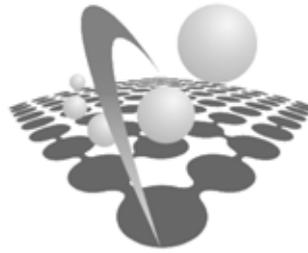


INSTITUTE FOR **Rural Futures**

Australian Farmers' Attitudes on
Rural Environmental
Issues: 1991–2000

UNIVERSITY OF NEW ENGLAND, ARMIDALE NSW 2351



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Ian Reeve

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A number of people have been involved in this study. Firstly, Professor Alan Black of the Centre for Rural Social Research at Edith Cowan University played a pivotal role in the design of the 1991 survey. Marjolein Heinemanns of Wageningen University in the Netherlands undertook the content analysis of Australian rural media and policy discussion papers while on work experience at the University of New England. Elaine Barclay of the Institute for Rural Futures managed the survey mail out and Katherine Crosby did the data entry. The word processing and formatting of this report was carried out by Jean Harris, Louise Brennan and Deborah Creed of the Institute for Rural Futures.

Summary

The study reported here is attitudinal and public opinion research based on two national surveys of primary producers undertaken in 1991 and 2000. The aim of the study was to provide an accurate and valid assessment of the nature of attitudinal change among primary producers in all States and agricultural zones of Australia. The specific research objectives were:

- to measure the changes that have occurred in attitudes relating to a range of agricultural environmental and land management issues,
- to show how these changes are related to each other and to agricultural and demographic factors,
- to establish additional attitudinal baselines in emerging areas of concern,
- to draw attention to any findings that could reasonably be seen as related in some way to Commonwealth and State policy initiatives in the 90s, and
- to canvass the implications for resource management policy in the next decade.

The content of the two surveys was chosen to reflect the rural environmental issues that had received the most attention in the rural media in the twelve months preceding the survey. The 2000 survey included a number of new questions to reflect new rural environmental issues that had emerged between 1991 and 2000. The 1991 survey was based on a sample of 2044 members of farmer organisations and Yellow Pages® listings. To ensure a valid comparison, a similar sample of 1455 respondents was obtained in 2000. To provide a more representative sample of rural landholders for future comparison purposes, the 2000 survey also included a sample drawn from rural addresses on Commonwealth electoral rolls. This sample was comprised of 860 responses. Response rates were: 1991 – 57 per cent; 2000 sample from farmer organisation and Yellow Pages® listings — 51 per cent; 2000 sample from electoral rolls — 30 per cent.

The study shows that, while there have not been large changes in opinions and attitudes over the Decade of Landcare, there have certainly been many statistically significant changes which, taken together, present a fairly cohesive picture of attitudinal change. Overall, it appears that rural environmental issues are better understood than they were in 1991 — a time immediately after several years in which environmental concern had reached historical highs in most Western countries, and in which environmental issues had had a marked impact on political agendas and elections. In the nine years since 1991, farmers have gained a fuller appreciation of the policies of environmental organisations but their support for these organisations has declined. For many issues, more farmers appear to be aware of the complexities and uncertainties in these issues, and it seems that fewer are inclined to believe there are simple solutions.

The main changes in attitudes between 1991 and 2000 were:

- increasing concern overall about chemical residues in agricultural produce and about the environmental and health effects of agricultural chemicals, but with those who are regular users of chemicals, such as cereal or fodder crop producers being less concerned and showing relatively little change over the period,
- decreasing concern overall about the seriousness of land degradation, but with decreases in concern in Queensland, New South Wales and Tasmania being partly offset by increases in Victoria, South Australia and Western Australia,
- increasing awareness that farm practices have impacts beyond the farm boundary, and increasingly favourable views nationally towards consideration of the wider public interest in farm decision-making, although the trend was the reverse in Queensland, and
- somewhat more favourable, but also slightly more polarised, views about conservation, while there is less support for conservation organisations and their activities.

There have also been changes in the level of support for various policy instruments aimed at addressing the problems of land degradation and making agriculture more sustainable. There was less support for policies likely to increase costs in farming, but increased support for policies involving public subsidies for preventative or remedial measures against land degradation.

The questionnaire asked whether respondents were members of a landcare or similar group. For the sample drawn mainly from farmer organisation membership, the proportion of farmers who were members of a group increased from 23 per cent in 1991 to 43 per cent in 2000. For the electoral roll sample, and excluding those with properties smaller than 50 ha and deriving no income from agriculture, the proportion who were members was 28 per cent.

The amount of change in environmental attitudes between 1991 and 2000, as measured by the responses to the attitude statements in the questionnaire, was about the same among landcare group members and those who were not members. Consistent with this, it was found that self-reported length of time in landcare was unrelated to measured environmental attitudes.

At face value, these findings appear not to support the view held by some in the formative years of landcare in the late 1980s and early 1990s, that those participating in landcare projects would develop a 'land stewardship' ethic. However, it is possible that the similarity in changes in attitudes among landcare group members and non-members is partly due to the timing of the first survey, given that farmers' environmental concerns may have been at historically high levels in 1991 (as they were among the general population in the late 1980s and early 1990s). It is also possible that there has been some turnover in landcare group membership, resulting in ex-members with favourable views about environmental issues being counted in the

non-member category. In addition, the increasingly favourable views among non-members could reasonably be seen as a consequence of the widespread publicity and acceptance of landcare in rural Australia.

The findings clearly show more favourable environmental attitudes with increasing level of involvement in landcare, although among all rural landholders with income from agriculture and/or properties larger than 50ha, those who rated themselves as 'actively involved' amounted to eight per cent of landholders. The marked difference between the eight per cent figure and the membership levels of 28 per cent and 43 per cent mentioned above highlights the sensitivity of estimates of landcare group membership to the definition of the base population and of participation in landcare.

With regard to opinions in 2000, there are several aspects that are relevant to future agricultural and resource management policies. Firstly, about 40 per cent of landholders have serious concerns about the safety of agricultural chemicals, and there is majority support for a range of measures to improve the safety of agricultural chemicals.

Secondly, new questions about compensation issues introduced in the 2000 survey show that there is very strong support for the view that farmers should be compensated for loss of income or autonomy of decision-making due to measures taken in the public interest. However, there is also substantial, but not majority, support for the view that compensation should be a matter of degree, *i.e.* when the loss of income is relatively small, no compensation should be expected. There also appears to be widespread acceptance that there will have to be major transformation of agricultural landscapes if farming is to be sustainable, with just over 46 per cent of respondents agreeing with the proposition that: *If Australian agriculture is going to have a long term future, there will have to be a lot of cleared country put back to bush and forestry plantations.*

Although the main focus on the study was on attitudinal changes over the Decade of Landcare, there were several changes in other respondent characteristics that are worthy of mention. Firstly, the proportion of older farmers has increased: for example, the proportion of respondents aged 60 years or more has increased from 24.1 to 30.4 per cent. Secondly, the proportion of respondents with a tertiary or postgraduate qualification has increased from 5.6 to 13.1 per cent. Lastly, a new question introduced in the 2000 survey shows that inter-generational continuity of ownership is declining. Just under 61 per cent of respondents indicated that their farm had been owned by parents or parents-in-law in the past, but only 29.1 per cent believed that their farm would be run by their siblings or children in the future. These findings all point to a period of rapid structural change in agriculture in the coming decade or so. The challenge for land resource management policy is to have the institutions in place to reduce the social costs of this period of change, and to halt the growth of land degradation and restore the productivity of the nation's agricultural and pastoral lands.

1 Introduction

The degradation of land resources in agricultural regions are among some of the most severe environmental problems facing governments today, both in Australia and internationally. A recent study commissioned by the National Farmers Federation to draw together various academic and government sources, estimated the annual cost of land degradation and other environmental impacts from agriculture in Australia at \$1.4 billion (VCG and Griffin nrm, 2000). This estimate did not include difficult-to-quantify costs such as riparian, wetland and estuarine pollution; coastal sedimentation and nutrient influxes; loss of environmental amenity and tourism returns; loss of biodiversity; and contributions to the greenhouse effect through loss of soil carbon. The Prime Minister's National Action Plan for Salinity and Water Quality (October, 2000) estimated that land and water degradation costs Australia \$3.5 billion annually. The environmental costs of agriculture are likely to increase substantially in the future. For example, estimates from the National Dryland Salinity Program and the Murray Darling Basin Commission Salinity Audit suggest that the annual cost of dryland salinity alone could increase to \$670 million in 2020 and to \$2 billion by 2100.

At the same time as the environmental costs and the costs of foregone production have been increasing, farmers face a chronic decline in their terms of trade (Lloyd and Malcolm, 1997). In these circumstances, it is unlikely for the foreseeable future that Australian agriculture itself will generate a level of returns that will allow investment in the agricultural land resource sufficient to prevent the types of environmental impacts discussed above. These will only be prevented if additional investment can be obtained from outside agriculture, from sources such as private investors and the public purse. There has been substantial government investment in the maintenance of the productivity of land resources — for example, government expenditure on Decade of Landcare has amounted to well over \$1billion.

Landcare has popularly been regarded as the key policy initiative in national efforts to bring land degradation problems under control. Originating in an approach to the Hawke Government by the Australian Conservation Foundation and the National Farmers' Federation in the late 1980s (Toyne and Farley, 2000), the premise underlying landcare as a policy measure is that participants in landcare projects would develop a 'land stewardship' ethic (see, for example Murray Darling Basin Commission, 1990; Campbell and Junor, 1992). This ethic would, in turn, lead to the wider adoption of agricultural practices that reduced or prevented land degradation problems.

From the outset, the validity of this premise was questioned in some quarters, particularly among social scientists who argued that farmers already had a strong ethical commitment to stewardship although they were limited by cost considerations in their ability to adopt sustainable agricultural practices (Vanclay, 1992; Carey, 1993). This view has subsequently been borne out by at least some empirical studies. Curtis (1997) found that there was no significant difference between landcare group members and non-members in their scores calculated from their responses to a series of questions comprising a stewardship scale. Vanclay and Lawrence (1995) used

findings from the Darling Downs to show that belief in land stewardship did not necessarily lead to adoption of soil conservation measures. However, the view that landcare has brought about substantial attitudinal change among farmers has retained wide currency, both among politicians (Hill, 1996), and the leaders of interest groups (Donges, 2001; Toyne and Farley, 2000).

Given the considerable expenditure on landcare, its contested rationale, its iconic status in political fora, and given also the need to balance policy experimentation with policy evaluation, attitudinal and public opinion research can make a valuable contribution to land resource management policy. On the one hand, it can provide an assessment of the extent of attitudinal change, thereby assisting the appraisal of the premises on which past policy has been based. On the other, this research can provide information on public opinion about emerging policy issues and public support for possible policy responses.

The study reported here is attitudinal and public opinion research based on two national surveys of primary producers undertaken in 1991 and 2000. The aim of the study was to provide an accurate and valid assessment of the nature of attitudinal change among primary producers in all States and agricultural zones of Australia. The specific research objectives were:

- to measure the changes that have occurred in attitudes relating to a range of agricultural environmental and land management issues,
- to show how these changes are related to each other and to agricultural and demographic factors,
- to establish additional attitudinal baselines in emerging areas of concern,
- to draw attention to any findings that could reasonably be seen as related in some way to Commonwealth and State policy initiatives in the 90s, and
- to canvass the implications for resource management policy in the next decade.

Chapter 2 describes the methods that were used in the study. Chapter 3 reports the findings from the study. The findings are discussed in chapter 4 and the conclusions presented in Chapter 5.

2 Methodology

2.1 Considerations in the Design of Repeated Cross-sectional Surveys

The main object of such surveys is to measure changes over time. If such measurements are to be reasonably accurate, there has to be a high degree of consistency in the way each survey is designed and carried out. However, the issues that are of interest, and which are reflected in the content of the survey, change over time. This means that there will always be a tension in the selecting of survey content between retaining content identical with previous surveys and introducing content to provide the basis for future comparisons. In general, it is necessary to retain a core of questions that do not change between surveys, together with temporary questions that might only be retained for two surveys to provide comparisons on issues that were of interest only at specific times. Obviously, the greater the core relative to the temporary questions, the greater the ability of the surveys to report on long term trends. The greater the space devoted to temporary questions relative to the core, the more the surveys are able to respond to issues with short life spans — at the expense of the ability to report on long term trends.

For the 2000 survey of landholders' attitudes on environmental issues, the decision was taken that approximately one sixth of the attitude statements used in the 1991 survey would be considered for deletion to make space for statements that covered new issues that had emerged since 1991.

A second consideration concerns the tension between specific and generic terminology in attitude statements. On the one hand, the validity of comparisons across time is improved if generic terminology is used that can be retained in exactly the same wording from one survey to the next. On the other hand, specific terminology may improve the clarity of the statement at a particular time, but become meaningless in a few years time. This problem was encountered with the term 'whole farm plan' which was used in the 1991 survey, but which had to be replaced with 'property management plan' in the 2000 survey. In this case there was no generic term that could be expected to remain meaningful for several decades and, unfortunately, it is unlikely that the meaning attributed to 'property management plan' by respondents in 2000 is exactly comparable to the meaning attributed to 'whole farm plan' in 1991. This problem can be overcome to some extent by providing definitions at the commencement of the survey form and by using specific terms as examples following the use of a generic term. Both these approaches were used in the 1991 and 2000 surveys.

2.2 Compilation of Attitude Statement Content

While the previous considerations meant that the content of the 2000 survey in terms of coverage of national rural environmental issues would have to be determined largely by the content of the 1991 survey, it was nevertheless considered important to

identify any new rural environmental issues that had arisen since 1991. Following the approach used in the 1991 survey, a range of national and State media sources for the period July 1998 to June 1999 were examined. These included: *The Land* newspaper, the *Farm Journal*, *Australian Landcare*, the press clippings service of the secretariat of the Community Advisory Committee of the Murray Darling Basin Ministerial Council (which covers most rural newspapers and magazines in the Basin), and press releases and policy discussion papers published by the National Farmers' Federation and the State farmers' organisations. A database of rural environmental issues, the way farmers expressed their opinions about these issues and examples of their exact wording was compiled. The latter drew only upon the verbatim quotes attributed to farmers, and not the third person reports by journalists.

The environmental issues that received the most attention over this period related to the COAG water reforms, land clearing and remnant native vegetation management, pesticides, environmental management systems and dryland salinity. Right to farm and management of kangaroo populations also received some attention. A full description of the ways in which these issues were viewed is provided in appendix 1.

Of the themes identified in appendix 1, the compensation issue appeared to be the most significant change since 1991 in the overall content of the views being expressed by farmers in relation to environmental issues. Almost all of the other issues were either covered in various ways in the 1991 survey, or only received limited attention in the media. Following discussion of the media analysis findings with a number of State agency staff, several further issues were noted for possible inclusion in the survey if space permitted. These included the bureaucratisation of landcare and concerns about the conversion of agricultural land from traditional grazing and cropping industries to plantation forestry.

2.3 Refinement of Survey Content

Each of the 75 attitude statements used in the 1991 survey was given a score according to its explanatory performance and reliability in three of the main analyses undertaken in the 1991 survey analysis (see sections 3.3 and 3.4.3 of Reeve and Black, 1993). These scores were summed and the attitude statements placed in order from highest to lowest score. This ranking was found to be generally consistent with the skewness of the responses to each statement. For example, six of the 17 lowest ranking statements were unacceptably skewed, while none of the 17 highest ranking statements had an unacceptably skewed response distributions. Twelve of the 15 lowest scoring statements were marked for deletion from the survey instrument. The three remaining low scoring statements in this group of 15 were retained as they covered specific policy issues that remain of interest. A further three statements, while occurring in the lower to middle part of the ranking, were deleted because they belonged to poorly performing attitudinal scales, most of the statements in which had already been deleted in the group of 15 lowest scoring statements. A pool of ten attitude statements covering various dimensions of the compensation issue was constructed. A further six attitude statements were developed covering various aspects of the bureaucratisation of landcare and concerns about the conversion of

agricultural land from traditional grazing and cropping industries to plantation forestry.

2.3.1 National Relevance

As a check on the relevance of the 2000 survey content throughout Australia, each attitude statement was subjectively rated for its relevance to eleven agro-ecological regions of Australia defined in the Provisional IBRA Regionalisation (appendix 2). Three ratings were used: 0 (largely irrelevant), 1 (possibly relevant) and 2 (relevant). By calculating the average rating for each zone, it was possible to identify any zones for which there were relatively few relevant attitude statements. The average ratings are shown in Table 2.3.1, below.

Table 2.3.1 shows that the agro-ecological regions to which the survey content is least relevant are the arid interior, followed by the wet tropical coasts. For the former, of the 75 attitude statements, 62 were rated as relevant, 6 as possibly relevant and 7 as irrelevant to this region. Given that the greater part of the value of Australian agricultural production comes from the first six regions in Table 2.3.1, and that these each have an average rating of 1.89 or above, it was concluded that the survey content was of an adequate level of relevance for a national survey relevant to the greater part of agricultural production in Australia.

Table 2.3.1 Average relevance ratings for all attitude statements across eleven agro-ecological zones.

Agro-ecological Zone	Average rating
Temperate highlands	1.99
Temperate slopes and plains	1.99
Subtropical slopes and plains	1.96
Wet temperate coasts	1.92
Wet subtropical coasts	1.90
Semi-arid tropical and subtropical plains	1.89
Northeast wet/dry tropics	1.84
North wet/dry tropics	1.84
Northwest wet/dry tropics	1.84
Wet tropical coasts	1.80
Arid interior	1.74

2.3.2 Pilot Surveys

The attitude statements were placed in a pre-pilot questionnaire, comprising 60 statements from the 1991 survey and 16 new statements as described above (appendix 3). This was administered to 29 students with farming backgrounds or interests at the

University of New England. The reliability of the attitudinal scales was assessed using Cronbach's Alpha. The *Compensation for taking of property rights* scale performed well with an Alpha of 0.79. By careful consideration of the Alpha values of various combinations of the ten statements and of the correlations between the statements, it was possible to delete two of the statements with negligible impact on the Alpha value. Two additional attitude statements were written to retain the size of the pilot survey, one dealing with spray drift onto grazing properties and one intended as a future replacement for one of the statements in the zoning of rural land scale (see table 3.3.3 of Reeve and Black, 1993), so that this scale, which was unbalanced in the 1991 survey, could become a balanced scale if the survey is to be repeated in the future. The wording of some of the statements relating to the bureaucratisation of landcare and the loss of agricultural land to forestry were adjusted in the light of correlations among them, with a view to improving their reliability.

The modified pre-pilot questionnaire (appendix 4) was mailed to 100 primary producers in the New England and North West Plains regions of New South Wales. A response rate of 51 per cent was obtained with one reminder letter. Responses were coded and analysed using SPSS. Cronbach's Alphas for the attitudinal scales are shown in Table 2.3.2.

Table 2.3.2 Values of Cronbach's Alpha for attitudinal scales in the modified pre-pilot questionnaire.

Attitudinal Scale	Cronbach's Alpha
Chemical residues in food	.66
Agricultural chemicals	.70
Spraydrift and right to farm	.44
Conservation orientation	.72
External intervention in decision-making	.70
Landcare orientation	.62
Seriousness of land degradation	.46
Zoning of rural land	.62
Compensation for taking of property rights	.73
Retaining traditional agricultural industries	.32

The unacceptably low value of Cronbach's Alpha for *Retaining traditional agricultural industries* was caused by a single statement which had tapped an unrelated dimension to do with whether agricultural land should be put to its highest valued use. This statement was replaced, and a second statement which had attracted written criticism from several respondents for its ambiguity was also rewritten.

The marginal values of Cronbach's Alpha for *Seriousness of land degradation* and *Spray drift and right to farm* were accepted as the statements comprising both scales were worth asking in their own right, and because most of the statements comprising these scales had been used in the 1991 survey.

The *Compensation for taking of property rights* scale was re-examined and it was found that two statements, including one which had attracted some criticism from respondents for ambiguity, could be deleted, while still retaining a balanced scale of six statements with a Cronbach's Alpha greater than 0.7.

Minor adjustments were made to several other statements in the light of comments received from respondents. These included generalising the mentions of the Australian Conservation Foundation to 'environmental organisations such as the Australian Conservation Foundation and the Wilderness Society'.

The set of attitude statements resulting from the adjustments described above were combined with the questions on demographics and farm characteristics from the 1991 survey. A number of small adjustments were made to these questions, such as replacing 'whole farm plans' with 'property management plans' as mentioned in section 2.1 above. The categories in several questions were adjusted to allow comparisons with other surveys being conducted as part of the National Soil and Water Resources Audit, while ensuring that the categories could also be grouped so as to allow comparison with the 1991 survey. This pilot survey (appendix 5) was mailed to a systematic sample of 600 addresses drawn from the sampling frame prepared for the study (see section 2.4, below). Responses were obtained from 123 of the addressees prior to sending a reminder, and a further 82 responses were obtained to the reminder, giving an effective response rate, after allowing for unlocatable addressees, of 38.1 per cent.

