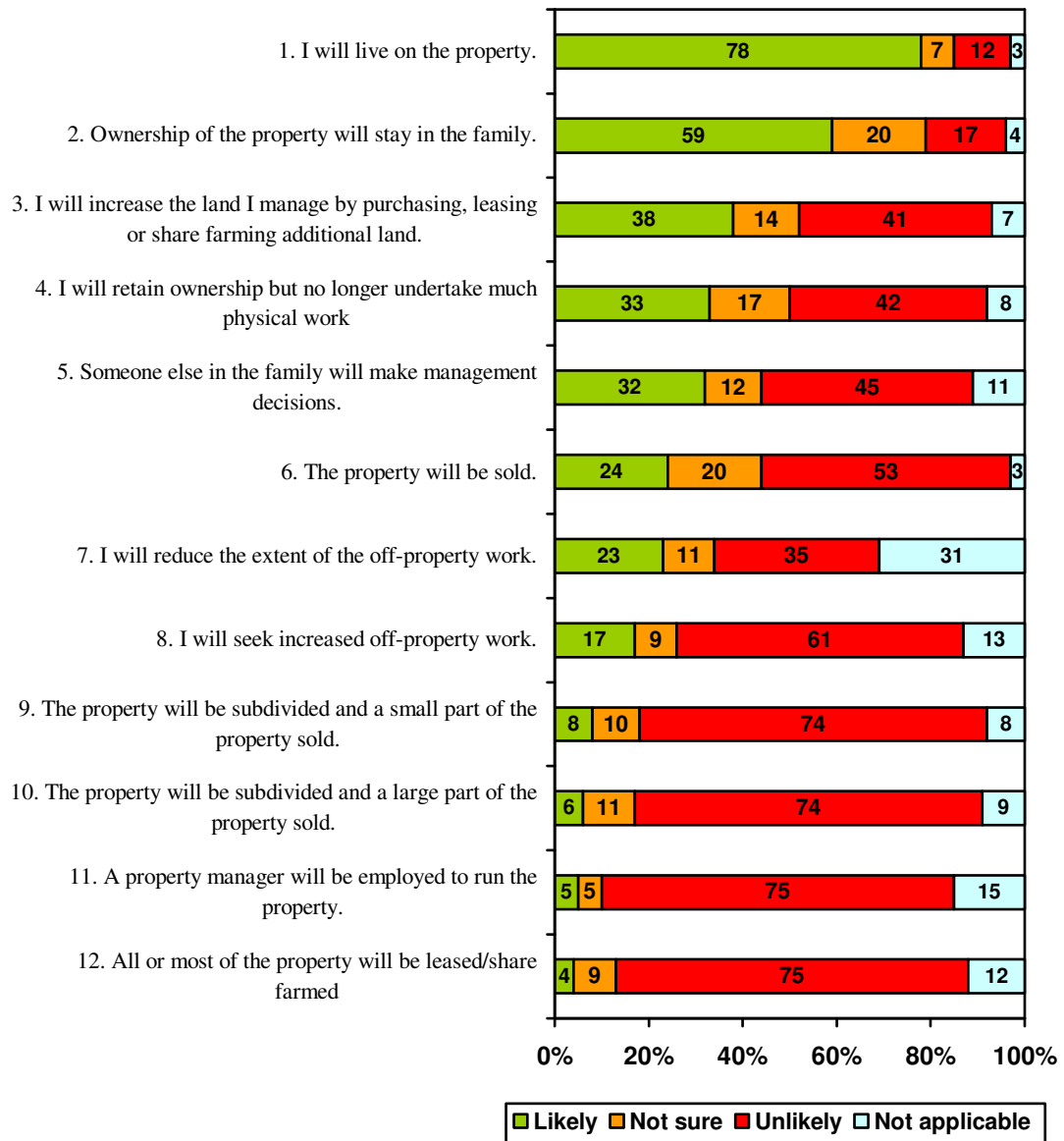
## Key findings

- The average age of landholders in the Lachlan Catchment was 51 years.
- Approximately three quarters of all respondents said it was likely that they would continue to live on their property and that ownership of the property was likely to stay within the family.
- Just under 40% of respondents said that their long-term plans were likely to involve expanding the area of land they managed. These respondents already owned/managed significantly larger properties than other respondents.
- Just under 30% of respondents said that they were likely to sell or lease all or most of their property in the long-term.
- Of those properties that are likely to be sold, the median year that the transfer was likely to occur was 2010.
- The median year of likely transfer for all properties surveyed was 2018, with 38% likely to change hands in the next decade.

### Box 10 – Long-term plans and adoption of CRP

Respondents who said they were likely to increase the area of land they managed were significantly more likely to adopt the CRP cropped using a rotation based on soil test results.

FIGURE 11 – LONG-TERM PLANS



### **Method and timing of property transfer**

Respondents were allocated one of the three long-term options based on how they answered questions in figure 11. These options were:

- Sell all or a large part of the property.
- Retain property in the family.
- Other plans, including continue to live on the property.

Those respondents who did not place highly likely/likely on any option (n=28) were removed from the sample for this analysis:

Where respondents indicated that it was highly likely or likely that their property would be sold or subdivided and a large part sold, they were asked to indicate the year they thought this sale might occur.

Those indicating highly likely/likely for only one long-term option were allocated to that option. Other respondents were allocated to one of the three options on the following basis and in the order shown:

- if they had a succession plan, then they were allocated to retain property in the family;
- if they nominated a date when they expected to sell the property, they were assumed to be likely to sell;
- if they planned to transfer the property in the family but did not have a succession plan, they were still allocated to retain in the family as long as they had not indicated they were likely to sell; and
- those indicating highly likely/likely for both selling the property and retaining it in the family, had no succession plan and did not nominate a date to sell, were assumed to be likely to sell.

The date of property transfer was assumed to occur in the year nominated on the survey. Where respondents had not nominated a date, it was assumed that transfer would occur on retirement at age 65 years for those under 65 years, and at death for those over 65 years. For the latter set, the Australian Bureau of Statistics (ABS) Life Tables (ABS 2001) were used to calculate the remaining life expectancy and provide the expected date of property transfer.

All other respondents were assumed to be planning to continue living on and retaining ownership of their properties until death required the transfer of their properties. Obviously, transfer could then be within the family or to others. Again the ABS Life Tables (ABS 2001) were used to calculate remaining life expectancy and provide the expected date of property transfer.

Respondents who had not provided their age (n=22) were excluded from these calculations.

Adopting the approach outlined above:

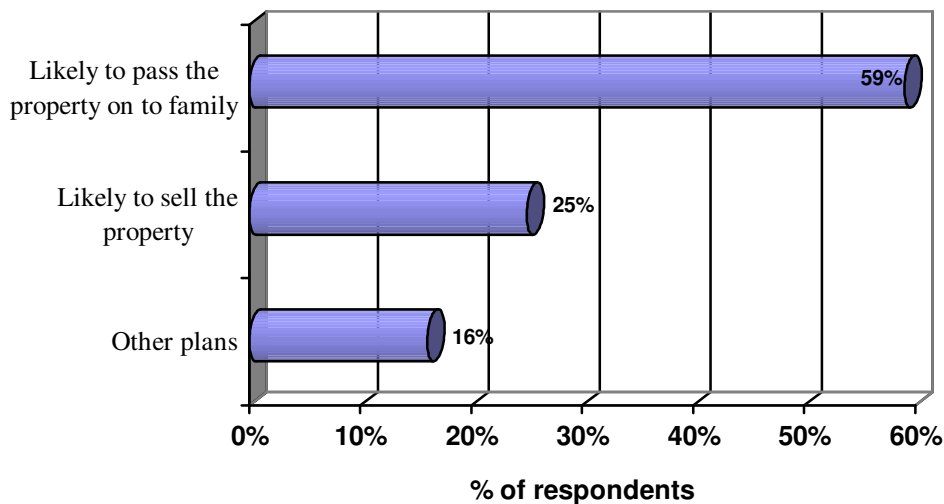
- 59% of respondents appear likely to pass their property on to someone else in the family;
- 25% appear likely to sell their property; and

- 16% had other plans, mostly to stay on the property in the long term [Figure 12].

Respondents who were classed as likely to sell using the method outlined above owned approximately 50,000 ha or 8% of the total land surveyed. The median year of sale for those likely to sell was 2010, with only approximately 3% of the all land surveyed likely to be sold during this period.

The median year of transfer for all properties including those likely to be sold, passed on to other family members, or those with other long-term plans, was 2018 (transfer is assumed to occur in the year nominated, at retirement age or upon death). Thirty-eight percent of all properties, representing 19% of the total area surveyed, are likely to change hands over the next decade.

FIGURE 12 – PROPERTY TRANSFER



### Involvement in planning processes

For this topic, respondents were asked to indicate the extent of their involvement in a number planning processes, including whole farm planning, having a long-term plan or vision for improvements to the property, succession planning and local action planning.

### Key findings

- Just under half of all respondents were involved in property planning and 13% had a completed or on-going property plan.
- Over 80% of respondents said they had a plan or vision about the improvements they would like to make on their property, and over a quarter of these respondents said they were well advanced in implementing those changes on their property.
- Despite the finding that most landholders said ownership of their property was likely to stay within the family, most respondents (58%) had not begun to plan the transfer of their property to the next generation.

## Property planning

The mail survey asked respondents to indicate if they had developed or were currently developing a written property plan that included a map or other documents that addressed the existing property situation and included future management and development plans. The response options were 'completed/ongoing', 'well advanced', 'halfway', 'early stages', and 'not started'.

Just under half of all respondents to the mail survey (42%) said that they were currently involved in or had completed a property plan. Only 13% of respondents, covering 25% of the survey area, had a completed or ongoing property plan [Figure 13]. As this finding suggests, larger property owners were significantly more likely to have completed a property plan ( $\chi^2 = 25.404$ ,  $df = 4$ ,  $p < 0.001$ ). The median property size for respondents who had a completed whole farm plan was 670 ha compared to 138 ha for those who had not yet started a plan.

With over half of all respondents not involved in property planning, ongoing promotion and greater support to assist landholders to implement plans appears likely to facilitate greater uptake of property planning in the future. In particular, there appears to be a need for greater attention to promoting and supporting property planning with managers of smaller properties. Involving the managers of smaller properties in property planning will be especially important in sub-catchments dominated by smaller property owners [see Appendix 1].

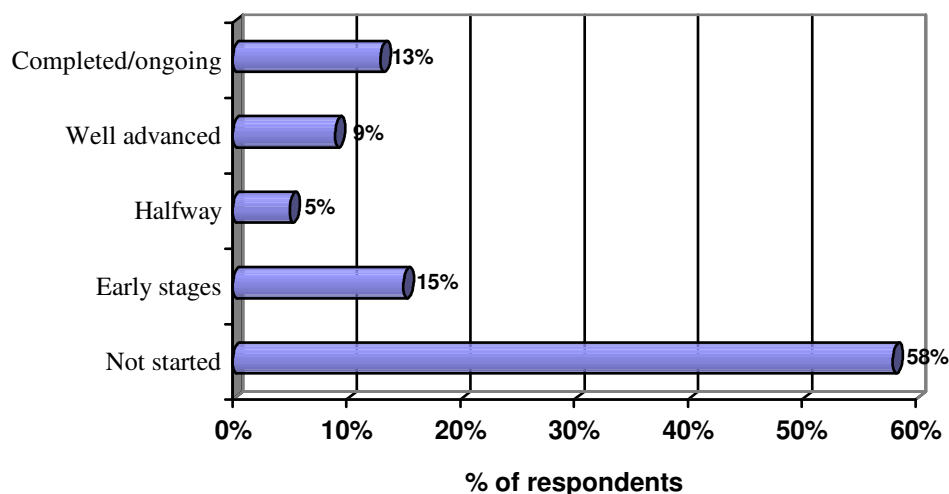
There was no significant difference in landholders' involvement in property planning across the survey sub-regions.

### Box 11 – Property planning and adoption of CRP

Involvement in property planning was significantly linked to adoption of the CRP:

- encouraged regrowth of native vegetation; and
- applied lime.

FIGURE 13 – INVOLVEMENT IN PROPERTY PLANNING



### Long-term plan or vision for improvements to property

Survey respondents were asked about the extent to which they had a long-term plan or vision about the improvements they would like to make to their property, and if so, how much of that vision they had achieved. Those respondents who said they had a long-term plan or vision were asked to use the following options to rate their performance against this plan: ‘completed/ongoing’, ‘well advanced’, ‘halfway’, ‘early stages’, and ‘not started’.

Almost all respondents to the survey said that they had a long-term plan or vision about the improvements they would like to make on their property. Furthermore, 93% of these respondents said they had made at least some progress towards making these improvements and around a quarter were well advanced [Figure 14].

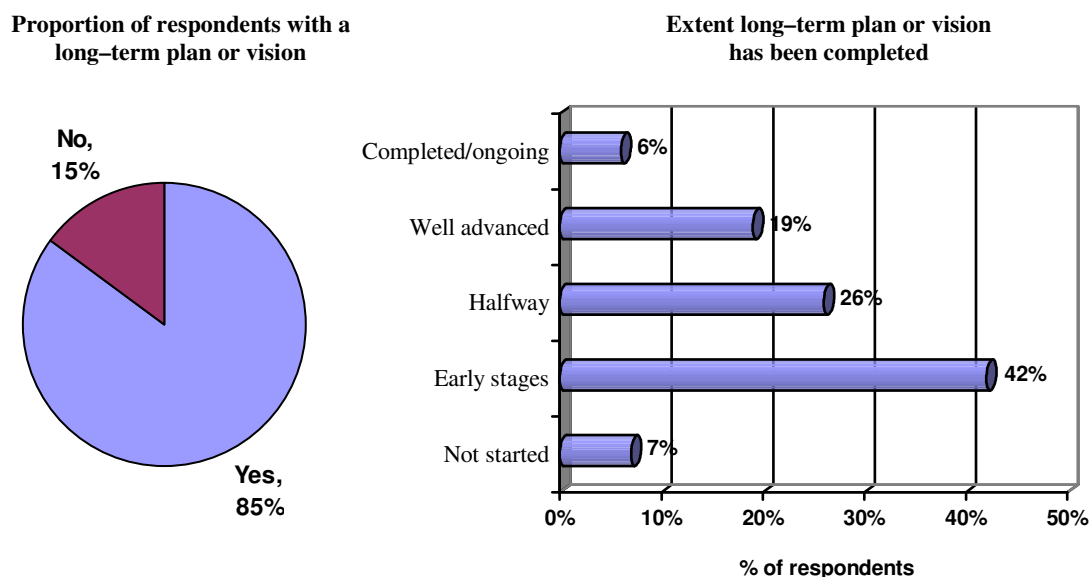
Although respondents reported limited involvement in formal whole farm planning, it is important to note that almost all respondents had some sort of a plan or vision about the improvements they wanted to make on their property and had started to implement these changes on their property.

