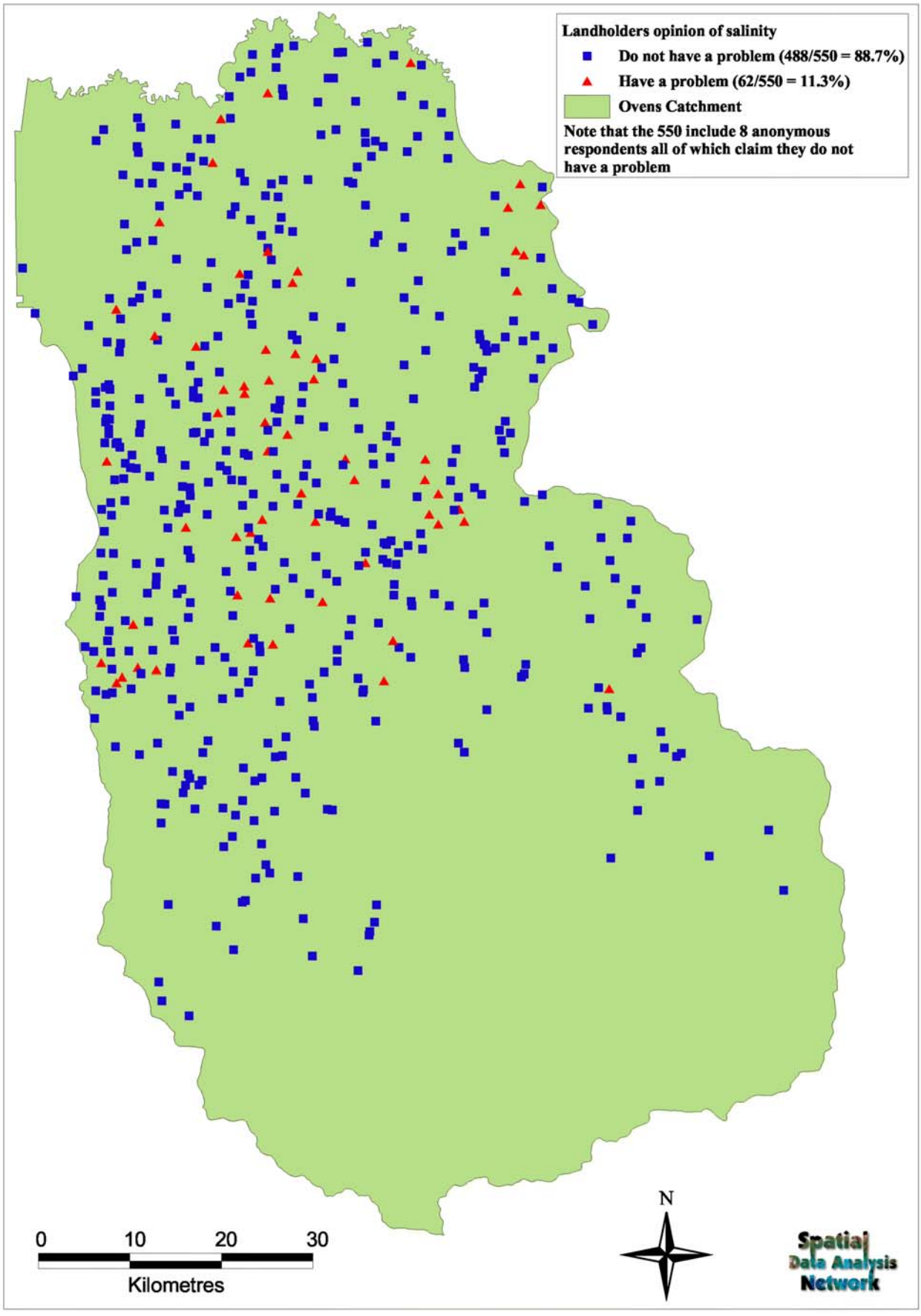
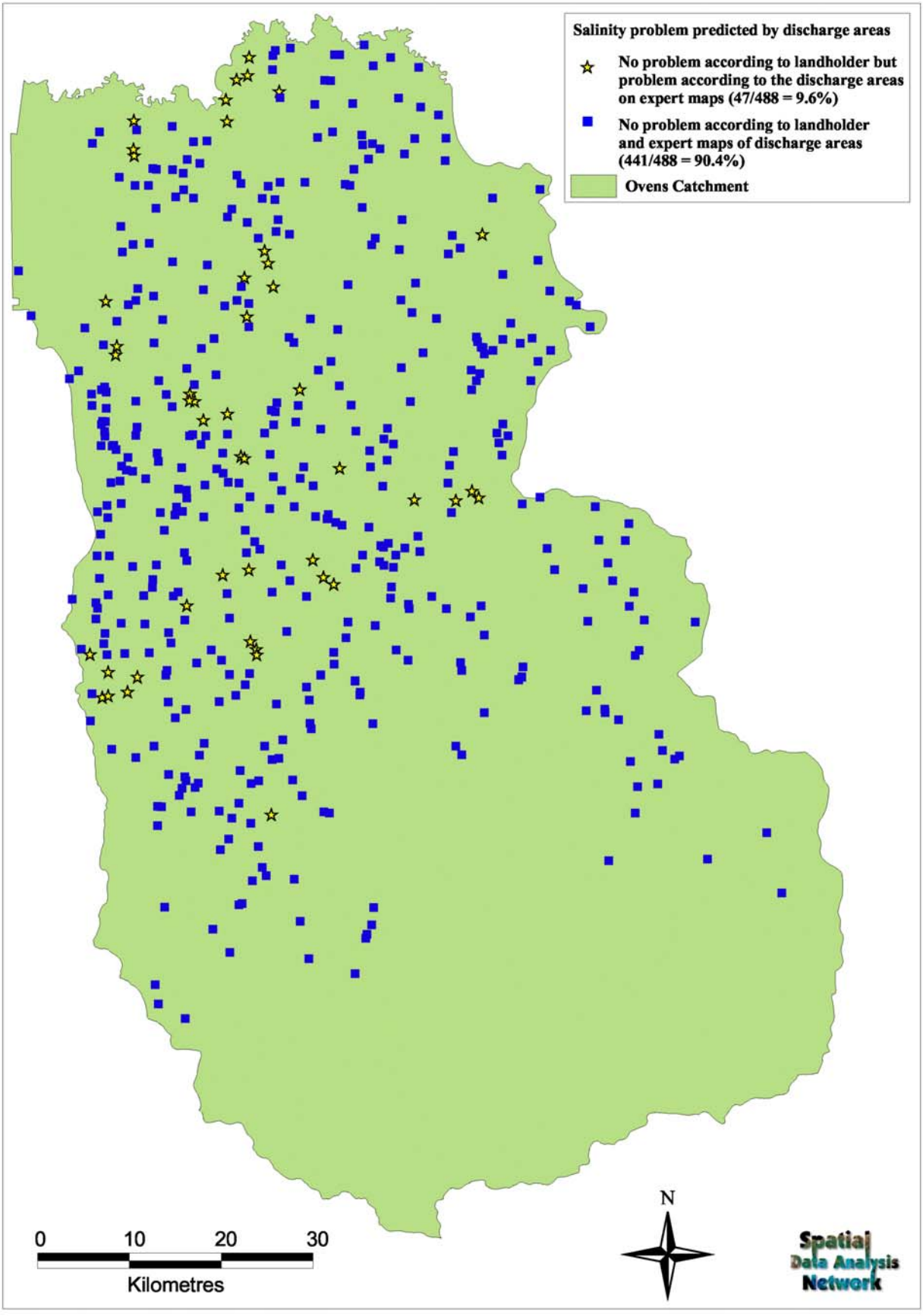
Map3
Landholder perceptions of salinity
Ovens Catchment 2001, N=550



Map 4
Comparing landholder awareness of salinity with expert maps
Landholders reporting no saline affected areas
Ovens Catchment 2001, N=550, n=488



Map 5
Comparing landholder reported saline affected areas with expert maps
Landholders reporting saline areas
Ovens Catchment 2001, N=550, n=62

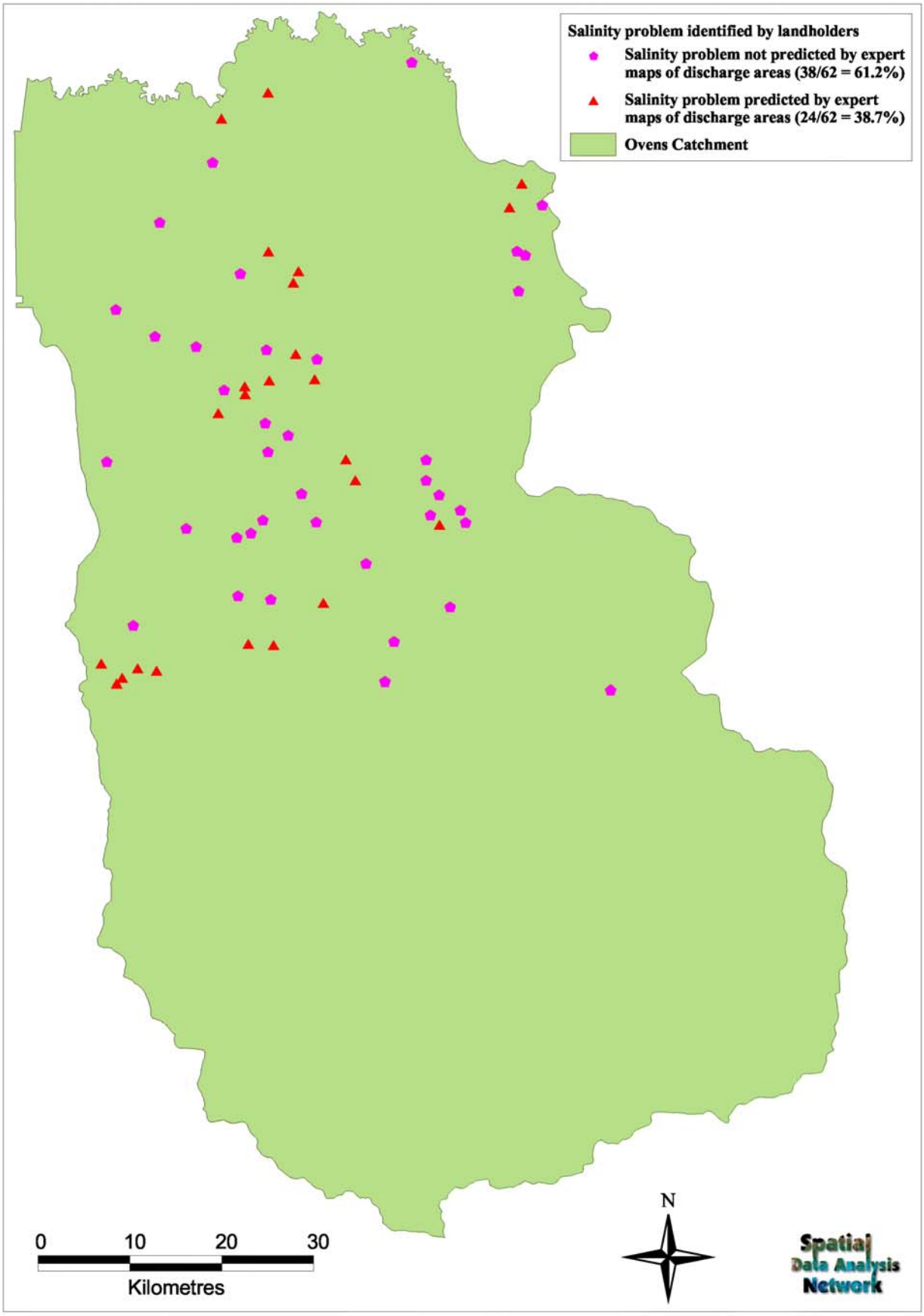


Table 4
Respondents knowledge of different topics
Ovens Catchment 2001, N=568

Topic	n	Could provide detailed explanation to others	Sufficient knowledge to take action if required	Some knowledge but need more information to act	Very little knowledge	No knowledge	Mean scores
How to collect samples for testing of soil fertility or acidity.	553	12%	47%	20%	13%	9%	3.41
How to establish introduced perennial pastures such as phalaris in this district.	550	12%	45%	23%	14%	7%	3.41
The production benefits of retaining native vegetation on farms.	548	10%	40%	28%	16%	6%	3.31
The ability of perennial vegetation to prevent water tables rising.	551	9%	38%	31%	15%	7%	3.29
The processes leading to soil acidification in this district.	550	5%	23%	32%	24%	17%	2.75
How to prepare a farm or property plan that allocates land use according to different land classes.	544	4%	25%	26%	25%	20%	2.68
The approximate per hectare returns for farm forestry in this district.	543	3%	6%	15%	29%	48%	1.87

Mean scores 1= no knowledge through to 5 = could provide detailed explanation to others

5.1.1.5 Roles and responsibilities in salinity management

A set of five statements explored respondents' views about the roles and responsibilities of different stakeholders in salinity management. For each statement, respondents were asked to choose one of five response options that ranged from 'strongly agree', 'agree', 'not sure', and 'disagree' to 'strongly disagree'. The five response options have been collapsed for presentation of data in Table 5.

- I am willing to work with government to improve the management of salinity problems in our district.
- Landholders need more help from government to manage salinity in this district.
- Individual landholders must take most responsibility for managing salinity on their land.
- Local people must work together if they are to prevent water tables rising.
- I am confident that onground work will be undertaken to prevent salinity undermining the viability of this district.

Seventy-nine per cent of respondents indicated that they were willing to work with government to improve the management of salinity problems in their area [Table 5]. The extent that most Ovens respondents have positive attitudes towards government was highlighted by the very small proportion (six per cent) indicating that they were not willing to work with government [Table 5]. It seems that part of the explanation of such widespread willingness to work with government was that most Ovens respondents (79 per cent) appreciate that local people will need help from government to manage salinity on their land [Table 5]. There were no significant differences across LMU on these variables. There were no significant relationships between willingness to work with government or needing help from government to manage salinity and adoption of CRP.

Involvement in a government program is a strong indication of a positive attitude towards cooperation with government. As we will explain later, there were significant positive relationships between respondents who reported government contributions and the adoption of CRP.

Most respondents (63 per cent) acknowledged that individual landholders must take most responsibility for managing salinity on their land [Table 5]. There were significant differences across LMU on this variable with 87 per cent of respondents in LMU 6 agreeing compared to 54 per cent in LMU 7 ($\chi^2 = 38.837$, df = 24, p = 0.028) [Table 5]. There was no significant relationship between this variable and adoption of CRP related to salinity management.

Almost all respondents (91 per cent) agreed that local people must work together if they are to prevent water tables rising [Table 5]. There were no significant differences across LMU on this variable. There were no significant relationships between this variable and adoption of CRP related to salinity management.

Almost half of the respondents were unsure if onground work would be undertaken to prevent salinity undermining the viability of their district. At the same time, 40 per cent were confident that work would be undertaken [Table 5]. There were no significant differences across LMU on this variable. There were no significant links between respondent confidence that on-ground work would be undertaken to prevent salinity undermining the viability of their district and the adoption of CRP related to salinity.

Table 5
Your views
Ovens Catchment 2001, N=568

Topic	n	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Mean score
Local people must work together if they are to prevent water tables rising.	558	34%	57%	6%	2%	1%	4.23
Landholders need help from Government to manage salinity in this district.	558	32%	47%	15%	5%	2%	4.03
I am willing to work with government to improve the management of salinity problems in our district.	552	21%	58%	15%	3%	3%	3.91
Individual landholders must take most responsibility for managing salinity on their land.	559	17%	46%	15%	15%	7%	3.52
I'm confident that onground work will be undertaken to prevent salinity undermining the viability of this district.	552	6%	34%	47%	9%	4%	3.28

5.1.2 Soil acidity

5.1.2.1 Awareness of soil acidity

Landholder awareness of soil acidity was explored in the mail survey. The key question asked respondents to indicate if they knew the soil acidity or pH for any of the paddocks on their property. Those respondents who said they did know the soil acidity level were asked to provide an estimate of the average pH or soil acidity level (using calcium chloride) for their paddocks. Respondents were invited to select one of eight options that started at <4 and finished at >5.