As a response rate of this magnitude leaves open the possibility of substantial but unknown non-response bias if the findings from the survey are to be generalised to the farm population as a whole, two approaches to dealing with non-response bias were trialled with samples of 100 non-responders to the pilot survey. The first approach was to send out a second reminder letter with the aim of increasing the response rate. From the additional responses obtained, it was estimated that a second reminder letter would raise the response rate from 38.1 to 42.3 per cent. The second approach was to send out a one page questionnaire with a small number of questions on it, including key demographic questions. The aim of this approach was to assess the nature of the non-response bias, with a view to allowing for it in the analysis of the responses to the full questionnaire. This approach elicited responses from 26 per cent of non-responders. As the two approaches were approximately similar in terms of survey costs, it was decided that a response rate of the order of 38 per cent to the full questionnaire, accompanied by an estimate of non-response bias was preferable to a response rate of the order of 42 per cent with any non-response bias remaining unknown.

A number of analyses were carried out with the data from the pilot survey. The values of Cronbach's Alpha for the attitudinal scales are shown in table 2.3.3. This shows that the changes to the *Retaining traditional agricultural industries* scale described above brought about a significant improvement in the reliability of the scale. The performance of the other scales was also satisfactory, with the exception of the *Spray drift and right to farm* scale. This scale was retained in the main survey for the reasons given above. The particularly large difference between farmers and non-farmers in Cronbach's Alpha on the *Zoning of rural land* scale was found to be due to

one statement being ambiguous for non-farmers. This statement was modified in the main survey to remove the ambiguity. The reasonable similarity between farmers and non-farmers in Cronbach's Alpha for many of the scales provided an indication that the attitude statements were understandable across a range of social backgrounds.

Table 2.3.3 Values of Cronbach's Alpha for attitudinal scales in the pilot questionnaire.

Attitudinal Scale	Cronbach's Alpha	
	Farmers	Non-farmers
Chemical residues in food	.73	.65
Agricultural chemicals	.82	.82
Spraydrift and right to farm	.43	.48
Conservation orientation	.78	.80
External intervention in decision-making	.83	.70
Landcare orientation	.63	.51
Seriousness of land degradation	.64	.59
Zoning of rural land	.74	.53
Compensation for taking of property rights	.64	.71
Retaining traditional agricultural industries	.59	.75

A range of preliminary analyses were conducted with the pilot survey data. These showed that the new attitudinal scales had a number of significant correlations with the scales that had also been used in the 1991 main survey. The proportions of respondents agreeing or disagreeing with single attitude statements were compared for the 1991 main survey and the 2000 pilot survey. There were a number of statements where there were significant changes in the proportions in agreement or disagreement with the statements. These findings suggested that the main survey could be confidently proceeded with, using the pilot survey instrument and the modifications referred to above.

Appendix 6 shows the full attitude statement listing for the 1991 and 2000 surveys, and enables the following to be identified:

- 1991 statements dropped from the 2000 survey,
- 1991 statements retained in the 2000 survey with identical wording,
- 1991 statements retained in the 2000 survey with very minor wording changes, and
- new statements introduced in the 2000 survey.

The coverage of issues by these statements is shown in *table 2.3.4*.

Table 2.3.4 Listing showing the issues covered by the attitude statements in the 2000 main survey, and the statements relevant to each issue.

Attitudinal Scale or Topic	Relevant Attitude Statements
Scale: Agricultural chemicals	22,28,49,59
Scale: Chemical residues in food	5,9,14,21,34,46,56,68
Scale: Spraydrift and right to farm	73,16
Scale: Conservation orientation	6,18,25,39,62,65,66,70
Scale: External intervention in decision-making	4,15,32,37,52,54,57,69
Scale: Landcare orientation	11,17,30,63
Scale: Seriousness of land degradation	2,45,50,60
Scale: Zoning of rural land	41,61,74
Scale: Compensation for takings of property rights	7,20,33,44,55,64
Scale: Retaining traditional agricultural industries	8,26,35,40
POLICY ISSUES	
Financial incentives for combating land degradation	1,48
Environmental levy on farmers	58
Safety of chemicals	14,19,34,43
Restrictions on clearing	20,33,35,57
Restrictions on water use	33,44
Remote sensing on private property	23
Tax on chemicals	24
Cross-compliance	27
Cost sharing	31,38
Farm forestry	8,26,35,40
Buffer zones round towns affected by spray drift	42
Chemical accreditation courses	19,43
Environmental education for farmers	67
Protection of prime agricultural land	72
FARM MANAGEMENT ISSUES	
Profitability and costs	12,51,63,66,70
Property management plans	15,32,37
Theoretical expertise vs practical experience	3,36
Government departments	4,30
Landcare - proactive or reactive	47
Need for chemicals	53,68
LAND DEGRADATION TYPES	
Land degradation generally	2,45,50,60
Salinity	8
Pollution from fertilisers	46
Pesticide pollution	56
Weed invasion	13
ENVIRONMENTAL	
Environmental impact statements	54
Environmental groups	25,39,65,71
Relative environmental impact of agriculture	10, 29

2.4 Sampling Frame

The survey used two separate sampling frames. The first aimed to replicate the sampling frame used in the 1991 survey and was to be based on the Yellow Pages® listings of farmers and graziers for New South Wales and farmer organisation membership lists in the other States. However, the participation of the South Australian Farmers' Federation was not able to be obtained. For this reason, Yellow Pages® listings were also used for South Australia. As was demonstrated in the 1991 survey, the biases in samples drawn from farmer organisation membership lists and those drawn from Yellow Pages® listings are likely to be similar. With the aim of providing a more representative sampling frame for comparison purposed in future surveys, the second frame was prepared from Commonwealth Electoral Rolls.

2.4.1 Farmer Organisation Sampling Frame

Farmer organisations were approached in relation to surveying a sample of their membership. With the exception of the South Australian Farmers' Federation, all the organisations approached were able to assist with the survey. Information on drawing a systematic sample from a membership list was provided to these organisations (appendix 7). In most cases, questionnaires, covering letters and reply-paid envelopes were provided to the farmer organisations, so that the identity of respondents was not known to the researchers. Copies of the questionnaire and covering and reminder letters are provided in appendix 8. The response rates for the main questionnaire and the one-page follow-up questionnaire are shown in table 2.4.1. The latter questionnaire contained a selection of the demographic and farm characteristics questions from the main survey. It was mailed to those who did not respond to the main questionnaire after one reminder. The responses to the one-page follow-up questionnaire provide a means for partially correcting for non-response bias (see section 3.1.1).

2.4.2 Commonwealth Electoral Roll Sampling Frame

The Electoral Roll sampling frame was prepared using a combination of stratified, systematic and random sampling. The electorates chosen consisted of those classified as rural by the Commonwealth Electoral Office, together with several classified as provincial that contained a substantial proportion of rural land. The electorates from which the sampling frame was prepared are listed in table 2.4.2, below.

Table 2.4.1 Sample sizes and response rates for the main questionnaire and the one-page follow-up questionnaire sent to farmer organisation members and farmers listed in the Yellow Pages®.

Sample	Number mailed out	Return to sender	Number completed	Response rate (%)	Follow ups completed	% of non-responders completing follow-up
NSW Yellow Pages®	650	61	285	48	95	31
Victorian Farmers' Federation	822	5	397	49	138	33
Agforce Queensland	638	11	300	48	112	34
SA Yellow Pages®	366	27	179	53	44	28
Pastoralists' and Graziers' Association of Western Australia	43	1	16	38	8	31
The Western Australian Farmers' Federation	339	16	191	59	74	56
Tasmanian Farmers' and Graziers' Association	134	5	82	64	28	60
Northern Territory Cattlemen's Association	8	0	5	63	1	33
Total	3000	126	1455	51	500	35

Table 2.4.2 Electorates used in preparation of the sampling frame

Electorate	State	Electorate	State
Calare	NSW	Blair	QLD
Cowper	NSW	Capricornia	QLD
Dobell	NSW	Dawson	QLD
Eden-Monaro	NSW	Fairfax	QLD
Farrer	NSW	Fisher	QLD
Gilmore	NSW	Forde	QLD
Gwydir	NSW	Groom	QLD
Hume	NSW	Herbert	QLD
Hunter	NSW	Hinkler	QLD
Lyne	NSW	Kennedy	QLD
Macarthur	NSW	Leichhardt	QLD
New England	NSW	Longman	QLD
Page	NSW	McPherson	QLD
Parkes	NSW	Maranoa	QLD
Paterson	NSW	Moncrieff	QLD
Richmond	NSW	Wide Bay	QLD
Riverina	NSW	Barker	SA
Robertson	NSW	Grey	SA
Ballarat	VIC	Mayo	SA
Bendigo	VIC	Wakefield	SA
Burke	VIC	Bass	TAS
Corangamite	VIC	Braddon	TAS
Corio	VIC	Lyons	TAS
Flinders	VIC	Forrest	WA
Gippsland	VIC	Kalgoorlie	WA
Indi	VIC	O'Connor	WA
McEwen	VIC	Pearce	WA
McMillan	VIC	Northern Territory	NT
Mallee	VIC		
Murray	VIC		
Wannon	VIC		

The sample was stratified by State to ensure a sufficiently large sample from the smaller States, so that a reasonable confidence interval on estimates of proportions for those States could be achieved. A confidence interval of +/- 7 per cent at the 95 per cent confidence level was the highest level of precision that could be achieved within the budget available to the project. After making allowances for the anticipated response rate, questionnaires returned to sender, and the addresses needed for the pilot survey, a sampling frame of 4000 addresses was prepared, distributed across the States as shown in 2.4.3, below.

Table 2.4.3 Distribution of sampling frame across States.

State	No of addresses
NT	349
TAS	580
SA	612
WA	612
QLD	615
VIC	615
NSW	617
Total	4000

Within each State, the number of addresses required from each slide of the Electoral Roll microfiche was calculated so as to provide the number of addresses listed in table 2.4.3, above. Each microfiche slide contained 268 boxes of 57 addresses each, with the exception of the last, usually partially full, slide. A set of boxes was chosen randomly on each slide, corresponding to the number of addresses required

from the slide. The first farm address was selected from the 57 addresses in the chosen box. If a farm address could not be found within a chosen box, the address fields on the spreadsheet being used for the sampling frame were left blank. When all the chosen boxes on all slides in all electorates had been examined and a farm address selected from each, if possible, the number of addresses was tallied and the shortfall from 4000 made good by randomly choosing a new set of boxes for examination in a systematic sample of the microfiche slides, allowing for the stratification by State. The procedure was repeated until the 4000 addresses were obtained, thus ensuring that the rate of sampling from electorates was reasonably proportional to the incidence of farm addresses in the electorate. This iterative procedure was necessary as the number of farm addresses within each electorate was not known in advance and consequently the sampling could not be stratified by electorate. Farm addresses were identified as those which were not numbered street addresses. The detailed criteria used in choosing farm addresses are described in appendix 9.

A total of 3000 questionnaires were mailed out to the addresses on the sampling frame drawn from the electoral rolls. Copies of the questionnaire and covering and reminder letter are provided in appendix 8. The response rates for the main questionnaire and the one-page follow-up questionnaire are shown in table 2.4.4.

2.5 Analysis

The questionnaire data was entered into Excel, where a number of checks for data integrity problems were performed. These included:

- duplicate questionnaire ID numbers (due to a second person in the household filling in and returning the second questionnaire sent with the reminder letter),
- follow-up questionnaires returned by those who had already filled in the main questionnaire,
- mis-spelt town and local government area names, and
- data known to lie outside the correct range.

Table 2.4.4 Sample sizes and response rates for the main questionnaire and the one-page follow-up questionnaire sent to electoral roll addresses.

Sample	Number mailed out	Return to sender	Number completed	Response rate	Follow ups completed	% of non-responders completing follow-up
New South Wales	461	34	168	39	139	54
Victoria	461	36	144	34	187	67
Queensland	462	48	119	29	149	51
South Australia	459	68	127	32	93	35
Western Australia	451	63	142	37	116	47
Tasmania	424	33	119	30	66	24
Northern Territory	282	61	41	18	22	12
Total	3000	126	860	30	772	38

Where it was possible to use gender to identify which of the two questionnaires from a household belonged to the addressee, the other questionnaire's data was discarded. Where this was not possible, one of the two was discarded at random. Data from follow-up questionnaires where the main questionnaire had also been returned was discarded. Individual questionnaires were re-examined to correct out-of-range data.

The corrected data was transferred to the University of New England mainframe computer for analysis with SPSS 4.0. A range of statistical procedures were used in the analysis of the data, and these are described in more detail adjacent to the sections in which the results of the analysis are presented.

3 Results

The analysis of the data from the 1991 and 2000 surveys was concerned with both the incidence of landholder opinion and explanations for the observed patterns of incidence. The generalisability of the findings from these surveys about the incidence of opinion is more likely to be compromised by the usual sources of bias in cross-sectional surveys than are the findings about possible explanations for patterns of index. For example, the relationship between age and the proportion of landholders holding a particular view is likely to be robust to undersampling of those in the oldest age group. However, this undersampling could well shift the overall proportion holding the particular view a number percentage points, such that the figure indicated from the sample of landholders in the survey is considerably different from the actual figure in the landholder population.

The order of presentation of the findings reflects these considerations, with the question of the representativeness of the findings being presented first, followed by a number of sections describing the incidence of landholder opinion and how that has changed since 1991. The final sections in this chapter deal with explanatory analysis of the patterns of incidence of opinion.

3.1 Representativeness of the Sample

3.1.1 Non-response bias

Non-response bias is the bias that results from those who respond to a survey being systematically different in some way from those who do not respond. As described in section 2.3.2, a one-page follow-up questionnaire was used to provide a means of estimating the extent of non-response bias and, if necessary, correcting for it in the analysis of the main questionnaire data. Because the one-page follow-up questionnaire did not elicit a response from all non-responders, it is impossible to correct completely for non-response bias. However, if it is assumed that those non-responders to the main questionnaire who respond to the one-page follow-up are likely to share some of the characteristics of the hard-core non-responders, then a comparison of the responses to questions that are common to both questionnaires provides some information about the extent and nature of non-response bias. Given that a substantial proportion of non-responders to the main questionnaire responded to the one-page follow-up (Tables 2.4.1 and 2.4.4), it can be concluded that the non-response bias in the main survey data is likely to be small if there is no significant difference between those who completed the main survey and those who completed the one-page follow-up. If there is a significant difference between the two groups, then there is likely also to be a some non-response bias in the main questionnaire data, which can be reduced by a weighting procedure that corrects for the over- and under-representation of people with particular demographic characteristics in the main survey data.

Separate comparisons were made for the electoral roll sample and the farmer organisation sample (which, as described in section 2.4, included samples based on the Yellow Pages® listings in New South Wales and South Australia).

Electoral roll sample

For the electoral roll sample, there were six questions on which there were significant differences between the responses of those who answered the main questionnaire and those who answered the one-page follow-up questionnaire (tables 3.1.1 to 3.1.6).

Table 3.1.1 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of male and female respondents.

Questionnaire	Male	Female
Main questionnaire	65.7	34.3
Follow-up questionnaire	58.2	41.8

(CHISQ = 4.61, d.f. 1, p<0.03178)

Table 3.1.2 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of respondents with various levels of education.

Questionnaire	No schooling, primary, part secondary or full secondary	Certificate, diploma or part of a degree course	Degree or post-graduate qualification
Main questionnaire	49.7	34.1	16.2
Follow-up questionnaire	58.6	31.6	9.8

(CHISQ = 8.8, d.f. 2, p<0.01230)

Table 3.1.3 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of respondents with properties of various sizes.

Questionnaire	<100ha	100-999ha	1000-4999ha	5000-24999ha	>25000ha
Main questionnaire	51.6	25.2	14.8	3.9	4.4
Follow-up questionnaire	63.2	15.0	12.3	3.2	6.3

(CHISQ = 16.03, d.f. 4, p<0.00298)

Table 3.1.4 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of respondents deriving various levels of income from agriculture.

Questionnaire	>85%	50%-85%	15%-50%	<15%	No income from farming
Main questionnaire	35	7.5	10.4	15.5	31.5
Follow-up questionnaire	27.3	4.0	9.5	15.4	43.9

(CHISQ = 15.85, d.f. 4, $p < 0.00323$)

Table 3.1.5 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of respondents who were dairy cattle producers.

Questionnaire	Dairy cattle producers	Other producers
Main questionnaire	9.5	90.5
Follow-up questionnaire	3.6	96.4

(CHISQ = 5.06, d.f. 1, $p < 0.02450$)

Table 3.1.6 Differences between the main and follow-up surveys (electoral roll sample) in the percentages of respondents who were involved in industries in addition to the main agricultural industries (beef, dairy cattle, dairy goats, sheep meat, goat meat, wool, goat fibres, pigs, poultry, horses, cereals, rice, cotton, grain legumes, oil seeds, fodder crops, grapes, fruit, nuts, vegetables, sugar, forestry).

Questionnaire	Main agricultural industries	Other agricultural industries
Main questionnaire	89.8	10.2
Follow-up questionnaire	74.1	25.9

(CHISQ = 23.24, d.f. 1, $p < 0.000005$)

Farmer organisation and Yellow Pages® sample

For the farmer organisation and Yellow Pages® sample, there were significant differences between the main and follow-up survey between only three variables:

level of education, level of income from farming and involvement in industries other than the main agricultural industries.

Table 3.1.7 Differences between the main and follow-up surveys (farmer organisation and Yellow Pages® sample) in the percentages of respondents with various levels of education.

Questionnaire	No schooling, primary, part secondary or full secondary	Certificate, diploma or part of a degree course	Degree or post-graduate qualification
Main questionnaire	55.1	31.8	13.2
Follow-up questionnaire	62.5	30.5	7.0

(CHISQ = 15, d.f. 2, p<0.00055)

Table 3.1.8 Differences between the main and follow-up surveys (farmer organisation and Yellow Pages® sample) in the percentages of respondents deriving various levels of income from agriculture.

Questionnaire	>85%	50%-85%	15%-50%	<15%	No income from farming
Main questionnaire	72.8	11.0	9.8	6.3	0.0
Follow-up questionnaire	70.8	11.1	10.2	5.1	2.9

(CHISQ = 41.55, d.f. 4, p<0.000005)

Table 3.1.9 Differences between the main and follow-up surveys (farmer organisation and Yellow Pages® sample) in the percentages of respondents who were involved in industries in addition to the main agricultural industries (beef, dairy cattle, dairy goats, sheep meat, goat meat, wool, goat fibres, pigs, poultry, horses, cereals, rice, cotton, grain legumes, oil seeds, fodder crops, grapes, fruit, nuts, vegetables, sugar, forestry).

Questionnaire	Other industries	Main agricultural industries
Main questionnaire	90.7	9.3
Follow-up questionnaire	79.8	20.2

(CHISQ = 37.52, d.f. 1, p<0.000005)

Concluding comments — non-response bias

The tables above suggest there may be two sources of non-response bias in the main survey data. The first is the tendency for those with lower levels of education (and possibly lower literacy levels) not to fill in written questionnaires. This is reflected in the higher proportions of respondents with lower levels of education to the follow-up questionnaire (tables 3.1.2 and 3.1.7).

The second source of non-response bias in the main survey would appear to be due to some of those receiving the questionnaire deciding that the questionnaire was directed to larger, fully commercial farms with the usual cereal, sheep, wool and beef industries. Because these people had smaller non-commercial farms, some with alternative or infant agricultural industries, they concluded that the questionnaire was not relevant to them and did not respond. As might be expected, the electoral roll sample was more likely to contain such people than the farmer organisation and Yellow Pages® sample. This is reflected in the wider range of variables in the electoral roll sample on which there were significant differences between the main and follow-up surveys.

Overall, the pattern of non-response bias is consistent with that found in the 1991 survey.

Because there are statistically significant differences between the main and follow-up surveys, the tables and graphs in sections 3.4 and 3.5 (based on electoral roll data for 2000) present results that include weighting to correct as far as possible for non-response bias.

3.1.2 2000 — 1991 Comparability Issues

In the 1991 survey, the issue of biases introduced by using samples from farmer organisations or the Yellow Pages® was considered in detail, because the total sample that aimed to be nationally representative was comprised of subsamples from farmer organisations in all States except New South Wales, where a subsample from the Yellow Pages® was used. It was found that there was not a great deal of difference between the two sources, and it was concluded that the national sample (including the subsample from the Yellow Pages®) could be taken as representative of the membership of farmer organisations throughout Australia (Reeve and Black, 1993:2).