There was no significant difference in the proportion of respondents across the survey sub-regions who said they had a plan or vision about the improvements they wanted to make on their property.

### Box 12 – Having a plan or vision about improvements and adoption of CRP

Respondents who had a plan or vision about the improvements they wanted to make on their property were significantly more likely to adopt the CRP sown perennial pasture.

FIGURE 14 – LONG TERM PLAN OR VISION FOR IMPROVEMENTS TO PROPERTY



## Succession planning

Respondents were asked if their family had agreed on a plan to manage the transfer of their property to the next generation. The possible response options were ‘completed/ongoing’, ‘well advanced’, ‘halfway’, ‘early stages’, and ‘not started’.

Despite the earlier finding that most landholders in the Lachlan Catchment said their long-term plans were likely to involve passing their property on to another family member, 58% of respondents said they had not started to plan the transfer of their property to the next generation. Only 11% of respondents had a completed or ongoing plan in place to manage the transfer of their property to the next generation [Figure 15]. However, it is encouraging to note that those who said ownership of the property was likely to remain in the family were significantly more likely to have started to plan. Nonetheless, 44% of these respondents had not started the planning processes ( $\chi^2 = 47.239$ ,  $df = 16$ ,  $p < 0.001$ ). However, older respondents were no more likely than younger ones to have started to plan the transfer of their property to the next generation [median age of those with a completed succession plan was 46 compared to 52 for those who have not yet started ( $\chi^2 = 5.584$ ,  $df = 4$ ,  $p = 0.232$ )].

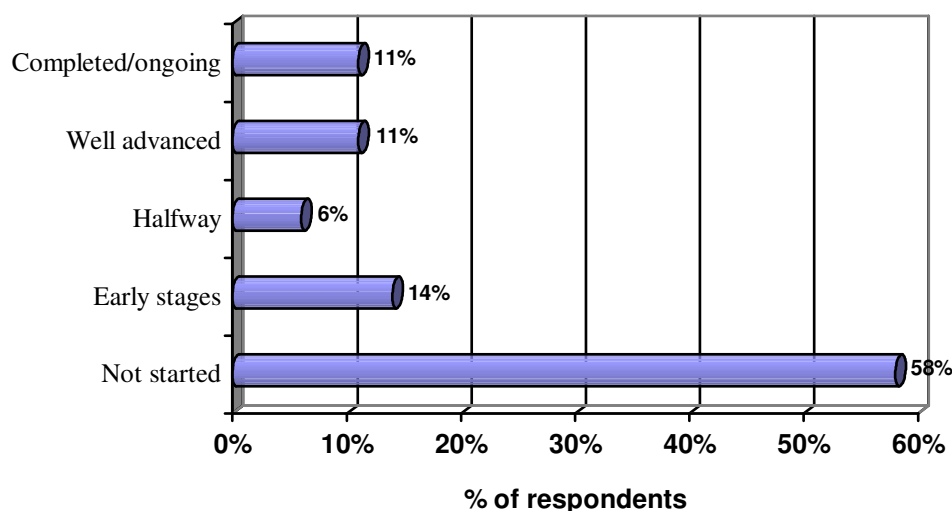
Family succession planning is often a complex processes that may require legal and financial advice and large investment of time, energy and money. It is possible that part of the explanation for limited involvement in succession planning is that many landholders do not know how to begin the process or the steps involved. Establishing an information package that outlines the common steps required to undertake a succession plan and a list of people to contact for advice may be an approach that can help facilitate greater uptake of succession planning. At the very least, such an information package could make the planning process easier for those involved. To the extent that the average age of landholders in the Lachlan Catchment continues to increase, the demand for information about succession planning is also likely to increase.

The proportion of respondents across the four survey sub-regions that were involved in succession planning ranged from 53% in Western/Lower Lachlan (4) to 35% in Upper Lachlan [Appendix 1].

### **Box 13 – Succession planning and adoption of CRP**

There were no significant links between succession planning and adoption of CRP in this study.

FIGURE 15 – INVOLVEMENT IN SUCCESSION PLANNING



### **Involvement in government funded programs**

The survey asked respondents to indicate their involvement in government funded programs that aim to assist landholders to implement improved land management practices.

Respondents were asked four questions:

- had there been work undertaken on their property in the last five years that was funded by government programs;
- were they currently a member of a Landcare group;
- were they currently a member of a local TopCrop group; and
- were they currently a member of any other best management practice group.

### **Key findings**

- Twenty-four percent of respondents said that they had work undertaken on their property in the past five years that was at least partially funded by government programs.
- Just under a third (32%) of respondents said they were currently a member of a Landcare group.
- Eight percent of respondents were a member of a local TopCrop group.
- Seven percent of respondents were a member of a best management practice group.

### **Work funded by government on their property**

Data indicated that most landholders in the Lachlan Catchment had not received government funding to undertake work on their property. Only 24% of respondents said that work had

been undertaken on their property in that last five years that was partially funded by State or Federal Government programs.

There were no significant differences in the proportion of respondents from the survey sub-regions who had work undertaken on their property funded by government.

#### **Box 15 – Work funded by government on property and adoption of CRP**

Having work funded by government on property was significantly linked to adoption of the CRP:

- planted trees and shrubs; and
- native bush fenced to manage stock access.

#### **Landcare membership**

Thirty-two percent of respondents to the survey said that they were currently a member of a Landcare group. Landcare members owned or managed almost 340,000 ha or 49% of the area surveyed.

#### **Box 16 – Landcare membership and adoption of CRP**

There were no significant links between Landcare membership and adoption of CRP in this research. However, it is important to note that there was a strong link between respondents who had government funded work on their property and Landcare membership. As a result when modelling adoption of CRP using binary logistic regression, these variables performed very similar roles and Landcare membership often dropped out of the final model. At the same time, Landcare membership was strongly associated with respondents who had work funded by government on their property which was in turn linked to the adoption of some CRP.

#### **Membership of a TopCrop group**

Eight percent of respondents said they were a member of a local TopCrop group.

Membership of a TopCrop group across ranged from 0% in the Upper Lachlan (1) to 18% in the Mid Lachlan (3) [Appendix 1].

#### **Box 17 – TopCrop group membership and adoption of CRP**

Respondents who were a member of a TopCrop group were significantly more likely to adopt the CRP:

- cropped using a rotation with ley pasture; and
- cropped using minimum tillage.

### **Membership of other best management practice group**

Seven percent of respondents said they were a member of other best management practice groups.

Membership of a best management practice group across the survey sub-regions ranged from 2% in the Upper Lachlan (1) to 13% in Mid Lachlan (3) [Appendix 1].

### **Box 18 – Best practice management group membership and adoption of CRP**

There were no significant links between membership of best practice groups and adoption of CRP.

### **Property size and farming as an occupation**

This section of the report focuses on a number of topics related to property size and occupation, including:

- property size;
- occupational grouping that best describes main area of paid/unpaid work; and
- level of on-property and off-property work.

### **Key findings**

- The median property size of landholders surveyed in the Lachlan Catchment was 319 ha.
- Only 13% of respondents owned or managed a property of at least 2,000 ha, yet this small group of respondents managed over three quarters (79%) of the total area surveyed.
- Fifty-nine percent of respondents said that farming was their primary occupation. The 41% of landholders that said farming was not their primary occupation managed approximately 8% of the total area surveyed.

### **Property size**

Survey respondents were asked to indicate the total area of land that was owned or managed by them or their immediate family in their local district. This area varied widely, ranging from the lower limit of 10 ha right up to properties of 70,000 ha. The median property size for respondents to the survey was 319 ha. Survey data suggested that a small number of large property owners manage the vast majority of land in the Lachlan Catchment. Only 13% of respondents reported that they owned or managed a property of at least 2,000 ha. However, these respondents managed almost 550,000 ha or approximately 79% of the total area surveyed, the majority of which was located in the Western/Lower Lachlan sub-regions [Table 2].

Appendix 2 highlights some of the key differences between landholders with properties over 2,000 ha and all other respondents.

The survey also asked respondents to indicate the area of their property that they leased, share farmed or agisted from others. Twenty percent of respondents said that they leased, share farmed or agisted land from other people ranging from an area of 2 ha up to 25,000 ha. The median area leased, share farmed or agisted from others was 200 ha.

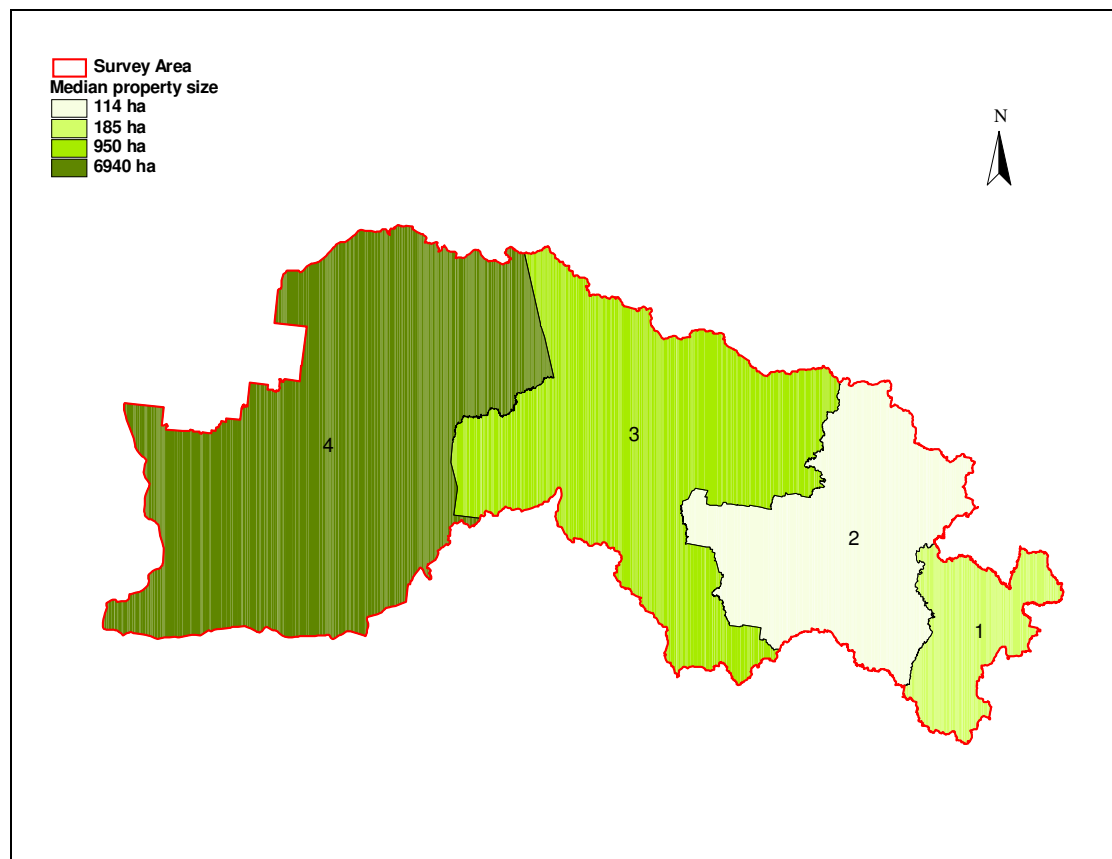
There was a significant difference in the median size of properties across the survey sub-regions ranging from 114 ha in the Lachlan Slopes (2) to 6,940 ha in the Western/Lower Lachlan (4) ( $\chi^2 = 92.331$ ,  $df = 3$ ,  $p < 0.001$ ) [Figure 16].

### Box 19 – Property size and adoption of CRP

Respondents with larger properties were significantly more likely to adopt the CRP:

- conducted work to control pest animals and non-crop weeds; and
- cropped using minimum tillage.

FIGURE 16: MEDIAN PROPERTY SIZE ACROSS SUB-CATCHMENTS



**Table 2**  
**Proportion of respondents by property size for each sub-catchment**

Survey sub-region	n	% respondents in each property size category						Median (ha)
		10 – 250	251 - 500	501 - 750	751 - 1000	1001 - 2000	> 2000	
1. Upper Lachlan	66	56%	15%	14%	5%	9%	1%	185
2. Lachlan slopes	212	61%	14%	11%	5%	7%	2%	114
3. Mid Lachlan	117	22%	8%	13%	10%	24%	23%	950
4. Western/ Lower Lachlan	30	23%	0%	0%	0%	0%	77%	6940
<b>Total*</b>	425	47%	12%	11%	6%	11%	13%	319

\* Totals calculated by adding sub-catchment data will differ slightly from these figures. There were a small number of respondents who removed the identification number from the survey and could not be allocated to a sub-catchment.

## Occupation

Respondents were asked to indicate the occupational grouping that they thought best described their main area of paid/unpaid work in terms of the time and energy they put into that activity. Examples provided in the questionnaire included farmer, teacher, investor or retiree.

Responses to this open-ended question were grouped into five occupational categories: farmer, professional, trades, retired and other. Farmers were the largest occupational grouping and comprised the majority of all respondents (59%). Forty-one percent of all respondents were not farmers, and these respondents owned or managed only 8% of all land surveyed.

Almost all respondents to the survey (95%) said they worked on farming/property related activities over the last year. These respondents reported spending a median of 50 hours per week on on-property work over that period. As expected all respondents who said farming was their primary occupation said they worked on property in the past year with a median of 60 hours per week.