Whilst a majority of respondents said they knew the soil acidity for some part of their property, a substantial minority (43 per cent) said they did not.

There were no significant differences in this variable across LMU.

Respondents who reported that they knew the level of soil acidity for some part of their property were more likely to be:

- concerned about the threat of soil acidity on the long-term productive capacity of land in their district (Wald = 4.715, p = 0.029, Exp(B) = 1.367);
- concerned about the threat of soil acidity on the long-term productive capacity of their property (Wald = 4.834, p = 0.028, Exp(B) = 1.322);
- more knowledge about the processes leading to soil acidification in the district (Wald = 8.837, p = 0.003, Exp(B) = 1.636);
- higher knowledge about how to prepare a property plan (Wald = 8.913, p = 0.003, Exp(B) = 1.586);
- higher on-property profit (Wald = 8.102, p = 0.004, Exp(B) = 1.116);
- worked longer hours on-property (Wald = 9.450, p = 0.002, Exp(B) = 1.018); and
- higher level of education (Wald = 5.521, p = 0.019, Exp(B) = 1.200).

Analysis of survey data established a significant positive relationship between respondents reporting knowledge of soil acidity and adoption of CRP relating to:

- lime applied to control acidity (Wald = 4.026, p = 0.045, Exp(B) = 1.713);

- lime applied to control acidity over the past 3 years (Wald = 18.503, $p < 0.001$, Exp(B) = 3.166);
- sown introduced perennial pasture (Wald = 8.350, $p = 0.004$, Exp(B) = 1.786);
- sown introduced perennial pasture over the past 3 years (Wald = 15.145, $p < 0.001$, Exp(B) = 2.429);
- record of soil test results (Wald = 54.346, $p < 0.001$, Exp(B) = 7.039); and
- record of soil test results over the past 3 years (Wald = 24.942, $p < 0.001$, Exp(B) = 4.561).

5.1.2.2 Level of concern about soil acidity

Respondents were asked to indicate the importance of soil acidity as a threat to the long-term productive capacity of land in their district and the long-term productive capacity of their property. This section also asked about a range of other environmental, social and economic issues, providing the opportunity to assess the relative importance of salinity to respondents [Table 3].

Soil acidity was rated significantly higher than dryland salinity as an important issue affecting the long-term productive capacity of respondents' properties (35 per cent rated soil acidity a very important/important issue) or their district (49 per cent) ($t_{property} = 14.008$, $p < 0.001$; $t_{district} = 11.476$, $p < 0.001$). Nevertheless, soil acidity was only ranked fifth of the 16 issues listed in Table 3.

As expected, there was a significant link between respondents who indicated that they knew soil acidity levels for part of their property and higher levels of concern ($\chi^2 = 23.862$, df = 4, $p < 0.001$).

There were significant difference in the level of concern about the impact of soil acidity on the long-term productive capacity of land in the district across LMU, ranging from 66 per cent in LMU 7 to 33 per cent in LMU 4.

Increased concern about soil acidity affecting the long-term productive capacity of land in the district was significantly linked to the adoption of CRP relating to:
- lime applied to control acidity (Wald = 24.872, $p < 0.001$, Exp(B) = 1.626);
- lime applied to control acidity over the past 3 years (Wald = 28.311, $p < 0.001$, Exp(B) = 1.973);
- trees and shrubs planted (Wald = 6.438, $p = 0.011$, Exp(B) = 1.217); and
- sown introduced perennial pastures in the past 3 years (Wald = 4.859, $p = 0.027$, Exp(B) = 1.209).

At the same time respondents who were more concerned about the effects of soil acidity on the long-term productive capacity of their property were significantly more likely to have adopted the CRP relating to:
- record of soil test results (Wald = 8.949, $p = 0.003$, Exp(B) = 1.274);
- record of soil test results over the past 3 years (Wald = 7.233, $p = 0.007$, Exp(B) = 1.241); and
- used conservation tillage practices (Wald = 7.917, $p = 0.005$, Exp(B) = 1.298).

5.1.2.3 Knowledge about soil acidity

Respondents were asked to rate their level of knowledge about 'How to collect samples for testing of soil fertility or acidity' and 'The processes leading to soil acidification in this district'[Table 4].

A majority of respondents (59 per cent) said they had sufficient knowledge to take action if required to collect samples for testing of soil fertility or acidity. On the other hand, a large majority of

respondents (73 per cent) said they would need more information before taking action related to the processes leading to soil acidification in their district [Table 4].

There were no significant differences in these variables across LMU.

Knowledge on how to collect samples for testing soil acidity was positively linked to the adoption of the following CRP:

- lime applied to control acidity (Wald = 7.530, p = 0.006, Exp(B) = 1.431);
- lime applied to control acidity over the past 3 years (Wald = 7.061, p = 0.008, Exp(B) = 1.417);
- record of soil test results (Wald = 18.395, p < 0.001, Exp(B) = 1.897); and
- record of soil test results over the past 3 years (Wald = 4.023, p = 0.045, Exp(B) = 1.349).

Respondents who reported higher knowledge about the processes leading to soil acidification had significantly higher adoption of the CRP recorded soil test results (Wald = 33.796, p > 0.001, Exp(B) = 1.608).

In terms of adoption of CRP, it seems it is more important for landholders to be convinced that soil acidity is a problem and to know how to collect soil samples than it is for them to understand the processes leading to soil acidification. If this is the case, this finding also highlights the importance of local trials and field days to demonstrate the impact of soil acidity on grass production.

5.2 Assessment of issues affecting property and district

As explained, respondents were asked to indicate their assessment of the importance of a range of issues in their district and on their property. These issues had been identified through discussions with CMA and NRE staff that live and work in the Ovens Catchment and with landholders at the survey pre-testing workshop. The response options were 'very important', 'important', 'some importance', 'minimal importance' and 'not important'. To simplify the presentation of data, the five response options have been collapsed into three categories – very important/important, some importance, and minimal/not important [Table 3].

Analysis of survey data appears to provide some interesting and useful findings.

Four of the sixteen issues were rated as very important/important by a majority of respondents. It seems that most of the listed issues were not considered to be very important/important by most respondents. Indeed, none of the issues listed had a mean score >4 out of the possible 5 [Table 3]. This result may be a reflection of the general health and prosperity of the Ovens Catchment

Whilst this section assessed the importance of issues as opposed to values, the finding that at least one social, economic and environmental issue was ranked in the top five issues [Table 3] suggests that appeals to landholders must address the range of values that they attach to natural resources.

The importance of introduced weeds and pest animals as a priority issue in the North East was confirmed with a second, sixth and seventh ranking for these topics. The impact of introduced weeds and pest animals on the decline of native plants and animals in the district was ranked higher (second) than for on-property profitability (seven), suggesting that landholders placed a high value on the environment. On the other hand, only a minority of respondents (30 per cent) thought the removal of native vegetation has contributed to the decline of native birds and animals in the district was a very important/important issue [Table 3]. While there are large areas of forested Crown land in the Ovens Catchment, most private land has been extensively cleared. Indeed, many of the ecological vegetation classes (EVC) in the Ovens Catchment have less than 15 per cent of their pre-1750 cover remaining. Importantly, a higher rating for the issue of native vegetation removal was

linked to higher adoption of CRP linked to the protection of remnant vegetation (see below). These findings appear to justify further investment in community education to raise awareness of the extent of native vegetation removal/decline.

For three topics, soil acidity, salinity and removal of native vegetation there was reference to both the district and the property scale. In each of these cases respondents rated district issues as being significantly more important ($t_{acidity} = 11.005$, $p < 0.001$; $t_{salinity} = 13.188$, $p < 0.001$; $t_{vegetation} = 10.777$, $p < 0.001$). It is difficult to assess the extent that this perception is correct or represents a case of denial by respondents of the severity of on-property issues. In the case of dryland salinity, we have already seen that few respondents had a salinity problem, so it is probably true that for most respondents the impact of salinity will be greater at the district as opposed to the property scale.

There were no significant differences in these variables across LMU.

There were significant relationships between these variables, mainly for salinity and soil acidity, and adoption of CRP.

- Higher concern about introduced weeds and pest animals contributing to the decline of native plants was significantly linked to adoption of the CRP relating to having paddocks where plants or plant matter covered 70% of the ground (Wald = 4.910, p = 0.027, Exp(B) = 1.193).
- Higher concern about the removal of native vegetation contributing to the decline of native birds and animals was significantly linked to adoption of the CRP native bush and waterways fenced to manage stock access (Wald = 6.626, p = 0.010, Exp(B) = 1.230).
- Higher concern about the cost of managing weeds and pest animals undermining the profitability of on-property enterprises was significantly linked to adoption of the CRP spent money on work to control weeds or rabbits last year (Wald = 10.992, p = 0.001, Exp(B) = 1.416).

None of the individual items exploring concern about salinity were linked to the adoption of CRP. However, as mentioned earlier in section 5.1.1.3 a scale of three variables regarding concern about salinity was linked to adoption of trees planted (Wald = 9.585, p = 0.002, Exp(B) = 1.036.

5.3 Self-assessment of knowledge

Self-assessment is a widely accepted approach to gathering information about knowledge of natural resource management topics. One approach is to ask each respondent to answer questions that test their knowledge of a particular topic. The researchers then "correct" the respondents' answers (Shindler and Wright 2000). In this study we asked respondents to rate their level of knowledge for each of seven topics, (Curtis and De Lacy 1996). Respondents were asked to select the best response option from amongst 'no knowledge', 'very little knowledge', 'some knowledge but need more information to act', 'sufficient knowledge to take action if required', 'could provide a detailed explanation to others' [Table 4].

Fifty per cent or more respondents said they had sufficient knowledge to act for three of the seven topics: collecting samples for testing soil fertility or acidity, how to establish introduced perennial pastures, and the production benefits of retaining native vegetation on farms [Table 4].

It should be of some concern that more than half the respondents indicated they didn't have sufficient knowledge to act for the topics relating to the processes leading to soil acidity and dryland salinity [Table 4].

It is also worth noting that very few respondents said they had sufficient knowledge to act for preparing a farm/property plan or the approximate returns per hectare from farm forestry [Table 4].

As we have seen, having sufficient knowledge to take action if required to establish introduced perennial grasses was significantly and positively related to the adoption of CRP relating to perennial pasture sown and perennial pasture sown in the last 3 years.

While most respondents indicated that they required more information about the ability of perennial vegetation to prevent water tables rising there was a significant positive relationship between higher knowledge and the adoption of CRP related to:

- trees and shrubs planted (Wald = 6.545, p = 0.011, Exp(B) = 1.278);
- native bush and waterways fenced to manage stock access in the last 3 years (Wald = 10.713, p = 0.001, Exp(B) = 1.437);
- a record of soil test results in the last 3 years (Wald = 5.353, p = 0.021, Exp(B) = 1.345); and

- planted trees for farm forestry, shelter and shade, habitat, erosion control or recharge control (Wald = 12.727, $p < 0.001$, Exp(B) = 1.547).

As we have seen, having sufficient knowledge on how to collect samples for testing soil acidity was positively linked to the adoption of CRP relating to lime applied to control acidity and recorded soil test results.

Higher knowledge about the approximate returns per hectare from farm forestry was linked to adoption of the CRP planted trees for farm forestry, shelter and shade, habitat, erosion control or recharge control (Wald = 11.025, $p = 0.001$, Exp(B) = 1.432).

There were significant differences across the LMU for two of the seven knowledge variables relating to knowledge to take action if required:

- to establish introduced perennial grasses ranging from 67 per cent in LMU 6 to 41 per cent in LMU 3 ($\chi^2 = 43.746$, df = 24, $p = 0.008$); and
- the production benefits of retaining native vegetation on properties from 60 per cent in LMU 6 to 44 per cent in LMU 4 ($\chi^2 = 38.387$, df = 24, $p = 0.032$).

Respondents who had higher knowledge about how to prepare a farm/property plan were significantly more likely to report they were further advanced in completing a written property plan ($r_s = 0.579$, $p < 0.001$). Respondents who had higher knowledge about how to prepare a farm/property plan were significantly more likely to have adopted CRP related to having 70 per cent of a paddock covered with vegetation (Wald = 21.288, $p < 0.001$, Exp(B) = 1.489).

5.4 Attitudes towards conservation

Measuring attitudes is a complex task and where possible, should be accomplished using a multiple item scale that has been accepted as a valid and reliable instrument. Adopting this approach has the added benefit of enabling comparisons between the findings of different research projects. In this study we have used a multiple item scale, the New Environmental Paradigm (NEP), that assesses a constellation of attitudes towards conservation.

In the late 1970s and early 1980's Dunlap and Van Liere (Dunlap and Van Liere 1978; Van Liere and Dunlap 1981) published the results of their seminal research measuring environmental attitudes using the New Environmental Paradigm (NEP). Dunlap and Van Liere (1978: 10) argued that ecological problems '… stem in large part from the traditional values, attitudes and beliefs prevalent within our society'. Dunlap and Van Liere (1978: 10) suggested that '… our belief in abundance and progress, our devotion to growth and prosperity, our faith in science and technology, and our commitment to a laissez-faire economy, limited governmental planning and private property rights …' were all part of a Dominant Social Paradigm (DSP) that contributed to environmental degradation. Dunlap and Van Liere (1978: 10) contrasted the DSP with a new paradigm that accepted the '… inevitability of "limits to growth", the necessity of achieving a "steady-state" economy, the importance of preserving the "balance of nature" and the need to reject the anthropocentric notion that nature exists solely for human use.'

Dunlap and Van Liere (1978) developed a 12 item-scale to measure the NEP. This scale used five point Likert-type response options ranging from 'strongly agree', 'agree', 'not sure', and 'disagree' to 'strongly disagree'. Using the NEP, these researchers were able to discriminate between environmentalists and the general public and identify hypothesised connections between NEP scores and environmental behaviour. The NEP scale also conformed to accepted statistical tests for validity and reliability. The NEP has been widely employed, often with minor changes to reflect particular research contexts (Steel *et al.* 1994).

The NEP scale items were:

1. We are approaching the limit of the number of people the earth can support.
2. The balance of nature is very delicate and easily upset.
3. Humans have the right to modify the natural environment to suit their needs.
4. Mankind was created to rule over the rest of nature.
5. When humans interfere with nature it often produces disastrous consequences.
6. Plants and animals exist primarily to be used by humans.
7. To maintain a healthy economy we will have to develop a 'steady-state' economy where industrial growth is controlled.
8. Humans must live in harmony with nature in order to survive.
9. The earth is like a spaceship with only limited room and resources.
10. Humans need not adapt to the natural environment because they can remake it to suit their needs.
11. There are limits to growth beyond which our industrialised society cannot expand.
12. Mankind is severely abusing the environment.

For this research, items four, seven and eight from the original NEP were deleted to form a nine-item scale [Table 6]. Item seven was deleted because it relied upon the concept of a "steady-state" economy that the authors believed would be unfamiliar to many survey recipients in Australia. Item four was thought to be more relevant to the religious context in the USA than to Australia. Item eight was similar to items nine and 10. Changes were also made to the wording of items to reflect the Australian context (item 12) or to have a better balance of positive and negative statements (item 11).

The reliability, or the ability to produce consistent results, of the modified NEP used in this study was tested using Cronbach alpha estimates. De Vaus (1991) suggested that an alpha value above 0.7 indicates that the scale is reliable. The Cronbach alpha value for the nine item version of the NEP was 0.81. The reliability of the NEP was further demonstrated by using item-total correlations. No item scored below the 0.3 value recommended by de Vaus (1991). The uni-dimensionality of the NEP, or the extent to which the scale measures some part of a distinct concept was tested using principal components factor analysis. Using this approach all the NEP items were loaded onto a single factor with factor loadings ranging from 0.529 to 0.725.

By summing scores for each item, it was possible to calculate an index score on the NEP for each respondent. Possible scores ranged from 9 to 45, with a mid-point of 27. With a median score of 33, and with 71 per cent of respondents from the random sample above 29, it seems that most respondents have embraced the constellation of values, attitudes and beliefs that constitute the NEP.