For the 2000 survey, however, the main sampling issue is to ensure that the two samples used to compare 1991 and 2000 are as similar as possible with regard to how they were obtained and to any weighting procedures used. The 2000 survey used exactly the same sources as the 1991 survey, with one exception, *viz.* South Australia where a Yellow Pages® sample had to be used when the main farmer organisation in that State was unable to assist with the survey. Consequently, the best replication of the 1991 survey in South Australia that could be obtained from the 2000 survey data was to select farmer organisation members from the Yellow Pages® sample for that State. However, in New South Wales, the full Yellow Pages® sample from the 2000 survey was used, as the full Yellow Pages® sample had been used in 1991.

Initial comparisons of the property size distribution for the 1991 and 2000 survey data (taking the subset of the data as explained in the previous paragraph) showed highly significant differences in the distribution in New South Wales, South Australia and Tasmania, while there were no significant differences, or marginally significant differences in Victoria, Queensland and Western Australia (3.1.10). The differences in New South Wales and South Australia comprised a substantial increase between 1991 and 2000 in the proportion of small properties, while the opposite was the case for Tasmania. The decrease in the proportion of small properties in the sample from the Tasmanian Farmers and Graziers was due to a change in the arrangements for membership of the organisation between 1991 and 2000. In 1991, any person paying industry levies when selling produce automatically became a member of the organisation, while in 2000 membership was optional. Many people selling small quantities of produce have opted not be members of the organisation.

Table 3.1.10 Property size distribution by state for the 1991 and 2000 surveys (percentage of respondents).

Property area (ha)	NSW		VIC		QLD		SA		WA		TAS		NT	
	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000
0-49	4.6	20.1	9.8	11.2	1.1	2.0	9.2	28.8	0.4	0.5	20.4	4.9	0.0	0.0
50-99	2.6	4.7	13.5	8.9	1.1	1.7	2.6	13.8	0.4	1.0	20.4	8.6	0.0	0.0
100-499	21.7	20.9	39.9	45.3	21.8	18.0	18.8	17.5	8.0	7.6	41.8	44.4	0.0	0.0
500-999	19.1	19.1	21.6	16.9	13.8	11.9	22.4	12.5	10.4	13.2	9.2	6.2	0.0	0.0
1000-2499	31.2	15.5	12.3	14.1	17.0	15.6	31.3	22.5	36.0	34.5	5.1	17.3	0.0	0.0
2500-4999	9.0	9.4	2.7	2.1	11.9	12.6	9.9	3.8	27.2	26.9	2.0	7.4	0.0	0.0
>=5000	11.9	10.4	0.2	1.6	33.2	38.1	5.4	1.3	17.6	16.2	1.0	11.1	100.0	100.0
	Chisq=50.20, d.f. 6, p<0.000005		Chisq=16.22, d.f. 6, p<0.05		Chisq=4.43, d.f. 6, n.s.		Chisq=42.65, d.f. 6, p<0.000005		Chisq=1.60, d.f. 6, n.s.		Chisq=29.71, d.f. 6, p<0.00004		Insufficient numbers for a valid chi-squared test	

The increase in the proportion of small properties in New South Wales and South Australia (the two States for which the Yellow Pages® were used) reflects an increased diversity of primary produce categories in the Yellow Pages, such that increased numbers of producers with smaller property sizes were obtained in the 2000 sample. For example, the number of poultry producers in the sample increased 16-fold and the number of fruit growers 5-fold between 1991 and 2000 in New South Wales.

Given that there was very little change in the property size distribution for the samples from farmer organisations where there has been no change to membership arrangements, the best way to maximise the comparability of the 1991 and 2000 samples was considered to be by weighting the New South Wales and South Australia data to give a property size distribution similar to that in the 1991 sample. Because the 1991 Tasmanian Farmers and Graziers sample was weighted in 1991 to reflect the property size distribution in the other farmer organisations, and because the 2000

Tasmanian Farmers and Graziers sample came from an organisation with membership arrangements similar to other farmer organisations, the 2000 Tasmanian Farmers and Graziers sample was left unweighted (apart from the State based weighting described below).

Because of the different response rates across States, some States were over- or under-represented in the data. To provide descriptive statistics that can be generalised to a national basis, it was necessary to weight the data according each respondent's state. This also improved the comparability with the 1991 survey as a similar procedure was followed in presenting descriptive statistics from that survey.

The property size distributions by State for 1991 and 2000 weighted data are shown in 3.1.11. It can be seen from this table that the 1991 and 2000 property size distributions are similar for all States, with the exception of Tasmania, where there are some difference in the 100 - 1000ha range. While it would be possible to carry out further weighting adjustments, this was considered to be unnecessary as it is the differences in the proportions of properties less than 100ha that are likely to have the most effect on attitudinal comparisons.

Table 3.1.11 Property size distribution by state for the 1991 and 2000 surveys after the weighting procedures described above (percentage of respondents).

Property area (ha)	NSW		VIC		QLD		SA		WA		TAS		NT	
	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000
0-49	4.6	4.6	9.8	11.2	1.1	2.0	9.2	9.2	0.4	0.5	7.7	4.9	0.0	0.0
50-99	2.6	2.6	13.5	8.9	1.1	1.7	2.6	2.6	0.4	1.0	7.7	8.6	0.0	0.0
100-499	21.7	21.7	39.9	45.3	21.8	18.0	18.7	18.9	8.0	7.6	27.8	44.4	0.0	0.0
500-999	19.1	19.1	21.6	16.9	13.8	11.9	22.4	22.5	10.4	13.2	18.9	6.2	0.0	0.0
1000-2499	31.2	31.1	12.3	14.1	17.0	15.6	31.2	31.6	36.0	34.5	22.6	17.3	0.0	0.0
2500-4999	9.0	9.0	2.7	2.1	11.9	12.6	9.9	9.8	27.2	26.9	10.7	7.4	0.0	0.0
>=5000	11.8	11.9	0.2	1.6	33.3	38.1	5.9	5.2	17.6	16.2	4.5	11.1	100.0	100.0

For comparison purposes, the distributions published by ABS in 1991 and 1999 for are also shown against the corresponding weighted results from the 1991 and 2000 surveys (tables 3.1.12a, 3.1.12b). Because of the categories used by ABS in reporting the property size distribution for Australia were different in 1991 compared to 1999, the comparison is shown in two tables. These show that the weighted data is representative of larger, commercial farms, both in 1991 and 2000. The increase between 1991 and 1999 in the proportion of properties smaller than 50ha shown in the ABS distributions is a result of the ABS lowering the threshold for inclusion of farms in its surveys, from an estimated value of operations of \$20 000 in the 1991 publication to an estimated value of operations of \$5 000 in the 1999 publication.

Tables 3.1.12a,b Property size distribution for Australia, comparing the results from weighted data for this study, and the results published by ABS in 1991 and 1999 (percentage of respondents).

Property area (ha)	AUS	
	Survey 1991	ABS 1991
0-49	5.4	15.4
50-99	5.0	9.7
100-499	24.7	34.8
500-999	18.1	15.5
1000-2499	23.6	14.0
2500-4999	10.0	8.7
>=5000	13.3	1.8

Property area (ha)	AUS	
	Survey 2000	ABS 1999
0-49	5.8	18.9
50-99	4.0	11.3
100-499	25.9	34.0
500-999	16.4	13.5
1000-2499	23.3	12.4
2500-24999	19.2	9.4
>=25000	5.3	0.4

The distribution of farms across States for the weighted survey data and as published by ABS in 1991 and 1999 is shown in able 3.1.13. It can be seen from the table that the distributions are all closely similar, verifying that the comparison of other findings from the 1991 and 2000 weighted survey data can be regarded as nationally representative.

Table 3.1.13 Distribution of farms across States, comparing the results from weighted data for this study, and the results published by ABS in 1991 and 1999 (percentage of respondents).

	NSW	VIC	QLD	SA	WA	TAS	NT
1991 Survey	29.3	26.2	20.9	11.5	10.3	1.5	0.2
ABS 1991	29.1	25.8	20.5	11.3	10.3	2.8	0.3
2000 Survey	29.1	25.7	21.6	10.6	9.8	3.1	0.2
ABS 1999	29.5	25.3	21.3	10.9	9.7	3.0	0.3

3.2 Comparison of Attitudinal Characteristics, 1991-2000

The questionnaires used in 1991 and 2000 contained 60 Likert-type attitude statements common to the two surveys, and to which respondents could indicate a response of ‘Strongly agree’, ‘Mostly agree’, ‘Neutral or not sure’, ‘Mostly disagree’ or ‘Strongly disagree’. Each statement served one or more of the following functions:

- as one of a number of statements, the responses to which, when averaged, would provide a single measure of a respondent's attitude towards the idea or concept expressed in the statements (a Likert Scale); and
- to elicit a response on a single policy or environmental issue encompassed by the statement.

The results for the statements that served the first function above are reported in section 3.2.2. Some of these statements also served the second function above and are

reported in section 3.2.3. However, before dealing with responses on policy issues and Likert Scales, the results from the simple comparison of responses to individual statements are presented. These are based on respondents from the farmer organisations and the Yellow Pages®, weighted in the way described in the previous section.

3.2.1 Simple Comparison of Attitude Statement Responses

A full listing of the responses to the 60 attitude statements that were present in both the 1991 and 2000 questionnaires is provided in appendix 10. The tables are listed in the same order as in the listing of statements in appendix 6, with statements used to construct Likert Scales coming first, followed by individual attitude statements.

Of the 60 attitude statements, 51 had differences in the pattern of responses between 1991 and 2000 that were significantly different according to a chi-squared test at the level $p < 0.05$ ¹. However, the chi-squared test on large samples can identify statistically significant differences that are substantively minor and which do not warrant interpretation. For example, 3.2.1 shows a difference between 1991 and 2000 which has a significance of $p < 0.005$ for a chi-squared test, yet the greatest difference between 1991 and 2000 in any of the categories was only 2.9 percentage points (the ‘strongly agree’ category).

Table 3.2.1 Responses in 1991 and 2000 to the statement: *Most rural properties have some sort of degradation, whether it be soil erosion, damage to soil structure, die-back, weed infestation, pollution of soils or streams, or salinity.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	43.0	46.8	4.3	4.3	1.6
2000	40.1	45.3	6.6	5.8	2.1

(CHISQ = 14.95, d.f. 4, $p < 0.005$)

For a single category considered in isolation, and for the size of sample involved in the two surveys, a percentage point difference of about seven per cent or more is significant at the $p < 0.05$ level. The responses from the 15 statements for which there was at least one category with a percentage point difference of seven or more percent are shown below. Thirteen of these statements have, according to the chi-squared

¹ It is generally accepted that caution has to be exercised in using inferential statistics with weighted data. The potential for inflated chisquare statistics is increased when a substantial proportion of cases have large weights. For the weighting described in section 3.1.2, 97.8 per cent of weights were less than 2. The total number of cases in the weighted data set was slightly less than the total number of cases in the unweighted data set, thereby ensuring that the total ‘sample’ size of the weighted data set did not inflate the chisquare statistic. As a further precaution, the chisquare test was run on both weighted and unweighted data. For 50 of the 60 attitude statements, the p values for weighted and unweighted data did not vary more than 0.05. For 25 of the 60 attitude statements, the p values for weighted and unweighted data were within 0.000005 of each other. In no case did weighting result in a non-significant chisquare statistic becoming significant, or *vice versa*.

test, significant differences between the 1991 and 2000 responses at the $p < 0.000005$ level. The remaining two have significant differences at the $p < 0.00003$ and the $p < 0.00001$ level.

The 15 statements are grouped according to statement content.

Chemicals and fertilisers

Figure 3.2.1 Response to: *The best way to reduce the mis-use of agricultural chemicals is for there to be courses on safety that are compulsory before you can use a chemical.*

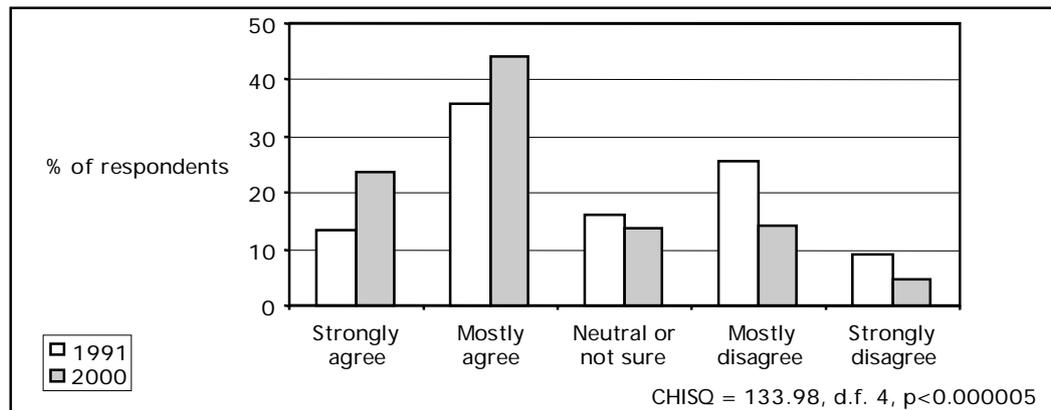
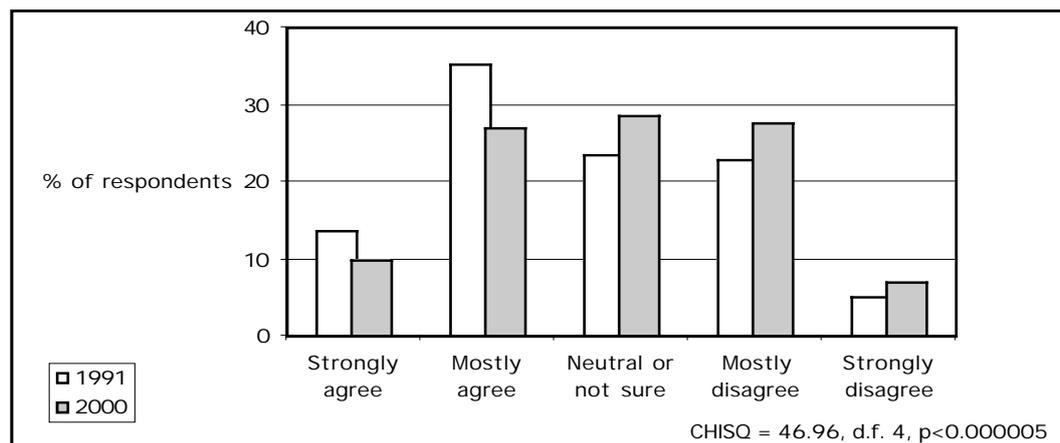


Figure 3.2.2 Response to: *The pollution effects of fertilisers are quite unimportant compared to their benefits in increasing production.*



Landcare and extension issues

Figure 3.2.3 Response to: *Investment in landcare is important to ensure future farm profitability.*

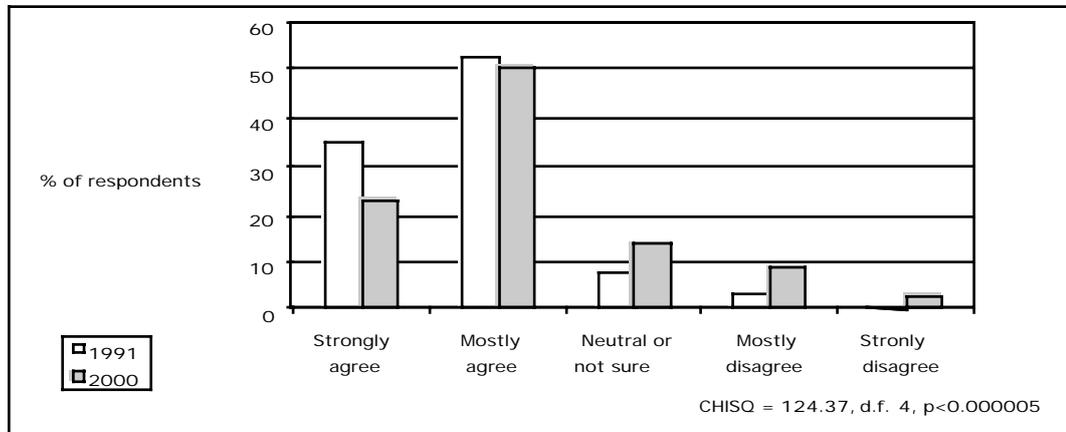


Figure 3.2.4 Response to: *It would be a waste of effort for governments to subsidise the preparation of environmentally sound management plans for each farm.*

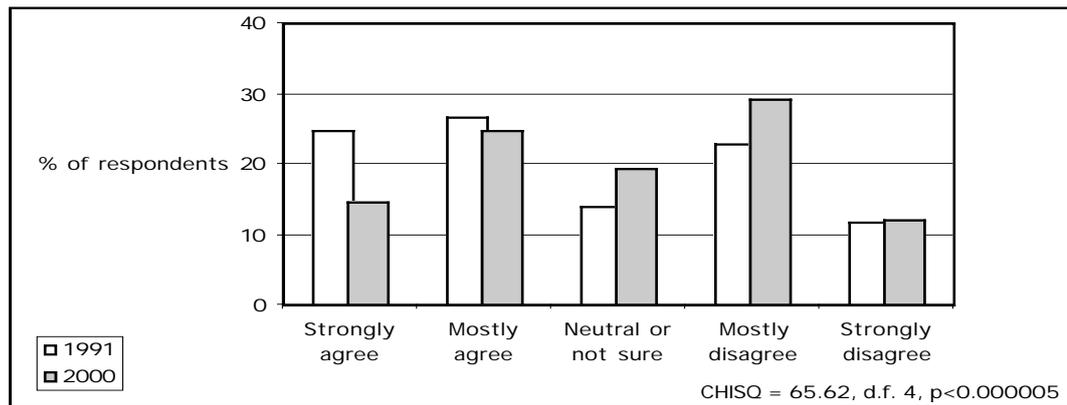


Figure 3.2.5 Response to: *Farming recommendations from government departments are generally worth following.*

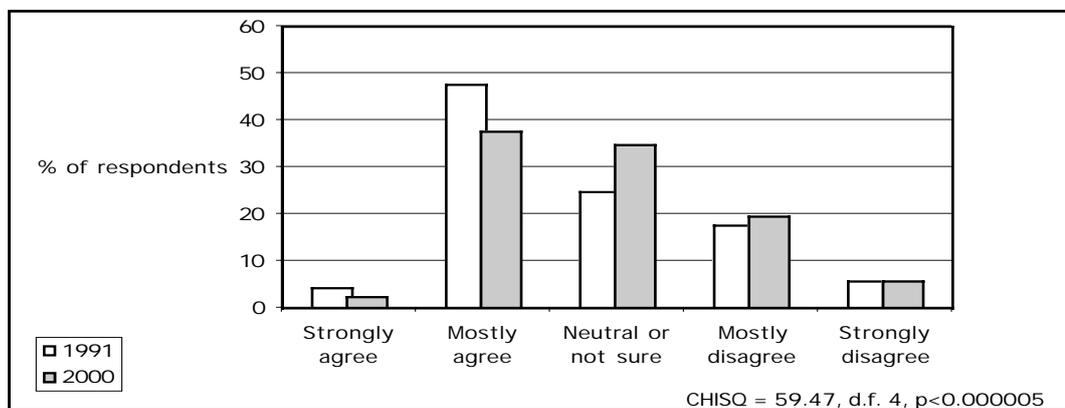


Figure 3.2.6 Response to: *It is unfair to expect people in towns and cities to contribute to the cost of preventing land degradation on rural lands.*

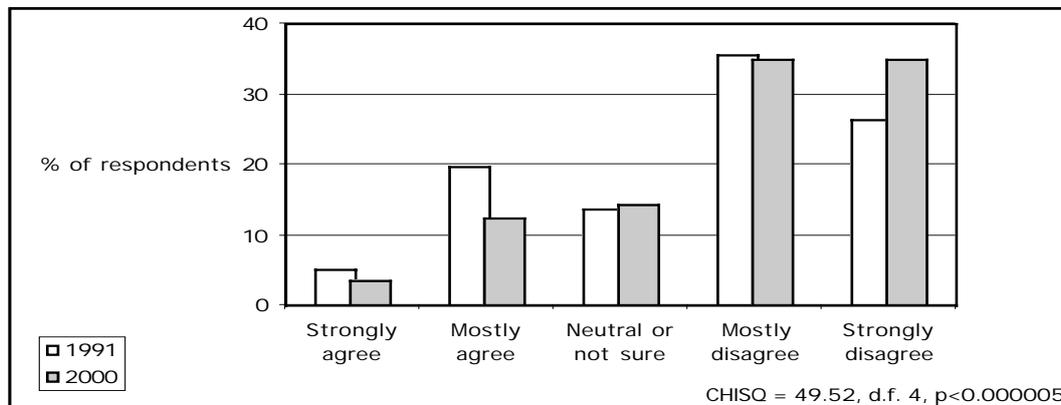


Figure 3.2.7 Response to: *On the whole, what a farmer does on his/her property has very little effect on other properties.*