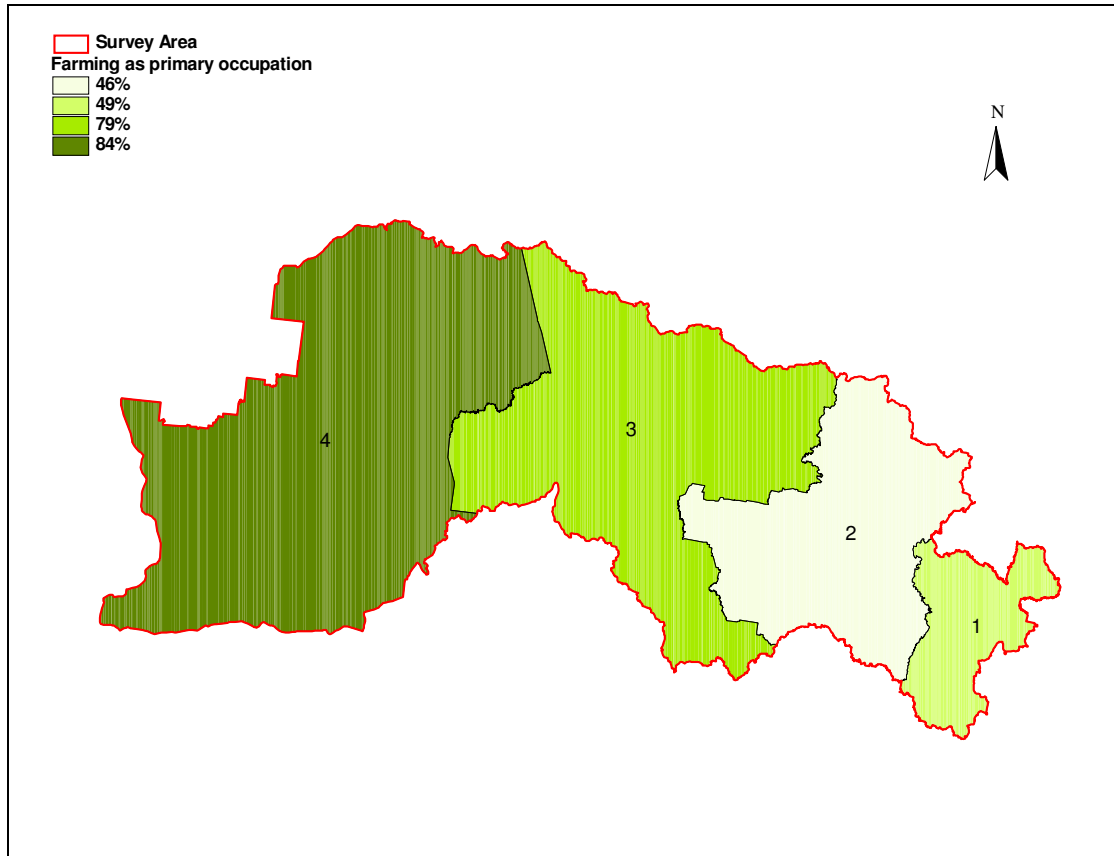
At the same time, half of all respondents also said they worked off-property in the past year with a median of 200 days. Respondents who said farming was their primary occupation were less likely to have worked off property with 36% reporting off property work and a median of 40 days over the past year.

There was a significant difference across the survey sub-regions in the proportion of respondents who said that farming was their primary occupation, ranging from 46% in Lachlan Slopes (2) to 84% in the Western/Lower Lachlan (4) ( $\chi^2 = 52.383$ ,  $df = 12$ ,  $p < 0.001$ ) [Figure 17].

### Box 18 – Occupation and adoption of CRP

Respondents whose primary occupation was farming were significantly more likely to adopt the CRP applied lime.

FIGURE 17: FARMEING AS PRIMARY OCCUPATION ACROSS SUB-CATCHMENTS



**Table 3  
Landholder occupations**

Survey sub-region	n	Farmer	Professional	Trades	Other: clerical, admin, retail, home duties	Retired
1. Upper Lachlan	66	48%	21%	11%	12%	8%
2. Lachlan slopes	207	46%	23%	6%	12%	13%
3. Mid Lachlan	120	79%	8%	1%	7%	5%
4. Western/Lower Lachlan	31	84%	6%	7%	0%	3%
<b>Total*</b>	424	59%	17%	5%	10%	9%

*\* Totals calculated by adding sub-catchment data will differ slightly from these figures. There were a small number of respondents who removed the identification number from the survey and could not be allocated to a sub-catchment.*

### **Levels of income and property equity**

The survey included six questions exploring levels of income and levels of equity in the property. A profit was defined as a situation where the amount of income from the property exceeded all expenses before tax. Respondents who indicated a profit were then asked to select the amount of profit from one of eight ranges. For the purpose of data analysis, each respondent was allocated the mid-point of the chosen dollar interval. These questions were completed by the vast majority of respondents with responses from 83% to 95% of completed surveys.

### **Key findings**

- About half of all respondents (52%) in the Lachlan Catchment made an on-property profit for the 2001/2002 financial year and the average on-property income was \$22,000.
- Almost three quarters of respondents (71%) also reported an off-property profit for the 2001/2002 financial year with an average off-property income of just over \$27,000.
- The average total household income for all respondents was \$49,000 and less than half of respondents (47%) reported a combined income in excess of \$50,000.
- There was an almost even split between the contribution of off-property (54%) income and on-property income (46%) to the combined total household income for landholders in the Lachlan Catchment for the 2001/2002 financial year.
- Most respondents (61%) had more than 80% equity in their property. Just under a fifth of respondents had less than 60% equity.

### **On-property income**

Survey data indicated that just over half of all respondents (52%) made a net pre-tax on-property profit for the 2001/2002 financial year. The mean on-property profit for all respondents was approximately \$22,000. Only 18% of all respondents exceeded the \$50,000 profit threshold considered necessary to sustain a household and invest in a farm's natural and capital resources (Rendell *et al.* 1996). The \$50,000 threshold was set as a result of research exploring the financial viability of cropping enterprises in Victoria in 1996 (Rendell *et al.* 1996). It is important to note that this threshold is now eight years old and may need to be revised since originally being proposed. Nevertheless, this threshold represents one of the most commonly applied benchmarks and provides a useful reference point for exploring farm incomes.

Respondents who said farming was their primary occupation were significantly more likely to report making an on-property profit for 2001/2002, with just under three quarters reporting a net pre-tax profit (73%) and an average income of \$36,000 ( $\chi^2=100.147$ ,  $df=1$ ,  $p<0.001$ ).

It is important to note that in many cases on-property incomes for the year 2001/2002 will have been affected by un-seasonally dry conditions. As a consequence the figures outlined above may not be an accurate reflection of the longer-term profitability of on-property enterprises in the Lachlan Catchment. To help clarify any changes, respondents were asked to indicate how their on-property income in 2001/2002 compared to their average return over the past five years. Just under half of the survey respondents said their on-property income in 2001/2002 was lower than the average over the last five years (44%), 28% said it was similar, and 28% said it was higher.

The proportion of respondents who returned an on-property profit across the survey sub-regions ranged from 39% in the Upper Lachlan (1) to 71% in the Western/Lower Lachlan (4) [Appendix 1].

#### **Box 19 – On-property profit and adoption of CRP**

Respondents who reported an on-property profit were significantly more likely to adopt the CRP:

- applied lime;
- sown perennial pasture; and
- cropped using a rotation with pasture.

### **Off-property income**

Almost three quarters of respondents (71%) reported an off-property profit for the 2001/2002 financial year. The mean pre-tax off-property profit for all respondents for this period was approximately \$27,000.

While farmers were significantly less likely to report an off-property income, over half still reported an off-property profit for 2001/2002 with an average income of \$17,000 ( $\chi^2=22.331$ ,  $df=1$ ,  $p<0.001$ ).

The proportion of respondents who reported an off-property profit across the survey sub-regions ranged from 34% in the Western/Lower Lachlan (4) to 86% in the Upper Lachlan (1) [Appendix 1].

#### **Box 20 – Off-property profit and adoption of CRP**

There were not significant links between off-property profitability and adoption of CRP in this study.

#### **Total household income**

The total household income for respondents was calculated by combining net pre-tax on-property and pre-tax off-property income. As the survey asked respondents to indicate their income using a range, the mid-point of the selected ranges were used. The mean total household income for all respondents was approximately \$49,000. That is 47% of respondents had a total household income above the \$50,000 threshold considered to necessary to maintain a household and to fund improvements in a farm's natural and capital resources (Rendell *et al.* 1996). Farmers were no more likely to report a household income in excess of \$50,000, with only 42% of these respondents above the \$50,000 threshold.

The combined total household income for all respondents was approximately \$20 million. Of this, on-property income accounted for approximately \$9 million or 46% of all income. The combined off-property income was just over \$11 million or 54% of the total income for the 2001/2002 financial year. To the extent that on-property profitability increases when the drought breaks, the balance of on-property and off-property income may shift. Nevertheless, information presented earlier suggests that the proportion of people seeking off-property income is likely to remain constant and therefore off-property income can be expected to remain as a very important contributor to household incomes.

#### **Box 21 – Total household income and adoption of CRP**

There were no significant links between respondents' total household income and adoption of CRP in this study.

#### **Level of property equity**

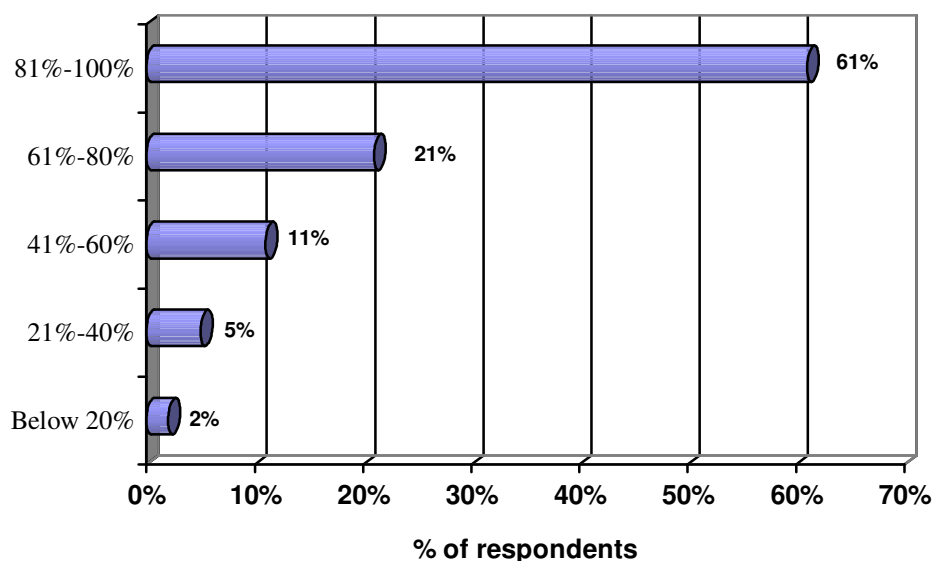
Respondents were asked to indicate the level of equity in their property (including land, machinery, buildings and livestock) using five options, each covering a 20% range.

Most respondents had high levels of equity with over half (61%) of all respondents indicating 81%-100% equity. About one fifth of respondents (18%) had less than 60% equity in their property [Figure 18].

#### **Box 22 – Equity and adoption of CRP**

There were no significant links between equity and adoption of CRP.

FIGURE 18 – LEVEL OF EQUITY



### Land use and enterprise mix

The survey asked respondents to indicate land uses/enterprises undertaken on their property and the approximate area under each enterprise from a list of 18 options.

### Key findings

- Dryland pasture (73%) and other trees for shade and shelter, erosion control or recharge control were the dominant enterprises/land uses and the only ones to be reported by the majority of respondents.
- The only other enterprises/land uses to be reported by at least a third of respondents were beef cattle (46%), sheep for wool (44%), native remnant vegetation (39%), and sheep for meat (39%).

### Proportion of respondents reporting landuses

Dryland pasture was the most common land use/enterprise reported by landholders in the Lachlan Catchment, with 72% of respondents reporting this enterprise on their property. Keeping in mind that respondents could nominate more than one enterprise on any area of their property, it is important to note that 90% of respondents with dryland pasture also reported either sheep for wool, sheep for meat and/or beef cattle on their property. Dryland cropping (52%) and sheep for wool (50%) were the only other land uses/enterprises reported by at least half the survey respondents.

Just under half of all respondents also reported having native remnant vegetation (43%), beef cattle (42%), sheep for meat (41%), and other tree plantings (41%) on their property. All other land uses or enterprises were reported by less than 10% of respondents.

Only a small proportion of respondents were involved in alternative enterprises including farm forestry (4%), intensive livestock (5%), other livestock (8%), grapes and stone fruit (7%), other horticulture (4%), and eco-tourism (1%) [Figure 19]. Considered collectively, 22% of respondents had at least one of these enterprises on their property.

Just under half of all respondents to the mail survey (48%) said there was a natural water way on their property that flowed most years.

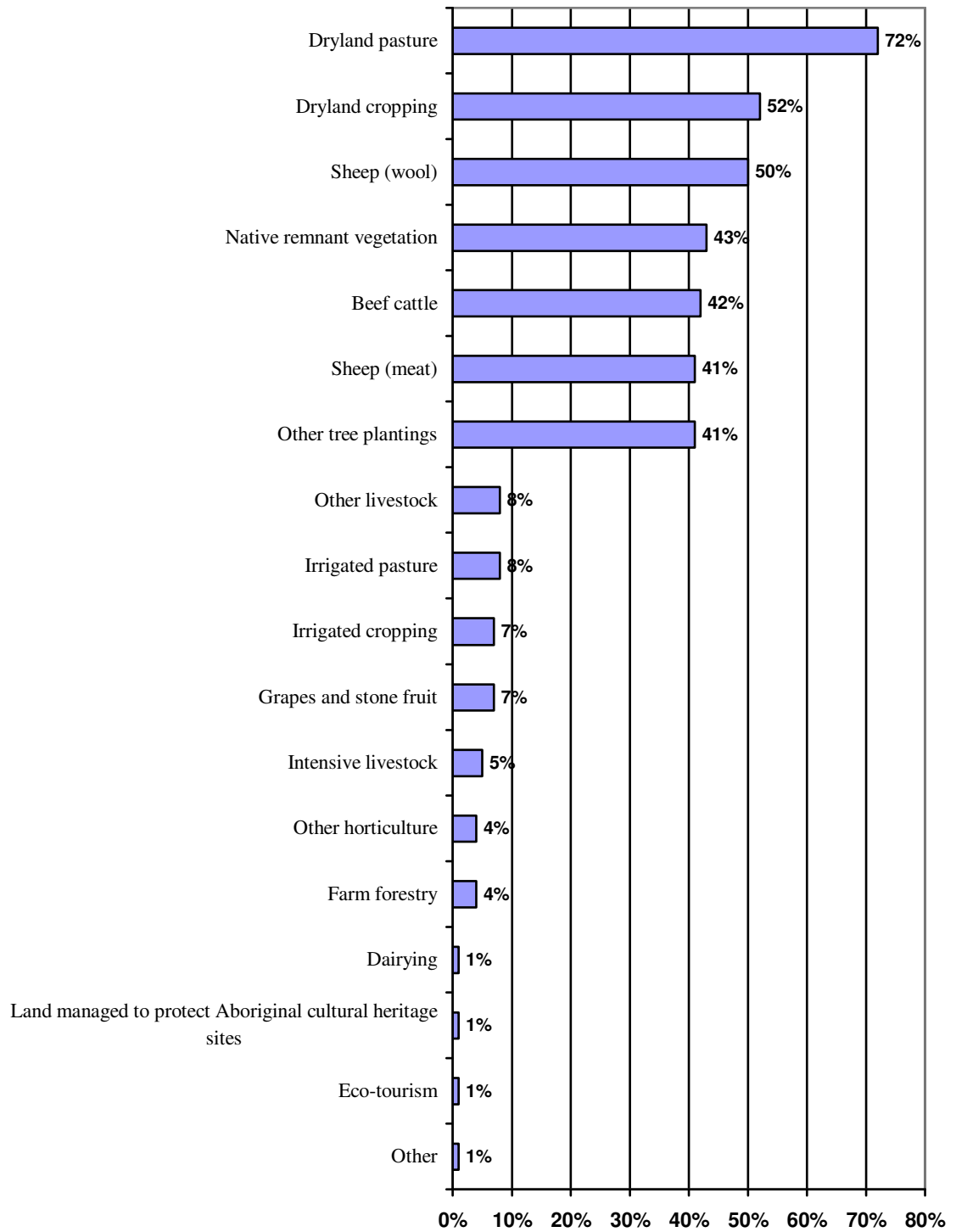
### **Proportion of land surveyed under landuses**

Dryland pasture accounted for 62% of the total area surveyed. Dryland cropping covered just over 100,000 ha or approximately 15% of the total area surveyed. The total area with sheep for wool was just over 460,000 ha or 66% of the survey area. Beef cattle covered a total of just under 210,000 ha or 30% of the survey area. Remnant vegetation, sheep for meat, and other trees covered 32% (220,000 ha), 42% (290,000 ha), and 1% (8,000 ha) of the survey area respectively.