On the other hand, survey data suggested a minority of respondents held attitudes more consistent with the Dominant Social Paradigm (DSP) of times past;

- 35 per cent think humans have the right to modify the natural environment to suit their needs; and
- 23 per cent disagree that humans are severely abusing the environment [Table 6].

Analyses failed to establish significant positive correlations between the NEP index score and adoption of CRP. However, four of the NEP items were significantly related to the adoption of CRP.

Table 6
NEP Scale
Ovens Catchment 2001, N=568

Topic	n	Strongly agree	Agree	Not sure	Disagree	Strongly disagree	Mean score
The balance of nature is very delicate and easily upset by human activities.	555	37%	42%	10%	9%	2%	4.04
The earth is like a spaceship with only limited room and resources.	553	29%	45%	15%	8%	3%	3.89
When humans interfere with nature it often produces disastrous consequences.	556	28%	45%	14%	12%	1%	3.87
Humans need not adapt to the natural environment because they can remake it to suit their needs.	553	3%	13%	18%	42%	24%	*3.69
Humans are severely abusing the environment.	556	25%	38%	15%	18%	5%	3.61
Plants and animals exist primarily for human use.	554	5%	20%	14%	42%	19%	*3.49
There are no limits to growth for industrialised nations like Australia.	551	6%	16%	20%	37%	20%	*3.48
We are approaching the limit of the number of people the earth can support.	554	25%	24%	29%	14%	9%	3.41
Humans have the right to modify the natural environment to suit their needs.	551	4%	31%	22%	29%	13%	*3.15

*Scores were reversed for calculating the mean scores when statements were in the negative.

5.5 Landcare participation

Fifty-five per cent of respondents indicated that they were members of a Landcare group. Landcare groups do not operate in every area of the Ovens and it is possible that in some LMU some respondents may not have the option of joining a group close by. Indeed, there were significant differences between the LMU on Landcare participation ($\chi^2 = 13.761$, df = 6, p = 0.032) with membership ranging from 62 per cent in LMU 5 to 34 per cent in LMU 3 [Table 7].

Table 7
Member of Landcare group
Ovens Catchment 2001, N=568

LMU	n	Yes	No
1	51	47%	53%
2	231	60%	40%
3	38	34%	66%
4	98	51%	49%
5	92	62%	38%
6	13	46%	54%
7	33	52%	49%
Total	**556**	**55%**	**45%**

Landcare membership was significantly related to:

- larger properties (Wald = 5.455, p = 0.020, Exp(B) = 1.001);
- higher concern about the cost of managing weeds and pest animals undermining on-property profitability (Wald = 3.832, p = 0.050, Exp(B) = 1.169);
- higher knowledge about how to establish introduced perennial pasture (Wald = 13.426, p < 0.001, Exp(B) = 1.489);
- higher knowledge about how to prepare a property plan (Wald = 7.226, p = 0.007, Exp(B) = 0.723);
- did not agree that there were no limits to growth for counties like Australia (Wald = 74.917, p = 0.027, Exp(B) = 0.814); and
- reported government contributions for on-ground work (Wald = 65.124, p < 0.001, Exp(B) = 10.139).

Landcare members were significantly more likely to adopt the following CRP:

- planted trees or shrubs (Wald = 3.913, p = 0.048, Exp(B) = 1.516);
- planted trees for farm forestry, shelter and shade, habitat, erosion control or recharge control (Wald = 6.327, p = 0.012, Exp(B) = 1.929);
- stock watered from a trough or tank (Wald = 5.236, p = 0.022, Exp(B) = 1.566); and
- spent money to control weeds and rabbits in the past year (Wald = 6.305, p = 0.012, Exp(B) = 2.075).

5.6 Factors affecting decision making about new enterprises

There were two parts to this section. In the first, the survey explored the importance of 17 factors that our previous research and industry partners thought were likely to affect landholder decision making about taking on a new enterprise. Enterprises suggested in the preamble included farm forestry, wine grapes, vegetables, cut flowers, nut trees or aquaculture. The response options were ‘very important’, ‘important’, ‘some importance’, ‘minimal importance’ and ‘not important’. These response options have been collapsed into three categories – very important/important, some importance, and minimal/not important [Table 8].

In the second part of this section, we posed a scenario where respondents were asked to include/add farm forestry to their existing enterprise mix and then select from the list of 17 factors the three most important constraints affecting their decision. The far right column in Table 8 provides a summary of the proportion of “votes” for each topic as the most important constraint.

Analysis of survey data appears to provide some interesting and useful findings.

It seems there is a large number of constraints that are likely to limit entry of landholders into new enterprises. Eleven of the 17 listed topics in Table 8 had mean scores >3.5 out a possible 5 and from 60 to 81 per cent of respondents rating the eleven constraints as very important/important influences on decision making.

It seems respondents are particularly wary of making any substantial new on-property investments, worry about access to long-term markets, require new enterprises to be compatible with their lifestyle and existing enterprises and are concerned about the need to update their knowledge or skills base.

While economic (three) and social (two) issues dominate the top five constraints in Table 8, respondents said that environmental factors, particularly soil acidity, soil fertility and low rainfall were also important constraints.

Indeed, the eleven most important constraints included a mix of environmental, social and economic issues that represents a formidable challenge for those attempting to implement change in the enterprise mix in the Ovens Catchment.

Five issues were rated as the number one constraint for farm forestry by 10 per cent or more respondents. The main concerns related to the need for a large investment of funds; the long-term nature of the investment, particularly for those in the later stage of life; the extent farm forestry is compatible with existing enterprises; and uncertainty about long-term markets. By comparison, respondents were far less concerned about environmental constraints, including soil acidity and fertility or access to water [Table 8].

There were few links between these issues and the adoption of farm forestry, wine grapes and other horticulture. For example, there were no links between the top ten issues in Table 8 and wine grapes and other horticulture. For farm forestry, there was a significant positive relationship with two of the top ten issues in Table 8. These were the extent a new enterprise fits with your existing lifestyle ($r_s = 0.278$, $p = 0.024$) and reluctance to change things at your stage of life ($r_s = -0.300$, $p = 0.003$).

Table 8
Capacity to change enterprise
Ovens Catchment 2001, N=568

Topic	n	Very important / important	Not sure	Very unimportant / unimportant	Mean score	% indicated most important constraint
Needs a large investment of additional funds.	510	81%	11%	8%	4.13	19%
Uncertainty about the existence of long-term markets.	509	78%	15%	6%	4.08	10%
Extent new enterprise fits well with your existing lifestyle.	514	76%	12%	13%	3.92	5%
Better returns may be available from other on or off-farm investments.	503	75%	14%	11%	3.91	5%
Extent you can access professional advice.	501	74%	16%	9%	3.87	1%
Need to invest considerable time and effort to acquire new knowledge or skills.	516	75%	11%	15%	3.86	5%
Extent new enterprise fits well with work requirements of existing enterprises.	510	72%	15%	14%	3.86	12%
A new enterprise will not succeed where there is low soil fertility or high acidity.	505	70%	18%	13%	3.85	2%
Low rainfall and/or limited storage capacity limits your landuse options.	509	68%	12%	21%	3.71	5%
Markets seem to be dominated by industry.	508	60%	30%	10%	3.70	3%
Income from enterprise does not come on-stream for at least five years.	510	62%	17%	21%	3.66	12%
Uncertainty about whether the enterprise would help control rising water tables.	506	43%	41%	16%	3.36	1%
Reluctance to change things at your stage-of-life.	518	50%	17%	32%	3.34	14%
A particular industry will lead to a smaller population in your district.	504	40%	36%	24%	3.26	5%
Earlier bad experience with enterprise in your district.	502	45%	26%	29%	3.18	2%
You may need to reorganise your paddocks.	507	43%	14%	43%	3.01	1%
There are not many other people with this enterprise in your district.	506	33%	21%	47%	2.83	1%

5.7 Level of equity in property

Respondents were asked to indicate their level of equity in their property by checking one of five options ranging from <20 per cent, 21 to 40 per cent, 41 to 60 per cent, 61 to 80 per cent and 81 to 100 per cent. Most respondents completed this question (N=568, n=408).
Survey data confirms information above suggesting that most landholders in the Ovens Catchment are risk averse in that the median level of equity was 90 per cent and this was consistent across all LMU. Indeed, only seven per cent of respondents said they had low equity levels (<40 per cent).

Those respondents with higher equity in their property were significantly more likely to:

- be younger in age;
- have more knowledge about the ability of perennial vegetation to prevent water tables rising;
- report lower importance to the number of other people in their district with an enterprise as a factor affecting their capacity to change their enterprise mix; and
- have long-term plans that involve living outside the region.

The level of equity was not significantly related to the adoption of any CRP or new and emerging enterprises included in this research.

5.8 Farming as an occupation and property size

A number of related topics that focus on occupation and property size will be addressed in this section, including:

1. property size;
2. occupational grouping that best describes the main area of paid/unpaid work; and
3. hours per week worked on and off-property.

5.9 Property size

Survey data shows that most properties in the Ovens Catchment were 150 hectares or less (55 per cent) and that 77 per cent were 300 hectares or less. The median property size for the Ovens was 130 hectares [Table 9].

There were significant differences in property size across the LMU ($\chi^2 = 30.656$, df = 6, $p < 0.001$). LMU 2 contained the largest properties with a median property size of 190 hectares compared to 65 hectares in LMU 3[Table 9].

Property size is an important element in determining the financial viability of grazing and dryland cropping enterprises. There was a significant positive relationship between increased property size and likelihood of respondents returning an on-property profit ($\chi^2 = 121.058$, df = 1, $p < 0.001$); as well as a higher amount of on-property profit ($r_s = 0.448$, $p < 0.001$). The threshold considered the minimum to sustain a family and provide sufficient funds to maintain the natural and capital assets of a property is $50,000 (Rendell *et al.* 1996). The smallest property to report an on-property profit of over $50,000 was 60 hectares. Only 53 respondents (<10 per cent of all respondents and 16 per cent of those reporting a profit [Table 13]) reported a profit in excess of $50,000. The median property size for this group of respondents was 266 hectares.

Analysis showed that property size was also an important element in property management issues. There were significant relationships between larger property size and the adoption of CRP (Yes/No as opposed to the amount that could be affected by property size):

- applied lime to control soil acidity (Wald = 4.321, p = 0.038, Exp(B) = 1.001);
- sown introduced perennial pasture in the past 3 years (Wald = 4.374, p = 0.036, Exp(B) = 1.001); and
- used conservation tillage practices (Wald = 19.798, p < 0.001, Exp(B) = 1.002).

Property size is potentially an important constraint on the capacity of land managers to adapt to changed circumstances. In this study no LMU had a median property size greater than 200 hectares, suggesting that there were few potentially viable grazing properties. On the other hand, in this study there was not a significant positive relationship between property size and adoption of farm forestry, wine grapes and other horticulture. As might be expected, smaller property size was significantly associated with higher adoption of other horticulture (r_s=-0.131, p= 0.002).

Table 9
Proportion of respondents by property size
by Land Management Unit (LMU)
Ovens Catchment 2001, N=568

LMU	n	% respondents in each property size category				Median (ha)
		10 - 40	41 - 150	151 - 300	> 300	
1	51	26%	39%	14%	22%	94
2	233	17%	27%	25%	32%	190
3	39	32%	37%	13%	18%	65
4	99	25%	37%	29%	8%	100
5	95	34%	32%	16%	19%	75
6	15	13%	33%	13%	40%	160
7	35	17%	31%	23%	29%	166
Total	**566**	**23%**	**32%**	**22%**	**24%**	**130**

A relatively small proportion of the respondent landholders owned most of the land. Eighty-four per cent of land was owned by the 46 per cent of respondents with properties larger than 150 hectares [Tables 10&11]. The proportion of land managed by small property owners was relatively small. Twenty-three per cent of all properties were 40 hectares or less [Table 9], but these properties represented only three per cent of all land [Table 10].

Table 10
Proportion of land occupied by property size category, by LMU
Ovens Catchment 2001, N=568

LMU	n	10 - 40	41 – 150	151 - 300	>300	Area of land surveyed	% of total Ovens
1	51	3%	17%	15%	65%	10,141	1.3%
2	233	2%	9%	21%	68%	61,407	7.8%
3	39	4%	15%	19%	62%	7,074	0.9%
4	99	4%	23%	45%	28%	13,974	1.7%
5	95	4%	15%	19%	63%	17,145	2.2%
6	15	1%	9%	11%	71%	3,987	0.5%
7	35	2%	12%	24%	62%	8,028	1.0%
Total	**566**	**3%**	**13%**	**22%**	**62%**	**12,756**	**16%**

5.10 Farming as an occupation

Respondents were asked to list 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. Some examples were provided including farmer, teacher, accountant, investor and retiree.

Responses on the open-ended question were collapsed into five broad occupational groupings: farmer; professional; trades; retired; and other [Table 11]. Farmers were the largest occupational grouping and comprised the majority of all respondents (58 per cent). At the same time, 42 per cent of all respondents were not farmers [Table 11]. However, farmers owned 78 per cent of all land held by respondents.

Table 11
Landholder occupations
Ovens Catchment 2001, N=568

LMU	n	Farmer	Professional	Trades	Retired	Other: clerical, admin, retail, home duties
1	50	50%	22%	10%	8%	10%
2	226	62%	13%	12%	7%	5%
3	38	66%	13%	11%	0%	11%
4	97	55%	17%	14%	9%	5%
5	94	47%	25%	11%	14%	4%
6	14	64%	7%	29%	0%	0%
7	34	62%	12%	6%	12%	9%
Total	553	58%	16%	12%	8%	6%

There were no significant differences in the proportion of respondents who were farmers across the LMU.

Analysis showed that there were significant relationships between farming as an occupation and:

- larger property size (Wald = 3.935, p = 0.047, Exp(B) = 1.002);
- lower education levels (Wald = 14.457, p < 0.001, Exp(B) = 1.655);
- longer hours worked on-property (Wald = 5.516, p = 0.019, Exp(B) = 1.630);
- fewer hours worked off-property (Wald = 5.546, p = 0.019, Exp(B) = 0.856);
- more likely to report an on-property profit (Wald = 71.480, p < 0.001, Exp(B) = 1.069);
- lower off-property income (Wald = 11.466, p = 0.001, Exp(B) = 0.973);
- higher knowledge about the processes leading to soil acidification in their district (Wald = 11.054, p = 0.001, Exp(B) = 2.647); and
- more likely to have agreed to a plan for managing the transfer of their property to the next generation (Wald = 5.900, p = 0.015, Exp(B) = 0.827).

Amongst farmers, median on-property income ($25,000) and total on-property income ($7 million) exceeded median off-property income ($15,000) and total off-property income ($4.6 million).

In this study, farming as an occupation was significantly linked to adoption of only one CRP. There was a significant positive relationship between farming and stock watered from a trough or tank (Wald = 5.694, p = 0.017, Exp(B) = 1.624).

5.11 Hours per week worked on and off-property

5.11.1 Hours worked on-property on farming related activities

Almost all respondents (95 per cent) indicated that they had spent time on farming related activities in the past 12 months. The median hours of on-property work per week over the past 12 months was 36 hours. The finding that 28 per cent of respondents worked for 15 hours or less per week on-property highlighted the extent of part-time farming.

There were no significant differences across the LMU for hours worked on-property.

Higher on-property hours worked was significantly associated with the adoption of CRP:

- lime applied to control soil acidity (Wald = 4.300, p = 0.038, Exp(B) = 1.009); and
- used conservation tillage practices such as direct drilling and stubble retention (Wald = 5.743, p = 0.017, Exp(B) = 1.012)

5.11.2 Hours worked off-property by respondent

Thirty nine per cent of respondents indicated that they had paid off-property employment that lasted at least three months in the past 12 months. For those respondents working off-property, the median was 38 hours, the equivalent of full-time employment.

There were no significant differences across the LMU for off-property work.

In this study, higher hours worked off-property were significantly linked to adoption of CRP planted trees for farm forestry, shelter and shade, habitat, erosion control or recharge control (Wald = 7.846, p = 0.005, Exp(B) = 1.016).