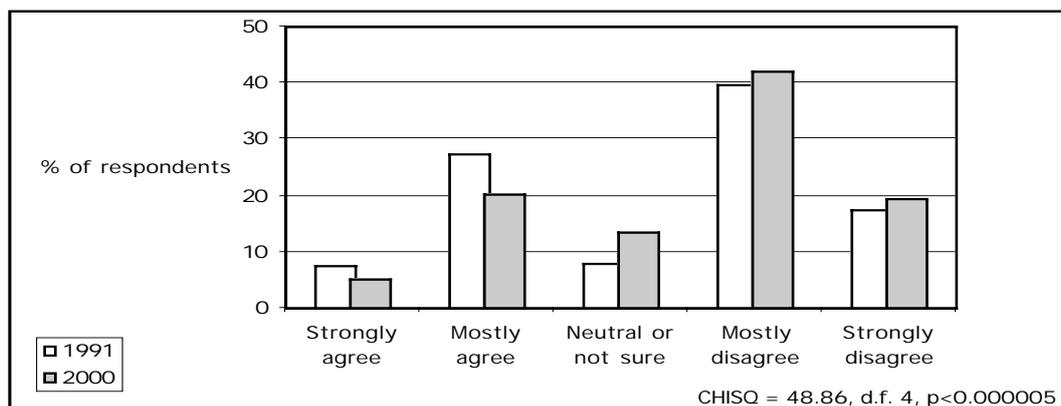


Figure 3.2.8 Response to: *The farmer is the best person to decide how land degradation problems on his/her farm should be tackled.*

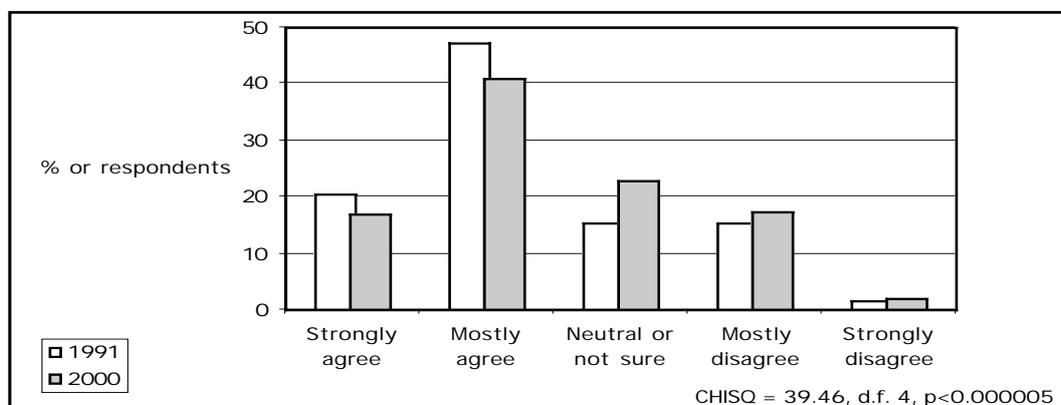
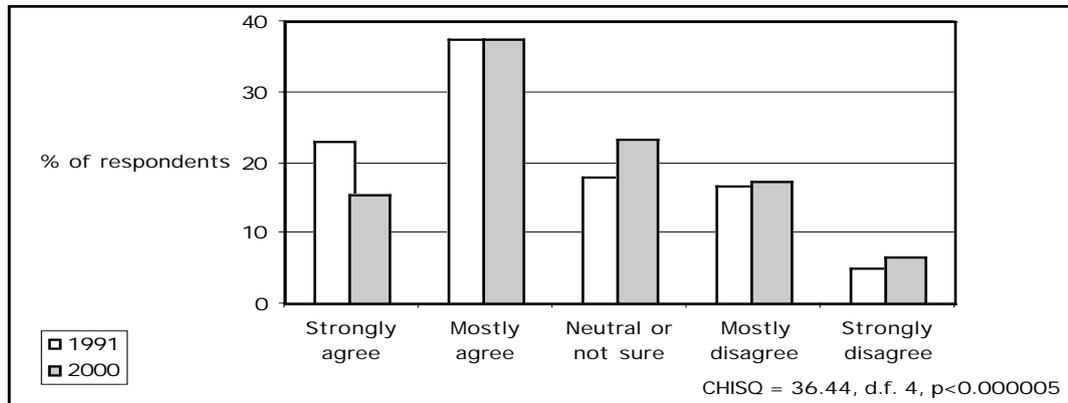


Figure 3.2.9 Response to: *Some types of country being used for agriculture in Australia will never be able to be farmed or grazed without badly damaging the land.*



Environmental organisations

Figure 3.2.10 Response to: *Environmental organisations, like the Australian Conservation Foundation (ACF) or the Wilderness Society, should confine their activities to the cities and national parks and not be concerned with rural and farming issues.*

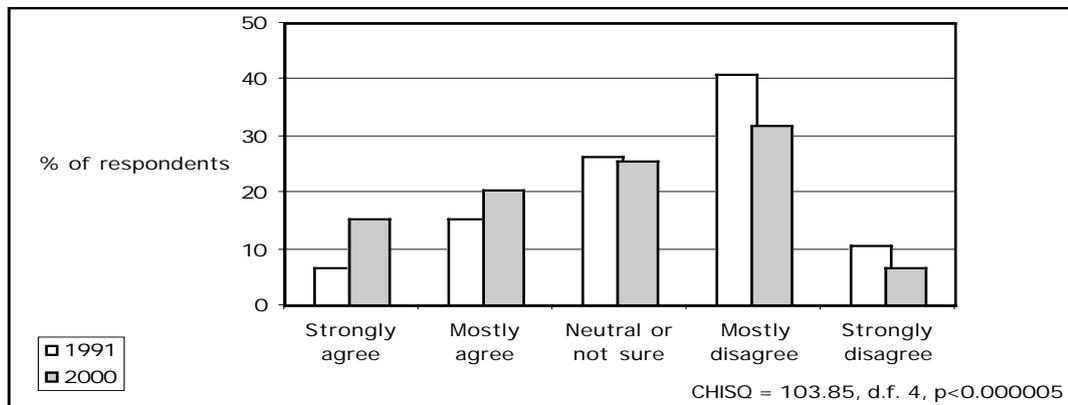


Figure 3.2.11 Response to: *On the whole, I approve of the policies of environmental organisations such as the Australian Conservation Foundation (ACF) or the Wilderness Society.*

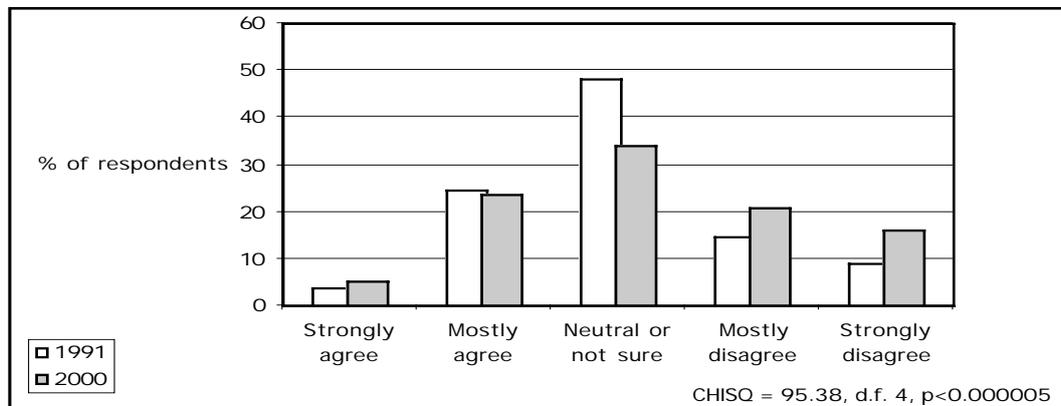


Figure 3.2.12 Response to: *Governments these days pay too much attention to the 'green movement'.*

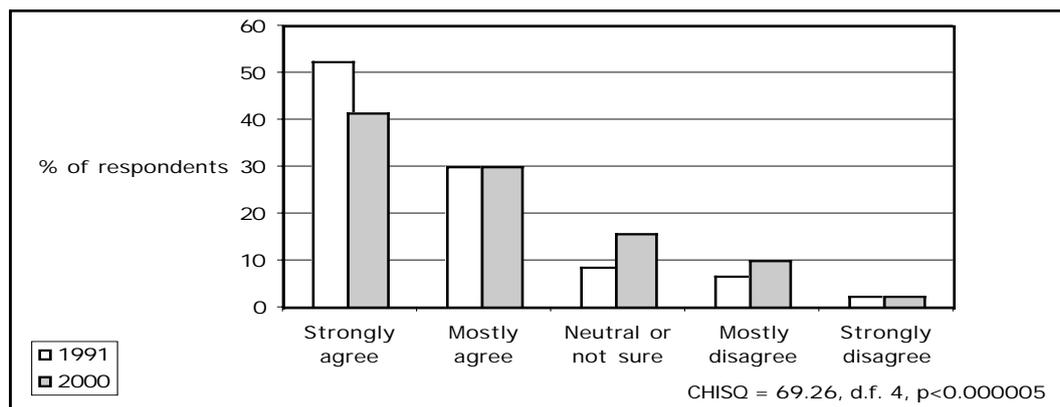
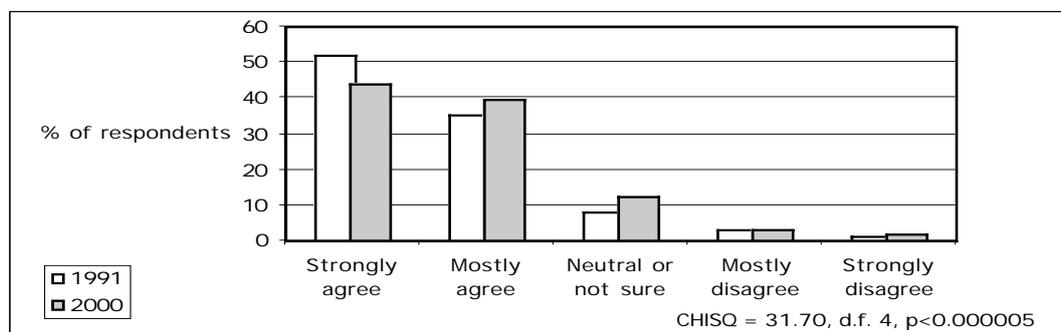


Figure 3.2.13 Response to: *Environmentalists seldom take account of the economic implications of their policies.*



Other

Figure 3.2.14 Response to: *People who knowingly pollute the countryside are just as criminal as people who steal.*

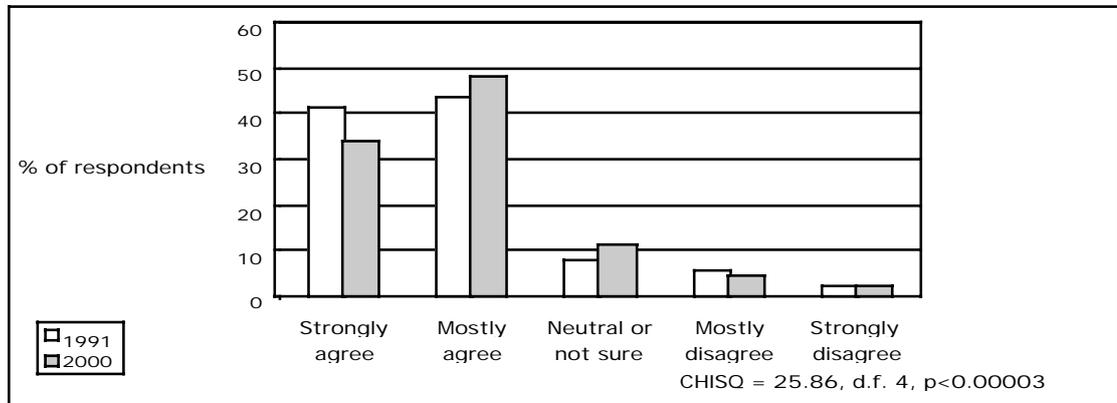
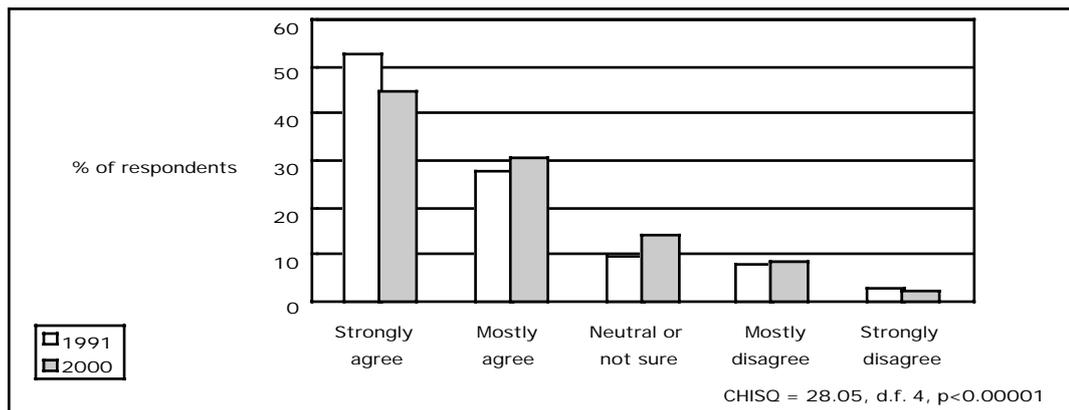


Figure 3.2.15 Response to: *Industrial and housing developments should not be allowed on prime agricultural land.*



3.2.2 Comparison of Attitudinal Scales

Of the ten attitudinal scales used in the 2000 survey (see section 2.3.2 and appendix 6), six were composed of attitude statements that had been used in the 1991 survey. These were: *Chemical residues in food*, *Agricultural chemicals*, *Conservation orientation*, *External intervention in decision-making* and *Zoning of rural land*. Each of these scales were comprised of approximately equal numbers of attitude statements favourable and unfavourable to the particular idea, issue or object encapsulated by the scale. Responses from 'Strongly agree' to 'Strongly disagree' on the favourable statements were coded from five to one, respectively, while responses were coded in the opposite direction on the unfavourable statements. Scales with approximately equal numbers of favourable and unfavourable statements provide a more valid measure of attitudes. The numbers of favourable and unfavourable statements in each scale are shown in table 3.2.2, below. The change between 1991 and 2000 in the value of Cronbach's alpha is shown in table 3.2.2, below. Cronbach's alpha is the

average of the pair-wise correlations between the attitude statements comprising a scale. A high value (usually accepted as between 0.5 and 1.0, depending on the number of statements in the scale) indicates a satisfactory scale as respondents are tending to answer the attitude statements in a consistent fashion. Cronbach's alpha was calculated from unweighted data. Because correlations can be affected by the number of cases, and because the 1991 data set contained more cases than the 2000 data set, a random sub-sample of cases was taken from the 1991 data, to yield a similar number of cases for the calculation of Cronbach's alpha for 1991 and 2000.

Table 3.2.2 Comparison of Cronbach's alpha for Likert scales common to the 1991 and 2000 surveys. The number of statements in each scale is shown in brackets, with the number of unfavourable statements followed by the letter 'R' (for 'R'eversal of coding).

Likert scale	1991	2000
Chemical residues (4,2R)	0.62	0.63
Agricultural chemicals (8,3R)	0.79	0.80
Conservation orientation (8,4R)	0.65	0.69
External influence on decision-making (8,4R)	0.64	0.71
Zoning of rural land(2,0R)	0.58	0.63
Seriousness of land degradation (4,2R)	0.52	0.51

The table shows that, with the exception of the *Seriousness of land degradation* scale, there have been increases of various magnitudes between 1991 and 2000 in the consistency with which the attitude statements comprising the scales have been answered.

The distribution of scores on each of the five scales for which there was a significant difference between 1991 and 2001 is shown in figures 3.2.15 to 3.2.19, below. There was no significant difference between 1991 and 2001 in the distribution of scores on the *Zoning of rural land* scale.

Figure 3.2.16 Change in distribution of scale scores on the *Chemical residues* scale. A high score on this scale represents a favourable view of, or a lack of concern about, chemical residues in agricultural produce. The mean of the distribution decreased from 2.98 in 1991 to 2.88 in 2000, a statistically significant difference (anova, $F=11.00$, d.f. 1, $p<0.005$).

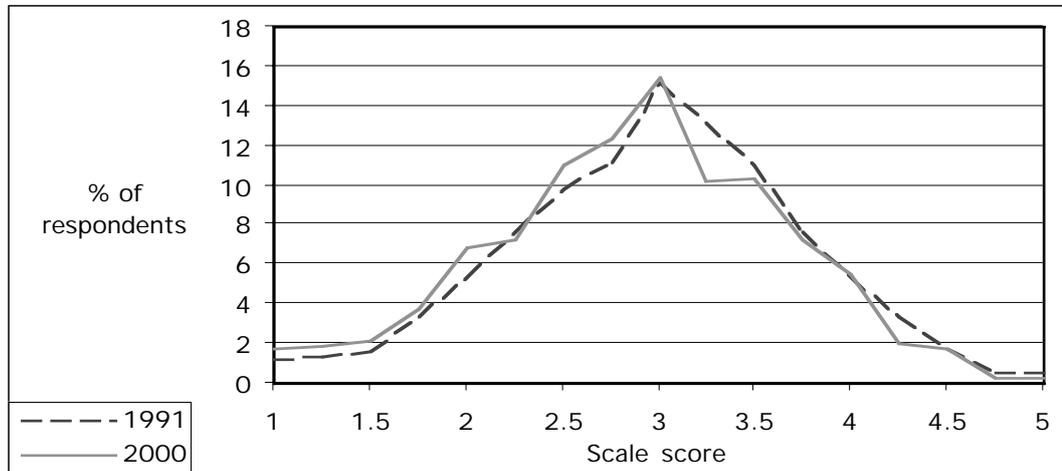


Figure 3.2.17 Change in distribution of scale scores on the *Agricultural chemicals* scale. A high score on this scale represents a favourable view of, or a lack of concern about, agricultural chemicals generally. The mean of the distribution decreased from 3.33 in 1991 to 3.14 in 2000, a statistically significant difference (anova, $F=48.08$, d.f. 1, $p<0.0005$).

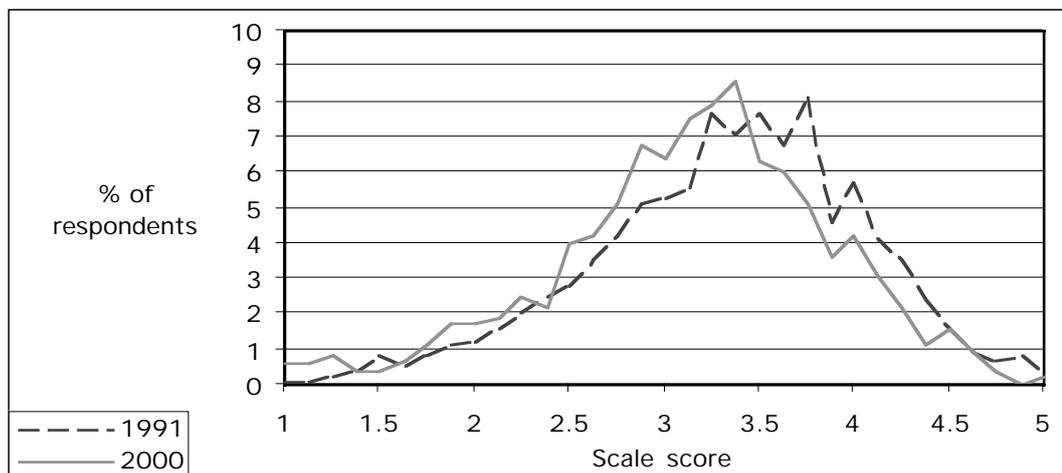


Figure 3.2.18 Change in distribution of scale scores on the *Conservation orientation* scale. A high score on this scale represents a favourable view towards rural conservation and conservationists. The mean of the distribution increased from 3.00 in 1991 to 3.12 in 2000, a statistically significant difference (anova, $F=28.54$, d.f. 1, $p<0.0005$).