When considered collectively, alternative enterprises covered almost 25,000 ha or approximately 3% of the area surveyed.

The total area under remnant vegetation, farm forestry or other tree plantings was approximately 230,000 ha or 33% of the area surveyed.

FIGURE 19 – PPOPORTION OF REPSONDENTS WITH LANDUSES/ENTERPRISES



## Constraints to change

The survey explored the importance of 18 factors that previous research and industry partners thought were likely to influence landholder decision making about taking on new practices. Practices suggested in the preamble included increasing the area under lucerne or native trees, using time controlled grazing, fencing to manage stock access to waterways, adopting minimum tillage, or applying lime to address soil acidity. The response options were ‘very important’, ‘important’, ‘some importance’, ‘minimal importance’, and ‘not important’. These response options have been collapsed into three categories – ‘important’ (very important and important), ‘some’ (some importance) and ‘unimportant’ (minimal importance and not important).

## Key findings

- At least three quarters of respondents said that cash flow, suitability of soils, cost of machinery, and the existence of long-term markets were or would be important constraints to changing management practices on their property.
- Water storage capacity and access to on-going professional advice were also among a range of other factors considered important by the majority of respondents.
- The only two factors that were not considered important factors influencing respondents decision making about changing management practices were: there not being many people undertaking the new practice in the district, and the returns available from off-property investments.

Responses to the mail survey highlighted a wide range of economic, environmental and social constraints likely to influence landholder decision making about changing management practices on their property. Indeed 16 of 18 topics listed in the survey were rated as an important constraint by at least half of all respondents in the Lachlan Catchment [Figure 20].

The highest rated constraint to implementing changed land management practices was available cash flow, with over 80% of respondents saying this would be an important factor affecting their decision making. Suitability of soils, the cost of machinery/equipment, and the existence of long-term markets were also rated as important factors by over at least three quarters of landholders [Figure 20].

Water storage capacity and access to on-going professional advice were also highlighted as important constraints by over two thirds of respondents [Figure 20].

The only two factors that were not considered important constraints to change were the extent there are other people in the district undertaking the new practice, and the returns available from off-property investments [Figure 20].

Survey data suggested that cash flow and cost of machinery/equipment were important constraints. When considered in light of the earlier finding that landholders thought they should be paid for environmental services, there appears to be potential for stronger cost sharing arrangements to contribute to increased adoption. Rural landholders are becoming increasingly aware that they are often being asked to implement works with wider community benefit. At the same time, most landholders in the Lachlan Catchment had not received any government funding to undertake works on their property over the last five years.

One of the assumptions underlying adjustment pressure towards larger more ‘viable’ production units has been that larger and more profitable enterprises will be better placed to implement improved management practices. However, findings from this survey indicated the respondents who reported an on-property profit were actually more likely to report that cash flow and the cost of machinery were important constraints. Ninety-one percent of those who returned an on-property profit said cash flow was an important constraint, compared to 71% of those who did not make a profit ( $\chi^2 = 40.732$ ,  $df = 4$ ,  $p < 0.001$ ). Eighty-four percent of those who returned an on-property profit also said the cost of machinery/equipment was an important constraint, compared to 73% of those who did not make a profit ( $\chi^2 = 17.822$ ,  $df = 4$ ,  $p = 0.001$ ).

While at first this finding may seem counter-intuitive, the strong link between returning a profit and larger property size appears to provide part of the explanation for this finding. Despite being more profitable, respondents with larger properties were significantly more likely to indicate that cash flow and the cost of machinery/equipment were important constraints to implement changed management practices. The median property size of those who said cash flow was an important constraint was 506 ha, compared to 40 ha for those who said it was not important ( $\chi^2 = 45.581$ ,  $df = 4$ ,  $p < 0.001$ ); and the median property size of those who said the cost of machinery/equipment was an important constraint was 465 ha, compared to 65 ha for those who said it was not important ( $\chi^2 = 29.357$ ,  $df = 4$ ,  $p < 0.001$ ). One possible explanation for this finding is that the scale of investment required by a single landholder to implement change across a larger property will be increased. This finding has important implications for efforts to adjust agricultural enterprises towards larger production units.

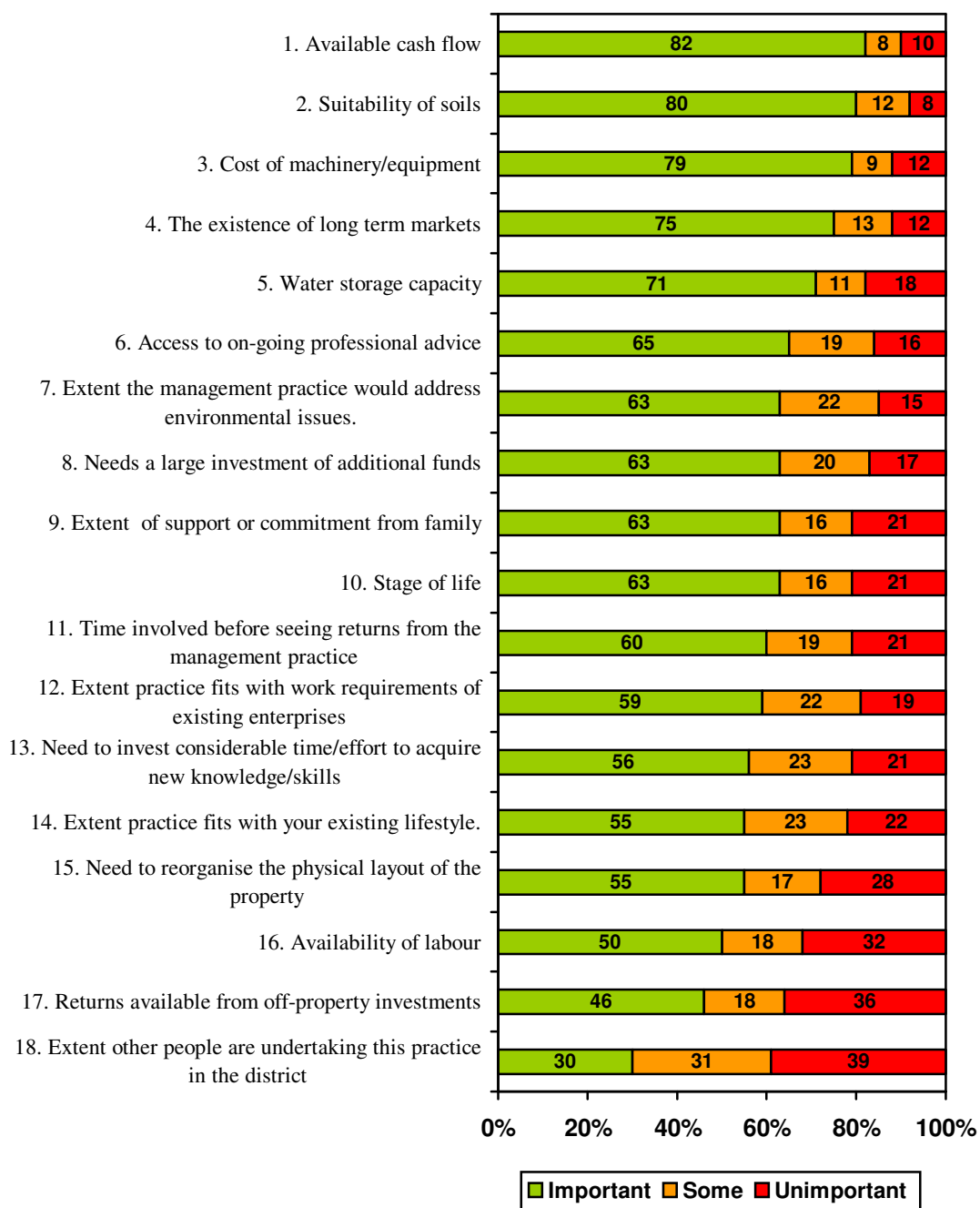
There were a small number of significant differences in respondents’ assessment of factors likely to influence their decision making about changing management practices across the survey sub-regions [Appendix 1].

### **Box 23 – Constraints to change and adoption of CRP**

There were some significant links between the perceived constraints to change and adoption of CRP.

- Respondents who said the extent a new practice fits with the work requirements of existing practices was an important constraint were significantly more likely to adopt the CRP sown perennial pasture.
- Respondents who said the extent of commitment or support from family was an important constraint were significantly more likely to adopt the CRP fenced to manage stock access to waterways.
- Respondents who said the extent a practice would address environmental issues was important were significantly more likely to adopt the CRP conducted work to control weeds and pest animals.
- Respondents who said the cost of machinery/equipment was an important constraint were significantly more likely to have adopted the CRP cropped using a rotation with ley pasture.

FIGURE 20 – CONSTRAINTS TO ADOPTING NEW LAND MANAGEMENT PRACTICES



## **Adoption of current recommended practices**

The mail survey included questions relating to the uptake of 13 current recommended practices (CRP) identified as likely to contribute to improved productivity and natural resource management outcomes in the Lachlan Catchment. Survey respondents were asked to indicate the area of their property under each practice. As some CRP relate to specific enterprises, only individuals who reported those enterprises on their property were included in calculations. For example, only respondents who reported that they cropped on their property were included in the analysis exploring the adoption of the CRP minimum tillage. As a result the 13 CRP have been grouped into three categories:

1. Non-specific CRP (including all respondents).
  - a. Planted trees and shrubs (including direct seeding).
  - b. Encouraged regrowth of native vegetation.
  - c. Sown perennial pasture or lucerne.
  - d. Applied lime.
  - e. Conducted work to control pest animal and non-crop weeds.
2. Cropping CRP (including only those respondents who reported cropping enterprises on their property).
  - a. Cropped using a rotation that was varied based on soil test results.
  - b. Cropped using a rotation with ley pasture (e.g. lucerne).
  - c. Cropped using minimum tillage practices.
3. Stock CRP (including only those respondents who reported stock on their property).
  - a. Fenced to manage stock access to waterways.
  - b. Fenced to manage stock access to native bush.
  - c. Only watered stock from a trough or tank.
  - d. Used time controlled or rotational grazing.
4. Irrigation CRP (including only those respondents who reported irrigated enterprises on their property).
  - a. Used low pressure overhead or drip irrigation systems.

## Key findings

- Survey data highlighted high levels of adoption of some CRP, including only watering stock from a trough or tank (87% with stock adopted practice), undertaking pest animal and non-crop weed control (83% adopted), cropped using a rotation with ley pasture (65% with cropping adopted), and used minimum tillage (62% with cropping adopted).
- Planted trees and shrubs (60%) and sown perennial pasture (58%) were also adopted by the majority of respondents.
- Findings demonstrated moderate uptake of the CRP encouraged regrowth of native vegetation, and cropped with a rotation based on soil test results.
- Only three CRP were adopted by less than 40% of respondents: Fenced waterways to manage stock access (38% with stock adopted), fenced to manage stock access to native bush (36% with stock adopted); and used low pressure overhead or drip irrigation systems (38% of those with irrigation adopted).

### Non-specific CRP

Survey findings highlighted encouraging levels of adoption of a number of current recommended practices, with over half of all respondents adopting three of the five non-specific practices included in the survey.

#### *Conducted work to control pest animals and non-crop weeds*

Eighty-three percent of respondents had adopted the CRP conducted work to control pest animals and non-crop weeds over the past five years, with a median of 50 days work. The combined total number of days spent on controlling pest animals and non-crop weeds by respondents to the survey over the past five years was 35,909 days. Using binary logistic regression, adoption of the CRP conducted work to control pest animals and non-crop weeds was significantly linked to respondents who:

- said the extent that a new practice would address environmental issues was an important factor in their decision making about changing management practices (Wald=11.578,  $p=0.001$ ,  $\text{Exp}(B)=2.039$ );

This variable explained approximately 9% of the variation in adoption of the CRP conducted work to control pest animals and non-crop weeds (Nagelkerke pseudo  $R^2=0.085$ ).

#### *Planted trees and shrubs*

Over half of all respondents (60%) had adopted the CRP planted trees and shrubs, with a median of 3 ha replanted. The combined area of trees and shrubs planted was just under 16,000 ha or approximately 2% of area surveyed. Using binary logistic regression, adoption of the CRP planted trees and shrubs was significantly linked to respondents who:

- said their property was important as it was an attractive place to live (Wald=9.041,  $p=0.003$ ,  $\text{Exp}(B)=1.930$ );
- agreed that clearing had substantially reduced the existence and diversity of native plants and animals in the district (Wald=6.690,  $p=0.008$ ,  $\text{Exp}(B)=1.602$ );
- said they had work funded by government undertaken on their property in the last 5 years (Wald=12.433,  $p<0.001$ ,  $\text{Exp}(B)=17.180$ ); and

These three variables accounted for approximately 30% of the variation in adoption of the CRP planted trees and shrubs (Nagelkerke pseudo  $R^2=0.303$ ).