5.11.3 Total hours worked by respondent

Combining on and off-property work showed that 76 per cent of respondents worked more than 30 hours per week, with a median of 50 hours per week.

There were no significant differences in the total number of hours worked across LMU.

Total hours worked was not significantly associated with the adoption of CRP.

5.11.4 Hours worked off-property by spouse/partner

Most respondents (84 per cent of 544 respondents) had a spouse/partner and 48 per cent of these had paid part or full-time off-property employment that lasted for at least three months during the past 12 months. The median hours worked in these cases was 29 hours per week.

5.12 On-property, off-property and total household income

5.12.1 On-property income

Almost all respondents (553) completed the two survey questions seeking information about on-property income.

1. Did the property return a profit last financial year (1999/2000)? A profit existed when the amount of income from the property exceeded all expenses before tax.
2. What was the approximate amount of profit? The amount of profit was indicated by selecting one of seven options where the amount of income increased by ten thousand dollars. For the purpose of data analysis, each respondent was allocated the mid-point of the chosen dollar interval.

Most respondents (61 per cent) reported an on-property pre-tax profit for 1999/2000 [Table 12]. Amongst those reporting a profit, the median profit was $15,000 [Table 12]. Only 16 per cent of these respondents reported an on-property profit exceeding the $50,000 threshold discussed earlier in this report (Rendell *et al.* 1996) [Table 13].

Table 12
On and off-property income available to households
Ovens Catchment 2001, N=568

LMU	n	% indicating on-property profit	Median on-property profit	n	% indicating off-property income	Median off-property income	Combined median income	% earning >$50,000
1	50	58%	$25,000	49	76%	$35,000	$50,000	48%
2	228	66%	$15,000	222	78%	$25,000	$45,000	38%
3	38	61%	$15,000	38	82%	$30,000	$35,000	32%
4	95	54%	$25,000	91	70%	$35,000	$40,000	31%
5	95	48%	$15,000	93	83%	$25,000	$30,000	25%
6	14	86%	$15,000	14	50%	$5,000	$25,000	21%
7	33	73%	$15,000	31	87%	$35,000	$50,000	48%
Total	**553**	**61%**	**$15,000**	**538**	**78%**	**$25,000**	**$40,000**	**35%**

Table 13
On-property profit
Ovens Catchment 2001, N=568, n=553

LMU	Yes n	$5,000	$15,000	$25,000	$35,000	$45,000	>$50,000
1	27	30%	19%	4%	11%	7%	30%
2	149	32%	20%	15%	9%	7%	16%
3	22	46%	14%	14%	0%	14%	14%
4	49	31%	14%	12%	14%	14%	14%
5	49	39%	18%	16%	6%	12%	8%
6	11	36%	27%	0%	18%	0%	18%
7	24	33%	21%	13%	0%	13%	21%
Total	**331**	**34%**	**19%**	**13%**	**9%**	**10%**	**16%**

As we have seen, higher on-property profitability was significantly associated with larger property size (r_s=-0.533, $p < 0.001$).

There were no significant differences across the LMU in on-property profitability.

There were no significant positive relationships between reporting an on-property profit and adoption of CRP likely to be affected by income. However, there were significant positive relationships between higher levels of on-property profit and the adoption of CRP:

- limed to control soil acidity (Wald = 4.170, p = 0.041, Exp(B) = 1.132);
- limed to control soil acidity in the past 3 years (Wald = 7.983, p = 0.005, Exp(B) = 1.173);
- paddocks where plants or plant matter covered 70% of the ground (Wald = 6.492, p = 0.011, Exp(B) = 1.676), and
- record of soil test results (Wald = 6.478, p = 0.011, Exp(B) = 1.158).

These findings appear to suggest that for expensive CRP where there are no government funded incentive schemes, as for lime to manage soil acidity compared to tree planting to control dryland salinity, it is the size of the on-property profit that is critical for adoption.

5.12.2 Off-property household income

Respondents were asked to indicate the extent of off-property household income (after expenses and pre-tax) that they or their partner received in the last financial year, including that from wages/salaries, dividends, interest, rent or social security. Again, the approximate amount of off-property income was indicated by selecting one of seven options that increased by amounts of ten thousand dollars and, for data analyses, each respondent was allocated the mid-point of the chosen dollar interval.

Seventy-eight per cent of the respondents had a surplus on pre-tax, off-property income for 1999/2000. The median income for these respondents was $25,000 [Table 12] and 25 per cent reported off-property income of $25,000 or more.

There were no significant differences in the level of off-property income across LMU.

Those with higher levels of off-property income were significantly more likely to be:
- non-farmers ($\chi^2 = 106.888$, df = 6, $p < 0.001$);
- own smaller properties ($r_s = -1.540$, $p < 0.001$);
- younger ($r_s = 0.192$, $p < 0.001$); and
- more highly educated ($r_s = 0.335$, $p < 0.001$).

Total off-property income was higher than total on-property income in the Ovens Catchment with off-property income worth $12.7 million compared to $8.34 million for on-property income. In all LMU, with the exception of LMU 6, total off-property income exceeded total on-property income.

There were no significant relationships between off-property income and adoption of CRP.

5.12.3 Total income available to households

The median combined on and off-property income was $40,000 for 1999/2000. Only 35 per cent of respondents had a combined on and off-property income over $50,000 for 1999/2000 [Table 12].

There were no significant differences in the level of total household income across LMU.

There were no significant relationships between total household income and adoption of CRP.

These findings suggest that whilst on-property profits are linked to adoption of CRP that there is considerable resistance to invest off-property income on-property. At the same time, it must be acknowledged that most respondents had total household income below the $50,000 threshold considered the minimum to sustain a farming household.

5.13 Budgeting, property planning and family succession planning

5.13.1 Property budgeting

Only 26 per cent of respondents (n=554) indicated that they had a property budget which was updated at least quarterly and it seems that few properties were being managed using sound business practices.

There were no significant differences across the LMU for the proportion of respondents who had a property budget that was updated at least quarterly.

In this study there were few links between property budgeting and adoption of CRP, with the exception being soil testing (Wald = 4.623, p = 0.032, Exp(B) = 1.522).

5.13.2 Property planning

For this topic respondents were asked if they had prepared a written property plan that involved a map and/or other documents that addressed the existing property situation and included future management and development plans. The response options were 'completed', 'well advanced', 'halfway', 'early stages', and 'not started'.

Only 12 per cent of respondents (n=525) said had completed or were well advanced with the preparation of a property plan. Most of respondents (67 per cent) reported that had not started preparation of a property plan. If there has been a substantial investment in promoting property planning it appears to have had little impact with most property owners.

There were no significant differences across LMU for involvement in property planning.

In this study there were few links between property planning and adoption of CRP, with the exception being trees and shrubs planted in the last three years (Wald = 4.087, p = 0.043, Exp(B) = 1.196).

5.13.3 Family succession planning

Thirty per cent of respondents (n=548) said their family had agreed to a plan for managing the transfer of their property to the next generation.

Property owners may plan to sell or otherwise dispose of their property outside their family. In another survey section respondents were asked to indicate their long-term plans for their property. Fifty-seven per cent of respondents indicated they were highly likely/likely to pass ownership of the property to some one else in their family [Table 14]. Even amongst this group, most (66 per cent) did not report their family had agreed to a plan for managing the transfer of the property to the next generation. Given the low level of on-property profitability and the reluctance of young people to live in rural areas, this information casts considerable doubt about the extent that family succession will occur.

There were no significant differences across LMU for involvement in family succession planning.

Having a family succession plan was significantly linked to the adoption of the CRP for used conservation tillage practices (Wald = 5.245, p = 0.022, Exp(B) = 1.551).

5.14 Landholder stage of life and long-term plans for their property

Twelve statements explored the likelihood that each respondent's long-term plans would involve the following choices.

- The property will be sold.
- The property will be subdivided and a large part of the property sold.
- The property will be subdivided and a small part of the property sold.
- All or most of the property will be leased.
- Someone else in the family will make the management decisions.
- Ownership of the property will stay within the family.
- The respondent will retain ownership but no longer undertake much physical property work.

- The respondent will live on the property.
- The respondent will live off the property in a neighbouring town or rural setting.
- The respondent will live outside the region where the property is located.

The response options were ‘highly likely’, ‘likely’, ‘not sure’, ‘unlikely’, and ‘highly unlikely’. The response options have been collapsed to simplify data presentation in Table 14.

Where respondents indicated highly likely/likely for the property will be sold or will be subdivided and a large part sold, they were asked to indicate the year they thought this might happen.

Other sections of the survey sought information about related topics.

- Age.
- Length of time they had lived in the district.
- Longest period they had owned at least a part of their property.
- Extent their capacity to take on new enterprises was constrained by their stage of life.

5.15 Age

Most of rural Australia has an ageing population and this trend was expected to be an important constraint affecting landholder willingness and capacity to change CRP and enterprises.

The median age of Ovens survey respondents was 54 years (n=556). Twelve per cent of respondents were under forty years and 53 per cent under 55 years. Forty-eight per cent of respondents were over 55 years of age with 20 per cent over 65 years and this group managed 20 per cent of all land surveyed.

There was no significant difference in the median age of respondents across the LMU.

The common perception of younger age being linked with higher adoption of CRP was not supported by survey findings. There was no significant relationship between younger age and higher adoption of CRP. This finding suggests that the ageing of rural landholders was not a major constraint to the adoption of CRP.

5.16 Long-term plans for transfer of property

5.16.1 Introduction

Almost all respondents (534 out of 545) completed the table asking about their long-term plans for their property. As outlined above, respondents were asked about the likelihood their plans would involve a number of possible choices, including that the property would be sold; that it would be passed to someone else in the family; or that they would continue to live on the property [Table 14]. These choices were not mutually exclusive (person could respond positively to a number of choices).

Survey data was expected to contribute to a better understanding of the potential for change in the management and ownership of land in the Ovens Catchment, including:

- The extent of family succession and of hypothesised links between family succession and adoption of CRP and new enterprises.
- The extent there will be changes in property ownership in the next 10 years as older landholders pass the normal retirement age. A large turnover of ownership could have implications for extension.
- Predicting the extent and time of property transfer would help those evaluating the potential for policy initiatives such as purchases of land to accomplish catchment targets for salinity or biodiversity. The opportunity for intervention is likely to be strongest where properties are put up for sale as opposed to those that are transferred in the family.

Table 14
Likelihood that long-term plans will involve a range of choices
Ovens Catchment 2001, N=568

Choices	n	Highly likely / Likely	Not sure	Highly unlikely/ Unlikely	Mean score ~
I will live on the property.	540	63%	14%	23%	3.59
Ownership of the property will stay within the family.	542	57%	18%	25%	3.49
I will retain ownership but no longer undertake much physical work.	535	37%	21%	44%	2.86
The property will be sold.	545	29%	19%	52%	2.61
Someone else in our family will make the management decisions.	540	31%	13%	57%	2.46
I will live off the property in a neighbouring town or rural setting.	531	20%	15%	66%	2.22
I will live outside the region where the property is located.	533	12%	16%	73%	1.94
The property will be subdivided & a large part of the property sold.	538	12%	10%	78%	1.87
All or most of the property will be leased.	534	9%	14%	77%	1.82
The property will be subdivided & a small part of the property sold.	536	8%	11%	80%	1.78

~Score where 1 = highly unlikely through to 5 = highly likely

5.16.2 Continue to live on the property

Information in Table 14 shows that the majority (63 per cent) of respondents believed it was highly likely/likely that they would continue to live on their property in the long-term. This set of respondents managed 68 per cent of land surveyed. Some of these people indicated they were highly likely/likely to pass some or all of the management decisions to others. This could happen if they passed decision making to others in their family; to those who will lease all or most of the property; or to those who will purchase land when they subdivide and sell part of the property. For the purpose of this research it has been assumed that most respondents who continue to live on their property will make most of the management decisions.

There were no significant differences across the LMU in the proportion of respondents who planned to continue living on their property.

There were significant positive relationships between planning to continue living on the property in the long-term and the adoption of CRP:

- planted trees and shrubs in the past three years (Wald = 4.257, p = 0.039, Exp(B) = 1.196);
- spent funds on work to control weeds and rabbits in the past year (Wald = 8.796, p = 0.003, Exp(B) = 1.307).

5.16.3 Property will stay within family

Fifty-seven per cent of respondents said that ownership of their property was highly likely/likely to stay within the family [Table 14]. This set of respondents managed 61 per cent of land surveyed.

There were significant differences across the LMU in the proportion of respondents who planned for their family to retain ownership of their property. In LMU 2, six per cent of respondents planned to retain ownership in the family compared to 87 per cent in LMU 6.

There were no significant positive relationships between planning to retain property ownership in the family and the adoption of CRP.

5.16.4 Property will be sold or large part subdivided and sold

Twenty-nine per cent of respondents thought it was highly likely/likely that their property would be sold [Table 14]. Some respondents indicated that they would subdivide and then sell a large part of their property. Combining the two groups, 30 per cent (n=166) thought it highly likely/likely that they would be selling all or a large part of their property.

Respondents who planned to sell all or a large part of their property were significantly less likely to adopt the CRP:

- lime applied to control soil acidity in the past 3 years (Wald = 9.388, p = 0.002, Exp(B) = 0.485).

5.16.5 Extent of property subdivision

Twenty per cent of respondents said that in the long-term they were highly likely/likely to subdivide and sell some part of their property [Table 14]. Those intending to subdivide owned 19 per cent of the land covered surveyed.

This type of property speculation should not hinder large-scale adoption of CRP or new enterprises in the Ovens. However, it was evident that there will be increased subdivision. This could result in an increased proportion of properties that will not be viable as cropping or grazing enterprises as well as an increased proportion of land managers who are non-farmers.

5.16.6 Long-term commitment to living in the local region

If property owners expect to live in their local region on retirement, they might be more committed to taking action to address natural resource problems. Respondents were asked to indicate if their long-term plans involved them moving away from the region where their property is located. Most respondents were committed to living in their region in the long-term. Only 12 per cent of all respondents indicated they were highly likely/likely to live outside their region [Table 14].

There were no significant differences across the LMU in the proportion of respondents who said they would live outside the region in the long-term.

There were no significant positive relationships between planning to live outside the region in the long-term and the adoption of CRP.

5.16.7 When the transfer of property ownership is likely to occur

5.16.7.1 The approach

Respondents (maximum n=545) were allocated to one of three long-term options if they selected highly likely/likely for any of the options in Table 14. Those who did not place highly likely/likely on any option (n=14) were removed from the sample for this analysis.

1. sell all or a large part of the property (n=163);

2. retain within the family (n=294); and
3. other plans, including continue to live on the property (n=74).

Those indicating highly likely/likely for only one long-term option (n=120) were allocated to that option (sell, n=38; retain within family, n=8; other plans, n=74).
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 in the family (n=132).
- If they nominated a date when they expected to sell the property, they were assumed to be likely to sell (n=118).
- 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 (n=154).
- 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 (n=7).

Those identified as likely to sell were assumed to be selling their property in the year nominated. Where these respondents had not nominated a date, it was assumed that the sale 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 ABS Life Tables (ABS 1997) and the ABS Life Expectancy Tables (ABS 1998) were used to calculate the remaining life expectancy and provide the expected date of property transfer.

Those identified as likely to retain in the family who were under 65 years it was assumed they would transfer the property on retirement, at age 65 years. For those over 65 years, it was assumed that they would stay on the property until death. The ABS Life Tables (ABS 1997) and the ABS Life Expectancy Tables (ABS 1998) 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. The ABS Life Tables (ABS 1997) and the ABS Life Expectancy Tables (ABS 1998) were used to calculate remaining life expectancy and provide the expected date of property transfer.

The mean age (54 years) was assigned to those respondents (n=12) who hadn't provided their age.

5.16.8 The overall regional pattern

Adopting the approach outlined above:

- 31 per cent (n=163) were likely to sell their property;
- 55 per cent (n=294) intended to pass the property to someone else in the family; and
- 14 per cent (n=74) had other long-term plans [Table 15].

The median year of transfer was 2012, with 22 per cent of properties expected to change hands by the end of 2005 (within five years from 2001) and 47 per cent by the end of 2010 (within 10 years from 2001). The proportion of all land that would change owners closely matched the proportion of properties that would change hands.