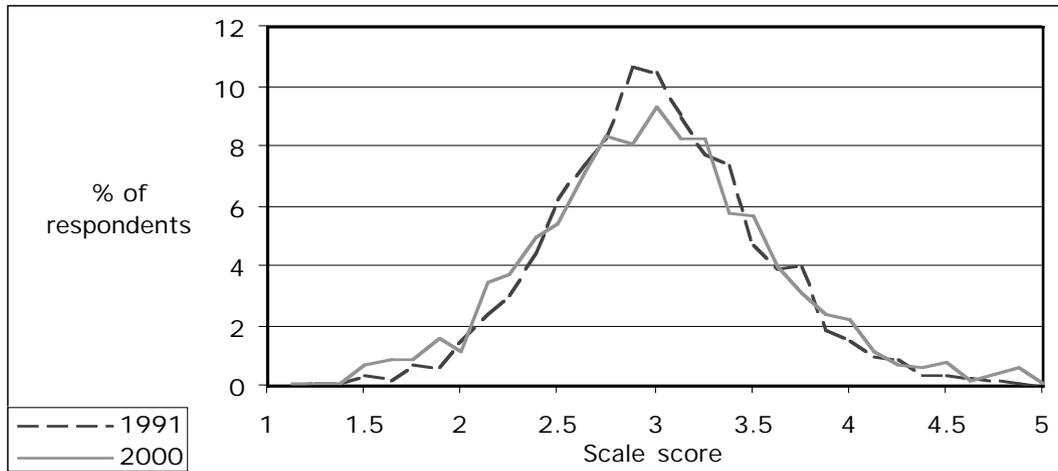


Figure 3.2.19 Change in distribution of scale scores on the *External influence on decision-making* scale. A high score on this scale represents a favourable view towards influences on farmers' autonomy in decision-making, such as extension recommendations and regulatory constraints. The mean of the distribution increased from 2.98 in 1991 to 3.06 in 2000, a statistically significant difference (anova, $F=11.58$, d.f. 1, $p<0.005$).

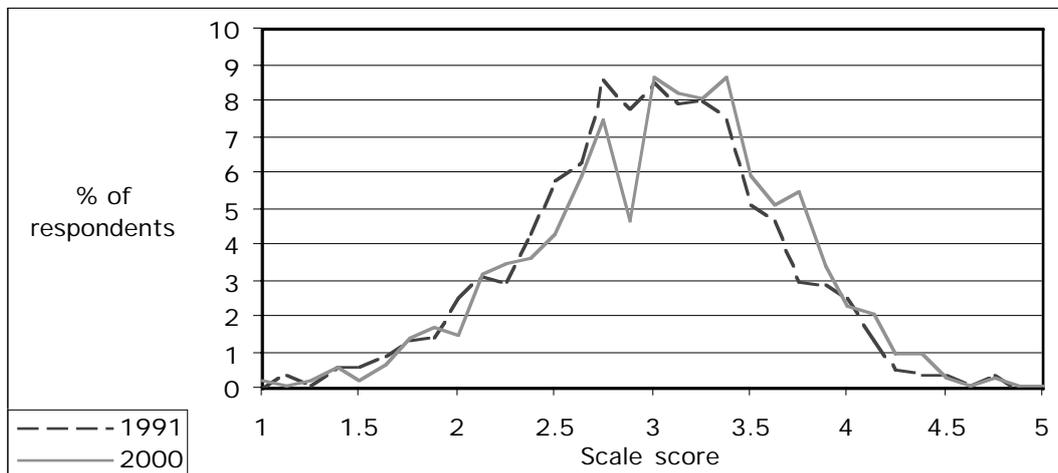
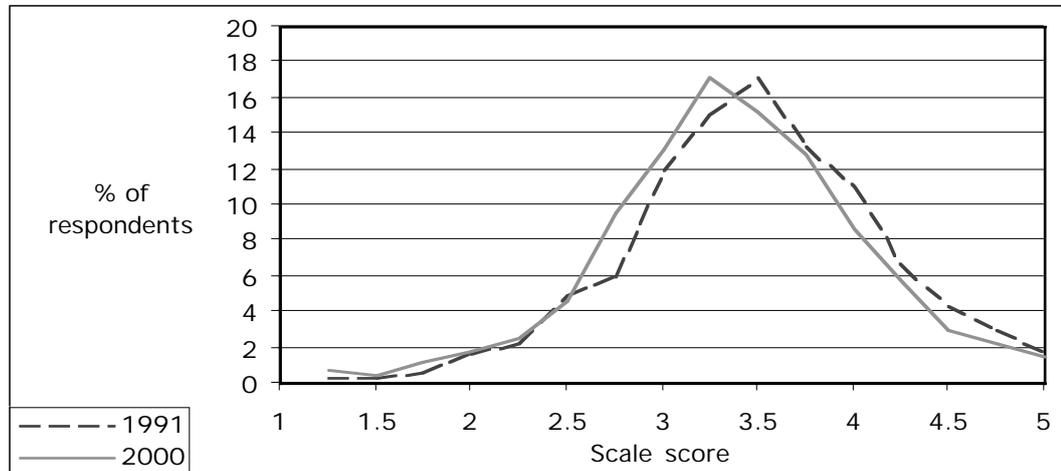


Figure 3.2.20 Change in distribution of scale scores on the *Seriousness of land degradation* scale. A high score on this scale would indicate that the respondent regarded land degradation as a serious matter. The mean of the distribution decreased from 3.48 in 1991 to 3.37 in 2000, a statistically significant difference (anova, $F=20.51$, d.f. 1, $p<0.0005$).



The changes between 1991 and 2000 in the responses to the individual attitude statements comprising each of the Likert scales are shown in appendix 10.

Concluding comments — comparison of attitudinal scales

Taking the figures above and the tables in appendix 10 together, the pattern of attitudinal changes between 1991 and 2000 can be described as follows.

Chemical residues: The shift in the distribution of scores on this scale suggests that there has been an increase the proportion of respondents with concerns about chemical residues. This is due mainly to a decrease in the number of respondents who regard the claims about the dangers of residues as exaggerated (tables A10.1-2). The level of support for additional policy measures to deal with chemical residues appears to have remained constant (see section 3.2.4).

Agricultural chemicals: The shift in the distribution of scores on this scale suggests that there has been an increase in the proportion of respondents with concerns about health, safety and environmental aspects of agricultural chemicals. The main areas where there have been changes relate to appreciation of the nutrient pollution impacts of fertilisers (table A10.7) and a increase in the number of respondents concerned about the dangers of, or problems with, agricultural chemicals (tables A10.10 and A10.11).

Conservation orientation: While there has been a slight and statistically significant increase in the mean score on the conservation orientation scale, the decrease in the kurtosis of the distribution (*i.e.* less peaked), suggests that a greater proportion of respondents have a clearer view on where they stand on conservation issues, compared to 1991. This has resulted in a decrease in the proportion of respondents

with scores at the middle of the scale (*i.e.* ticking the 'Neutral or not sure' box, or ticking approximately equal numbers of boxes denoting pro-conservation and anti-conservation positions), and an increase in the proportion of respondents in the tails of the distribution (*i.e.* a consistent pro-conservation or anti-conservation position). These broad changes evident from the distributions in figure 3.2.18 are the aggregate effect of fairly complex changes at the individual attitude statement level (tables A10.14-21). The individual statement showing the greatest change (table A10.20) refers to the view that environmental organisations should confine their activities to cities — a view that has significantly increased support in 2000 compared to 1991. Another individual statement showing a relatively strong change refers to approval of the policies of environmental organisations, with a significant increase in 2000 in the proportion of respondents disapproving of these policies (table A10.14). This statement also shows a marked decrease in the proportion indicating 'Neutral or not sure', suggesting that there is a greater level of awareness about environmental organisations in 2000 than was the case in 1999. In contrast, the statements referring to conservation or environmental issues rather than conservationists, (tables A10.15-18) generally show increases in the proportion of respondents ticking 'Neutral or not sure'. Amongst these statements, there is no strong consistent trend between 1991 and 2000, although it is worth noting that the proportion of respondents agreeing with the statement that: *It is worth putting up with a small decrease in farm profits to protect the environment* decreased from 76.7 per cent in 1991 to 66.8 per cent in 2000 (table A10.17).

External influence on decision-making: The shift in the distribution of scores on this scale suggests that there has been a slight increase overall in the proportion of respondents with favourable attitudes towards extension information and regulatory constraints on their autonomy of decision-making. As with the previous scale, this change is the aggregate effect of changes on individual statements that are not necessarily consistent in direction. For example, the two individual statements with the strongest change between 1991 and 2000 (table A10.22 and A10.28) show that there has been a decline in the proportion of respondents who believe that farming recommendations from government departments are generally worth following, and an increase in the proportion who support the concept of a subsidy for the preparation of an environmentally-sound management plan for each farm. Consistent with the latter is the decrease in the proportion agreeing with the statements that: *The farmer is the best person to decide how land degradation problems on his/her farm should be tackled* (from 67.6 to 58.0 per cent — table A10.27) and: *Farmers are the best persons to decide how much of their land should be cleared* (from 63.9 to 55.4 per cent — table A10.29).

Seriousness of land degradation: The shift in the distributions of scores on this scale suggests that there has been a slight decrease overall in the proportion of respondents who view land degradation as a serious issue. The change in the scores on this scale appears to have been most strongly influenced by a decrease in the proportion of respondents who agreed with the proposition that: *Some marginal types of country being used for agriculture in Australia will never be able to be farmed or grazed without badly damaging the land* (table A10.33).

3.2.3 Correlations between Attitudinal Scales

The correlations between the six attitudinal scales with Cronbach's alpha greater than 0.5 are shown in table 3.2.3. As might be expected from the improvements in Cronbach's alpha from 1991 to 2000 shown in table 3.2.2, there has also been an increase in the correlations between the scales. Most notably, the correlation between the *Conservation orientation* scale and the *External influence in decision-making scale* increased from 0.53 in 1991 to 0.65 in 2000. These two scales also experienced marked increases in their value of Cronbach's alpha between 1991 and 2000 (table 3.2.2).

The other strong correlation between attitudinal scales was that between *Agricultural chemicals* and *Chemical residues*. However the increase from 0.62 in 1991 to 0.66 in 2000 was not as great as that for the correlation between the *Conservation orientation* and *External influence in decision-making* scales.

Table 3.2.3 Comparison of correlations between attitudinal scales in 1991 and 2000. All correlations are significantly different from 0 (2-tailed test, $p < 0.01$). The correlations are calculated from unweighted data. The figures for 1991 differ slightly from those published in Reeve and Black (1993:59) by between 0.01 and 0.04 as a 0.653 sub-sample of the 1991 data was used so that the 1991 and 2000 correlations were based on the same number of cases (correlations tend to decrease slightly for larger samples).

	Chemical residues		Agricultural chemicals		Conservation orientation		External influence in decision-making		Zoning of rural land	
	1991	2000	1991	2000	1991	2000	1991	2000	1991	2000
Agricultural chemicals	0.62	0.66								
Conservation orientation	-0.41	-0.46	-0.42	-0.42						
External influence on decision-making	-0.27	-0.33	-0.22	-0.27	0.53	0.65				
Zoning of rural land	-0.27	-0.29	-0.19	-0.20	0.30	0.40	0.39	0.42		
Seriousness of land degradation	-0.28	-0.33	-0.34	-0.34	0.34	0.49	0.39	0.46	0.33	0.34

3.2.4 Comparison of Attitudes toward Policy Issues

A number of the attitude statements that were used in both 1991 and 2000 related to various rural environmental policy issues. The responses to these statements are presented in the following tables, grouped according to policy issue. The tables are based on respondents from the farmer organisations and the Yellow Pages®, weighted according to the procedure described in section 3.1.2.

Financial assistance to reduce land degradation

Table 3.2.4 Response to: *It is unfair to expect farmers to bear the cost of repairing land degradation on their properties.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	13.5	34.4	20.1	27.6	4.3
2000	14.9	37.6	23.2	22.2	2.2

(CHISQ = 26.82, d.f. 4, p<0.00002)

Table 3.2.5 Response to: *Without financial assistance, there is little farmers can do to prevent land degradation occurring on their properties.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	18.4	30.8	7.8	33.5	9.4
2000	15.0	30.4	11.4	35.9	7.3

(CHISQ = 21.71, d.f. 4, p<0.00023)

Table 3.2.6 Response to: *It is unfair to expect people in towns and cities to contribute to the cost of preventing land degradation on rural lands.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	5.2	19.6	13.6	35.5	26.2
2000	3.5	12.4	14.2	35.0	34.8

(CHISQ = 49.52, d.f. 4, p<0.000005)

The pattern of responses in tables 3.2.4 and 3.2.6 suggests that there has been an increase in the proportion of respondents in favour of public subsidy for both remedial and preventative measures against land degradation on rural lands, although there has been a very slight decrease in the proportion who believe there is little farmers can do in this regard without financial assistance (table 3.2.5).

Financial incentives to encourage use of soil improving practices

There was no significant difference between the 1991 and 2000 pattern of responses to the statement: *Financial incentives should be made available to encourage farmers to use soil improving practices, e.g. rotation, stubble retention or deep ripping* (see table A10.38). The proportion in favour remained nearly constant at just under 80 per cent.

Cross-compliance — primary producer status and sustainable practices

There was no significant difference between the 1991 and 2000 pattern of responses to the statement: *Farmers should not receive the financial benefits of primary producer status (e.g. income averaging, diesel fuel rebate) unless they are following recommended sustainable agricultural practices* (see table A10.47). The proportion of respondents in favour remained constant at 32.5 per cent.

Levy to pay for environmental research and monitoring

Table 3.2.7 Response to: *Farmers should be levied to pay for environmental research and monitoring in their industry.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	1.5	9.1	14.0	35.3	40.1
2000	1.2	7.6	18.5	38.0	34.7

(CHISQ = 21.02, d.f. 4, $p < 0.00031$)

There has been a slight decline in the proportion of respondents in favour of levies to pay for environmental research and monitoring, and a somewhat greater increase in the proportion who were neutral or not sure

Tax on agricultural chemicals to finance research on alternatives

Table 3.2.8 Response to: *There is no need for a tax on agricultural chemicals to finance research on safer alternatives.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	22.3	26.2	17.0	24.4	10.2
2000	17.8	25.0	23.7	24.8	8.8

(CHISQ = 28.05, d.f. 4, $p < 0.00001$)

There has been a moderate decrease in the proportion of respondents who believed there was no need for a tax on agricultural chemicals, as well as an increase in the proportion of respondents who were neutral or not sure.

Penalties for chemical residues in foods

There was no significant difference between the 1991 and 2000 pattern of responses to the statement: *There are not enough penalties against those farmers whose produce contains chemical residues at levels known to be harmful.* The level of support for this statement remained nearly constant at just over 50 per cent.

Testing for chemical residues

Table 3.2.9 Response to: *There needs to be more testing of all agricultural produce for harmful chemical residues.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	12.8	37.9	23.3	21.8	4.2
2000	12.4	34.5	27.7	20.4	5.1

(CHISQ = 10.81, d.f. 4, p<0.02873)

There was only a slight and marginally significant change in the pattern of responses to this statement between 1991 and 2000, with a slight fall in the proportion agreeing with the statement and a slight increase in the proportion who were neutral or not sure.

'Right to farm'

Table 3.2.10 Response to: *If people build houses close to where farmers are growing crops that need spraying, the newcomers have no right to complain about spray drift.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	25.1	32.1	13.9	20.6	8.3
2000	30.8	32.2	13.8	16.4	6.8

(CHISQ = 18.71, d.f. 4, p<0.00090)

There has been a significant change in the pattern of responses to this statement, with a moderate increase in the proportion of respondents who believed that a history of cropping land use absolves landowners from responsibility for the spillover effects of that landuse, from 57.2 per cent in 1991 to 63 per cent of respondents being of this view in 2000.

Buffer zones around towns in cropping areas

There was no significant difference between the 1991 and 2000 pattern of responses to the statement: *Buffer zones around towns where there is a lot of crop spraying are essential to protect the health of townspeople.* The proportion agreeing with this statement remained nearly constant at just over 55 per cent.

Compulsory courses on agricultural chemical safety

Table 3.2.11 Response to: *The best way to reduce the mis-use of agricultural chemicals is for there to be courses on safety that are compulsory before you can use a chemical.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	13.5	35.8	16.2	25.4	9.1
2000	23.7	43.9	13.7	14.0	4.8

(CHISQ = 133.98, d.f. 4, p<0.000005)

There has been a significant change in the pattern of responses to this statement, with a marked increase in the proportion of respondents agreeing with this statement, from 49.3 per cent in 1991 to 67.2 per cent in 2000.

Environmental education for farmers

Table 3.2.12 Response to: *Too little is being done to educate farmers about damage done to the environment by some agricultural practices.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	12.3	43.5	16.7	24.1	3.5
2000	8.3	38.1	22.6	26.6	4.5

(CHISQ = 35.89, d.f. 4, p<0.000005)

There also has been a significant change in the pattern of responses to this statement, with a marked decrease in the proportion of respondents agreeing with this statement, from 55.8 per cent in 1991 to 46.4 per cent in 2000. There was also a moderate increase in the proportion of respondents who were neutral or not sure.

Environmental impact statements

Table 3.2.13 Response to: *Farmers should have to provide Environmental Impact Statements before undertaking large developments like feedlots or major land clearing on their properties.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	18.2	35.0	13.3	20.4	13.1
2000	17.1	40.0	15.0	18.2	9.7

(CHISQ = 17.41, d.f. 4, p<0.00161)

The pattern of responses to this statement changed significantly between 1991 and 2000, with a slight increase in the proportion agreeing with the statement from 53.2 per cent in 1991 to 57.1 per cent in 2000.

Zoning of rural land

There were two attitude statements common to the 1991 and 2000 survey relating to rural zoning issues. The two statements were used as the items of a Likert Scale (see section 3.2.2) and, as reported in section 3.2.2, there was no significant difference between 1991 and 2000 in the distribution of scores on the *Zoning* scale. There was, however, a significant change in the pattern of responses on one of the attitude statements comprising the scale, as shown in table 3.2.14, below.

Table 3.2.14 Response to: *Zoning rural land, so that farmers are only allowed to use it according to its capability, will be necessary to prevent land degradation in some areas of Australia.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	11.8	34.9	18.8	19.8	14.7
2000	9.0	31.8	24.1	22.5	12.5

(CHISQ = 24.39, d.f. 4, p<0.00007)

There has been a moderate decrease in the proportion of respondents agreeing with this statement, from 46.7 per cent in 1991 to 40.8 per cent in 2000. There has also

been a moderate increase in the proportion of respondents who were neutral or not sure.

Industrial and housing developments on agricultural land

Table 3.2.15 Response to: *Industrial and housing developments should not be allowed on prime agricultural land.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	52.4	28.1	9.6	7.8	2.2
2000	44.6	30.5	14.3	8.7	1.9

(CHISQ = 28.05, d.f. 4, $p < 0.00001$)

There has been a significant change in the pattern of responses between 1991 and 2000, with a moderate decrease in the proportion of respondents agreeing with the statement, from 80.5 per cent in agreement in 1991 to 75.1 per cent in agreement in 2000. There was also a slight increase in the proportion who were neutral or not sure.

Remote sensing of land degradation on individual properties

Table 3.2.16 Response to: *Satellite photography and remote sensing should be more widely used to monitor whether land degradation is occurring on individual properties.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	20.3	37.1	24.2	12.4	6.1
2000	13.7	39.3	25.7	13.7	7.7

(CHISQ = 25.28, d.f. 4, $p < 0.00004$)

There has been a significant change in the pattern of responses between 1991 and 2000, with a slight decrease in the proportion of respondents agreeing with this statement, from 57.4 per cent in 1991 to 53.0 per cent in 2000.

Encouraging wider use of property management plans

Among the attitude statements common to the 1991 and 2000 surveys were three statements relating to property management plans (the term 'whole farm plan' was used in the 1991 survey). There was no significant change in the pattern of responses

to the statement: *For the farmer who wants to farm sustainably, it is essential to have a property management plan prepared*, with the proportion in agreement remaining nearly constant around 69 per cent. There were, however, significant changes in the other two statements as shown in tables 3.2.17 and 3.2.18, below.

Table 3.2.17 Response to: *It would be a waste of effort for governments to subsidise the preparation of environmentally sound management plans for each farm.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	24.7	26.7	14.0	22.9	11.8
2000	14.7	24.7	19.3	29.1	12.2

(CHISQ = 65.62, d.f. 4, $p < 0.000005$)

Table 3.2.18 Response to: *Property management plans prepared by government agencies are an unnecessary interference with farmers' rights to use their land as they see fit.*

Survey year	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
1991	25.5	31.2	19.3	18.3	5.7
2000	22.5	31.1	24.2	18.0	4.2

(CHISQ = 15.16, d.f. 4, $p < 0.00437$)

It can be seen from table 3.2.17 that there has been a moderate increase in support for the subsidy of management plans for farms, from 34.7 per cent in 1991 to 41.3 per cent in 2000. There has also been a slight decrease in the proportion of respondents who regarded government agency involvement in the preparation of property management plans as an interference with their right to use their land as they see fit (table 3.2.18). The proportion who held this view in 2000 was 53.6 per cent.

3.3 Comparison of Situational Characteristics, 1991-2000

The 1991 and 2000 surveys gathered information on a number of aspects relating to the respondent's farm characteristics and demographics. The two questions most relevant to the subject of this study are those relating to landcare group membership and property management plans. The changes in the responses to these questions are presented in sections 3.3.1 and 3.3.2, below. For completeness, a number of other situational characteristics for which there were significant changes are then described in section 3.3.4.