#### *Sown perennial pasture*

Fifty-eight percent of respondents had adopted the CRP sown perennial pasture on their property. The median area sown to perennial pasture was 150 ha, with a combined area of over 81,000 ha or 12% of the area surveyed. Using binary logistic regression, adoption of the CRP sown perennial pasture was significantly linked to respondents who:

- said they made an on-property profit for 2002/2003 (Wald=18.743,  $p<0.001$ , Exp(B)=5.149);
- said they had a long-term plan or vision about the improvements they would like to make on their property (Wald=12.274,  $p<0.001$ , Exp(B)=8.455);
- said the extent a new practice fits with the work requirements of existing practices was an important factor in their decision making about changing management practices (Wald=6.611,  $p=0.010$ , Exp(B)=1.721).

These variables explained almost 31% of the variation in adoption of the CRP sown perennial pasture (Nagelkerke pseudo  $R^2=0.314$ ).

#### *Applied lime*

Just under half of all respondents to the mail survey (44%) had adopted the CRP applied lime. The median area of respondents' property where lime had been applied was 100 ha, with a total area of nearly 43,000 ha or 6% of the combined area of properties surveyed. Using binary logistic regression, adoption of the CRP applied lime was significantly linked to respondents who:

- said soil acidity undermining the long-term productive capacity of their property was an important issue (Wald=21.861,  $p<0.001$ , Exp(B)=1.601);
- had higher knowledge about how to interpret results from soil testing (Wald=17.189,  $p<0.001$ , Exp(B)=1.806);
- had employed a consultant to provide advice on property management in the last year (Wald=4.860,  $p=0.027$ , Exp(B)=1.900); and
- said they made an on-property profit for 2002/2003 (Wald=18.409,  $p<0.001$ , Exp(B)=3.199).

These four factors accounted for approximately 32% of the variation in adoption of the CRP applied lime (Nagelkerke pseudo  $R^2=0.315$ ).

#### *Encouraged regrowth of native vegetation*

Just under half (47%) of all respondents adopted the CRP encouraged regrowth of native vegetation. The median area respondents reported where regrowth of native vegetation had been encouraged was 11 ha, with a total of 77,000 ha or 11% of the area surveyed under this CRP. When combining both the area of trees and shrubs planted and the area where regrowth had been encouraged, about 13% of the area surveyed had been revegetated.

Using binary logistic regression, adoption of the CRP encouraged regrowth of native vegetations was significantly linked to respondents who:

- said native vegetation on their property providing habitat for native animals was an important value of their property (Wald=11.362, p=0.001, Exp(B)=1.474);
- were more confident in the scientific advice that 30% of their district needs to be under native vegetation to improve the environment (Wald=8.749, p=0.003, Exp(B)=1.418);
- had higher knowledge about the change in native tree cover in their district over their lifetime (Wald=9.373, p=0.002, Exp(B)=1.501); and
- were involved in developing a written property plan (Wald=10.931, p=0.001, Exp(B)=1.344).

These variables accounted for approximately 21% of the variation in adoption of the CRP encouraged regrowth of native vegetation (Nagelkerke pseudo  $R^2=0.214$ ).

### **Cropping CRP**

Respondents involved in cropping enterprises reported relatively high levels of adoption of cropping CRP with over half of all respondents adopting two of the three cropping CRP.

#### *Cropped using a rotation with ley pasture*

Sixty-five percent of respondents adopted the CRP cropped using a rotation with ley pasture with a median of 200 ha cropped under this practice. The total area cropped using a rotation with ley pasture was 68,000 ha or approximately 64% of the total area used for cropping. Using binary logistic regression, adoption of the CRP cropped using a rotation with pasture was significantly linked to respondents who:

- had higher knowledge about the benefits of ley pasture and crop rotation in maintaining soil health and productivity (Wald=5.474, p=0.019, Exp(B)=1.609);
- said the cost of machinery/equipment was an important factor in their decision making about changing management practices (Wald=6.618, p=0.010, Exp(B)=1.850);
- said they were a member of a TopCrop group (Wald=6.043, p=0.014, Exp(B)=13.152); and
- said they made an on-property profit in 2002/2003 (Wald=8.128, p=0.004, Exp(B)=2.826).

These four factors explained approximately 27% of the variation between respondents (involved in cropping) who had and had not adopted minimum tillage practices (Nagelkerke pseudo  $R^2=0.266$ ).

#### *Cropped using minimum tillage*

Just under two thirds of all respondents with cropping enterprises on their property had adopted the CRP cropped using minimum tillage. The median area cropped using this practice was 245 ha. The total area cropped using minimum tillage was 96,000 ha or approximately 90% of the total area used for cropping. Using binary logistic regression, adoption of the CRP minimum tillage was significantly linked to respondents who:

- said their property was important because it provided the majority of their household income (Wald=5.925, p=0.015, Exp(B)=1.536);

- had higher knowledge about the processes leading to soil acidification in their district (Wald=11.958, p=0.001, Exp(B)=1.946); and
- said they were a member of a TopCrop group (Wald=4.322, p=0.038, Exp(B)=5.080).

These variables explained approximately 27% of the variation between respondents (involved in cropping) who had and had not adopted minimum tillage practices (Nagelkerke pseudo  $R^2=0.273$ ).

#### *Cropped using a rotation based on soil test results*

The only cropping CRP that was adopted by less than half of all respondents with cropping enterprises was cropped using a rotation based on soil test results, with 44% of respondents adopting this practice on a median of 246 ha. However 71,362 ha or 67% of all cropping land was cropped using a rotation based on soil test results. Results from binary logistic regression indicated that the adoption of a cropping rotation varied according to soil test results was significantly linked to respondents who:

- said that their long-term plans were likely to involve increase the area of land they managed by purchasing or leasing additional land (Wald=6.950, p=0.008, Exp(B)=1.419);
- had higher knowledge about how to recognise the signs of salinity (Wald=4.939, p=0.026, Exp(B)=1.656); and
- said they had employed a consultant to provide advice on property management (Wald=9.783, p=0.002, Exp(B)=3.527).

These three factors explained approximately 26% of the variation in the adoption of the CRP cropped using a rotation varied according to soil test results (Nagelkerke pseudo  $R^2=0.264$ ).

### **Stock CRP**

Findings regarding the adoption of stock related CRP highlighted slightly lower levels of adoption across most of the CRP included in the survey.

#### *Only watered stock from a trough/tank/dam*

Almost all respondents (87%) involved in stock related enterprises in the Lachlan Catchment adopted the CRP only watered stock from a trough or tank for all paddocks on their property. Using binary logistic regression adoption of the CRP stock only watered from a trough/tank/dam was significantly linked to respondents who:

- said their property was important as it allowed them to be part of a rural community (Wald=5.182, p=0.023, Exp(B)=2.173);

This factor explained approximately 14% of the variation between those who had and had not adopted the CRP only watered stock from a trough/tank/dam (Nagelkerke pseudo  $R^2=0.135$ ).

#### *Used time controlled or rotational grazing*

Forty-two percent of respondents with stock related enterprises had adopted the CRP used time controlled or rotational grazing. The median uptake of the practice was 180 ha, with a total area of approximately 61,000 ha. Binary logistic regression showed that adoption of the CRP used time controlled or spell grazing was significantly linked to respondents who:

- had higher knowledge about the benefits of ground cover on grazing or cropping paddocks to maintain or improve soil health (Wald=4.759, p=0.029, Exp(B)=1.462);
- were involved in developing a written property plan (Wald=4.961, p=0.026, Exp(B)=1.225); and
- owned smaller properties (Wald=14.089, p<0.001, Exp(B)=0.745).

These variables accounted for just under 13% of variation in the adoption of the CRP used time controlled or spell grazing (Nagelkerke pseudo  $R^2=0.126$ ).

#### *Fenced to manage stock access to waterways*

Less than half of all respondents (38%) with stock related enterprises had adopted the CRP fenced waterways to manage stock access with a median length of 3 km of fencing. The combined length of fencing erected to manage stock access to waterways in the Lachlan Catchment was 1,600 km. Using binary logistic regression, adoption of the CRP fenced to manage stock access to waterways was significantly linked to respondents who:

- said their property was **not** important in providing a place for recreation (Wald=4.301, p=0.038, Exp(B)=0.285);
- had higher knowledge about the effects of unrestricted stock access on waterways and native vegetation (Wald=6.350, p=0.012, Exp(B)=16.175); and
- said the extent of support and commitment from their family was an important factor in their decision making about changing management practices (Wald=8.269, p=0.004, Exp(B)=10.950).

These factors explained approximately 74% of the variation between those who had and had not adopted the CRP fenced to manage stock access to waterways (Nagelkerke pseudo  $R^2=0.736$ ).

#### *Native bush fenced to manage stock access*

Only 36% of respondents with stock had adopted the CRP fenced to manage stock access to native bush. Of those who adopted this practice, the median area fenced was 15 ha with a combined area of 27,000 ha. Using binary logistic regression, adoption of the CRP native bush fenced to manage stock access was significantly linked to respondents who:

- said the time and expense in watering stock off-stream was justified by improvements in bank stability, water quality, or stock condition (Wald=5.394, p=0.020, Exp(B)=1.559); and
- said they had work funded by government undertaken on their property in the last five years (Wald=5.779, p=0.016, Exp(B)=2.410).

These factors explained approximately 12% of the variation in adoption of the CRP fenced to manage stock access to native bush (Nagelkerke pseudo  $R^2=0.118$ ).

### **Irrigation CRP**

Respondents involved in irrigated enterprises reported only limited adoption of the irrigation CRP included in the survey.

*Used low pressure overhead or drip irrigation systems*

Thirty-eight percent of respondents adopted the CRP used low pressure overhead or drip irrigation systems with a median of 12 ha cropped under this practice. The total area cropped using a rotation with ley pasture was 2,300 ha or approximately 39% of the total area used for cropping. As there were only a very small number of respondents involved in irrigated enterprises, and even fewer who adopted used low pressure overhead or drip irrigation, it was not possible to undertake binary logistic regression analysis to explore the factors linked to adoption for this CRP.

**Table 4**  
**Adoption of current recommended practices**

Current Recommended Practice		% of landholders adopting practice	Median uptake of practice per landholder
<b>Non-specific</b>	Planted trees and shrubs	60%	3 ha
	Encouraged regrowth of native vegetation	47%	11 ha
	Sown perennial pasture (e.g. lucerne)	58%	150 ha
	Applied lime	44%	100 ha
	Control of pest animal and non-crop weeds	83%	50 days
<b>Cropping</b>	Cropped using a rotation that was varied based on soil test results	44%	246 ha
	Cropped using a rotation with ley pasture	65%	200 ha
	Cropped using minimum tillage practices	62%	245 ha
<b>Stock</b>	Fenced to manage stock access to waterways	38% (a)	3 km (a)
	Used time controlled or rotational grazing	42%	180 ha
	Only watered stock from a trough or tank	87% (a)	80% of paddocks (a)
	Fenced to manage stock access to native bush	36% (b)	15 ha (b)
<b>Irrigation</b>	Used low pressure overhead or drip irrigation systems	38%	12 ha

*a – calculated by using only those respondents who had a natural waterway on their property (83%).*

*b – calculated by using only those respondents with areas of native bush on their property (58%).*

Table 5 outlines the difference in adoption of CRP across the survey sub-regions in the Lachlan Catchment.

**Table 5**  
**Adoption of current recommended practices across survey sub-regions**

CRP	Survey sub-region (% adopted CRP)			
	Upper Lachlan	Lachlan slopes	Mid Lachlan	Western /lower Lachlan
Planted trees and shrubs	57%	71%	52%	28%
Encouraged regrowth of native vegetation	48%	49%	45%	48%
Sown perennial pasture (e.g. lucerne)	43%	58%	78%	24%
Applied lime	42%	53%	43%	3%
Control of pest animal and non-crop weeds	73%	85%	86%	83%
Cropped using a rotation that was varied based on soil test results	21%	43%	53%	39%
Cropped using a rotation with ley pasture	26%	69%	75%	39%
Cropped using minimum tillage practices	58%	60%	69%	46%
Fenced to manage stock access to waterways	52%	52%	45%	75%
Used time controlled or rotational grazing	36%	51%	41%	6%
Only watered stock from a trough or tank	86%	88%	90%	82%
Fenced to manage stock access to native bush	44%	40%	26%	39%
Used low pressure overhead or drip irrigation systems	29%	59%	26%	0%

## **Discussion of major factors influencing adoption of CRP**

The single variable most commonly linked to the adoption of CRP included in the mail survey was returning an on-property profit for the 2001/2002 financial year. Respondents who had an on-property profit were significantly more likely to adopt the CRP applied lime, sown introduced perennial pasture and cropped using a rotation with ley pasture. Half of all respondents indicated they did not make an on-property profit. This finding highlights that low profitability is likely to be an important barrier to the adoption of improved management practices in the Lachlan Catchment. At the same time, these findings also provide evidence that on-property profitability can be maintained and even enhanced through adoption of CRP. Respondents who had adopted the CRP applied lime, sown introduced perennial pasture, and cropped using a rotation with ley pasture, were all more likely to report a trend towards increased profitability over the last five years.

- 38% of respondents who adopted the CRP applied lime said that their profitability for 2001/2002 was higher than the average over the past five years compared to 20% of non-adopters.
- 33% of respondents who adopted the CRP sown introduced perennial pasture said that their profitability for 2001/2002 was higher than the average over the past five years compared to 21% of non-adopters.
- 36% of respondents who adopted the CRP cropped using a rotation with ley pasture said that their profitability for 2001/2002 was higher than the average over the past five years compared to 29% of non-adopters.

Having work undertaken on their property that was at least partially funded by government in the past five years was also linked to the adoption of the CRP planted trees and shrubs, and fenced native bush to manage stock access. The importance of government funded work in facilitating adoption is consistent with the finding that the majority of respondents thought that landholders should be paid for providing environmental services that benefit the wider community. At the same time, over 70% of landholders in the Lachlan Catchment said they had not had any work funded on their property in the last five years. The perceived complexity of application processes to access government funding appears to be part of the explanation for limited government funded work on private property in the region. Just under half of all respondents reported that red tape limited their interest in applying for government assistance. Access to government funding can clearly help facilitate higher adoption of CRP, however, careful consideration needs to be paid to ensuring any application process is as streamlined as possible. Findings from the survey also highlighted that stronger cost sharing arrangements have considerable potential to improve the establishment of native vegetation and management of remnants.

The extent to which respondents were involved in a range of property planning activities was also linked to the adoption of a number of CRP. Respondents who were involved in property planning were significantly more likely to have adopted the CRP encouraged regrowth of native vegetation, and used time controlled or rational grazing. Respondents who said they had a plan or vision about the improvements they wanted to make on their property were also more likely to have adopted the CRP sown introduced perennial pasture.