The median year for property transfer by sale was 2008. The median year for property transfer through family succession was 2015. The median year for property transfer for other plans was also 2015.

Table 15
Property transfer by selling, retaining within family or other long-term plans
Ovens Catchment 2001, N=568

LMU	n	Selling property	Retain in family	Other plans
1	50	20%	62%	18%
2	222	34%	49%	17%
3	37	27%	68%	5%
4	84	27%	56%	17%
5	90	33%	50%	17%
6	14	14%	86%	0%
7	34	26%	53%	21%
Total	**531**	**31%**	**55%**	**14%**

5.17 Time lived in local district and longest period owned part of property

This data was expected to give some insights into the extent respondents have had time to learn from experiences about managing a property in their area; to locate themselves within their community; and the extent that land has changed hands.

Eighty-seven per cent of respondents (n=545) had been living in their local district for at least 10 years (median 38 years). This information suggests that the Ovens Catchment has had a fairly stable rural population.

There were no significant differences across the LMU in the length of time respondents had lived in their local area.

There were no significant positive relationships between the length of time respondents had lived in their local area and the adoption of CRP.

Seventy-three per cent of respondents (n=537) had owned some part of their property for at least 10 years (median 20 years). This set of respondents owned 83 per cent of land surveyed. This information suggests that most property owners in the Ovens Catchment should be familiar with the conditions in their district. Nevertheless, there is a small minority that has owned their land for a short period (14 per cent <6 years).

There were no significant differences across the LMU in the length of time respondents had owned their property.

There were no significant positive relationships between the length of time respondents had owned their property and the adoption of CRP.

5.18 Involvement in government programs

Thirty-two per cent of respondents (n=556) said that in the past five years there had been work on their property that had been partially funded by federal or state government programs.

There were no significant differences across the LMU in reporting that work on the property had been partially funded by government programs.

Respondents who reported government contributions for work on their property were significantly more likely to report:

- funds were an important factor limiting change in their enterprise mix; (Wald = 4.696, p = 0.030, Exp(B) = 1.339)
- willingness to work with government to manage salinity; (Wald = 18.654, p < 0.001, Exp(B) = 2.104)
- being further advanced in the preparation of a property plan; (Wald = 11.828, p = 0.001, Exp(B) = 1.404)
- they did not plan to sell all or a large part of their property; (Wald = 6.640, p = 0.010, Exp(B) = 0.513)
- working more hours on farm; (Wald = 11.584, p = 0.001, Exp(B) = 1.018)
- being a Landcare member (Wald = 77.707, p < 0.001, Exp(B) = 12.223); and
- off-property income (Wald = 11.457, p = 0.001, Exp(B) = 2.834).

There were significant positive relationships between respondents who reported government contributions and the adoption of CRP relating to:

- trees and shrubs planted (Wald = 6.098, p = 0.014, Exp(B) = 1.734);
- trees for farm forestry, shelter and shade, habitat, erosion control or recharge control (Wald = 10.245, p = 0.001, Exp(B) = 2.207);
- sown introduced perennial pasture (Wald = 10.933, p = 0.001, Exp(B) = 2.237);
- native bush and waterways fenced to manage stock access (Wald = 19.987, p < 0.001, Exp(B) = 2.627); and
- native bush and waterways fenced to manage stock access over the past 3 years (Wald = 17.656, p < 0.001, Exp(B) = 2.531).

5.19 Gender

Women play an important role in decision-making in farming families but their voice is often not heard (Curtis *et al.* 1997). About 32 per cent of Australia's farm work force are female and slightly less than 20 per cent of agricultural decision-makers are women (Elix and Lambert 2000). The mailing list for this survey was compiled from lists of rural property owners provided by local councils [see the earlier section on Methodology]. No attempt was made to target women property owners or managers.

Of the 555 respondents who gave an indication of their gender, 18 per cent were women, a proportion that is consistent with the figure for women decision-makers in agriculture that was provided by Elix and Lambert (2000).

It may also explain differences in approaches taken to property budgeting, where 16 per cent of women had a property budget updated at least monthly compared to 21 per cent of men.

Female respondents were significantly less likely to report adoption of the CRP spent funds on work to control weeds and rabbits in the past year (Wald = 5.333, p = 0.021, Exp(B) = 0.487).

5.20 Education

Respondents were asked to indicate the number of years of full-time or equivalent, post-primary school education that they had completed.

The median number of years of post-primary school education was five years.

Education is typically correlated with age as previous generations of rural Australians had fewer opportunities to pursue higher education. This was reflected in the significant negative correlation between age and years of education (r_s= -0.328, p<0.001).

There were no significant differences across the LMU in the number of years of post-primary education.

In this study there were few links between formal education and adoption of CRP, with the exception being a significant positive relationship between formal education and fencing native bush and waterways to manage stock access (Wald = 3.987, p = 0.046, Exp(B) = 1.061).

5.21 Landuse/enterprises mix

5.21.1 Introduction

Respondents were asked to provide information about their landuse/enterprise mix in three questions.

1. Select the best description from nine options provided of the landuse/enterprises on their property.
2. Indicate the area allocated to nine landuses/enterprises at the time of the survey and the area they expected to allocate to each in five years time.
3. Indicate how much land is covered by patches of native bush of a minimum size of one hectare.

We were interested in exploring the extent respondents were prepared to enter new enterprises, including farm forestry, grapes and other horticulture (flowers, olives, nuts) to assess the extent landholders were prepared to try new options that would diversify income sources away from grazing.

5.21.2 Best description of landuse/enterprise mix

Grazing (71 per cent of properties) was the dominant landuse with beef cattle (53 per cent), sheep (six per cent) or beef and sheep (12 per cent) the main grazing enterprises. Mixed crop and livestock accounted for another 10 per cent of properties and there were small proportions of dairying (five per cent) and horticulture/viticulture (four per cent) [Table 16].

Table 16
Proportion of properties under each landuse / enterprise
Ovens Catchment, 2001, N=568

LMU	n	Grazing of sheep	Grazing of beef cattle	Grazing of sheep and beef cattle	Dairying	Mixed crop & livestock	Crops	Horti-culture, Viti-culture	Tobacco	Other
1	47	2%	62%	9%	11%	2%	0%	2%	6%	6%
2	208	5%	51%	13%	3%	20%	1%	2%	1%	3%
3	35	3%	54%	17%	3%	3%	0%	11%	0%	9%
4	84	0%	51%	12%	7%	4%	1%	8%	1%	15%
5	88	14%	53%	11%	3%	2%	0%	3%	0%	13%

6	14	7%	50%	14%	14%	0%	0%	7%	0%	7%
7	29	10%	52%	10%	0%	10%	0%	3%	0%	14%
Total	**505**	**6%**	**53%**	**12%**	**5%**	**10%**	**1%**	**4%**	**1%**	**8%**

5.21.3 Involvement in enterprises: current and next 5 years

Information provided in this section was used to explore the extent respondents thought they were likely to change the enterprise mix on their property in the short/medium term. Those respondents that answered for only one year (either end of 2000 or end of 2005) were removed to provide a sample of 418 or 73 per cent of all respondents [Tables 17 and 18].

5.22 Major trends

5.22.1 Dryland pasture

The proportion of respondents with dryland pasture in 2000 varied significantly across the LMU (χ^2 = 32.523, df = 6 p < 0.001) from 95 per cent in LMU 2 to 81 per cent in LMU 7 [Table 17]

There is a downward trend, but not a significant decline, with dryland pasture (from 89 per cent of respondents at the end of 2000 to 85 per cent in 2005). Eighteen individuals (five per cent of respondents with dryland pasture) indicated they would no longer have dryland pasture in 2005. With the exception of LMU 7, this trend is consistent across all LMU. At the same time, there is likely to be little change in the median area under dryland pasture [Tables 17 and 18].

5.22.2 Irrigated pasture

The proportion of respondents with irrigated pasture in 2000 varied significantly across the LMU (χ^2 = 34.995, df = 6 p < 0.001) from 43 per cent in LMU 1 to six per cent in LMU 5 [Table 17].

Survey data suggests there is a trend towards the adoption of irrigated pasture (up from 16 to 19 per cent of respondents). Fifteen additional individuals (23 per cent of respondents with irrigated pasture) indicated they would have irrigated pasture in 2005. LMU 5 is the exception to this trend in that the proportion of respondents with irrigated pasture is likely to remain the same. However, across the Ovens, the median area under irrigated pasture is likely to be unchanged at 16 hectares [Tables 17 and 18].

5.22.3 Dryland cropping

The proportion of respondents with dryland cropping in 2000 varied significantly across the LMU (χ^2 = 59.666, df = 6 p < 0.001) from 32 per cent in LMU 2 to one per cent in LMU 4 [Table 17].

Survey data suggests there is likely to be little change in the proportion of respondents (18 per cent in 2000) or the median area (55 hectares in 2000) under dryland cropping [Tables 17 and 18].

5.22.4 Tobacco

The proportion of respondents with tobacco in 2000 varied significantly across the LMU (χ^2 = 16.313, df = 6 p = 0.012) from 10 per cent in LMU 1 to nil in LMU 5 and 6 [Table 17].

Survey data suggests there is a downward trend, but not a significant change, in the proportion of respondents (down from three to two per cent of respondents) and the median area (13 to 12 hectares) under tobacco. Five individuals (39 per cent of respondents with tobacco) indicated they would no longer have tobacco in 2005. In five years time tobacco is likely to be grown in only three of the seven LMU, down from 5 LMU in 2000 [Tables 17 and 18].

5.22.5 Dairying

There was not a significant difference in the proportion of respondents with dairying in 2000 despite the range from 17 per cent in LMU 6 to nil in LMU 7 [Table 17]. Survey data suggested there is likely to be little change in the proportion of respondents (five to four per cent) and the median area (160 to 156 hectares) over the next five years. Three individuals (15 per cent of

respondents with dairying) indicated they would no longer have dairying in 2005 [Tables 17 and 18].

5.22.6 Grapes

Although grapes were grown in all LMU in 2000, there was a significant difference in the proportion of respondents with grapes ($\chi^2 = 16.635$, df = 6 p = 0.011), varying from 33 per cent in LMU 6 to four per cent in LMU 2 [Table 17].
Survey data suggested there was likely to be little change in the proportion of respondents (nine per cent) or the median area under grapes (12 hectares) [Tables 17 and 18].
The adoption of grapes as an enterprise was significantly linked to:

- Lower concern about the production of wine grapes leading to controls on spraying that will reduce the ability of landholders to manage weeds (Wald = 21.862, p < 0.001, Exp(B) = 0.457);
- Knowledge of soil acidity levels for part of their property (Wald = 9.634, p = 0.002, Exp(B) = 10.753);
- Less concern about the need to reorganise paddocks affecting the capacity to change enterprise mix (Wald = 6.292, p = 0.012, Exp(B) = 0.630);
- Plans for family succession (Wald = 16.406, p < 0.000, Exp(B) = 2.562);
- Higher education (Wald = 16.232, p < 0.001, Exp(B) = 1.291);
- More time spent on on-property work (Wald = 8.839, p = 0.003, Exp(B) = 1.021); and
- Lower equity (Wald = 6.855, p = 0.007, Exp(B) = 0.630).

5.22.7 Other horticulture (flowers, olives, nuts)

Other horticultural enterprises were reported in all LMU and there was not a significant difference in the proportion of respondents with this type of enterprise across the LMU [Table 17].

Survey data suggested there was likely to be an increase, but not a significant change, in the proportion of respondents involved in other horticulture (10 per cent to 14 per cent) and in the median area established (four to five hectares). Six additional individuals (13 per cent of respondents with horticulture) indicated they would have horticulture in 2005 [Tables 17 and 18].

The adoption of other horticulture as an enterprise was significantly linked to:

- Smaller property size (Wald = 7.667, p = 0.006, Exp(B) = 0.997);
- Knowledge about collecting samples for testing soil fertility or acidity (Wald = 8.276, p = 0.004, Exp(B) = 1.673);
- Knowledge about the approximate per hectare returns from farm forestry in the district (Wald = 5.348, p = 0.021, Exp(B) = 1.368);
- Lower concern about changing enterprise mix at their stage of life (Wald = 6.231, p = 0.013, Exp(B) = 0.729);
- Lower confidence that on-ground work will be undertaken to prevent salinity undermining the viability of their district (Wald = 12.442, p < 0.001, Exp(B) = 0.539); and
- The perception that the earth is like a spaceship with only limited room and resources (Wald = 5.242, p = 0.022, Exp(B) = 1.358).

5.22.8 Farm forestry

Farm forestry was reported in all LMU but there was a significant difference across the LMU in the proportion of respondents with farm forestry in 2000 ($\chi^2 = 14.879$, df = 6 p = 0.021), varying from 25 per cent in LMU 6 to four per cent in LMU 2 [Table 17].

Survey data suggested that while the proportion of respondents involved in farm forestry is likely to remain constant (10 to 11 per cent), there is likely to be an upward trend in the median area under farm forestry (from 10 hectares in 2001 to 14 hectares in 2005) [Tables 17 and 18].
Although not a significant change, this seems a noteworthy trend in that more landholders are approaching the 20 hectares of farm forestry that is considered to the minimum viable area for farm forestry in North East Victoria. Indeed, in 2005, 43 per cent (N= 44, n= 19) of those with farm forestry expect to have more than 20 hectares of farm forestry. This compares with 28 per cent (N= 36, n= 10) in 2001.
The adoption of farm forestry as an enterprise was significantly linked to:

- Larger areas of property covered by patches of native bush (Wald = 9.802, $p < 0.001$, Exp(B) = 1.009);
- Knowledge about the approximate per hectare returns from farm forestry in the district (Wald = 29.854, $p < 0.001$, Exp(B) = 2.113);
- Increased likelihood to apply for government funding to replant native species or better manage remnants (Wald = 8.472, $p = 0.004$, Exp(B) = 1.657); and
- Lower likelihood to sell all or a large part of their property (Wald = 5.054, $p = 0.025$, Exp(B) = 0.359).

Table 17
Per cent of properties with each landuse/enterprise
Situation at end of 2000
Ovens Catchment 2001, N=568

LMU	n	Dryland pasture	Irrigated pasture	Dryland cropping	Tobacco	Dairying	Grapes	Other horti-culture	Farm forestry	Other tree planting
1	40	83% 130ha	43% 13ha	10% 63ha	10% 11ha	8% 110ha	10% 14ha	10% 10ha	5% 13ha	25% 5ha
2	185	95% 185ha	11% 15ha	32% 56ha	1% 9ha	4% 169ha	4% 14ha	5% 2ha	4% 13ha	34% 5ha
3	29	90% 40ha	21% 21ha	10% 20ha	3% 30ha	3% 300ha	13% 22ha	17% 7ha	10% 5ha	21% 2ha
4	71	85% 100ha	17% 20ha	1% 101ha	7% 8ha	7% 154ha	13% 14ha	15% 3ha	12% 10ha	35 % 2ha
5	54	89% 96ha	6% 10ha	2% 40ha	0% 0ha	5% 154ha	9% 4ha	13% 5ha	13% 6ha	48% 4ha
6	12	83% 290ha	8% 25ha	17% 50ha	0% 0ha	17% 263ha	33% 5ha	8% 1ha	25% 20ha	33% 10ha
7	27	81% 160ha	19% 10ha	19% 54ha	7% 18ha	0% 0ha	11% 12ha	11% 10ha	15% 41ha	33% 5ha
Total (ha)	**418**	**89% 128ha**	**16% 16ha**	**18% 55ha**	**3% 13ha**	**5% 160ha**	**9% 12ha**	**10% 4ha**	**10% 10ha**	**34% 4ha**

Table 18
Per cent of properties expected to have each landuse/enterprise
Situation at end of 2005
Ovens Catchment 2001, N=568

LMU	n	Dryland pasture	Irrigated pasture	Dryland cropping	Tobacco	Dairying	Grapes	Other horti-culture	Farm forestry	Other tree planting
1	40	75% 115ha	48% 17ha	8% 40ha	10% 10ha	5% 97ha	10% 17ha	8% 10ha	5% 13ha	25% 15ha
2	185	91% 169ha	14% 16ha	28% 60ha	0% 0ha	4% 163ha	5% 15ha	8% 2ha	6% 13ha	42% 8ha
3	29	83% 63ha	31% 17ha	10% 21ha	0% 0ha	3% 300ha	17% 12ha	24% 10ha	10% 7ha	34% 5ha
4	71	79% 100ha	23% 15ha	3% 6ha	1% 12ha	5% 165ha	13% 18ha	14% 3ha	15% 18ha	42% 4ha
5	54	83% 107ha	6% 20ha	2% 40ha	0% 0ha	5% 144ha	7% 7ha	19% 7ha	19% 8ha	50% 7ha
6	12	75% 260ha	25% 5ha	8% 80ha	0% 0ha	17% 255ha	25% 9ha	8% 2ha	25% 20ha	33% 18ha
7	27	81% 160ha	19% 20ha	19% 40ha	7% 5ha	0% 0ha	11% 12ha	11% 10ha	15% 46ha	41% 8ha
Median ha	**418**	**85% 131ha**	**19% 16ha**	**19% 50ha**	**2% 12ha**	**4% 156ha**	**9% 13ha**	**14% 5ha**	**11% 14ha**	**40% 7ha**

Total of 93,107 hectares

5.22.3.10 Extent of native bush

Eighty-seven per cent of respondents (n=495) provided details of the extent of patches of native bush larger than one hectare on their property. Survey data suggested that there is little remaining native bush on the respondents' properties. Thirty-three per cent of respondents said they had no patches of native bush. A further 50 per cent provided information suggesting that their remnants covered no more than 10 per cent of their property covered. The median area of native bush was three hectares.