3.3.1 Landcare group membership

There was a significant² change in the proportion of respondents who were members of landcare groups between 1991 and 2000. This proportion increased from 22.6 per cent in 1991 to 43.2 per cent in 2000. The percentages for each State are shown in table 3.3.1, below.

Table 3.3.1 Proportion of respondents who were landcare group members by State. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Survey year	Proportion of respondents who were landcare group members (%)						
	NSW	VIC	QLD	SA	WA	TAS	AUS
1991	12.1	21.9	28.9	17.2	48.2	15.5	22.6
2000	38.9	52.7	36.1	20.0	68.9	52.5	43.2

3.3.2 Property management plans

There was also a significant³ change in the proportion of respondents who reported that they had a property management plan, with an increase from 38.9 per cent in 1991 to 55.8 per cent in 2000. The percentages for each State are shown in table 3.3.2, below.

Table 3.3.2 Proportion of respondents who had a property management plan by State. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Survey year	Proportion of respondents who had a property management plan (%)						
	NSW	VIC	QLD	SA	WA	TAS	AUS
1991	36.7	34.5	44.7	39.3	45.7	25.6	38.9
2000	52.8	50.4	58.1	62.1	64.8	60.5	55.8

² CHISQ=154.22, d.f. 1, p<0.000005

³ CHISQ=90.05, d.f. 1, p<0.000005

3.3.3 Changes in other farm and demographic characteristics

Table 3.3.3 Sex of respondent

Survey year	Proportion of respondents (%)	
	Female	Male
1991	7.2	92.8
2000	14.8	85.2

(CHISQ=49.40, d.f. 1, $p < 0.000005$)

Table 3.3.4 Age of respondent

Survey year	Proportion of respondents (%)			
	less than 40 yrs	40-49 yrs	50-59 yrs	60 yrs or more
1991	22.5	29.1	24.3	24.1
2000	16.6	24.6	28.4	30.4

(CHISQ=36.20, d.f. 3, $p < 0.000005$)

Table 3.3.5 Highest level of formal education

Survey year	Proportion of respondents (%)						
	Primary	Part of secondary	All of secondary	Trade or certificate course	Diploma or associate diploma	Part of a degree course	All of a degree course or postgrad. course
1991	11.4	38.7	21.9	13.4	5.6	3.5	5.6
2000	5.2	27.1	21.6	21.4	8.0	3.5	13.1

(CHISQ=155.50, d.f. 6, $p < 0.000005$)

Table 3.3.6 Previous ownership of property

Survey year	Proportion of respondents (%)	
	Owned by parent(s) or parent(s)-in-law	Other
1991	61.2	38.8
2000	57.0	43.0

(CHISQ=5.53, d.f. 1, $p < 0.05$)

Table 3.3.7 Amount of off-farm employment

Survey year	Proportion of respondents (%)		
	Regular	Occasional	None
1991	14.0	15.0	70.9
2000	16.0	12.4	71.6

(CHISQ=6.07, d.f. 2, $p < 0.05$)

Table 3.3.8 Proportion of total net income derived from agricultural production

Survey year	Proportion of respondents (%)		
	More than 85%	50-85%	Less than 50%
1991	75.8	12.1	12.1
2000	72.3	11.9	15.8

(CHISQ=8.92, d.f. 2, $p < 0.05$)

Table 3.3.9 Level of equity

Survey year	Proportion of respondents (%)			
	90% or more	70-89%	50-69%	Less than 50%
1991	51.3	30.2	12.0	6.6
2000	44.8	35.4	14.5	5.3

(CHISQ=19.20, d.f. 3, $p < 0.0005$)

3.3.4 Concluding comments — comparison of situational characteristics

The preceding tables show that, over the period 1991 to 2000, there has been a substantial increase in landcare group membership and in the proportion of respondents who had a property management plan. The greatest changes in other situational characteristics are in the age and sex of respondents and in their level of education. The proportion of female respondents doubled, the age of respondents shifted significantly toward older age groups, and there was a marked increase in the level of formal education, with a more than doubling of the proportion of respondents with a university degree or postgraduate qualification. The changes in the remaining situational characteristics were less marked, with a slight increase in the proportion of respondents with regular off-farm work, a slight decrease in the proportion of respondents deriving most of their income from agriculture, a slight fall in the proportion of respondents with a high level of equity, and a slight decrease in the proportion of respondents whose property was previously owned by one or more of

their parents and parents-in-law. There was no significant change in the distribution of Responses across the various forms of farm business structure, such as sole operator, family partnership, other partnerships, or public company.

3.4 New Attitude Statements and Scales in 2000

3.4.1 Weighting Considerations

As described in sections 2.2 to 2.4, the 2000 survey included a number of attitude statements and scales that had not been used in the 1991 survey. In addition, the 2000 survey was based on two samples of landholders: one drawn from farmer organisations membership lists and Yellow Pages[®] listings, and one drawn from Commonwealth electoral rolls. As the goal of the previous sections (sections 3.2 and 3.3) was to provide a best estimate of how attitudinal and situational characteristics had changed between 1991 and 2000, the findings presented in these sections were based on the farmer organisation and Yellow Pages[®] sample, with weighting procedures designed to maximise the comparability between the 1991 and 2000 samples.

However, the goal of this section, and the following one (section 3.5), is to present a best estimate of attitudinal and situational characteristics for the year 2000, without regard to obtaining comparability with 1991. Accordingly, the findings presented in these sections are based on the electoral roll sample with weighting to correct for the stratified sampling described in section 2.4.2 and to minimise the non-response bias described in section 3.1.1.

3.4.2 Selection of a Sub-Sample from the Electoral Roll Sample

An important issue in providing a best estimate of attitudinal and situational characteristics in 2000 is the question of whether all from the electoral roll sample who responded to the survey should be included in the data set for analysis. As described in section 2.4.2, the sample was drawn from the electoral roll in a way that aimed to avoid urban addresses. However, a proportion of rural addresses on the electoral rolls are the addresses of hobby farms and rural retreats, and the question arises as to whether respondents from such addresses should be included in the analysis. Two questions in the survey offer the possibility of excluding hobby farms and rural retreats from the analysis if this is required — the question on property size and the question on proportion of income from farming (see appendix 8).

The property size distribution for rural Australia is highly skewed, *i.e.* there is a large number of small rural properties and a relatively small number of large properties. This means that the management responsibility for the bulk of the rural land area in private ownership or leasehold lies with relatively few landowners. For example, using data weighted as described above in section 3.4.1, it appears that properties smaller than 100ha comprise just 0.43 per cent of the rural land area covered by the electoral rolls, whereas the owners of properties smaller than 100ha comprise 72.8 per cent of all rural landowners. In other words, the management of 99.57 per cent of

rural land in private ownership or leasehold rests with 27.2 per cent of rural landowners.

The distribution of property size between those who do, and those who do not, derive income from agriculture is similarly skewed. Of the rural land area covered by the electoral rolls, 1.2 per cent has owners who derive no income from agricultural production. However, these landowners comprise 46.4 per cent of all rural landowners.

It is apparent from these figures that using a property size threshold in selecting a sub-sample for analysis has the potential to severely reduce the size of this sub-sample. For the example above, a 100ha threshold would reduce the sub-sample to one quarter of the full sample, a reduction that would severely limit options for analysis. Using income from agriculture as the criterion for choice of a sub-sample for analysis results in a reduction in size of the sample of nearly one half.

For this reason, the following criterion was adopted in selecting the sub-sample for analysis: that the property size be greater than 50ha for any respondents who derived no income from agriculture. This meant that the sub-sample, the analysis of which is presented in the sections below, was comprised of respondents who derived income from agriculture with any property size greater than a suburban block, together with respondents who did not derive income from agriculture, but had properties 50ha or more in size. In other words, respondents who derived no income from agriculture and had property sizes smaller than 50ha were excluded from the analysis. The sub-sample chosen according to this criterion comprised just under 60 per cent of respondents to the electoral roll survey. These respondents owned and/or managed 99.9 per cent of the rural land area covered by the electoral rolls.

3.4.3 Responses to Attitude Statements

A full listing of the proportions of respondents indicating each of the five categories in the 74 attitude statements in the 2000 electoral roll survey is provided in appendix 11. The figures are based on data weighted in the way described in section 3.4.1. As this weighting procedure is different from that used in section 3.2, no comparisons should be made between the figures in appendix 11 and those in appendix 10 and section 3.2. The following sections present the findings for some of the attitude statements in appendix 11, viz. those used in the construction of Likert Scales (section 3.4.4) and those resulting to policy issues (section 3.4.6).

3.4.4 Attitudinal Scales

As explained in section 3.2.2, attitudinal scales are comprised of approximately equal numbers of attitude statements favourable and unfavourable to the particular idea, issue or object encapsulated by the scale. Responses from 'Strongly agree' to 'Strongly disagree' on the favourable statements were coded from five to one, respectively, while responses were coded in the opposite direction on the unfavourable statements. Scales with approximately equal numbers of favourable and

unfavourable statements provide a more valid measure of attitudes. The numbers of favourable and unfavourable statements in each scale are shown in table 3.4.1, below. Cronbach's alpha is the average of the pair-wise correlations between the attitude statements comprising a scale. A high value (usually accepted as between 0.5 and 1.0, depending on the number of statements in the scale) indicates a satisfactory scale as respondents are tending to answer the attitude statements in a consistent fashion. Cronbach's alpha was calculated from unweighted data.

The values of Cronbach's alpha in the table above would suggest that all the attitudinal scales, with the exception of *Spray drift and right to farm*, performed satisfactorily. The low correlation between the two statements in the latter scale (see tables A11.13 and A11.14), is due to there being two conflicting dimensions in the statement:

If people build houses close to where farmers are growing crops that need spraying, the newcomers have no right to complain about spray drift.

viz. the question of spillover effects between agriculture and residential areas, and the question of whether prior landuse over-rides the responsibility to minimise such spillover effects.

Table 3.4.1 Comparison of Cronbach's alpha for the Likert scales used in the 2000 survey. The number of statements in each scale is shown in brackets, with the number of unfavourable statements followed by the letter 'R' (for 'R'eversal of coding).

Likert scale	Cronbach's alpha
Chemical residues (4,2R)	0.72
Agricultural chemicals (8,3R)	0.85
Spray drift and right to farm (2,1R)	0.36
Conservation orientation (8,4R)	0.78
External influence on decision-making (8,4R)	0.75
Zoning of rural land (2,0R)	0.65
Seriousness of land degradation (4,2R)	0.55
Compensation for taking of property rights (6,3R)	0.68
Retaining traditional agricultural industries (4,2R)	0.63
Landcare orientation (4,2R)	0.59

It is worth noting that the values of Cronbach's alpha in table 3.4.1, above, are markedly higher in most cases than those in table 3.2.2. The former are based on the electoral roll sample, with the restriction on size of property and income from agriculture described in section 3.4.2. The latter are based on the farmer organisation and the Yellow Pages® sample, as described in section 3.1.2.

The pattern of responses across the attitude statements comprising each of the scales is shown in the tables below. The figures shown in these tables are based on data weighted as described in section 3.4.1, above with the restriction on size of property and income from agriculture described in section 3.4.2.

Table 3.4.2 Responses to attitude statements in the *Chemical residues* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
Many of the fears expressed by consumers about chemical residues in food are quite unreasonable.	6.6	26.0	20.8	27.8	18.8
The dangers of chemical residues in agricultural produce have been greatly exaggerated.	5.0	29.5	22.0	25.0	18.5
There are not enough penalties against those farmers whose produce contains chemical residues at levels known to be harmful (R).	27.8	33.6	25.4	11.1	2.1
There needs to be more testing of all agricultural produce for harmful chemical residues (R).	22.5	40.1	22.9	12.4	2.2

Table 3.4.3 Responses to attitude statements in the *Agricultural chemicals* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
If you follow the manufacturer's directions, the agricultural chemicals now available will not harm your health.	7.9	31.3	21.7	20.4	18.7
There is too much talk about the harmful environmental effects of pesticides and not enough about their benefits.	12.1	34.6	22.1	19.5	11.8
The pollution effects of fertilisers are quite unimportant compared to their benefits in increasing production.	6.5	18.2	26.2	27.8	21.3
Sustainable agriculture in my industry will probably always require extensive use of agricultural chemicals.	5.7	29.3	20.5	29.6	14.9
The dangers of environmental pollution from agricultural chemicals have been greatly exaggerated (R).	4.8	25.7	25.5	25.1	18.7
Agricultural chemicals create far more problems than they solve (R).	10.8	18.3	27.2	30.7	13.0
Agriculture today is too dependent on the use of agricultural chemicals (R).	28.8	31.8	15.4	20.6	3.4
Agricultural pesticides are a serious threat to public health (R).	21.2	20.1	23.6	27.3	7.8

Table 3.4.4 Responses to attitude statements in the *Seriousness of land degradation* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
Most rural properties have some sort of land degradation, whether it be soil erosion, damage to soil structure, die-back, weed infestation, pollution of soils or streams, or salinity.	41.8	45.4	5.2	5.6	1.9
Some marginal types of country being used for agriculture in Australia will never be able to be farmed or grazed without badly damaging the land.	19.7	34.7	27.4	15.2	3.0
Compared to what happened in the past, the amount of land degradation occurring in Australia now is relatively minor (R).	6.3	25.1	29.3	22.1	17.2
The land used for agriculture in Australia is in better condition than it has ever been (R).	4.1	15.0	33.2	28.2	19.5

Table 3.4.5 Responses to attitude statements in the *Conservation orientation* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
On the whole, I approve of the policies of environmental organisations such as the Australian Conservation Foundation (ACF) or the Wilderness Society.	12.3	27.5	37.2	15.4	7.7
People who knowingly pollute the countryside are just as criminal as people who steal.	45.5	40.0	8.7	4.2	1.6
All necessary soil conservation methods should be used, whatever the costs.	13.6	34.4	26.9	20.1	5.1
It is worth putting up with a small decrease in farm profits to protect the environment.	25.8	51.7	12.1	7.1	3.3
Farmers have a greater responsibility to produce food and fibre than they have to preserve the rural environment (R).	4.4	13.4	15.5	38.3	28.4
Some of the things conservationists are trying to protect are not worth worrying about (R).	17.6	24.5	21.9	20.7	15.3
Environmental organisations, like the Australian Conservation Foundation (ACF) or the Wilderness Society, should confine their activities to the cities and national parks and not be concerned with rural and farming issues (R).	11.4	19.1	20.2	31.3	18.0
Governments these days pay too much attention to the 'green movement' (R).	33.2	21.1	14.4	17.9	13.4

Table 3.4.6 Responses to attitude statements in the *External influence on decision-making* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
Farming recommendations from government departments are generally worth following.	2.2	37.2	37.2	17.0	6.5
For the farmer who wants to farm sustainably, it is essential to have a property management plan prepared.	33.3	42.6	13.1	8.1	2.8
It is well worth seeking outside advice to help you decide how best to use your land.	24.0	47.5	13.4	10.4	4.7
Farmers should have to provide Environmental Impact Statements before undertaking large developments like feedlots or major land clearing on their properties.	27.5	37.0	11.6	15.3	8.7
Property management plans prepared by government agencies are an unnecessary interference with farmers' rights to use their land as they see fit (R).	19.0	28.8	26.7	20.6	4.9
The farmer is the best person to decide how land degradation problems on his/her farm should be tackled (R).	14.8	35.5	20.2	25.3	4.2
It would be a waste of effort for governments to subsidise the preparation of environmentally sound management plans for each farm (R).	11.5	17.1	21.9	30.2	19.3
Farmers are the best persons to decide how much of their land should be cleared (R).	16.1	31.8	18.2	23.9	10.0

Table 3.4.7 Responses to attitude statements in the *Zoning rural land* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
Zoning rural land, so that farmers are only allowed to use it according to its capability, will be necessary to prevent land degradation in some areas of Australia.	12.5	37.7	24.0	14.5	11.3
Poor or marginal country should be officially zoned to show what types of agriculture shall be permitted.	17.1	47.5	16.9	13.7	4.7

Table 3.4.8 Responses to attitude statements in the *Compensation for taking of property rights* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
It is only fair that owners of rural land should be fully compensated for any changes they have to make to their management for environmental reasons.	35.7	34.5	14.8	13.4	1.7
If restrictions on clearing or irrigation water mean a loss of income for farmers, they have every right to be fully compensated.	34.1	33.4	16.6	13.2	2.7
If governments have decided that the rivers need more water for environmental purposes, it is unfair to expect irrigators to give up their water without being compensated for their losses.	29.3	38.3	17.8	10.7	3.9
Talk about compensation for restrictions on land and water use is a real threat to the goodwill that is needed if communities are going to work together to solve land degradation problems (R).	8.9	28.6	36.9	18.4	7.1
Environmental laws have imposed many uncompensated restrictions on businesses in the cities to improve the environmental quality for everyone, so farm businesses should not expect compensation for similar restrictions on them (R).	4.7	26.8	28.2	28.9	11.3
Farmers have gained many benefits from clearing much of their country, so they should not expect to be compensated for leaving any remaining bits of bush untouched (R).	14.9	25.4	20.5	24.9	14.3

Table 3.4.9 Responses to attitude statements in the *Retaining traditional agricultural industries* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
In salinity affected areas, it is more important to retain the traditional rural industries, such as wool and wheat, than to let farmlands be turned into blue gum, pine or other forestry plantations.	7.7	13.1	22.6	36.0	20.7
It could be the end for many rural communities if significant areas of Australia's wool and wheat growing lands are put into blue gum, pine or other farm forestry plantations.	28.4	29.8	17.7	18.6	5.6
The future of farming in Australia is with the new industries, like farm forestry plantations, olives, ostriches, bush foods etc, not the old industries like wool, wheat and beef (R).	4.1	8.7	20.3	38.3	28.7
If Australian agriculture is going to have a long term future, there will have to be a lot of cleared country put back to bush and forestry plantations (R).	15.1	31.4	17.9	26.1	9.4

Table 3.4.10 Responses to attitude statements in the *Landcare orientation* scale.

Attitude statement	Proportion of respondents (%)				
	Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
One of the good things about all the money that governments have put into landcare in the last ten years is the extra facilitators and staff that the State departments of land management and conservation have been able to employ.	7.5	17.6	30.5	25.5	18.9
Investment in landcare is important to ensure future farm profitability.	46.1	12.5	5.5	1.8	46.1
On the whole, the benefits of applying landcare practices on-farm are being greatly over-rated (R).	6.6	19.0	17.6	36.1	20.7
With the amount of paperwork it takes to get government grants these days, it is hardly worth farmers' time to get involved in landcare projects (R).	28.0	31.7	16.5	16.8	6.9

3.4.5 Correlations between Attitude Scales

As shown in table 3.4.11, the strongest correlation between attitudinal scales is, as might be expected, between the *Chemical residues* scale and the *Agricultural chemicals* scale. However, there is also a strong correlation between the *Conservation orientation* scale and the *External influence on decision-making* scale — two scales that deal with somewhat dissimilar issues. Overall, the pattern of correlations is similar to that in table 3.2.3, *i.e.* similar to the pattern in 1991, but with individual correlations generally slightly higher.

Four new attitudinal scales were introduced in the 2000 survey. One of these, *Spraydrift and right to farm*, performed poorly as an attitude scale, although the individual attitude statements were retained for use as single statements (see sections 2.3.2 and 3.4.3, and table 3.4.1. For this reason, the *Spraydrift and right to farm* scale is not included in table 3.4.11.

The *Landcare orientation* scale and *Retaining traditional agricultural industries* scale were both moderately correlated with the *Conservation orientation* scale ($r^2=0.57$ and -0.54 , respectively). Those with favourable attitudes toward conservation were also likely to have favourable attitudes towards landcare and towards the substitution of newer agricultural industries and forestry for the traditional industries.

The *Compensation for the taking of property rights* scale was only weakly correlated with the other attitudinal scales, the highest correlation being an r^2 of -0.38 with the *Conservation orientation* scale. This suggests that those with a favourable attitude towards conservation are less concerned about receiving compensation where property rights have been curtailed in the public interest.

Retaining traditional agricultural industries	Compensation for taking of property rights	Seriousness of land degradation	Zoning of rural land	External influence on decision-making	Conservation orientation	Agricultural chemicals	Chemical residues	
							0.76	Agricultural chemicals
						-0.56	-0.56	Conservation orientation
					0.70	-0.38	-0.42	External influence in decision-making
				0.55	0.52	-0.38	-0.41	Zoning of rural land
			0.50	0.52	0.57	-0.50	-0.45	Seriousness of land degradation
		-0.32	-0.35	-0.31	-0.38	0.30	0.29	Compensation for taking of property rights
	0.26	-0.48	-0.32	-0.48	-0.54	0.39	0.37	Retaining traditional agricultural industries
-0.38	-0.22	0.37	-0.35	-0.58	0.57	-0.33	-0.38	Landcare orientation

Table 3.4.11 Correlations between attitudinal scales for the 2000 survey. The correlations are based on data from the electoral roll sample, with the restriction on property size and income from agriculture described in section 3.4.2. All correlations are significantly different from 0 (2-tailed test, $p < 0.01$).