In light of the earlier findings of limited involvement in property planning, on-going promotion and support for landholders to undertake these plans appears to be an important element in facilitating the adoption of CRP. Findings from this survey also highlight the importance of less formal and less structured planning processes. Given the earlier finding that smaller property owners were less likely to be involved in whole farm planning, providing a less structured and less formal alternative may help facilitate planning and

ultimately adoption for smaller landholders. An information package outlining some simple planning steps and processes and people to contact for advice may provide a useful resource to help landholders plan the improvements they would like to make on their property.

The survey also highlighted that involvement in TopCrop groups was linked the adoption of the cropping CRP cropped using a rotation with ley pasture, and cropped using minimum tillage practices. Similarly, respondents who had employed a consultant to provide advice about property management were more likely to have adopted the CRP cropped using a rotation based on soil test results, and applied lime. These findings highlight that access to information, knowledge and skills can be important factors influencing the adoption of improved land management practices. These findings were further highlighted by strong links between a number of CRP and questions relating to respondents' knowledge about the benefits of these practices, including the benefits of maintaining ground cover on grazing and cropping paddocks, the benefits of ley pasture and crop rotation, the effects of unrestricted stock access of waterways and native vegetation. One option to improve landholder confidence in CRP could be to establish local demonstration sites and field days designed to clearly test the on-ground benefits of implementing CRP.

Contrary to the common perception, there were no links between respondents' age and adoption of CRP. However it is important to note that over half of respondents said that stage of life was an important factor in their decision making about new practices. If the average age of landholders in the Lachlan Catchment continues to increase, age may become a more important barrier to the adoption of CRP.

## Confidence in CRP

Respondents were asked to provide information about their level of confidence in fencing waterways, watering stock off-stream and wetlands, and cropping using stubble retention. This information was gathered using five statements. For each statement respondents were asked to indicate their level of agreement from the following options: 'strongly agree', 'agree', 'not sure', 'disagree' and 'strongly disagree'. To simplify presentation these categories have been collapsed into three groups: 'agree' (strongly agree/agree), 'not sure' and 'disagree' (strongly disagree/disagree).

### Key findings

- The majority of survey respondents agreed that fencing waterways was an important part of the work required to revegetate these areas. At the same time, some respondents also acknowledged that fencing makes these areas more difficult to manage.
- Just under half of all respondents indicated that the time and expense of watering stock off-stream was justified by improvements in bank stability and water quality.
- There was less certainty regarding the benefits and costs of stubble retention, with 44% of respondents uncertain if the benefits of stubble retention outweighed problems with disease and the difficulties/costs of seeding through stubble.
- Only a small minority of respondents said they were confident with the scientific advice that 30% of their region needs to be under native vegetation.

Over two thirds of survey respondents acknowledged that fencing was an important part of the work required to revegetate waterways (68% agreed). At the same time, there was some concern about the efficacy of fencing waterways with 44% of respondents reporting that fencing these areas makes them more difficult to manage [Figure 21].

Just under half of all respondents (48%) also thought that the time and expense of watering stock off-stream was justified by improvements in bank stability, water quality and stock condition. Only 15% of respondents indicated that the benefits of watering stock off-stream did not outweigh the time and expense involved [Figure 21].

There was considerably more uncertainty regarding the efficacy of stubble retention with the 44% indicating that they were not sure if the benefits of stubble retention outweighed the costs and difficulties associated with this practice [Figure 21].

Over half of all respondents said they were not confident with the scientific advice that 30% of their region needed to be under native vegetation to improve the environment. Only 24% of respondents agreed with this advice.

Part of the logic in attempting to engage landholders in new land management practices has been that those who trial these practices will have a positive experience and therefore promote or advocate these practices within their local district. To test this assumption, analyses were conducted to compare the levels of confidence in CRP between those who adopted these practices and those who had not. These analyses produced mixed results. Individuals who had fenced waterways to manage stock access and only watered stock from a trough or tanks slightly less confident in the efficacy of these practices while those who adopted minimum

tillage and planted trees or shrubs were more confident in those practices. While these differences were only small, findings clearly indicate that many of those adopting CRP were still unconvinced about the efficacy of these practices. These findings highlight the need to follow up with landholders adopting new practices and provide ongoing support to help them work through any issues associated with implementing the new practice.

- Respondents who had fenced waterways or eroded gullies to manage stock access were only slightly less likely to indicate that fencing made it difficult to manage these areas (46% of those who adopted compared to 54% of non-adopters).
- Respondents who only watered stock from a trough or tank were slightly less likely to report that benefits in terms of improved water quality, bank stability and stock condition outweighed the time and expenses involved (46% of those who adopted compared to 54% of non-adopters).
- Respondents who had adopted minimum tillage practices were also more likely to indicate that the benefits of stubble retention outweighed the difficulties and costs (49% of those who adopted compared to 34% of non-adopters).
- Respondents who planted trees and shrubs were significantly more likely to indicate that they were confident with the scientific advice that 30% of the region needed to be under native vegetation (29% of those who adopted compared to 17% of non-adopters).

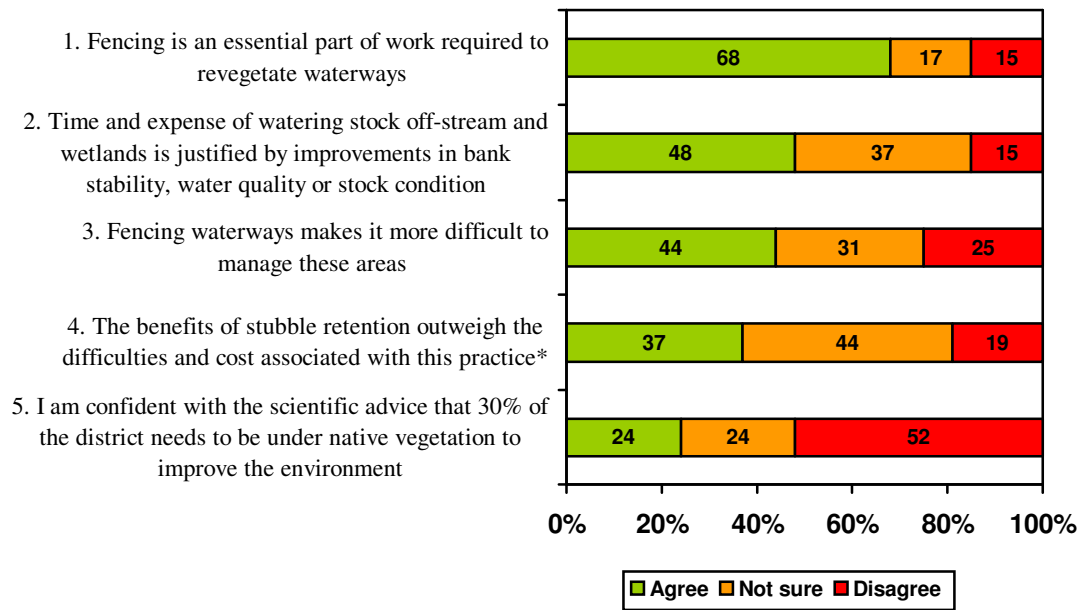
There were several significant differences in respondents' confidence in CRP across the survey sub-regions [Appendix 1].

#### **Box 24 – Confidence and adoption of CRP**

There were a number of links between confidence and adoption of CRP.

- Respondents who were confident in the scientific advice that 30% of the district needs to be under native vegetation were significantly more likely to adopt the CRP encouraged regrowth of native vegetation.
- Respondents who thought that the time and expense of watering stock off-stream or off wetlands was justified by improvements in bank stability, water quality, or stock condition were significantly more likely to adopt the CRP fenced to native bush to manage stock access.

FIGURE 21 – CONFIDENCE IN CURRENT RECOMMENDED PRACTICES



\*Note statement presented in the negative

## **Other social and demographic variables**

### **Gender**

Women play an important role in decision-making in farming families but their voices are often not heard (Curtis *et al.* 1997). According to estimates by Elix and Lambert (2000) about 30% of Australia's farm work force is female and slightly less than 20% of agricultural decision-makers are women. The mailing list for this survey was compiled from lists of rural property owners provided by local councils [see earlier section on methodology]. No attempt was made to target women property owners or managers.

Of the 436 respondents who indicated their gender, 59 or 14% were women. This value is slightly lower than the 20% reported by Elix and Lambert (2000).

### **Time lived in the local district**

Most respondents to the mail survey had lived in their local district for the majority of their life with a median of 33 years. Approximately 18% of respondents had lived in the area for less than 10 years. The long period of residence in the district for landholders may partly explain the strong attachment to their community and concerns about community decline noted earlier in this chapter.

### **Time lived on current property**

Respondents to the mail survey also indicated that they had lived for a median of 17 years on their current property.

### **Employment of a consultant to provide advice on property management**

Twenty-four percent of respondents said that they had employed a consultant to provide advice on some aspect of property management in the past 12 months.

### **Use of rural counselling services**

A small minority (11%) of respondents had used the services of a rural counsellor in the past 12 months.

### **Number of family members supported by property**

On average, respondents to the survey indicated that income from their property contributed to supporting three family members.

### **Number of individuals employed on property**

Thirty-six percent of respondents said that they had employed at least one person continuously (either part-time or full-time) for a period of at least 3 months to work on-property in the past 12 months. The average number of persons employed per respondent was 1.3 or a total of 492 persons.

## Differences between farmers and non-farmers

An important aim of this project was to provide baseline social and economic information about community attitudes towards natural resource management in the Lachlan Catchment. To achieve this aim, the project partners felt it was necessary to include all landholders in the random sample of survey respondents. As outlined earlier in this report, respondents who identified their primary occupation as farmers accounted for over half of all respondents and managed the vast majority of land area. Notwithstanding this finding, the distribution of farmers and non-farmers across the region was not even. Depending on where natural resource management issues are occurring, and the aim of any strategies to engage the community in management activities, the mix of landholders involved will need to vary. To help understand some of the differences and enable better targeted activities, the following section outlines some of the key differences between landholders who identified their primary occupation as farmers and all other respondents.

When comparing farmers' and non-farmers' assessment of issues on their property, findings highlighted that farmers have a higher level of concern across a range of issues. In particular, farmers were much more likely to report that uncertain or low returns affected their capacity to invest in the long-term health of their property and that government 'red tape' limited their interest in assistance for environmental works. The only exception to this trend was lower concern by farmers about the impacts of dryland salinity on the productive capacity of their property [Table 6].

**Table 6**  
**Perception of issues on property by farmer/non-farmer**

Issues on property	% who said important		Test
	Farmer	Non-farmer	
Access to farm labour limiting management options	28%	17%	$\chi^2=13.293$ , $p=0.001$
Uncertain or low returns limiting investment in the long-term health of property	74%	40%	$\chi^2=60.105$ , $p<0.001$
Dryland salinity undermining the long-term productive capacity of my property	17%	26%	$\chi^2=6.453$ , $p=0.040$
Government 'red tape' limiting my interest in applying for assistance to undertake work with environmental benefits	60%	46%	$\chi^2=17.986$ , $p<0.001$

Respondents' assessment of issues affecting their region showed some important differences between farmers and non-farmers. While farmers were significantly more concerned about the right to harvest or purchase water for agriculture, they were significantly less concerned about a wide range of natural resource management issues across the region. These included water quality, decline in soil health, dryland salinity, and removal of native vegetation. The previous finding that farmers had higher concern across a range of property level issues appears to be part of the explanation for these findings. That is, the need for farmers to deal with a wide range of issues at a property scale is likely to limit the time and energy they have to devote to issues that may be beyond their direct control and have less immediate or direct impacts on their property [Table 7].

**Table 7**  
**Perception of issues in region by farmer/non-farmer**

Issues in region	% who said important		Test
	Farmer	Non-farmer	
The right to harvest or purchase water for agriculture	72%	59%	$\chi^2=8.096$ , p=0.017
Changes to river/stream flows affecting the quality of recreational experiences	31%	45%	$\chi^2=8.923$ , p=0.012
Altered river or stream flow threatening the health of waterways	35%	53%	$\chi^2=14.156$ , p=0.001
Dryland salinity undermining long-term productive capacity of district	32%	47%	$\chi^2=10.353$ , p=0.006
Farming practices contributing to soil erosion	34%	54%	$\chi^2=17.003$ , p<0.001
Inefficient use of water for agriculture	39%	50%	$\chi^2=6.601$ , p=0.037
Nutrient, sediment and chemical loads affecting quality of river systems	40%	61%	$\chi^2=16.832$ , p<0.001
Dryland salinity reducing water quality	30%	44%	$\chi^2=8.443$ , p=0.015
Decline of soil health	43%	55%	$\chi^2=10.258$ , p=0.006
Removal of native vegetation	28%	47%	$\chi^2=18.439$ , p<0.001
Lack of awareness about aboriginal cultural heritage sites on private property	10%	23%	$\chi^2=13.904$ , p=0.001

As expected, the values respondents attached to their property showed a number of differences between farmers and non-farmers. Farmers were more likely report that their property was important for economic reasons including providing income, building a viable business, and providing a sound long-term investment. Nevertheless, farmers were also more likely to report that being able to pass the property on in better condition, being part of a rural community and having the freedom of being self-employed were important. By comparison, non-farmers were more likely to report that recreation and aesthetics were important values they attached to their property. Again these findings highlight that respondents whose occupation was farming aspire to achieve a wider range of outcomes through the management of their property [Table 8].

**Table 8**  
**Values attached to property by farmer/non-farmer**

Values	% who said important		Test
	Farmer	Non-farmer	
Provides most of our household income	90%	16%	$\chi^2=206.652$ , p<0.001
Being able to pass the property on in better condition	92%	76%	$\chi^2=25.452$ , p<0.001
A place for recreation	32%	71%	$\chi^2=57.557$ , p<0.001
Sense of accomplishment from building or maintaining a viable business	91%	60%	$\chi^2=60.457$ , p=0.001
Work on the property is the only job I have ever done	51%	7%	$\chi^2=53.826$ , p<0.001
Being part of a rural community	73%	63%	$\chi^2=8.207$ , p=0.017
Work on the property is break from my normal occupation	19%	71%	$\chi^2=86.386$ , p<0.001
To preserve family tradition as the property has been in the family for a long time	56%	28%	$\chi^2=18.769$ , p<0.001
Sense of accomplishment in providing food and fibre for others	75%	47%	$\chi^2=33.982$ , p<0.001
Being able to build a business that employs other family members	59%	26%	$\chi^2=43.804$ , p<0.001
It is an attractive place to live	81%	93%	$\chi^2=11.773$ , p=0.003
The freedom of being self employed	90%	69%	$\chi^2=27.632$ , p<0.001
Provides a sound-long-term economic investment	81%	63%	$\chi^2=21.353$ , p<0.001

When asked about their long-term plans for their property, farmers said they were more likely to keep the property in the family, defer management decisions to another family member and increase their land holding than non-farmers. Conversely, non-farmers said they were more likely to increase their off-property work [Table 9].