6.0 FACTORS AFFECTING LANDHOLDER ADOPTION OF CRP

6.1 Adoption of CRP by respondent and LMU

CRP information was obtained for use in analyses that attempted to explain differences in adoption by landholders. Respondents were asked to provide information for CRP across a range of issues [refer to Section 4.4]. Some questions asked for details of the current situation on the property, others referred to activity over the past year or the previous three years [Table 19].

There were no significant differences across the LMU in respondents reporting that they had undertaken any of these CRP.

The results of multi-variate analyses exploring hypothesised links between independent variables and the adoption of CRP have been presented in earlier sections of the report. A summary of significant relationships is presented in Table 20. It is also important to identify those variables for which the hypothesised relationship(s) were not identified.

The ensuing discussion will examine the range of natural resource management issues, including dryland salinity, soil acidity, weeds and pest animals and habitat decline and will attempt to highlight lessons for natural resource managers.

It had been assumed that landholders are either unaware of the extent and impact of less obvious forms of land degradation, such as dryland salinity and soil acidity, or were in a state of denial. Those who reported saline affected areas had higher adoption of CRP than all of the respondents who said they didn't have saline affected areas. Those who acknowledged they had saline affected areas had adopted CRP for salinity mitigation at significantly higher levels than those who were thought to be unaware of salinity affected areas on their property. These findings suggest that awareness is linked to adoption and that the substantial investment in salinity education in this catchment has been successful in raising salinity awareness and has contributed to the adoption of CRP linked to salinity mitigation.

Most properties in the Ovens have high levels of soil acidity, but almost half the respondents said they did not know the soil acidity for any part of their property. Those reporting that they knew the soil acidity level on their property were significantly more likely to undertake ameliorative action.

Whilst the Ovens survey explored the importance of issues as opposed to values, the finding that at least one social, economic and environmental issue was ranked in the top five issues suggests that appeals to landholders must address the range of values that they attach to natural resources. In a number of instances, respondents were more concerned about the environmental impact of issues than their economic impact. These findings suggest that appeals that focus primarily on dryland salinity or soil acidity and on the production benefits of remedial or preventative action will have limited success.

Most respondents said they had sufficient knowledge to act for three of the seven topics included in the survey: collecting samples for testing soil fertility or acidity, how to establish introduced perennial pastures, and the production benefits of retaining native vegetation on farms. More than half the respondents indicated they didn't have sufficient knowledge to act for the topics relating to the processes leading to soil acidity and dryland salinity, preparing a farm/property plan or the approximate returns per hectare from farm forestry. In this study there were significant positive relationships between respondent's self-assessed knowledge and their adoption of CRP.

Just over half of all respondents were members of Landcare groups and Landcare participation was linked to higher adoption of CRP, particularly those related to habitat rehabilitation. These findings appear to confirm the value of community education and suggest there is room for further investment to address shortcomings on important topics, particularly those related to understanding processes leading to dryland salinity. In the

case of soil acidity, it seems that it is sufficient for landholders to be convinced that soil acidity is a problem and to know how to collect soil samples as opposed to understanding the processes leading to soil acidification. If this is the case, this finding also highlights the importance of local trials and field days to demonstrate the impact of soil acidity on grass production. Again, to the extent that soil acidity impacts are quarantined on-property, there is less justification for large scale investment in community education on this topic.

This study employed the New Environmental Paradigm (NEP) to explore links between attitudes to conservation and adoption of CRP. It seems that most respondents have embraced the constellation of values, attitudes and beliefs that constitute the NEP. There were no significant positive correlations between the NEP index score and adoption of CRP. Most respondents also had positive attitudes towards working together, working with government and accept that landholders have most responsibility for work to address land and water degradation on their property. Again, these attitudes were not linked to the adoption of CRP.

The median age of Ovens survey respondents was 54 years. The common perception of younger age being linked with higher adoption of CRP was not supported by survey findings, suggesting that the ageing of rural landholders was not a major constraint to the adoption of CRP. In an era of declining farm profitability and stagnant property prices, it seems that some of the over 65 years group may feel they are locked into living long-term on their property. Given current trends for younger people to abandon farming and to leave rural areas, a sizeable proportion of the properties of the over 65 years group are unlikely to pass to the next generation until after the death or incapacity of the current owners prevents them farming. With increased life expectancy, inter-generational transfer of many of these properties will not occur for some time. There is also anecdotal evidence of a trend for people "retiring" to rural landholdings. This information suggests that resource managers cannot ignore the older landholders and must work harder to understand their values, aspirations and needs.

More than two thirds of all respondents were not involved in property planning, did not use a property budget and had not developed a succession plan. There were some links between involvement in these planning activities and higher adoption of CRP. It seems a case could be made for the inclusion of these activities in community education programs. On the other hand, if there has been a substantial investment in promoting these planning processes then it appears to have had little impact. Any additional investment would need to be carefully targeted. Royce Sample's experience suggests that landholders will undertake property planning if it is presented as part of the package delivering assistance with onground work.

There were significant positive relationships between the level of on-property profits and the adoption of CRP, particularly those linked to the management of pastures and soil acidity. However, forty per cent of landholders did not make any on-property surplus and less than 10 per cent of all respondents reported an on-property income above the $50,000 threshold required to sustain a household and fund investment in a farm's natural and capital resources (Rendell *et al.* 1996). At the same time, off-property income was higher than on-property income but off-property and total household income were not linked to higher adoption of CRP. After combining on and off-property income only 35 per cent of households exceeded the $50,000 threshold. It is also possible that landholders earning income off-property are reluctant to invest in unprofitable on-property enterprises. It is also possible that the identity or self-esteem of those working off-property is less tightly linked to the condition of their property. Those working longer hours off-property also have less time to work on their property.

The small number of respondents and small median areas allocated to the emerging and potentially profitable enterprises, such as farm forestry, wine grapes and other horticulture, suggests that these enterprises will not overcome low on-property profitability in the short-term. Despite generally high levels of equity in their properties, respondents are particularly wary of making substantial new on-property investments. The extensive list of important constraints includes a mixture or economic, environmental and social issues that represent a formidable challenge for those attempting to change the enterprise mix in the Ovens Catchment. The association between higher on-property profitability and adoption suggests that if economic conditions change, for example, a sustained rise in commodity prices, that there would be increased adoption of CRP.

However, in this study there were no links between higher levels of profitability and adoption of CRP for weed and pest management or habitat rehabilitation.

Property size is an important element in determining the financial viability of grazing and dryland cropping enterprises. There was a significant positive relationship between increased property size and on-property profitability. The median property size to report an on-property profit in excess of $50,000 was 266 hectares. Larger property size was also linked to significantly higher adoption of CRP associated with commercial agriculture (liming, conservation tillage, and perennial pasture) as opposed to those related to habitat rehabilitation.

Most land was owned by landholders with properties larger than 150 hectares and by those who were farmers by occupation, suggesting that an effective strategy to improve the adoption of CRP would include a strong focus on farmers. However, subdivision of properties in the Ovens is expected to continue and small property owners are already a majority of landowners and manage a substantial proportion of land, often in critical sites for recharge control or habitat rehabilitation. The reality is therefore, that resource managers will need to work with the owners of both small and large properties. Again, it needs to be emphasised that non-farmers, including retirees, are less likely to be motivated by appeals to improving agricultural production and profits. The finding that higher levels of off-property work were associated with significantly higher involvement in tree planting suggests that non-farmers can be motivated to adopt CRP, particularly those related to habitat rehabilitation.

Arrangements for separating the ownership and management of land and the establishment of professionally managed teams that undertake onground work are two approaches that may be needed to effect change where there are substantial proportions of landholders working off-property. Natural resource managers should also consider establishing partnerships with state and local governments to ensure that planning schemes help to minimise the potentially negative impacts of the trend for the suburbanisation of rural land.

Even taking into account off-property income, most respondents had very low household incomes. In this context, it was not surprising that access to government funded programs was linked to higher adoption of CRP related to habitat rehabilitation. As will be explained in the next chapter, respondents were also asked to indicate their level of interest in committing to additional revegetation work in exchange for an incentive package that provided for establishment costs, opportunity costs and a fee for active management. About half the respondents said they would take up the incentive proposal and the package would have substantially increased the area revegetated. While this level of support is encouraging, the fact that about half the respondents were not interested suggests that constraints other than financial capacity limit the adoption of CRP.

Survey data suggests that almost half of the properties covering half of the land in the Ovens Catchment will change hands within the next 10 years. As will be explored in the next chapter, this situation could provide an opportunity for intervention by government or industry, for example, to purchase land for habitat rehabilitation.

Table 19
Adoption of best management practices
Ovens Catchment 2001, N=568

nagement practices	Past 12 months		Situation during 2001		Activity in past 3 years			
	% responding activity done	Median of those who responded Yes	% responding activity done	Median of those who responded Yes	% responding activity done	Median of those who responded Yes		
Area limed to control soil acidity [hectares].					35%	26 ha	39%	35 ha
Trees and shrubs planted including farm forestry	31%	5 ha					47%	300
Area of native bush or water ways fenced to manage stock access [hectares].					34%	5 ha	29%	5 ha
Area sown to introduced perennial pastures including lucerne [hectares].					48%	35 ha	36%	23 ha
Number of paddocks where plants or plant matter covered 70% of the ground this summer.					75%	8 paddocks		
Number of paddocks for which you have a record of soil test results.					47%	4 paddocks	29%	4 paddoc
Number of paddocks where stock is usually watered from a trough or tank.					73%	4 paddocks		
Area cropped using conservation tillage practices such as direct drilling and stubble retention [hectares sown]. N = 568, n = 34					63%	100 ha		
Estimated cost of work to control weeds and rabbits last year (your time at $20 per hour).	96%	$1000						

Table 20
Independent variables linked to the adoption of CRP
Ovens Catchment, 2001 N=568

CRP	● denotes a positive relationship ❍ denotes a negative relationship																												
Limed to control soil acidity	●									●	●						●					●	●					
Limed to control soil acidity (3 yrs)						❍				●	●						●					●	●					
Trees and shrubs planted			●				●								●	●	●							●				
Native bush or water ways fenced													●			●				●						●		
Native bush/water ways fenced (3 yrs)																●	●							●				
Sown introduced perennial pastures																●						●			●			
Sown perennial pastures (3 yrs)	●																●					●			●			
Plants cover 70% of paddock									●										●									●
Recorded soil test results				●						●								●				●	●			●		
Recorded soil test results (3 yrs)																		●				●	●	●				
Stock watered from a trough or tank								●						●														
Used conservation tillage practices	●				●						●							●										
Spent funds to control weeds/rabbits							●						❍	●							●							●
Other trees planted		●										●		●	●									●	●			
Independent variables	Property size	Areas where plants show signs of salinity	Written property plan	Property budget	Family succession plan	Plan to sell all or a large part of property	Plan to live on property	Farmer by occupation	On-property profit	Level of on-property profit	Hours worked on-property	Hours worked off-property	Education	Gender (being female)	Landcare membership	Work on property funded by government	Likely to apply for revegetation grant	Soil acidity and productive capacity of district	Soil acidity and productive capacity of property	Weeds\pest animals and decline of native species	Removal of native vegetation and decline of birds and animals	Cost of managing weeds and pest animals	Knowledge of soil acidity levels	Collecting samples for testing soil fertility or acidity	Perennial pastures ability to prevent water tables rising	Establishing perennial pasture	Approximate returns for farm forestry	Processes leading to soil acidification	Preparing a property plan using land classes
	FARM MANAGEMENT							**SOCIO-DEMOGRAPHIC**										**CONCERN**					**KNOWLEDGE**						

7.0 POTENTIAL OF ECONOMIC INCENTIVES AND LAND PURCHASES TO ACHIEVE NRM OBJECTIVES

7.1 Background

Most native vegetation has been cleared on private land in the Ovens Catchment (see discussion below). Indeed, 33 per cent of respondents (n=495) reported that on their property there was no patch of remnant bush of at least 1 hectare in area. Compared to the median property size of 130 hectares, the median area of remnant vegetation was 3 hectares. For 83 per cent of respondents, remnant vegetation covered <11 per cent of their property.

Given the lack of remnant vegetation, revegetation is an important element of efforts to manage dryland salinity and enhance biodiversity in the Ovens Catchment. Information in Table 19 indicates that 47 per cent of respondents said that they had planted trees and shrubs, including for farm forestry, in the past 3 years. The extent that these revegetation efforts have been largely symbolic is illustrated by the median of 300 trees/shrubs planted per respondent over that time [Table 19].

There is a large suite of policy options available to natural resource managers. Our survey examined a small number of the potential approaches. Our intention was to gather information that would stimulate discussion amongst NECMA stakeholders.

Given the limited financial capacity of many landholders and the considerable off-site and community benefits of revegetation, federal and state governments have developed incentive packages to support revegetation work by private landholders. Thirty-four per cent of respondents said that trees/shrubs had been planted (not including farm forestry) at some time on their property, with a median of 4 hectares [Table 17]. At the same time, 40 per cent of respondents said they expected to plant trees/shrubs over the next five years, for a median of 7 hectares [Table 18]. As we have seen, 32 per cent of respondents had received federal or state funding for onground work over the previous five years. There was a significant positive relationship between this funding and the adoption of CRP, including the planting of trees, fencing of native bush and water ways and the establishment of perennial pasture [Table 19].

7.2 Interest in a package offering stronger economic incentives

Most incentive programs reimburse landholders for all or part of the establishment costs associated with revegetation work. These costs can include the price of materials and labour for fencing, weed and pest animal control, ripping and seed/seedlings. However, there are other important costs, including those related to ongoing management to maintain fences, control weeds and pest animals and manage wildfires. There is also the issue of opportunity cost where a landholder forgoes potential income from other enterprises in the area revegetated. At the same time, revegetation can enhance farm productivity by providing wind breaks for crops and pasture, shelter for stock, materials for fencing and habitat for birds and insects that predate on pest species. In most instances, government programs have only funded part of the cost of establishment work and there has been no attempt to reimburse landholders for opportunity costs or pay a fee for ongoing management. To the extent that the full cost of revegetation work has not been funded, landholders have effectively subsidised conservation work.

In this research we wanted to assess the extent stronger incentives would motivate landholders to adopt revegetation. With this information it would then be possible to model the extent that regional

catchment revegetation targets (see below) for dryland salinity mitigation and biodiversity conservation would be accomplished.