3.4.6 Attitudes toward Policy Issues

A number of the attitude statements that were used in both 1991 and 2000 related to various rural environmental policy issues. The responses to these statements in the 2000 survey are presented in the following tables, grouped according to policy issue. The tables are based on data weighted as described in section 3.4.1, above with the restriction on size of property and income from agriculture described in section 3.4.2.

Financial assistance to reduce land degradation

Table 3.4.12 Response to: *It is unfair to expect farmers to bear the cost of repairing land degradation on their properties.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
14.4	37.5	17.7	26.9	3.4

Table 3.4.13 Response to: *Without financial assistance, there is little farmers can do to prevent land degradation occurring on their properties.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
14.6	30.8	11.0	33.7	9.8

Table 3.4.14 Response to: *It is unfair to expect people in towns and cities to contribute to the cost of preventing land degradation on rural lands.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
5.7	12.5	13.7	35.4	32.7

Overall, the tables above suggest there is majority or near majority support in favour of public subsidy for both remedial and preventative measures against land degradation on rural lands

Financial incentives to encourage use of soil improving practices

Table 3.4.15 Response to: *Financial incentives should be made available to encourage farmers to use soil improving practices, e.g. rotation, stubble retention or deep ripping.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
46.3	33.3	11.3	7.1	2.1

Cross-compliance — primary producer status and sustainable practices

Table 3.4.16 Response to: *Farmers should not receive the financial benefits of primary producer status (e.g. income averaging, diesel fuel rebate) unless they are following recommended sustainable agricultural practices.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
12.8	30.5	12.8	20.9	23.0

Levy to pay for environmental research and monitoring

Table 3.4.17 Response to: *Farmers should be levied to pay for environmental research and monitoring in their industry.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
2.6	15.1	21.5	35.3	25.5

Tax on agricultural chemicals to finance research on alternatives

Table 3.4.18 Response to: *There is no need for a tax on agricultural chemicals to finance research on safer alternatives.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
13.5	20.4	21.0	27.1	18.0

Penalties for chemical residues in foods

Table 3.4.19 Response to: *There are not enough penalties against those farmers whose produce contains chemical residues at levels known to be harmful.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
27.8	33.6	25.4	11.1	2.1

Testing for chemical residues

Table 3.4.20 Response to: *There needs to be more testing of all agricultural produce for harmful chemical residues.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
22.5	40.1	22.9	12.4	2.2

Options for spray drift problems

Table 3.4.21 Response to: *If people build houses close to where farmers are growing crops that need spraying, the newcomers have no right to complain about spray drift.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
29.9	30.4	11.2	16.6	11.9

Table 3.4.22 Response to: *There need to be tougher penalties against farmers who allow spray drift to blow over adjacent grazing properties or residential areas.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
29.4	39.9	20.8	8.5	1.4

Table 3.4.23 Response to: *Buffer zones around towns where there is a lot of crop spraying are essential to protect the health of townspeople.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
26.9	38.8	21.6	10.7	2.0

The pattern of responses to the three tables, above, suggests that the majority of respondents were in favour of increasing penalties and setting up buffer zones as a means of reducing spray drift problems, although the majority also believed that prior land uses should have precedence.

Compulsory courses on agricultural chemical safety

Table 3.4.24 Response to: *The best way to reduce the mis-use of agricultural chemicals is for there to be courses on safety that are compulsory before you can use a chemical.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
29.8	43.4	13.5	9.3	3.9

Environmental education for farmers

Table 3.4.25 Response to: *Too little is being done to educate farmers about damage done to the environment by some agricultural practices.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
19.4	39.6	18.5	19.0	3.5

Environmental impact statements

Table 3.4.26 Response to: *Farmers should have to provide Environmental Impact Statements before undertaking large developments like feedlots or major land clearing on their properties.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
27.5	37.0	11.6	15.3	8.7

Zoning of rural land

Table 3.4.27 Response to: *Zoning rural land, so that farmers are only allowed to use it according to its capability, will be necessary to prevent land degradation in some areas of Australia.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
12.5	37.7	24.0	14.5	11.3

Table 3.4.28 Response to: *Poor or marginal country should be officially zoned to show what types of agriculture shall be permitted.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
17.1	47.5	16.9	13.7	4.7

Table 3.4.29 Response to: *Agricultural land should not be zoned to restrict particular land uses in particular areas, as happens in towns and cities.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
14.7	29.7	21.9	23.6	10.0

Industrial and housing developments on agricultural land

Table 3.4.30 Response to: *Industrial and housing developments should not be allowed on prime agricultural land.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
44.3	32.7	14.4	6.5	2.1

Remote sensing of land degradation on individual properties

Table 3.4.31 Response to: *Satellite photography and remote sensing should be more widely used to monitor whether land degradation is occurring on individual properties.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
24.1	31.4	25.9	11.2	7.4

Encouraging wider use of property management plans

Table 3.4.32 Response to: *For the farmer who wants to farm sustainably, it is essential to have a property management plan prepared.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
33.3	42.6	13.1	8.1	2.8

Table 3.4.33 Response to: *It would be a waste of effort for governments to subsidise the preparation of environmentally sound management plans for each farm.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
11.5	17.1	21.9	30.2	19.3

Table 3.4.34 Response to: *Property management plans prepared by government agencies are an unnecessary interference with farmers' rights to use their land as they see fit.*

Proportion of respondents (%)				
Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
19.0	28.8	26.7	20.6	4.9

The pattern of responses in the three tables, above, suggest that, while there is widespread support for the idea of property management plans, there is less support for government agency involvement in the preparation of these plans.

Compensation for the taking of property rights

A number of the individual attitude statements in the *Compensation for the taking of property rights* scale relate to policy issues. The pattern of responses to these statements has already been presented in table 3.4.8 and is not repeated here. It can be seen from table 3.4.8 that there is majority support for compensation across a range of situations where public interest considerations might lead to restrictions on land or water use.

3.5 Situational Characteristics in 2000

As mentioned in section 3.3, the 2000 survey gathered information on a number of aspects relating to the respondent's farm characteristics and demographics. The two questions most relevant to the subject of this study are those relating to landcare group membership and property management plans. The results from the responses to these questions are presented in the sections 3.5.1 and 3.5.2, below. For completeness, a number of other situational characteristics for which there were significant changes are then described in section 3.5.3. The figures shown in these sections are based on data weighted as described in section 3.4.1, above with the restriction on size of property and income from agriculture described in section 3.4.2.

3.5.1 Landcare group membership

The proportion of respondents who were members of landcare groups in 2000 are shown for each State in table 3.5.1, below.

Table 3.5.1 Proportion of respondents who were landcare group members. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Proportion of respondents who were landcare group members (%)						
NSW	VIC	QLD	SA	WA	TAS	AUS
25.1	33.4	19.1	20.6	55.9	27.8	28.0

The levels of landcare membership shown in this table are considerably lower than that shown in table 3.3.1. This is a consequence of the different sources of the samples used to calculate the figures shown in the two tables, together with the different weighting procedures used, that for table 3.3.1 aiming to maximise the comparability between the 1991 and 2000 surveys, and that for table 3.5.1, above, aiming to provide the best estimate for 2000. The lower levels of membership in table 3.5.1 are a reflection of the greater number of smaller farms in the electoral roll sample.

The length of membership and level of involvement in landcare among those who were landcare group members are shown in tables 3.5.2 and 3.5.3, below.

Table 3.5.2 Length of membership in landcare. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Length of membership	Proportion of respondents (%)						
	NSW	VIC	QLD	SA	WA	TAS	AUS
More than 10 years	8.9	15.1	32.6	20.9	25.5	26.6	18.3
10-5 years	37.4	29.1	13.7	21.3	39.0	31.6	30.9
Less than 5 years	53.6	55.8	53.7	57.8	35.5	41.8	50.7

Table 3.5.3 Level of involvement in landcare. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Level of involvement	Proportion of respondents (%)						
	NSW	VIC	QLD	SA	WA	TAS	AUS
Actively involved	29.3	34.2	4.3	19.9	39.7	54.4	29.4
Some involvement	26.8	19.3	35.0	24.2	26.9	31.6	25.8
Occasional involvement	44.0	46.5	60.7	55.9	33.4	33.4	44.8

There is a significant relationship between length of membership in landcare and level of involvement (unweighted data — $\text{chisq}=11.93$, d.f. 4, $p<0.05$), in which there is a greater proportion of actively involved members among those who have been members for more than five years. About 50 per cent of members who joined prior to 1995 indicated they were actively involved, whereas just over 29 per cent of members who have joined since 1995 indicated they were actively involved. Correspondingly, about 25 per cent of members joining prior to 1995 gave their level of involvement as ‘occasional’, while nearly 47 per cent of those who had joined since 1995 gave their level of involvement as ‘occasional’.

3.5.2 Property management plans

Table 3.5.4 Proportion of respondents who had a property management plan by State. The figures for Australia include the Northern Territory, which is not shown separately due to the small number of respondents.

Proportion of respondents who had a property management plan (%)						
NSW	VIC	QLD	SA	WA	TAS	AUS
40.8	42.7	42.2	43.7	57.3	37.1	42.9

3.5.3 Other farm and demographic characteristics

Table 3.5.5 Sex of respondent.

Proportion of respondents (%)	
Female	Male
39.5	60.5

Table 3.5.6 Age of respondent.

Proportion of respondents (%)			
less than 40 yrs	40-49 yrs	50-59 yrs	60 yrs or more
23.2	26.2	25.5	25.2

Table 3.5.7 Highest level of formal education.

Proportion of respondents (%)						
Primary	Part of secondary	All of secondary	Trade or certificate course	Diploma or associate diploma	Part of a degree course	All of a degree course or postgrad. course
7.8	23.9	20.3	19.0	8.9	6.5	13.6

Table 3.5.8 Previous ownership of property.

Proportion of respondents (%)	
Owned by parent(s) or parent(s)-in-law	Other
60.9	39.1

Table 3.5.9 Response to the question: *Do you expect your present farm will be run by close relative in the future? (for example, children, or brothers or sisters).*

Proportion of respondents (%)		
Yes	No	Not sure
29.1	37.1	33.8

Table 3.5.10 Amount of off-farm employment

	Proportion of respondents (%)		
	Regular	Occasional	None
Respondent	32.9	8.3	58.8
Others in respondent's household	34.0	11.3	54.7

Table 3.5.11 Proportion of total net income derived from agricultural production

Proportion of respondents (%)				
More than 85%	50-85%	15-50%	1-15%	No income from farming
35.8	6.4	18.9	31.4	7.5

Table 3.5.12 Situation of those whose main income was not from agriculture

Proportion of respondents (%)					
Retired from farming	Retired, other	Student	Employed or self-employed	Unemployed and looking for work	Home duties
7.9	12.6	0.7	64.3	4.2	8.3

Table 3.5.13 Level of equity

Proportion of respondents (%)			
90% or more	70-89%	50-69%	Less than 50%
48.4	26.4	13.7	11.6

Table 3.5.14 Business structure

Proportion of respondents (%)			
Sole operator	Family partnership	Other partnership	Private or family company
17.8	64.3	3.9	14.0

3.6 Relationships between Attitudinal and Situational Variables

The primary aim of this study was to provide an assessment of the changes in attitudes that have occurred between 1991 and 2000, and to provide baseline information on new rural environmental issues that have emerged since 1991,. These has been presented in sections 3.2 and 3.4, respectively. The surveys also gathered information on a range of situational variables, such as basic demographics of the respondent, and information about the respondent’s property. The changes between 1991 and 2000 in the proportions of respondents with various situational characteristics are described in section 3.3. Situational profiles for 2000 were described in section 3.5.

It is also possible to make some assessment of causal factors that might lie behind the changes that have occurred, and that might influence attitudes on particular issues. It is these explanatory aspects that are the subject of the following sections.

3.6.1 Contributions to Attitudinal Change

A question that follows where significant attitudinal changes have occurred between 1991 and 2000 is whether or not this change is more or less the same across all sub-groups among rural land owners, or whether change is confined to particular sub-groups. For example, was the decrease in the average score on the *Seriousness of land degradation* scale (figure 3.2.20) mainly among those who were not landcare group members, while the average score for landcare group members remained constant? In other words, was change in the score on the *Seriousness of land degradation* scale related to landcare group membership? The statistical technique used to answer this question is two way analysis of variance. With this technique, a relationship between the change from 1991 to 2000 in the score on the *Seriousness of land degradation* scale and landcare group membership is known as ‘interaction’

between survey year (*i.e.* 1991 or 2000) and landcare group membership. Because the 1991 and 2000 surveys involved random selections of rural landowners (from sampling frames such as farmer organisation membership lists and electoral rolls), rather than being surveys of the same set of people in 1991 and 2000, the appropriate form of two way analysis of variance to use is that known as a ‘between subjects factorial design’.

The task of the statistical procedure is to determine firstly whether or not there is a significant interaction between the two variables of interest with respect to a third variable. To return to the previous example, is there a significant interaction between survey year and landcare group membership with respect to the score on the *Seriousness of land degradation* scale? If there is no significant interaction, it is then possible to determine whether there were significant ‘main effects’. Firstly, was the average score across 1991 and 2000 significantly higher among landcare group members compared to the average score across 1991 and 2000 for those who were not members of a landcare group, *i.e.* was there a significant main effect for landcare group membership? Secondly, was the average score across both members and non-members of landcare groups significantly higher or lower in 2000 compared to 1991, *i.e.* was there a significant main effect for year of survey?⁴

The results for two way analysis of variance with attitudinal scale scores, year of survey and a range of situational variables are shown in tables A12.1 to A12.100 in appendix 12. As these analyses involve a greater number of categories (for example, five property size categories and two year of survey categories), the number of cases for each combination of categories (for example, respondents to the 1991 survey with properties smaller than 100 ha) is smaller. Consequently, the potential for weighting procedures to invalidate the tests of significance in the two way analysis of variance is greater. For this reason, the figures presented in tables A12.1 to A12.100 are for unweighted data, although the analysis is based on a subsample from the 2000 survey as described in section 3.1.2. In addition, as the validity of the analysis can be compromised by extremely unequal cell sizes (for example, a few tens of respondents who were goat fibre producers compared to over a thousand respondents who were not), situational variables with extremely unequal cell sizes were omitted from the analysis.

Chemical residues

There were two significant interactions between year of survey and situational variables. Table 12.17 shows that the overall decrease in the average score on the *Chemical residues* scale (indicating increasing concern about chemical residues in agricultural products — see figure 3.2.16) was due more to those respondents who were not cereal producers. The decrease in the average score on the *Chemical residues* scale was much smaller for those who were cereal producers.

The interaction between year of survey and whether or not the respondent produced fodder crops was even greater (table A12.20). This shows that the average score on

⁴ This latter question has, in fact, already been answered in figure 3.2.19 using one way analysis of variance.

the *Chemical residues* scale increased between 1991 and 2000 (indicating a decrease in concern) for those respondents who produced fodder crops, compared to a decrease in the average score for respondents who did not produce fodder crops.

For the analyses of variance where there was not a significant interaction (tables A12.1-16 and A12.18-19), it can be inferred that, irrespective of year of survey, those who are more concerned about chemical residues in agricultural products are more likely to:

- be female,
- have fewer years involvement as an adult in farming,
- own relatively small (less than 100ha) or relatively large (more than 25 000ha) properties,
- have a lesser proportion of total net income derived from agriculture,
- have regular off-farm employment,
- not own a property inherited from a parent or parent-in-law,
- have more grazing enterprises than cropping enterprises,
- have a property management plan,
- have dairy cattle,
- not produce sheep meat,
- not produce grain legumes, and
- not produce oil seeds.

Agricultural chemicals

There were three significant interactions between year of survey and situational variables. Table A12.23 shows that the overall decrease in the average score on the *Agricultural chemicals* scale (indicating increasing concern about agricultural chemicals generally — see figure 3.2.17) occurred in all States, except Tasmania, where was an increase in the average score on the *Agricultural chemicals* scale.

Table A12.36 shows that the decline in the average score on the *Agricultural chemicals* scale was much less for respondents who were sheep meat producers than for respondents who were not, *i.e.* the increase in concern about agricultural chemicals generally was less among sheep meat producers than others.

There was a similar significant interaction between year of survey and whether or not respondents grew fodder crops. Those who grew fodder crops showed a much

smaller increase in concern about agricultural chemicals generally than those who did not (table A12.40).

For the analyses of variance where there was not a significant interaction (tables A12.21-22, A12.24-35 and A12.36-39), it can be inferred that, irrespective of year of survey, those who are more concerned about agricultural chemicals generally are more likely to:

- be female,
- be younger,
- have fewer years involvement as an adult in farming,
- have higher levels of formal education,
- own relatively small (less than 100ha) or relatively large (more than 25 000ha) properties,
- have a lesser proportion of total net income derived from agriculture,
- have regular off-farm employment,
- not own a property inherited from a parent or parent-in-law,
- have more grazing enterprises than cropping enterprises,
- have a property management plan,
- be a beef producer,
- not produce sheep meat,
- not produce cereals,
- not produce grain legumes, and
- not produce oil seeds.

Conservation orientation

There were three significant interactions between year of survey and situational variables. Table A12.43 shows that the overall increase in the average score on the *Conservation orientation* scale (indicating an increasingly favourable view towards rural conservation and conservationists — see figure 3.2.18) occurred in all States, except Tasmania, where was a decrease in the average score on the *Conservation orientation* scale.

Table A12.54 shows that the increase in the average score on the *Conservation orientation* scale was much less for respondents who were beef producers than for respondents who were not beef producers.

There was a similar significant interaction between year of survey and whether or not respondents grew fodder crops. Those who grew fodder crops showed a much smaller increase in the average score on the *Conservation orientation* scale than those who did not (table A12.60).

For the analyses of variance where there was not a significant interaction (tables A12.41-42, A12.44-53 and A12.55-59), it can be inferred that, irrespective of year of survey, those who have more favourable views on rural conservation and conservationists are more likely to:

- be female,
- be younger,
- have fewer years involvement as an adult in farming,
- have higher levels of formal education,
- among 1991 respondents, own a relatively small (less than 100ha) property, and among 2000 respondents, own a relatively small or a relatively large (more than 25 000ha) property,
- have a lesser proportion of total net income derived from agriculture,
- have regular off-farm employment,
- not own a property inherited from a parent or parent-in-law,
- be a member of a landcare group,
- have a property management plan,
- not be a beef producer, and
- not produce cereals.

External influence on decision-making

There were two significant interactions between year of survey and situational variables. Table A12.63 shows that the overall increase in the average score on the *External influence on decision-making* scale (indicating an increasingly favourable view towards influences on farmers' autonomy in decision-making, such as extension recommendations and regulatory constraints — see figure 3.2.19) occurred in all States, except Queensland, where was an decrease in the average score on the *External influence on decision-making* scale.

Table A12.74 shows that the increase in the average score on the *External influence on decision-making* scale was much less for respondents who were beef producers than for respondents who were not. beef producers.

For the analyses of variance where there was not a significant interaction (tables A12.61-62, A12.64-73 and A12.75-80), it can be inferred that, irrespective of year of survey, those who have more favourable views on external influence on their decision-making are more likely to:

- be younger,
- have fewer years involvement as an adult in farming,
- have higher levels of formal education,
- own a relatively small (less than 100ha) property,
- have a lesser proportion of total net income derived from agriculture,
- have regular off-farm employment,
- be a member of a landcare group,
- have a property management plan,
- not be a beef producer,
- be a grain legume producer, and
- be an oil seed producer.

Seriousness of land degradation

There were three significant interactions between year of survey and situational variables. Table A12.83 shows that the overall decrease nationally in the average score on the *Seriousness of land degradation* scale (indicating a decreasing concern about land degradation — see figure 3.2.20) was made up of decreases in New South Wales, Queensland and Tasmania that were not offset by the increases in the average score on the *Seriousness of land degradation* scale in Victoria, South Australia and Western Australia.

Table A12.94 shows that the average score on the *Seriousness of land degradation* scale decreased for respondents who were beef producers, but increased among respondents who were not. beef producers.

There was a similar significant interaction between year of survey and whether or not respondents produced sheep meat. Those who produced sheep meat showed an

increase in concern about land degradation between 1991 and 2000, while those who did not produce sheep meat showed a decrease in concern (table A12.96).