**Table 9**  
**Long-term plan by farmer/non-farmer**

Topic	% who said likely		Test
	Farmer	Non-farmer	
Someone else in the family will make management decisions	42%	24%	$\chi^2=15.863$ , p<0.001
Ownership of the property will stay in the family	66%	54%	$\chi^2=6.538$ , p=0.038
I will increase the area of land I manage by purchasing, leasing or share farming additional land	50%	27%	$\chi^2=19.430$ , p<0.001
I will increase off-property work	13%	34%	$\chi^2=23.250$ , p<0.001

Analyses exploring the differences between farmers and non-farmers highlighted that farmers were significantly less confident about the efficacy of or need for practices to improve environmental outcomes including fencing waterways, increasing native vegetation, and stubble retention. The finding that farmers were less likely to indicate that short term loss in production could be justified by long-term improvement in resource conditions is likely to partly explain these differences [Table 10].

**Table 10**  
**Attitudes to NRM by farmer/non-farmer**

Topic	% who agreed		Test
	Farmer	Non-farmer	
I'm confident in the scientific advice that 30% of the district needs to be under native vegetation to improve the environment	13%	42%	$\chi^2=77.746$ , $p<0.001$
Aboriginal communities and landholders should work together to protect cultural heritage sites on private property	34%	46%	$\chi^2=6.918$ , $p=0.031$
Landholders should be fully paid for providing environmental services that that benefit the wider community	80%	65%	$\chi^2=11.269$ , $p=0.004$
Fencing is an essential part of the work required to revegetate waterways	61%	79%	$\chi^2=18.885$ , $p<0.001$
The time and expense of water stock off-stream and/or off-wetlands is justified by improvements in bank stability, water quality and stock condition	40%	60%	$\chi^2=18.402$ , $p<0.001$
Fencing waterways makes it more difficult to manage these areas	51%	33%	$\chi^2=14.559$ , $p=0.001$
Problems with pest, diseases and the difficulties/costs of seeding through stubbles do not outweigh the benefits of stubble retention on cropping land	47%	24%	$\chi^2=27.882$ , $p<0.001$
Reduced production in the short-term is justified where there are long-term improvements to the environment	48%	67%	$\chi^2=25.605$ , $p<0.001$
Clearing of native vegetation has substantially reduced the existence and diversity of native plants and animals	42%	70%	$\chi^2=43.144$ , $p<0.001$
The benefits of sub-division of rural land outweigh the disadvantages	16%	29%	$\chi^2=10.082$ , $p=0.006$
I think we need better knowledge about how to manage dryland salinity in this district	60%	71%	$\chi^2=72.056$ , $p<0.001$

While previous comparisons of responses from farmers and non-farmers has indicated lower levels of concern about a range of natural resource management issues for farmers, it is interesting to note that farmers reported significantly higher knowledge across almost every topic covered in the survey. This finding might suggest that the lower priority accorded to natural resource management issues by farmers does not reflect a lower level of knowledge or understanding about the processes leading to these issues, rather that these are only one dimension of their property that they must manage [Table 11].

**Table 11**  
**Knowledge about NRM by farmer/non-farmer**

Topic	% who said high knowledge		Test
	Farmer	Non-farmer	
How to interpret results from soil testing	35%	14%	$\chi^2=63.155$ , $p<0.001$
Ability to identify sodic soils	30%	6%	$\chi^2=37.308$ , $p<0.001$
Farming systems that minimise water entering groundwater systems	30%	7%	$\chi^2=7.573$ , $p=0.023$
Local areas of native vegetation identified as being of high conservation value	24%	14%	$\chi^2=22.632$ , $p<0.001$
Catchment management priorities and targets identified by the LCMB's blueprint	7%	1%	$\chi^2=39.791$ , $p<0.001$
The area of land where plants are affected by salinity	8%	2%	$\chi^2=44.625$ , $p<0.001$
The processes leading to soil acidification	28%	8%	$\chi^2=32.277$ , $p<0.001$
The change in native vegetation cover in the district over your lifetime	35%	11%	$\chi^2=83.294$ , $p<0.001$
The benefits of ground cover on grazing and cropping paddocks to maintain or improve soil health	71%	30%	$\chi^2=53.296$ , $p<0.001$
How to recognise the signs of salinity	81%	14%	$\chi^2=62.444$ , $p<0.001$
Assistance available for drought/exceptional circumstances	25%	8%	$\chi^2=25.386$ , $p<0.001$
The ability of vegetation in waterways to improve water quality	26%	10%	$\chi^2=12.548$ , $p=0.002$
Where to go for advice about government programs that support to landholders to better manage native vegetation	21%	11%	$\chi^2=7.015$ , $p=0.030$
The link between soil acidity and dryland salinity	6%	4%	$\chi^2=79.233$ , $p<0.001$
The benefits of ley pasture and crop rotation in maintaining soil health and productivity	57%	17%	$\chi^2=83.555$ , $p<0.001$
The ability of perennial vegetation to prevent water tables rising	53%	20%	$\chi^2=60.354$ , $p<0.001$
The effects of unrestricted stock access on waterways and native vegetation	33%	16%	$\chi^2=21.966$ , $p<0.001$

Farmers were also significantly more likely to report that a wide range of factors were important considerations when making decisions about changing management practices [Table 12]. This trend is consistent with the earlier finding that farmers were attempting to achieve a wider range of goals through the management of their property.

**Table 12**  
**Constraints to change by farmer/non-farmer**

Topic	% who said important		Test
	Farmer	Non-farmer	
The extent new practice fits with work requirements of existing enterprises	73%	39%	$\chi^2=51.415$ , $p<0.001$
Extent new practice fits with your existing lifestyle	63%	43%	$\chi^2=16.396$ , $p<0.001$
Time involved before seeing returns from new practice	72%	41%	$\chi^2=39.474$ , $p<0.001$
Need to invest considerable time and effort to acquire new knowledge or skills	61%	47%	$\chi^2=7.652$ , $p=0.022$
Extent there is commitment or support from family or partner(s)	74%	48%	$\chi^2=33.279$ , $p<0.001$
Extent the new practice will address environmental issues	68%	55%	$\chi^2=10.232$ , $p=0.006$
Available cash flow	92%	67%	$\chi^2=40.347$ , $p<0.001$
Needs a large investment of additional funds	73%	49%	$\chi^2=25.696$ , $p<0.001$
Availability of labour	59%	36%	$\chi^2=21.408$ , $p<0.001$
Extent that other people are undertaking this practice in the district	36%	23%	$\chi^2=8.481$ , $p=0.014$
The existence of long-term markets	90%	28%	$\chi^2=72.098$ , $p<0.001$
Need to reorganise the physical layout of the property	63%	41%	$\chi^2=20.416$ , $p=0.001$
Cost of machinery/equipment	89%	65%	$\chi^2=36.087$ , $p<0.001$
Water storage capacity	77%	62%	$\chi^2=35.579$ , $p<0.001$
Access to ongoing professional advice	73%	54%	$\chi^2=16.414$ , $p<0.001$
Suitability of soils	88%	69%	$\chi^2=21.340$ $p<0.001$

Table 13 provides a summary of key socio-demographic differences between farmers and non-farmers.

**Table 13**  
**Background socio-economic data by farmer/non-farmer**

<b>Topic</b>	<b>Farmer</b>	<b>Non-farmer</b>	<b>Test</b>
Property size (median)	750 ha	38 ha	$\chi^2=38.766$ , p<0.001
Time lived in the local area (median)	41 yeas	23 years	$\chi^2=83.022$ , p<0.001
Time lived on the property (median)	27 years	9 years	$\chi^2=190.838$ , p<0.001
Respondent gender	94% male	77% male	$\chi^2=21.340$ , p<0.001
Involvement in a short course related to property management in the past year	70%	15%	$\chi^2=124.158$ p<0.001
Involvement in Landcare	44%	15%	$\chi^2=41.810$ , p<0.001
Involvement in TopCrop	13%	1%	$\chi^2=22.709$ , p<0.001
Involvement in other Best Practice group	11%	2%	$\chi^2=12.636$ , p<0.001
Employed a consultant to provide on-property advice in the past year	32%	14%	$\chi^2=18.230$ , p<0.001
Had on-ground work undertaken on-property that was at least partially funded by government in the past 5 years	35%	9%	$\chi^2=37.304$ , p<0.001
Used the services of a rural financial counsellor in the past year	18%	1%	$\chi^2=29.860$ , p<0.001
Made an on-property profit in 2001/2002	73%	22%	$\chi^2=106.728$ , p<0.001
Made an off-property profit in 2001/2002	62%	83%	$\chi^2=20.186$ , p<0.001
Involvement in property planning	53%	26%	$\chi^2=30.713$ , p<0.001
Presence of a long-term vision or plan for on-property improvements	92%	74%	$\chi^2=25.905$ , p<0.001
Involvement in succession planning	57%	21%	$\chi^2=50.765$ , p=0.001

## Conclusions and implications

---

Findings from this research have provided fundamental baseline information about the attitudes, values, knowledge and behaviour of landholders in the Lachlan Catchment. These baseline data also present an opportunity to track changes over time and thus contribute to the monitoring and evaluation of natural resource management activities across the catchment. Ideally a follow up survey should be conducted in three to five years time in order to realise the full potential of this project. Data from the survey also highlighted a number of potential challenges and opportunities for efforts to improve the management of natural resources across the Lachlan Catchment.

This project highlighted that many of the key issues outlined in the Lachlan Catchment Blueprint were not rated amongst the most important issues by landholders. Major issues identified by landholders were the availability of services, the decline of small towns, and reduced employment opportunities. The most important environmental and production issues identified by respondents were the cost of managing weeds and pest animals, and the right to harvest or purchase water for agriculture. Comparatively few respondents reported that they thought dryland salinity, water quality, and decline of native vegetation, represented important issues.

Notwithstanding the finding that many natural resource management issues were not highly rated, landholders in Lachlan Catchment appear to have a strong land stewardship ethic. Being able to pass the property on in better condition was rated as an important value attached to the majority respondents' properties. Contributing to the environmental health of the district was also considered to be an important value by over half of all respondents. At the same time, respondents' properties were also highly valued for providing a range of social and economic benefits including providing their desired lifestyle and maintaining a viable business. Overall these findings highlighted that landholders in the Lachlan Catchment were clearly very conscious of the need to adopt an approach to natural resource management that considered environmental, social and economic outcomes. The majority of survey respondents also appeared confident that action at the property level could improve the environmental health of their district. Furthermore, over half of all respondents (and just under half of those who said farming was their primary occupation), thought that improvements in environmental conditions could justify a short-term loss in productive capacity.

It appears that attempts to engage landholders in natural resource management activities that have a narrow focus on the priority issues outlined in the Catchment Blueprint may be of limited interest to many landholders. Even though most landholders appear to strongly value the environmental health of their property, these issues only represent one dimension of the raft of issues affecting land managers. To the extent that natural resource management activities can draw links and benefits across a range of environmental, social and economic issues, the chances for uptake will be greatly increased. In particular, any benefits to the wider community, lifestyle of the landholder, and productivity need to be considered.

The mail survey included a number of questions that asked respondents to assess their knowledge about a range of natural resource management topics. Responses to these questions highlighted only one topic (the benefits of ground cover on grazing and cropping paddocks to maintain or improve soil health) where at least half of the respondents said they had sound knowledge. In contrast, respondents reported more limited knowledge across many topics including those about salinity, water quality, soil acidity and Aboriginal land management practices. The relatively low level of knowledge across these issues is likely to

reflect the finding that most landholders did not consider these important issues in their district or on their property. While few respondents said they had sound knowledge about Aboriginal land management practices, just under 40% agreed that Aboriginal communities and landholders should work together to protect cultural heritage sites on private property. These findings highlight a significant opportunity to improve the management of Aboriginal cultural heritage sites on private property through a targeted education/awareness raising campaign.

Just over half of landholders surveyed in this project said that farming was their primary occupation and a large proportion of the survey area was owned or managed by a small group of large property owners. By contrast, there were a large number of small property owners, many of whom were not farmers by occupation.

Just over half of all survey respondents said they returned a pre-tax profit for the 2002/2003 financial year. On-property profitability was the single factor most frequently linked to the adoption of CRP in this study and highlights that low profitability is likely to represent an important barrier to the adoption of improved practices in the Lachlan Catchment. At the same time, information from the survey suggested that profitability can be maintained or even increased through the adoption of some CRP.

In addition, cash flow and the cost of machinery/equipment were rated amongst the most important factors likely to influence respondents' decision making about taking on new practices. A common assumption underlying adjustment pressure towards larger, profitable and more viable enterprises has been that these producers will be better placed to implement improved management practices. Certainly, this research did find a link between profitability and adoption of CRP. While lack of profitability can clearly limit the uptake of CRP, the presence of an on-property profit is not necessarily an absolute indication of a landholder's financial capacity to implement improved practices.

Findings from this survey highlighted that respondents who returned an on-property profit were actually more likely to indicate that cash flow and the cost of machinery/equipment was likely to be an important constraint to implementing changed management practices. Part of the explanation for this finding is the link between on-property profit and larger properties. Despite being more profitable, respondents with larger properties were significantly more likely to indicate that cash flow and the cost of machinery/equipment were important constraints to implement changed management practices. One possible explanation for this finding is that the scale of investment (both financial and in labour) required by a single landholder to implement change across a larger property will be higher. This is likely to be particularly important for practices that require significant financial or labour inputs to implement across a large scale. This finding has important implications for efforts to adjust agricultural enterprises towards larger production units, and also for the nature of incentives or cost sharing arrangements that will be needed to offset costs.

Almost three quarters of respondents reported an off-property profit for 2002/2003. When considering the combined total household incomes, there was almost a 50/50 contribution of on-property and off-property income, and less than half of all respondents had total household income above the \$50,000 threshold considered necessary to sustain a household and maintain a farm's natural and capital assets. Unlike on-property profitability, there were no links between the adoption of CRP and off-property profitability. These findings are consistent with previous research and suggest that many landholders are unwilling to invest off-property income back into their property.

Landholders in the Lachlan Catchment were also aware that they are increasingly being asked to implement works that have wider environmental benefits. Almost three quarters of survey

respondents agreed that landholders should be paid for providing environmental services. Having works undertaken on their property that was at least partially funded by government in the past five years was linked to the adoption of several CRP. Despite this finding, less than one quarter of respondents said they had received any government funding for on-ground work over the past five years.