The scenario we posed to respondents required them to enter a written agreement with the North East Catchment Management Authority that would set out the nature of the work to be completed and payments to be made. This agreement was to run for 10 years and would be binding on anyone who purchased their property. The proposal offered a grant of $1,000 per hectare to fund establishment costs plus a payment at least equal to the gross returns per hectare from grazing for a period up to 10 years (see below).

Almost all respondents (N=568, n=557) completed the question asking if they would apply for funding under this type of arrangement to carry out replanting with native species or better manage existing remnant bush over the next three years. Just over half said they were likely to apply (28% said 'yes', 31% 'more likely than not'). Twenty-three per cent said 'unlikely' and 18 per cent said 'no'.

Amongst those who said 'yes' and 'more likely than not', 55 per cent said 'yes', 37 per cent 'possibly' and eight per cent 'no', when asked if the additional support provided by the CMA would enable them to do more replanting or better manage existing remnants than previously planned.

Respondents who said 'yes' or 'more likely than not' were significantly associated with:

- Higher concern about soil acidity threatening the long-term productive capacity of their property (Wald = 8.566, p = 0.005, Exp(B) = 1.262);
- Higher knowledge about the ability of perennial vegetation to prevent water tables rising (Wald = 5.387, p = 0.020, Exp(B) = 1.268);
- Lower concern about stage of life affecting their capacity to change enterprise mix (Wald = 6.533, p = 0.011, Exp(B) = 0.800);
- Willingness to work with government to improve the management of salinity problems (Wald = 24.006, p < 0.001, Exp(B) = 1.990);
- The perception that landholders need help from the government to manage salinity (Wald = 4.578, p = 0.032, Exp(B) = 1.296);
- Lower agreement with the assertion that humans need not adapt to the natural environment because they can remake it to suit their own needs (Wald = 4.216, p = 0.040, Exp(B) = 0.819);
- Older age (Wald = 9.040, p = 0.003, Exp(B) = 0.972);
- Landcare membership (Wald = 4.324, p = 0.038, Exp(B) = 1.540);
- Have off-property income (Wald = 7.088, p = 0.004, Exp(B) = 1.926); and
- Higher levels of off-property income (Wald = 4.352, p = 0.037, Exp(B) = 1.114).

Intention to apply for funding to replant native species or better manage existing remnant vegetation was significantly linked with adoption of the CRP native bush and waterways fenced to manage stock access over the past 3 years (Wald = 15.945, p < 0.001, Exp(B) = 3.024).

7.3 Expected extent of property transfer through market sales

Some of those who responded negatively to the incentive package may have done so because the package did not offer the full-cost of revegetation work, they lacked confidence in the CMA or they did not fully understand the proposal or felt that it lacked sufficient detail. Notwithstanding these points, it seems there was a substantial minority (23% said 'unlikely', 18% said 'no') who were simply not interested in undertaking revegetation work on their property. While there are a number of ways to respond to such a situation, we were interested in exploring the potential contribution of land purchases to the achievement of regional catchment targets. A revolving fund could be established by government and managed at the regional level to purchase properties, place covenants that prescribe their future management, and then re-sell them to new owners. These new

owners, given the covenant, are more likely to be supportive of and have the capacity to adopt best practice land and water management.

As we have seen, 31 per cent of respondents thought that in the longer-term it was highly likely/likely that they would be selling all or a large part of their property. Given current social and economic trends it is highly problematic that the intended high level of family succession (55%) will be realised [Table 15]. Our modelling suggested that 47 per cent of properties would change hands within 10 years. There is likely to be a steady stream of properties being offered for sale. This situation presents an opportunity for the purchase of land on the open-market, an approach that is likely to meet less public resistance than compulsory acquisition of properties.

Intention to sell all or a large part of their property was significantly associated with:

- Time for income to come on-stream was an important constraint in changing enterprise mix (Wald = 4.153, p = 0.042, Exp(B) = 1.196);
- Reluctance to change enterprise mix at their stage of life (Wald = 15.650, p < 0.001, Exp(B) = 1.380);
- Did not agree that there were no limits to growth for industrialised nations like Australia (Wald = 7.413, p = 0.006, Exp(B) = 0.787;
- Did not have a property plan that was updated at least quarterly (5.009, p = 0.025, Exp(B) = 0.647);
- No work on their property funded by federal or state government programs over past five years (Wald = 7.310, p = 0.007, Exp(B) = 0.551); and
- Had off-property income (Wald = 7.344, p = 0.007, Exp(B) = 2.011).

7.4 Revegetation targets for salinity mitigation and biodiversity in the Ovens

Targets have been established across the North East Catchment for biodiversity conservation (pers comm, Geoff Robinson) and salinity mitigation (NESWG 1999).

7.4.1 Biodiversity targets

Biodiversity conservation targets concern protection and management of extant native vegetation; re-establishing native vegetation; and integrating native vegetation with productive landscapes. In this report, we only address the 2010 target for re-establishing native vegetation, which is:

- Increasing the extent of all threatened Ecological Vegetation Classes (EVC) to at least 15% of their pre-1750 cover in each bioregion.

Bioregions are a broad landscape-approach to classifying land, based on climate, geomorphology, landform, lithology, flora and fauna. Eighty bioregions are recognised across Australia, varying in size from 2,372 km^2 (Furneaux, in Bass Strait) to 423,751 km^2 (Great Victoria Desert) (Thackway and Creswell 1995). Six of these occur in the North East Catchment [Figure 2].

EVC are used in Victoria to classify vegetation according to structural, floristic and environmental characteristics. Seventy EVC occur in the North East region, and 33 of these currently have less than 15 per cent their pre-1750 cover remaining, 28 of which have at least part of their distribution in the Ovens Catchment [Figure 3].

Combining Bioregions and EVC yielded 58 target strata in the Ovens Catchment, 30 of which were located on properties surveyed during this research. Sixteen of the 28 unsurveyed strata occurred over very small areas within the Ovens (<500 hectares). At least four survey responses per strata were required to proceed with our analysis. On this basis, 26,725 hectares from the 29,260 hectares in the target strata were included in our calculations. Biodiversity targets in the Ovens catchment were calculated for each strata. This was accomplished by calculating the area required to achieve the 15% of pre-1750 cover for the North East region and then multiplying that figure by the proportion of that strata in the Ovens catchment.

Figure 2
Bioregions in North East Victoria
Ovens Catchment 2001, N=568

Bioregion Number	Bioregion Name
4	Victorian Riverina
6.2	Central Victorian Uplands
7	Northern Inland Slopes
10.1	Highlands - Southern Fall
10.2	Highlands - Northern Fall
11	Victorian Alps

Figure 3
Ecological Vegetation Classes in the Ovens Catchment
Depleted (<15% pre-1750 cover by Bioregion)
Ovens Catchment 2001, N=568

EVC Number	Ecological Vegetation Class
81	Alluvial Terraces Herb-rich Woodland/Creekline Grassy Woodland Mosaic
152	Alluvial Terraces Herb-rich Woodland/Plains Grassy Woodland Complex
153	Alluvial Terraces Herb-rich Woodland/Valley Grassy Forest Complex
247	Box Ironbark Forest/Shrubby Granitic-outwash Grassy Woodland Mosaic
68	Creekline Grassy Woodland
56	Floodplain Riparian Woodland
235	Gilgai Plain Woodland/Wetland Mosaic
72	Granitic Hills Woodland
22	Grassy Dry Forest
175	Grassy Woodland
868	Pine Box Woodland
55	Plains Grassy Woodland
238	Plains Grassy W'land/Creekline Grassy Woodland/Floodplain Riparian W'land
240	Plains Grassy Woodland/Creekline Grassy Woodland/Wetland Mosaic
294	Plains Grassy Woodland/Gilgai Plains Woodland/Wetland Mosaic
187	Plains Grassy Woodland/Rainshadow Grassy Woodland Complex
188	Plains Grassy Woodland/Valley Grassy Forest Complex
237	Riparian Forest/Swampy Riparian Woodland Mosaic
84	Riparian Forest/Swampy Riparian W'land/Riparian S'land/Riverine Escarp. Scrub
234	Riverina Plains Grassy Woodland/Shrubby Granitic-outwash Grassy Woodland
82	Riverine Escarpment Scrub
255	Riverine Grassy Woodland/Riverine Sedgy Forest/Wetland Mosaic
264	Sand Ridge Woodland
83	Swampy Riparian Woodland
47	Valley Grassy Forest
213	Valley Grassy Forest/Box Ironbark Forest Complex
127	Valley Heathy Forest
74	Wetland Formation

7.4.2 Salinity targets

Salinity targets for the North East region focus on salinity priority areas (SPA) identified by the NESWG (1999). Most of the Ovens Catchment has been designated as having high priority for salinity control in North East Victoria [Figure 1]. In this research we addressed those targets related to revegetation with either native or non-native species. For each Salinity Priority Area (SPA), net targets for the next decade were calculated by combining the annual targets for recharge treatment and discharge treatment, multiplying them by 10, and adjusting the result according to the relative area in the Ovens compared with the whole of the North East [Table 23, Column 3]. We assumed that annual revegetation targets could be met by revegetation with trees across any part of the corresponding SPA (Allen pers. comm.).

7.5 Modelling the impact of stronger incentives and land purchases

We explored the potential for two policy initiatives to increase revegetation sufficient to meet the targets for salinity mitigation and biodiversity conservation in the Ovens Catchment.

1. An extended revegetation incentive program.
2. A revolving fund for land purchase, revegetation and resale.

Estimates were also made of the effectiveness of two different combined policy options:

- A combination where landholders willing to take up incentives were given first priority, then any other landholders willing to sell were accommodated into the revolving fund.
- A combination where landholders willing to sell were accommodated into the revolving fund and any remaining landholders willing to take up incentives were then given the opportunity to do so.

As explained, the revegetation incentive program involved landholders signing up for a 10-year contract to revegetate an area with native species according to the intentions expressed in their survey response. The incentive offered was a one-off grant of $1,000 per hectare plus $90/ha/year for opportunity cost (total $1,900 per ha over the 10 years), with opportunity cost based on a gross margin (GM of $15/DSE and average of 6 DSE/ha) (NESWG 1999: 63).

Landholders were first asked if they would apply for funding under the incentives scheme (see above). If their response was ‘yes’ or ‘more likely than not’, they were asked if this funding would allow them to undertake more revegetation than their current intentions (the response options were ‘yes’, ‘possibly’ and ‘no’). They were then asked to nominate the area to be revegetated. We estimated a revegetation area for each respondent by multiplying his or her nominated area by a probability factor calculated as indicated in Figure 4. Given the subjectivity of these factors, analyses were made based on low, mid and high estimates.

Table 21
Probability factors used to estimate revegetated area
Ovens Catchment 2001, N=568

Would Apply?	Would Revegetate?	Low	Mid	High
Yes	Yes	0.9x0.7=0.63	1.0x0.9=0.90	1.0x1.0=1.00
Likely	Yes	0.5x0.7=0.35	0.7x0.9=0.63	0.8x1.0=0.80
Yes	Possibly	0.9x0.2=0.18	1.0x0.3=0.30	1.0x0.5=0.50
Likely	Possibly	0.5x0.2=0.10	0.7x0.3=0.21	0.8x0.5=0.40

The survey instrument did not distinguish between revegetation and management of existing native vegetation – we have assumed that the entire response related to revegetation. Other assumptions that were necessary for estimation of the biodiversity target results included:

- where there were more than four responses per stratum, respondents were representative of the landholders in that stratum;
- all revegetation work on the property in the past and over the next 5 years is with local native species;
- the intended revegetation work over the next five years is all that landholders would do over the next 10 years; and
- the entire area of respondents' properties are in the same stratum as the property centroid.

The revolving fund would be used to:

- purchase those properties or parts of properties that landholders offered for sale over the next 10 years;
- revegetate on average 30% of the cleared area on these properties; and
- re-sell the properties with a covenant that prevented clearing of all tree cover.

The amount of land purchased under the revolving fund was estimated based on landholders' intentions to sell as expressed in the Ovens survey. The following factors were used to convert ordinal intentions to sell properties to probable area to be sold:

- 'Highly likely' to sell: 0.9 x (property area)
- 'Likely' to sell: 0.6 x (property area)
- 'Highly likely' to subdivide and sell a large part: 0.7 x (property area)
- 'Likely' to subdivide and sell a large part: 0.4 x (property area).

It was also necessary to make some additional assumptions concerning those landholders who already had remnant vegetation, farm forestry or some other form of tree cover, and who only intended to sell a part of their property. Two estimates were made: a low one in which any remnant vegetation was sold first before any cleared area, and a high one in which cleared areas were sold first.

7.5.1 Sample size and extrapolation of data

Of the original 561 respondents, 377 were included in the analysis because they were in EVC targeted for revegetation and had at least three other respondents living in the same stratum. Two hundred and eighteen of the original respondents were included in the salinity mitigation analysis because they lived in priority areas. Areas of biodiversity strata, SPA and locations of respondents' properties in relation to bioregions, EVC and SPA were determined using a Geographic Information System (GIS). Data for respondents were extrapolated based on the summed area of landholders' properties for each strata and Salinity Priority Area relative to the total area of the corresponding strata or Salinity Priority Area.

Other assumptions that were necessary for estimation of the salinity target results included:

- for each Salinity Priority Area, respondents are representative of the landholders in that Salinity Priority Area;
- area of trees includes current and proposed native revegetation, current and proposed farm forestry, and current and proposed non-native revegetation;

- the intended revegetation and farm forestry work over the next five years is all that landholders would do over the next 10 years;
- all answers to the incentive proposal concerned revegetation, not better managing existing vegetation; and
- the entire area of respondents' properties are in the same Salinity Priority Area as the property centroid.

7.5.2 Results for biodiversity conservation and salinity mitigation

Across the Ovens Catchment, the incentive package offered would increase the area of remnant vegetation and accomplish between 19 per cent and 35 per cent (29 per cent mid estimate) of the catchment target [Table 22 and Table 24]. The revolving fund appears more effective in that this policy would accomplish between 45 per cent and 50 per cent of the catchment target [Table 22 and Table 24].

The salinity revegetation targets for the Ovens Catchment are much more modest than those related to biodiversity conservation, and either the incentive scheme or the revolving fund would have no difficulty meeting them [Table 23]. However, landholders' current intentions would not meet the catchment target (60% overall), so some additional policy intervention is required.

Analyses exploring the effectiveness of the combination of incentives and land purchases suggested that they would accomplish between 55 per cent and 75 per cent of biodiversity conservation targets [Table 24]. For salinity mitigation there was no need to combine the two policy options as either would accomplish the revegetation required.