It seems that part of the explanation for the limited government funded work being undertaken on private property (in addition to the limited funds available), was the perceived complexity of the application processes. Just under half of all respondents reported that red tape limited their interest in applying for government assistance. There is clearly considerable potential for government funding to facilitate the adoption of CRP. However, careful consideration needs to be paid to ensuring any application process is as streamlined as possible.

The median age of landholders in Lachlan Catchment was 51 years. The common perception that older age represents an important barrier to the adoption of CRP was not supported in this research as there were no links between respondents' age and the adoption of CRP.

Survey findings highlighted encouraging levels of involvement in property planning with just under half of all respondents either currently developing or with a completed property plan. Nevertheless, over half of all respondents had no involvement in property planning and smaller landholders were significantly less likely to be involved. Respondents who were involved in property planning were significantly more likely to adopt several of the CRP included in the survey. On-going promotion and support for landholders to undertake these plans appears to be an important element in facilitating the adoption of CRP.

Having a plan or vision about the improvements landholders wanted to make on their property was also linked to adoption of CRP. Encouraging participation in less formal and less structured planning processes appears to provide a useful alternative in terms of promoting the adoption of CRP. This strategy could be particularly useful for engaging those respondents less interested in developing a written property plan, such as smaller property owners, in thinking about the ways they could improve their property and the region. An information package outlining some simple planning steps and processes and people to contact for advice may provide a useful resource to help landholders plan the improvements they would like to make on their property.

Overall, findings from this research highlighted promising levels of adoption of CRP by landholders in the Lachlan Catchment. In particular the CRP only watered stock from a trough or tank, conducted work to control pest animals and plants, cropped using a rotation with ley pasture, and cropped using minimum tillage practices have been widely adopted. Part of the logic in promoting the adoption of CRP has been that those who have trialed these practices will continue to use them and even promote them to other landholders in the region. When comparing respondents' level of confidence in the efficacy of CRP, this project highlighted that many of those respondents who had adopted CRP were not confident that the benefits of these practices outweighed the costs. Both greater confidence in the efficacy of CRP and higher knowledge about the benefits of CRP, including maintaining and improving soil health and vegetation, were linked to higher levels of adoption. These findings emphasise a need to provide ongoing support for landholders implementing CRP and to learn from their experiences in adapting these techniques to suit local conditions. Taking landholders to visit and talk to other locals who have successfully implemented CRP is likely to provide an effective method of communicating the benefits of these practices.

## References

---

- Australian Bureau of Statistics (ABS). 2001. *Deaths*. Publication number 3302.0. ABS, Canberra.
- Australian Soil Conservation Council (ASCC). 1991. *Decade of Landcare plan*. ASCC, Canberra.
- Barr, N. and Cary, J. 2000. Influencing improved natural resource management on farms. Bureau of Rural Sciences, Canberra.
- Barr, N., Ridges, S., Anderson, N., Gray, I., Crockett, J., Watson, B. and Hall, N. 2000. Adjustment for Catchment Management. Murray-Darling Basin Commission, Canberra, Australia.
- Cavaye, J. 2003. Integrating Economic and Social Issues in Regional Natural Resource Management Planning: A Framework for Regional Bodies (National Action Plan for Salinity and Water Quality). Department of State Development, Queensland, Australia.
- Curtis, A. 2000. Landcare: approaching the limits of volunteer action. *Australian Journal of Environmental Management*, 7(1): 19-27.
- Curtis, A. and De Lacy, T. 1996. Landcare in Australia: does it make a difference. *Journal of Environmental Management* 46: 119-137.
- Curtis, A. and Lockwood, M. 2000. Landcare and catchment management in Australia: lessons for state-sponsored community participation. *Society and Natural Resources* 13:61-73.
- Curtis, A. and Byron, I. 2002. Understanding the social drivers of catchment management in the Wimmera region. The Johnstone Centre, Charles Sturt University, Albury, Australia.
- Curtis, A., Davidson, P. and De Lacy, T. 1997. The participation and experience of women in landcare. *Journal of Sustainable Agriculture*, 10(2/3): 37-55.
- Curtis, A., Lockwood, M. and MacKay, J. 2001. Exploring landholder willingness and capacity to manage dryland salinity in the Goulburn Broken Catchment. *Australian Journal of Environmental Management* 8:20-31.
- Curtis A., MacKay, J. Van Nouhuys, M. Lockwood, M., Byron., I. and Graham., M. 2000. Exploring landholder willingness and capacity to manage dryland salinity in the Goulburn Broken Catchment. The Johnstone Centre, Charles Sturt University, Albury.
- Curtis, A., Graham, M., Byron, I., Lockwood, M. and McDonald, S. 2002. Providing the knowledge base to achieve landscape change in the Ovens catchment. Albury, New South Wales: The Johnstone Centre, Charles Sturt University, Albury, Australia.
- Dillman, D.A. 1979. Mail and telephone surveys: the total design method. New York: Wiley.
- Dovers, S.R. 1995. Information, sustainability and policy. *Australian Journal of Environmental Management* 2:142-156.
- Dovers, S.R. and Mobbs, C.D. 1997. An alluring prospect? Ecology, and the requirements of adaptive management. In N. Klomp and I. Lunt (eds) *Frontiers in ecology: building the links*. Elsevier, Oxford.

- Elix, J. and Lambert, J. 2000. Missed opportunities: harnessing the potential of women in agriculture. In Proceedings of the International Landcare Conference, March 2-5, 2000. Department of Conservation and Natural Resources, Melbourne.
- Guerin, T. 1999. An Australian perspective on the constraints to the transfer and adoption of innovations in land management. *Environmental Conservation*, 26:4,289-304.
- Haberkorn, G., Hugo, G., Fisher, M. and Aylward, R. 1999. *Country matters: a social atlas of rural and regional Australia*. Bureau of Rural Sciences, Canberra.
- Lachlan Catchment Management Board. 2003. Lachlan Catchment Blueprint. NSW Department and Land and Water Conservation, Forbes.
- Lockwood, M., Hawke, M. and Curtis, A. 2002. Potential of revegetation incentives to meet biodiversity and salinity objectives: a study from the Goulburn Broken Catchment. *Australian Journal of Environmental Management* 9:79-88.
- Millar, J. and Curtis, A. 1997. Perennial Grasses: finding the balance. *Australian Journal of Soil and Water Conservation* 10(1):21-28.
- Murray-Darling Basin Commission (MDBC). 1990. *Natural Resources Management Strategy*. MDBC, Canberra.
- Race, D. and Curtis, A. 1998. Socio-economic considerations for regional farm forestry development. *Australian Forestry* 60(4):233-239.
- Rendell, R., O'Callagan, P. and Clark, N. 1996. *Families, Farming & the Future*. Agriculture Victoria, Bendigo.
- Shindler, B. and Wright, A. 2000. *Watershed management in the central cascades: a study of citizen knowledge and the value of information sources*. USDA Forest Service Research Report, Pacific Northwest Research Station, Corvallis, Oregon, USA.
- Shultz, S., Saenz, F. and Hyman, G. 1998. Linking people to watershed protection planning with a GIS: a case study of a central American watershed. *Society and Natural Resources* 11:663-675.
- Stirzacker, R., Lefroy, T., Keating, B. and Williams, J. 2000. A revolution in land use: emerging land use systems for managing dryland salinity. CSIRO Division of Land and Water, Canberra.
- Vanclay, F. 1992. The social context of farmers' adoption of environmentally-sound farming practices. In: *Agriculture, environment and society*, G. Lawrence, F. Vanclay, and Furze, B. (Editors). Macmillan, Melbourne, Australia.
- Vanclay, F. 1997. The social basis of environmental management in agriculture: a background for
- Webb, T.J. and Curtis, A. 2002. Mapping regional capacity. Bureau of Rural Sciences, Canberra, Australia.
- Walker, G., Gilfedder, M. and Williams, J. 1999. *Effectiveness of current farming systems in the control of dryland salinity*. CSIRO Division of Land and Water, Canberra, ACT.

## Appendix 1 – Differences across survey sub-regions

Survey question	Upper Lachlan	Lachlan slopes	Mid Lachlan	Western/lower Lachlan
<b>Issues affecting property (% who said important/very important)</b>				
Uncertain/low returns limiting investment in the long-term health of property	60%	56%	71%	65%
Identified areas where plants were showing signs of salinity	25%	22%	11%	7%
<b>Issues affecting local district (% who said important/very important)</b>				
Property sub-division undermining the viability of agriculture	45%	40%	15%	32%
Soil acidity reducing long-term productive capacity of land	56%	54%	38%	22%
Decline of soil health in district	58%	48%	42%	45%
Provides most of the household income	46%	56%	79%	83%
<b>Values attached to property (% who said important/very important)</b>				
An asset that will fund my retirement	54%	58%	76%	71%
Work on the property is a welcome break from normal occupation	58%	56%	35%	23%
Being able to build a business that employs other family members	41%	47%	60%	48%
This is a great place to raise a family	75%	87%	86%	83%
<b>Long term plans for property (% who said likely/highly likely)</b>				
The property will be sold	21%	26%	29%	7%
Ownership of the property will stay within the family	68%	56%	63%	77%
<b>Attitudes towards natural resource management (% who said agree/strongly agree))</b>				
I am confident with the scientific advice that 30% of the district needs to be under native vegetation to improve the environment	30%	29%	15%	19%
Landholders should be fully paid for providing environmental services that have wider benefits	65%	73%	81%	63%
Fencing is an essential part of work required to revegetate waterways	61%	78%	59%	45%
The time and expense of watering stock off-stream/wetlands is justified by improvements in bank stability, water quality, or stock condition	34%	55%	43%	47%
The benefits of stubble retention outweigh the difficulties and cost associated with this practice	26%	34%	49%	38%
Clearing of native vegetation has substantially reduced the existence and diversity of native plants and animals in this district.	49%	63%	45%	29%

Survey question	Upper Lachlan	Lachlan slopes	Mid Lachlan	Western/lower Lachlan
<b><i>Knowledge about natural resource management (% who said sound/very sound knowledge)</i></b>				
How to interpret results from soil testing	14%	30%	28%	27%
Ability to identify sodic soils in this district	8%	18%	30%	16%
Farming systems that minimise water entering groundwater systems	12%	19%	23%	33%
Local areas of native vegetation identified as being of high conservation value	14%	18%	20%	42%
The land management activities of Aboriginal communities in this district	0%	3%	1%	13%
The change in native vegetation cover in the local district over your lifetime	19%	20%	29%	50%
The benefits of ground cover on grazing and cropping land to improve/maintain soil health	46%	50%	63%	53%
Who to contact for advice regarding the management of Aboriginal cultural heritage sites	3%	3%	7%	10%
Assistance available for drought/exceptional circumstances.	14%	11%	27%	29%
Where to go for advice about programs to better manage native vegetation	15%	12%	25%	10%
The benefits of ley pastures and crop rotation in maintaining soil health and productivity.	22%	36%	57%	30%
<b><i>Constraints to changing management practices (% who said important/very important)</i></b>				
Extent practice fits with work requirements of existing enterprises	55%	52%	70%	64%
Extent practice fits with your existing lifestyle.	49%	50%	66%	54%
<b><i>Adoption of Current Recommended Practices (% who adopted)</i></b>				
Planted trees and shrubs	57%	71%	52%	28%
Sown perennial pasture (e.g. lucerne)	43%	58%	78%	24%
Applied lime	42%	53%	43%	3%
Cropped using a rotation with ley pasture	26%	69%	75%	39%
Used time controlled or rotational grazing	36%	51%	41%	6%
Used low pressure overhead or drip irrigation systems	29%	59%	26%	0%
<b><i>Background social and demographic data</i></b>				
Farmer by occupation	48%	46%	79%	84%
On-property profit	39%	50%	63%	71%
Off-property profit	86%	76%	63%	34%
Median property size	185ha	114ha	950ha	6940ha
Involvement in succession planning	49%	35%	49%	53%
Topcrop group membership	0%	5%	18%	6%
Membership of other benchmark or best management practice group	2%	6%	13%	6%
Completion of a short course related to property management in past year	36%	41%	61%	59%

## Appendix 2 – Differences between landholder with properties over 2,000 ha and all other respondents

Survey question	Landholders >2,000 ha	Landholders <2,000 ha
<b><i>Assessment of issues (% who said important/very important)</i></b>		
Access to farm labour limiting management options	42%	22%
Decline of small towns in local district	80%	69%
Salinity undermining productive capacity of district	26%	40%
Soil acidity reducing productive capacity of district	34%	49%
<b><i>Values attached to property (% who said important/very important)</i></b>		
Provides most of the household income	96%	59%
Being able to pass property on in better condition	98%	84%
Providing a place for recreation	24%	52%
Providing a break from normal occupation	12%	53%
Building a business that can employ family members	60%	48%
Being an attractive place to live	74%	88%
<b><i>Long-term plans for property (% who said likely/highly likely)</i></b>		
The property will be sold	8%	29%
Ownership of property will stay within the family	73%	59%
Will increase the area of land managed	59%	38%
Will seek increased off-property work	8%	22%
Will reduce off-property work	26%	33%
<b><i>Attitudes towards NRM (% who agreed/strongly agreed)</i></b>		
Confident with advice that 30% of district needs to be under native vegetation to improve environment	4%	28%
Fencing is essential to revegetate waterways	44%	72%
Problems with stubble retention outweigh the benefits	8%	21%
Clearing has reduced the diversity of native plants and animals	31%	58%
<b><i>Knowledge (% who said sound/very sound knowledge)</i></b>		
How to interpret results from soil tests	39%	25%
Ability to identify sodic soils	35%	18%
Farming systems that minimise water entering groundwater	38%	18%
Local areas of vegetation of high conservation value	40%	16%
Targets and priorities in the Lachlan Catchment blueprint	12%	4%
The area of land where plants are affected by salinity	15%	4%
The change in native vegetation cover in the district	49%	20%
Benefits of ground cover to maintain soil health	73%	50%
How to recognise the signs of salinity	41%	29%
Who to contact for advice about the management of Aboriginal cultural heritage sites on private property	12%	4%
Assistance available for drought/exceptional circumstances	40%	15%
Who to contact for advice about government programs to help landholders better manage native vegetation	33%	13%
Ability of perennial vegetation to prevent water tables rising	51%	36%
<b><i>Constraints to change (% who said important/very important)</i></b>		
Time involved before seeing returns	80%	57%
Need to reorganise the physical layout of property	71%	52%
<b><i>Other factors (% who said yes)</i></b>		
Completed a short course related to property management	74%	43%
Used the services of a rural financial counsellor	26%	8%
Made an on-property profit	78%	50%
Made an off-property profit	39%	76%
Involved in succession planning	66%	38%