Table 22
Capacity of incentives and rolling fund to meet biodiversity targets
Ovens Catchment 2001, N=568

Bioregion	EVC	No. Resp's	Area in Ovens (ha)	Target in Ovens (ha)	Current area native vegetation (ha)	New area Native vegetation mid estimate (ha)	Incentive cost ($)	Purchase area low estimate (ha)	Target met incentive (%)	Target met –purchase (%)
4.0	**47**	4	2,254	237	360	470	209,657	0	47%	0%
4.0	**55**	129	94,583	12,759	4,368	7,521	5,989,378	5,314	25%	42%
4.0	**74**	5	3,544	185	210	260	94,621	34	27%	18%
4.0	**175**	4	2,927	395	123	170	89,670	0	12%	0%
4.0	**238**	7	1,525	187	29	48	35,169	0	10%	0%
4.0	**240**	19	7,844	834	174	250	144,388	1,087	9%	130%
4.0	**868**	9	5,745	791	439	852	783,479	390	52%	49%
6.2	**47**	34	21,592	1,591	2,030	2,509	910,137	530	30%	33%
6.2	**55**	9	6,058	786	191	229	70,978	603	5%	77%
6.2	**56**	10	4,295	358	421	493	136,580	8	20%	2%
6.2	**175**	6	1,117	149	16	18	3,990	42	1%	29%
7.0	**47**	44	27,281	1,877	2,761	4,005	2,362,674	435	66%	23%
7.0	**55**	48	28,685	4,012	886	1,379	938,118	1,977	12%	49%
7.0	**68**	4	2,503	220	254	293	73,902	57	18%	26%
7.0	**175**	29	17,888	1,502	598	1,398	1,520,389	981	53%	65%
10.2	**47**	16	14,172	843	2,373	2,999	1,188,752	494	74%	59%
TOTAL		**377**	**242,014**	**26,725**	**15,234**	**22,893**	**14,551,880**	**11,952**	**29%**	**45%**

Table 23
Capacity of incentives and rolling fund to meet salinity mitigation targets
Ovens Catchment 2001, N=568

Salinity Priority Areas	Area in Ovens (ha)	Target in Ovens (ha)	Number respond's	Sampled area (ha)	Current area trees (ha)	Total new area trees (ha)	Incentive cost ($)	Purchase area (ha)	Target met incentive (%)	Target met - purchase (%)	Target met - current intent (%)
Riverine Plain	51,346	575	74	14,800	2,491	4,704	4,204,195	4,865	385%	846%	45%
Indigo valley	15,923	166	13	5,009	683	929	466,130	506	148%	306%	74%
Greta	18,943	249	39	8,004	1,966	2,387	800,388	355	169%	142%	86%
Everton/ Tarrawingee	17,000	250	24	3,616	2,644	3,847	2,284,748	697	481%	279%	125%
Carborr/ Bobinawarrah	15,705	300	19	5,039	1,214	1,457	462,439	1,224	81%	408%	22%
Rutherglen	14,588	470	14	3,276	1,469	1,847	717,537	367	80%	78%	47%
Springhurst/ Byawatha	14,517	540	18	6,643	1,001	1,964	1,829,714	438	178%	81%	34%
Murmungee	11,910	110	17	5,251	621	962	646,913	458	310%	417%	184%
Total	**159,933**	**2,660**	**218**	**51,638**	**12,091**	**18,097**	**11,412,064**	**8,911**	**226%**	**335%**	**60%**

Table 24
Summary of impacts of combinations of policy options targets
Ovens Catchment 2001, N=568

Policy options	% Biodiversity target met	% Salinity target met
Incentive (low estimate)	19%	147%
Incentive (mid estimate)	29%	226%
Incentive (high estimate)	35%	*
Purchase (low estimate)	45%	335%
Purchase (high estimate)	50%	*
Incentive (mid estimate) and Purchase (low estimate)	55%	*
Purchase (high estimate) and Incentive (high estimate)	75%	*

* Indicates not calculated

8.0 CONCLUSIONS

8.1 Land management issues and CRP

The most important land management issues for landholders were the farm dams policy; weeds and pest animals; impact of cutbacks by government and large businesses; and the impacts of property subdivision and off-property work.

Dryland salinity was not a high priority issue, reflecting the fact that few landholders in the Ovens Catchment are experiencing salinity.

Soil acidity was rated significantly higher than dryland salinity (fifth out of 16). However, non-farmers appear to be ignoring soil acidity. To the extent that the impacts of soil acidity are quarantined on-property, this lack of concern may not be an issue for natural resource managers.

Whilst the Ovens survey explored the importance of issues as opposed to values, the finding that at least one social, economic and environmental issue was ranked in the top five issues suggests that appeals to landholders must address the range of values that they attach to natural resources. In a number of instances, respondents were more concerned about the environmental impact of issues than their economic impact. These findings suggest that appeals that focus primarily on dryland salinity or soil acidity and on the production benefits of remedial or preventative action will have limited success.

At the same time, most respondents gave a low rating to the removal of native vegetation as a factor contributing to the decline of native birds and animals in the district. While there are large areas of forested Crown land in the Ovens Catchment, most private land has been extensively cleared. Indeed, many of the ecological vegetation classes (EVC) in the Ovens Catchment have less than 15 per cent of their pre-1750 cover remaining. Importantly, a higher rating for the issue of native vegetation removal was linked to higher adoption of CRP linked to the protection of remnant vegetation. These findings appear to justify further investment in community education to raise awareness of the extent of native vegetation removal/decline.

Higher levels of concern about the impacts of soil acidity, soil salinity, weeds and pest animals and habitat decline were all linked to higher adoption of CRP.

8.2 CRP and landholder knowledge

Most respondents indicated that they had sufficient knowledge to collect samples for testing soil fertility or acidity, establish introduced perennial pastures, and take advantage of the production benefits of retaining native vegetation. More than half the respondents indicated that they did not have sufficient knowledge to tackle the processes leading to soil acidity and dryland salinity, prepare a property plan or estimate returns from farm forestry.

In this study there were significant positive relationships between respondent's self-assessed knowledge and their adoption of CRP. Just over half of all respondents were members of Landcare groups and Landcare participation was linked to higher adoption of CRP, particularly those related to habitat rehabilitation. These findings appear to confirm the value of community education and suggest there is room for further investment to address shortcomings on important topics, particularly those related to understanding processes leading to dryland salinity. In the case of soil acidity, it seems that it is sufficient for landholders to be convinced that soil acidity is a problem and to know how to collect soil samples as opposed to understanding the processes leading to soil acidification. If this is the case, this finding also highlights the importance of local trials and field days to demonstrate the impact of soil acidity on grass production. Again, to the extent that soil acidity impacts are quarantined on-property, there is less justification for large scale investment in community education on this topic.

More than two thirds of all respondents were not involved in property planning. Given that those who did engage in planing were more likely to adopt CRP, more emphasis on property planning in community education programs seems warranted. Recent experience suggests that landholders will undertake property planning if it is presented as part of the package delivering assistance with onground work.

It had been assumed that landholders are either unaware of the extent and impact of less obvious forms of land degradation, such as dryland salinity and soil acidity, or were in a state of denial. In this study we explored respondent's awareness of dryland salinity and soil acidity.

Comparisons of landholder identified salinity affected areas and those predicted by expert maps suggested that landholders in the Ovens Catchment had excellent knowledge of the current extent of saline affected areas on their properties. Those who acknowledged they had saline affected areas had adopted CRP for salinity mitigation at significantly higher levels than those who were thought to be unaware of salinity affected areas on their property. Those who reported saline affected areas also had higher adoption of CRP than all of the respondents who said they didn't have saline affected areas. These findings suggest that awareness is linked to adoption and that the substantial investment in salinity education in this catchment has been successful in raising salinity awareness and has contributed to the adoption of CRP linked to salinity mitigation.

NRE maps of discharge sites failed to predict more than half of the saline affected areas reported by landholders. It is unlikely that landholders would deliberately overstate the extent of salinity on their property. It is possible that some landholders failed to distinguish between water logged and saline affected areas. It seems there is a need for a substantial investment in updating NRE maps of saline affected areas in the Ovens catchment.

Most properties in the Ovens have high levels of soil acidity, but almost half the respondents said they did not know the soil acidity for any part of their property. Those reporting a salt problem or that they knew the soil acidity level on their property were significantly more likely to undertake ameliorative action. These links were particularly strong for soil acidity.

8.3 CRP and landholder values

Most respondents had positive attitudes towards working together, working with government and accept that landholders have most responsibility for addressing land and water degradation on their property. Many respondents had well-developed environmental values, and were more concerned about the environmental impact of issues than their economic impact. Appeals to landholders must address the range of values that they attach to natural resources, not just the production benefits of remedial or preventative action. However, given that environmental values and attitudes are already strong, and the fact that they are not significantly correlated with adoption of CRP, education programs should be focussed elsewhere.

8.4 CRP and landholder age and income

The median age of survey respondents was 54 years. With increased life expectancy, inter-generational transfer of many properties will not occur for some time. Resource managers should not ignore older landholders and must work harder to understand their values, aspirations and needs. However, age was not related to adoption of CRP.

Off-property income was higher than on-property income, but off-property and total household income were not linked to higher adoption of CRP. Landholders earning income off-property seem to be reluctant to invest in unprofitable on-property enterprises, and have less time to do so. On the other hand, higher amounts of time worked off-property was associated with significantly higher involvement in tree planting, suggesting that non-farmers can be motivated to adopt CRP, particularly those related to habitat rehabilitation. Arrangements for separating the ownership and management of land and the establishment of professionally managed teams that undertake

onground work are two approaches that may be needed to effect change where there are substantial proportions of landholders working off-property.

There was a significant positive relationship between on-property profits and the adoption of CRP, particularly those linked to the management of pastures and soil acidity. Less than 10 per cent of all respondents reported an on-property income above the $50,000 threshold required to sustain a farming family. These profitable enterprises tended to occupy larger properties. Larger property size was also linked to significantly higher adoption of CRP associated with commercial agriculture (liming, conservation tillage, perennial pasture). However, in this study there were no links between higher levels of profitability and adoption of CRP for weed and pest management or habitat rehabilitation. This finding suggests there is merit in community education that makes appeals to social and environmental values property owners attach to their land. Subdivision of properties in the Ovens is expected to continue and small property owners are already a majority of landowners and manage a substantial proportion of land, often in critical sites for recharge control or habitat rehabilitation. Resource managers will also need to work with the owners of both small and large properties.

Arrangements for separating the ownership and management of land and the establishment of professionally managed teams that undertake onground work are two approaches that may be needed to effect change where there are substantial proportions of landholders working off-property. Natural resource managers should also consider establishing partnerships with state and local governments to ensure that planning schemes help to minimise the potentially negative impacts of the trend for the suburbanisation of rural land.

8.5 Emerging enterprises

The small number of respondents and small median areas allocated to the emerging and potentially profitable enterprises, such as farm forestry, wine grapes and other horticulture, suggests that these enterprises will not overcome low on-property profitability in the short-term. Despite generally high levels of equity in their properties, respondents are particularly wary of making substantial new on-property investments. Other important factors influencing investment in emerging enterprises are uncertainty about long-term markets; extent the new enterprise fits an existing lifestyle; opportunities for gaining better returns elsewhere; and access to professional advice. These economic, environmental and social factors present a formidable challenge for those attempting to change the enterprise mix in the Ovens Catchment.

8.6 Enhancing extent of revegetation

The NECMA has identified 15 per cent of pre-1750 cover as the revegetation target to achieve biodiversity conservation objectives in the North East.

There is a large suite of policy options available to natural resource managers. Our survey examined a small number of the potential approaches. Our intention was to gather information that would stimulate discussion amongst NECMA stakeholders.

Very few landholders in the Ovens catchment are experiencing the effects of salinity and it was no surprise that dryland salinity was not a high priority issue. Most respondents had very low household incomes and higher on-property income was associated with higher adoption of CRP. If salt loads originating in the Ovens Catchment are contributing to negative environmental, economic and social impacts downstream, this needs to be acknowledged and addressed. In this study access to government funded programs was linked to higher adoption of CRP related to habitat rehabilitation, suggesting that stronger cost sharing by government would be an effective approach to achieving revegetation targets. Other policy approaches could include supporting landholders to move into more profitable enterprises and strategic land purchases.

About half the respondents said they would take up an incentive package that covered establishment costs, opportunity costs and a fee for active management. The incentives would increase the area revegetated and accomplish between 19 per cent and 35 per cent (mid estimate of 29 per cent) of the catchment biodiversity target. The high level of property turn over provides an alternative opportunity for intervention by government. A revolving fund appears to be a more effective strategy than revegetation incentives in that this policy would accomplish between 45 per cent and 50 per cent of the catchment target. We estimate that a combination of incentives and land purchases would accomplish between 55 per cent and 75 per cent of biodiversity conservation targets. Additional work is required to evaluate the relative cost-effectiveness of these two policy options and to investigate ways of implementing a revolving fund.

The salinity mitigation revegetation targets for the Ovens Catchment are much more modest than those related to biodiversity conservation, and either the incentive scheme or the revolving fund would have no difficulty meeting them. However, landholders' current revegetation intentions would not meet the catchment target (60% overall), so some additional policy intervention is required.

8.7 Repeat survey

This research has provided a coherent explanation of landholder adoption of recommended practices in the Ovens. The survey data also represent baseline information that is not provided by other sources. The real potential of the study will not be realised unless there is a follow-up study in about five years to begin the process of identifying trends over time.

9.0 REFERENCES

Allan, M., Reynard, K. and Williams, S. (1997). Dryland salinity discharge sites (linear and point). Department of Natural Resources and Environment, Melbourne.

Australian Bureau of Statistics. (1998). *Australian Demographic Statistics.* Cat. No. 3101.0. Retrieved via Netscape (22/12/99). http://www.abs.gov.au

Australian Bureau of Statistics. (1997). *Deaths.* Cat. No. 3302.0. ABS Government Publishing Service, Canberra.

Australian Soil Conservation Council. (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.

Centre for Land Protection and Research. (2000). Discharge sites (GIS map layers). CLPR, Bendigo, Victoria.

Curtis, A., Lockwood, M., and MacKay, J. (2001a) Exploring landholder willingness and capacity to manage dryland salinity in the Goulburn Broken Catchment. *Australian Journal of Environmental Management* 8, 20-31.

Curtis, A., Robertson, A., and Tennant, W. (2001b) Understanding landholder willingness and capacity to improve the management of river frontages in the Goulburn Broken Catchment. The Johnstone Centre, Charles Sturt University, Albury.

Curtis, A., MacKay, J., and McDonald, S. (2001c). Using spatial data to explore landholder awareness and concern about dryland salinity. Unpublished. Submitted to *Australian Geographer.*

Curtis, A. (2000). Landcare: approaching the limits of volunteer action. *Australian Journal of Environmental Management*, 7(1): 19-27.

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., 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. and De Lacy, T. (1998). Landcare, stewardship and sustainable agriculture in Australia. *Environmental Values* 7: 59-78.

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 Race, D. (1996). *Review of socio-economic factors affecting regional farm forestry development in Australia.* The Johnstone Centre, Albury.

Curtis, A. and Race, D. (1995). *Review of DPIE National Farm Forestry Program projects. Volumes 1 & 2.* The Johnstone Centre, Albury.

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.

Department of Natural Resources & Environment & North East Catchment Management Authority (2000) *Groundwater Monitoring Summary North East Salinity Strategy – Year 2000.*

De Vaus, D. A. (1991). *Surveys in social research*. Allen and Unwin, Sydney, NSW.

Dillman, D.A. (1979). *Mail and telephone surveys: the total design method*. Wiley. New York, USA.

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.

Dunlap, R. E., and Van Liere, K. (1978) The new environmental paradigm. *The Journal of Environmental Education* **9**, 10-19.

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.

Lockwood, M., Hawke, M., Curtis, A. (2001) *Viability of revegetation incentives for meeting biodiversity and salinity objectives in the Goulburn-Broken Dryland. Johnstone Centre Report* No. 153. Johnstone Centre, Albury.

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. (1990). *Natural Resources Management Strategy*. MDBC, Canberra.

North East Salinity Working Group and North East Catchment Management Authority (1999) *Reversing the trend: North East Salinity Strategy*. DNRE, Wangaratta

North East Regional Catchment and Land Protection Board (1997) North East Regional Catchment Strategy.

Ovens Basin Water Quality Working Group. (2000). Ovens Basin Water Quality Strategy, An action plan within the North East regional catchment strategy.

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.

Steel, B. S., List, P., and Shindler, B. (1994). Conflicting values about federal forests: a comparison of national and Oregon publics. *Society and Natural Resources.* 7: 137-153.

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.

Thackway, R., Cresswell, I.D. (eds) **(**1995) *An interim biogeographic regionalisation for Australia: a framework for establishing the national system of reserves.* ANCA, Canberra.

Vanclay, F. (1997). The social basis of environmental management in agriculture: a background for understanding Landcare. In S. Lockie and F. Vanclay (eds) *Critical Landcare*, Key Papers Series, No 5.: Centre for Rural Social Research, Charles Sturt University, Wagga Wagga.

Vanclay, F. (1992). The social context of farmers' adoption of environmentally-sound farming practices. In G.Lawrence, F. Vanclay and B. Furze (eds) *Agriculture, environment and society*. Macmillan, Melbourne.

Van Liere, K., and Dunlap, R. (1981). Environmental concern: Does it make a difference, how is it measured? *Environment and Behaviour.* 13: 651-684.

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.

9.1 Personal Communications

Allan, C. (2001). Charles Sturt University, Albury.
Ockenden, P. (2001). Department of Natural Resources and Environment, Wangaratta.
Robinson, G. (2001). North East Catchment Management Authority, Wodonga
Sample, R. (2001). North East Catchment Management Authority, Wodonga.