For the analyses of variance where there was not a significant interaction (tables A12.81-82, A12.84-93, A12.95 and A12.97-100), it can be inferred that, irrespective of year of survey, those who are more concerned about land degradation are more likely to:

- be younger,
- have fewer years involvement as an adult in farming,
- have higher levels of formal education,
- own a relatively small (less than 100ha) property,
- have a lesser proportion of total net income derived from agriculture,
- have regular off-farm employment,
- have higher levels of equity,
- be a member of a landcare group,
- have a property management plan,
- engage in mixed farming, with more cropping enterprises than grazing enterprises,
- be an oil seed producer.

Concluding comments on contributions to attitudinal change

In interpreting the relationships between average scores on attitudinal scales and situational variables as outlined in the preceding sections, it is important to be aware that the situational variables can be strongly related among themselves. Consequently, a relationship between the average score on an attitudinal scale and a particular situational variable may be the result of further relationship between that situational variables and another situational variable, rather than indicating a causal relationship between the average score on the attitudinal scale and the first situational variable. This is well illustrated for the *Seriousness of land degradation* scale, above. The fact that beef producers have become less concerned about land degradation, while other producers have become more concerned, does not necessarily mean that attitudes to land degradation are influenced by beef production *per se*. Rather, it is a reflection of increasing concern about land degradation in Victoria, South Australia and Western Australia, where salinity problems have received the most attention in the last decade, and where there are less beef producers than in Queensland.

3.6.2 Scales Introduced in the 2000 Survey

As described in section 2.3, a number of new attitudinal scales were introduced in the 2000 survey. Table 3.4.1 shows that three of these scales, the *Compensation for the taking of property rights* scale, the *Retaining traditional agricultural industries* scale and the *Landcare orientation* scale had acceptable values of Cronbach's alpha. Significant relationships between the scores on these scales and situational variables were identified using one-way analysis of variance and are tabulated in appendix 13. For similar reasons to those described in the previous section, unweighted data and a subsample of the 2000 survey responses were used in this analysis. The relationships identified in appendix 13 are described below.

Compensation for the taking of property rights

A high value on this scale is indicative of views in favour of farmers receiving compensation in a range of situations where government actions constrain the use of land and water resources, while a low value is indicative of views that accept that compensation may not be appropriate. The individual statements comprising the scale are listed in table 3.4.8. Those with higher scores on this scale were more likely to:

- be resident in New South Wales or Victoria,
- own medium to large properties,
- derive most or all of their income from agriculture,
- own a property inherited from a parent or parent-in-law,
- be a sheep meat producer, or
- be a cereal producer.

Retaining traditional agricultural industries

A high score on this scale is indicative of a belief in the importance of the traditional agricultural industries, such as beef, wool and wheat, to the future of rural Australia. A low score is indicative of a more favourable view of infant industries and forestry as important industries in the future. The individual statements comprising the scale are listed in table 3.4.9. Those with higher scores on this scale were more likely to:

- be resident in Victoria,
- have a greater number of years of involvement as an adult in agriculture,
- have lower levels of formal education,
- derive most or all of their income from agriculture,

- have no off-farm employment,
- believe that their property will be run by close relatives, such as children or brothers or sisters, in the future,
- be a member of a farmer organisation,
- to have mainly grazing enterprises, or
- be a beef producer.

Landcare orientation

A high score on this scale indicates a more favourable view of landcare as practices contributing to farm profitability and as a government program worth participating in. The individual statements comprising the scale are listed in table 3.4.10. Those with higher scores on this scale were more likely to:

- have a fewer number of years of involvement as an adult in agriculture,
- have higher levels of formal education,
- own smaller properties,
- have regular off-farm employment,
- own a property that was not inherited from a parent or parent-in-law, or
- be a member of a landcare group,

3.7 Landcare Issues

Landcare programs are an important and politically visible part of Australian public policy efforts directed at the prevention and repair of land degradation on both private and public lands. As discussed in chapter 1, policy-makers, politicians and interest groups have all claimed at various times during the Decade of Landcare that landcare would bring, or has brought, about changes in the attitudes of those who participated. The 1991 survey asked respondents whether or not they were members of a landcare group, and this enabled a detailed attitudinal and situational comparison to be made between landcare group members and non-members. This comparison was published by Black and Reeve in the *Journal of Environmental Management* in 1993. A similar comparison for 2000 is to be published at a future date in that or another journal.

The 2000 survey contained two additional questions relating to landcare membership: the date when the respondent first joined a landcare or similar group, and how they ranked their level of involvement. These questions allow attitudinal comparisons to be made for various durations and levels of involvement in landcare.

3.7.1 Duration of involvement

The 1991 and 2000 survey data enables the formation of five opinion groups for the purposes of comparison:

- 1991 opinions of members who joined prior to 1991
- 1991 opinions of non-members
- 2000 opinions of members who joined prior to 1991,
- 2000 opinions of members who joined after 1991, and
- 2000 opinions of non-members.

Significant differences across these five groups and the scores on the five scales which showed significant changes between 1991 and 2000 were identified using one-way analysis of variance. The results are tabulated in appendix 14. For similar reasons to those described in the previous section, unweighted data and a subsample of the 2000 survey responses were used in this analysis. The differences identified in appendix 14 are described below.

Chemical Residues and Agricultural Chemicals

For both these scales, the differences in the average scores are greater between 1991 and 2000, than they are between landcare group members and non-members in either of the years (tables A14.1 and A14.2).

Conservation orientation

In contrast, there are differences in the average scores both between 1991 and 2000 and between landcare group members and non-members (table A14.3). Average scores are higher in 2000, compared to 1991, and average scores are higher for landcare group members than non-members in both years. The average score for a non-member in 2000 is about the same as that for a landcare member in 1991. For the scores measured in 2000, there is virtually no difference between those who joined landcare groups prior to 1991 and those who joined after that date.

External influence on decision-making

The pattern of differences in average scores on this scale across the five groups is exactly the same as that for the *Conservation orientation* scale (table A14.4).

Seriousness of land degradation

In both 1991 and 2000, landcare group members have higher average scores on this scale than do non-members (table A14.5). However, the scores of those who joined landcare prior to 1991 are lower in 2000 than they were in 1991. Also, the scores of non-members have declined between 1991 and 2000.

Landcare orientation

Some of the attitude statements comprising this scale were not asked in 1991. However, for the 2000 survey, landcare group members who joined prior to 1991 and those who joined after that date have a higher average score than those who were not members of a landcare group (table A14.6). There is virtually no difference in the average scores of those who joined a group before 1991 and those who joined after that date.

Among the attitude statements comprising the *Landcare orientation* scale were two statements introduced in the 2000 survey that provide some insights into the current opinions about landcare. For the statement: *One of the good things about all the money that governments have put into landcare in the last ten years is the extra facilitators and staff that the State departments of land management and conservation have been able to employ* there was no significant difference between members and non-members, or landcare members with various durations of membership or landcare members with various levels of involvement. The relatively low approval of the value of expenditure on facilitators and other support staff in State agencies (see table 3.4.10) was unaffected by experience of landcare, or the intensity and duration of landcare experience among those who were members. However, it is important to note in relation to the findings for this statement that the brevity that is a necessary feature of attitude statements may have resulted in some respondents interpreting the statement as only referring to facilitators employed by State agencies, whereas the intention of the wording of the statement was that the clause about 'State departments ...' refer only to the word 'staff', and not to the word 'facilitators'.

For the statement: *With the amount of paperwork it takes to get government grants these days, it is hardly worth farmers' time to get involved in landcare projects*, the intensity and duration of landcare experience among members also had little effect on the substantial levels of agreement with this statement (see table 3.4.10). However, there was a significant difference in the response to this statement between members of landcare groups and non-members (table 3.7.1, below).

Table 3.7.1 Comparison of responses of landcare group members and non-members to the statement: *With the amount of paperwork it takes to get government grants these days, it is hardly worth farmers' time to get involved in landcare projects.*

		Proportion of respondents (%)				
		Strongly agree	Mostly agree	Neutral or not sure	Mostly disagree	Strongly disagree
Landcare	group	23.6	31.5	9.6	30.9	4.5
Non-members		28.5	34.8	19.5	11.4	5.7

(CHISQ = 33.16, d.f. 4, p<0.000005)

It can be seen from table 3.7.1 that, while there are almost three times as many landcare group members who mostly disagree with the statement, there are still 55.1 per cent who agree, compared to 62.3 per cent of respondents who were not landcare group members. In other words, experience with landcare has made little difference to the perception that the costs of dealing with a bureaucracy outweigh the benefits of funding.

3.7.2 Level of involvement

Using just the data from the 2000 survey, it is possible to divide respondents into four groups: those who indicated they were actively involved in their landcare group, those who indicated they had some involvement, those who indicated they were occasionally involved and those who were not members of a landcare group. Significant differences in the average scores on attitudinal scales across these groups were identified using one-way analysis of variance (appendix 15).

Agricultural chemicals

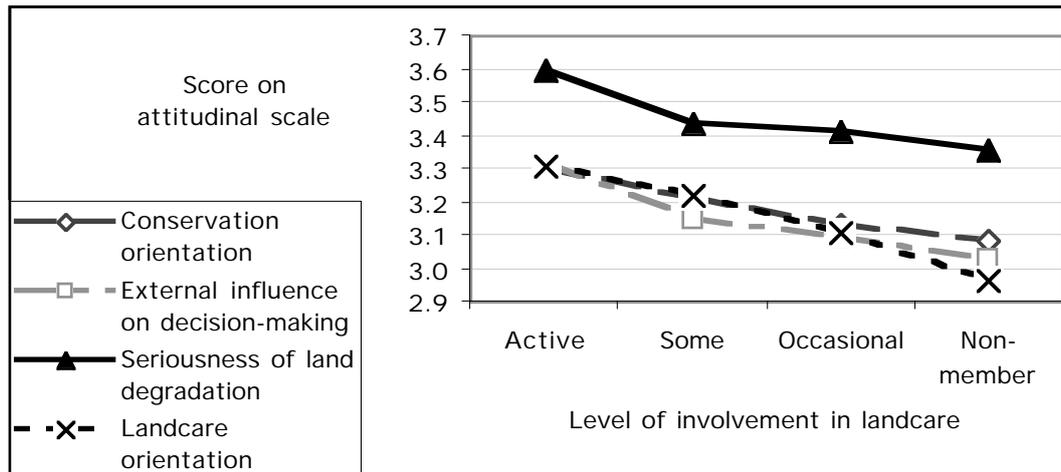
Respondents who were actively involved in a landcare group had a relatively low score on this scale compared to either landcare group members with lower levels of involvement, or non-members (table A15.1). This indicates a higher level of concern about agricultural chemicals amongst those who are actively involved in a landcare group.

Conservation orientation, External influence on decision-making, Seriousness of land degradation and Landcare orientation

For all four of these attitudinal scales, there was a consistent trend across the four respondent groups, with those who were actively involved in a landcare group having the highest average score on each of the scales, and those who were not members of a

landcare group having the lowest average score on each of the scales (tables A15.2-5). The average scores for landcare group members with some landcare group involvement and those for landcare group members with occasional involvement were of intermediate magnitude, with the scores for the former group of respondents being greater than the latter. The trends in the four attitudinal scales are shown in figure 3.7.1, below.

Figure 3.7.1 Changes in average scores on four attitudinal scales across four respondent groups according to level of involvement in landcare.



4 Discussion

4.1 Methodological Issues

4.1.1 Sampling frame

The choice of sampling frame for a survey that aims to provide findings that can be considered as nationally representative raises some important issues. The 1991 survey attempted to use membership lists from farmer organisations and encountered the problem of the New South Wales Farmers Association being unable to participate. The Yellow Pages® were used to provide a sampling frame for New South Wales. This problem was encountered again in 2000 with the South Australian Farmers' Federation and, as described in section 3.1.2, considerable care is required in minimising the impact of changes in the sampling frame on the validity of comparisons between 1991 and 2000. A further problem with the use of farmer organisation membership lists is that the nature of the membership may change over time, as occurred in Tasmania where membership changed from mandatory for anyone selling agricultural produce in 1991 to voluntary in 2000.

In all, these problems suggest that Commonwealth electoral rolls would provide a better sampling frame for future surveys. However, experience with the 2000 survey would indicate that this sampling frame is not without its own sampling issues. Firstly, the way in which urban and non-urban addresses are identified will affect the composition of the sampling frame. Provided that the selection process errs on the side of including some urban addresses, rather than excluding some non-urban addresses, this problem can be rectified by use of screening questions in the survey which identify those living at urban addresses and having no income from farming, so that they can be excluded from the analysis. Secondly, the near universality of the electoral roll as a sampling frame of adults is both an advantage and a disadvantage. The disadvantage is that the sampling frame will contain the members of ethnic minorities for whom a mail questionnaire will be culturally inappropriate or impossible to respond to if there are English literacy problems. If possible, it is preferable to exclude such minorities from the sampling frame to avoid inconveniencing those for whom a mail questionnaire would be inappropriate. The opinions and views of ethnic minorities should be the subject of separate studies, with culturally appropriate methodologies.

In the case of Aboriginal people living on outstations in the Northern Territory, it was relatively simple to identify them from their names and addresses and exclude them from the sampling frame. In addition, because of the choice of electorates to include in the sampling frame, non-English speaking background market gardeners located within capital cities were excluded from the sampling frame. Those located within towns in country areas would also have been excluded due to the way the sampling frame was constructed. Consequently, the findings reported from this study are not nationally representative in a very strict sense although, given the very small proportion of the totality of land owners that these exclusions constitute, it is unlikely

the figures presented in this study would be very different if these special groups had been included.

The near universality of the electoral roll sampling frame has also raised the issue of where the dividing line should be drawn among those who own small properties and earn only a small proportion of income from agriculture. As described in section 3.4.2, it appears from the data gathered from the electoral roll survey that, among those living in rural areas, the management of 99.57 per cent of rural land in private ownership or leasehold rests with 27.2 per cent of rural land owners. These are the land owners with properties greater than 100ha in area. This extremely skewed distribution was not taken account of in calculating the size of the electoral roll sampling frame and, consequently, a 100ha cut-off on property size would have resulted in nearly three quarters of the available data being discarded and, consequently, an inadequate sample size. A cut-off of 50ha was used, as well as including those respondents on areas smaller than 50ha if they derived income from agriculture. Given that a number of attitudinal characteristics have been shown to vary with property size, the findings of any attitudinal or opinion surveys of rural land owners are likely to be quite sensitive to the extent of inclusion of land owners of smaller properties and lower levels of income from agriculture.

The extreme skewness of the property size distribution translates into a large disparity between the rural constituency with management control of rural land, and the constituency who have an interest in its management and might give effect to their interests through the ballot box. It has been long accepted that, within Australia's population as a whole, farmers constituted a small minority. The findings above suggest that merely within the population who lives outside urban areas, farmers are also a minority.

4.1.2 Response rate

The response rate from the farmer organisation and Yellow Pages® samples declined from 57 per cent in 1991 to 51 per cent in 2000. This is consistent with the general trend towards increasing public resistance to mail surveys. This trend will mean that increasing attention will need to be directed to non-response bias issues and, ultimately, alternatives to mail surveys. One approach to raising response rates that was used with the pre-pilot survey (see section 2.3.2) was to include a \$4.50 book of postage stamps with each questionnaire as a gesture of appreciation for the time taken to fill in the questionnaire. From previous experience with surveys in the same region as the where pre-pilot survey was conducted, and given that the pre-pilot questionnaire was mailed out during the busy wheat harvest period and close to Christmas, it would appear that the book of postage stamps raised the response rate by from ten to fifteen per cent. However, a change of this magnitude from, say, 50 per cent response rate to 65 per cent response rate will make little difference to the potential for non-response bias, while adding \$18 000 to the cost of a mail out of 4 000 questionnaires. This additional cost is equivalent to at least five additional mail outs, suggesting that it would be more economical and give better control of the non-response bias problem if one or two reminders were sent after the one-page follow-up questionnaire.

The remaining strategy to improve response rates, and one that is less frequently acknowledged among researchers, is to accept that the members of the population being surveyed have every right to respond only if they believe there will be some benefit to them in doing so. Rather than increasing coercion to respond, this strategy seeks to ensure that there are benefits to the research and that these are publicised among the population being surveyed.

The use of the electoral roll sampling frame improves the potential for this approach, as the addresses surveyed are known to the researchers (in contrast to the former organisation sampling frame in which some organisations mailed out the questionnaires themselves to protect the confidentiality of their membership lists). Having access to all addresses in the sampling frame makes it more practicable to mail summaries of the research findings to all who were surveyed. This might be followed by another mailing a year or so later explaining what the research had achieved.

The objective of this approach would be to build some trust and familiarity between the research organisation and those in the sampling frame, such that in future surveys there are a greater number of people who believe that there is a benefit to be had by participating. It should also be noted, that the use of the same sampling frame in subsequent surveys changes the research design from repeated cross-sectional surveys to a longitudinal study. The latter has greater statistical power in detecting changes that have occurred in the period between two surveys.

4.2 Attitudinal Change, 1991 - 2000

There have been a number of readily identifiable changes in attitudes as measured by single attitude statements and by attitudinal scales. There have also been a number of more subtle changes that are similar across most of the attitudinal areas of interest. The following sections discuss these latter changes, before turning to attitudinal changes in specific areas.

4.2.1 Broad Attitudinal Changes

An unexpected change between 1991 and 2000 in the relationships among attitude statements within attitudinal scales was the increases in the values of Cronbach's alpha for five of the six attitudinal scales (the comparisons of Cronbach's alpha were based on similar sample sizes — see table 3.2.2 and the text immediately preceding it). In this situation, the only reason that Cronbach's alpha has increased is that the correlation between individual attitude statements has increased. This would suggest that the responses given in 2000 were more consistent with the intent of the attitudinal

scales which, in turn, suggests that the statements were generally better understood in 2000 than they were in 1991.⁵

Consistent with this was the increase in the correlations among attitudinal scales. Of the 15 correlations among the six scales available in both the 1991 and 2000 surveys, 13 showed increases (table 3.2.3). Some of these increases were quite considerable, in particular, the correlations between the *Conservation orientation* scale and three other scales: the *Seriousness of land degradation* scale, the *Rural zoning* scale and the *External influence on decision-making* scale. These correlations all increased by more than 0.1.

Given that rural and conservation and environmental issues had only just begun to receive widespread media attention in the late 1980s, it is likely that these increases in correlations between scales reflect the changes in opinion that have occurred as issues have been debated in the rural press and as farmers have had the opportunity to reflect on the issues.

However, this is not to say that uncertainty about these issues has decreased. To the contrary, of the 60 attitude statements common to the 1991 and 2000 surveys, there were increases in the proportion of respondents indicating 'Neutral or not sure' in 56 of the statements (appendix 10). Two of the four attitude statements in which there were decreases in the proportion of respondents indicating 'Neutral or not sure' concerned conservation organisations, one related to the need for compulsory courses on safe chemical use and the fourth had only a decrease of 0.1 per cent. The decline in uncertainty about conservation organisations is also reflected in the distribution of scores on the *Conservation orientation* scale (figure 3.2.18). The decline in uncertainty about courses on safe chemical use may be a reflection of the considerable effort that has been put into accreditation arrangements for farm chemicals since the early 1990s.

In all, the increases in proportions of respondents indicating 'Neutral or not sure' on many attitude statements, together with the increases in Cronbach's alpha and in the correlations between attitudinal scales, would suggest that Australian farmers now have a wider understanding of environmental issues that they did in 1991, and are becoming increasingly aware that many of the issues are complex with no simple answers.

4.2.2 Chemicals and Fertilisers

There has been an increase in concern about the chemical residues in agricultural produce (figure 3.2.16), which appears to be related mainly to fewer farmers regarding the claims about the problems of residues as being exaggerated. This may be a reflection of the publicity afforded the compensation case over residues in beef as a result of the feeding of cotton trash. The overall increase in concern about chemical residues is mainly due to increases in concern among those farmers who do not

⁵ Strictly, the inference is that the statements were understood in a way more consistent with how the statements were understood by the researchers who devised them.

produce cereals or fodder crops. There was relatively little change, or a decrease in concern among cereal and fodder crop producers, respectively (tables A12.17 and A12.20).

There was also increased concern about the environmental and health effects of chemicals more generally (figure 3.2.17), particularly with respect to the pollution effects of fertilisers (figure 3.2.2). The confidence in safety directions has also declined, with a increase in the proportion of respondents disagreeing that: *If you follow the manufacturer's directions, the agricultural chemicals now available will not harm your health* from 23.6 per cent in 1991 to 29.2 per cent in 2000 (table A10.5). As with concern about chemical residues, the increase in concern between 1991 and 2000 was less among those who grew fodder crops (table A12.40), as well as being less among sheep meat producers (table A12.36). Among Tasmanian respondents, there was a decrease in concern about the environmental and health effects of chemicals, in contrast to respondents in other States where there was an increased incidence of concern between 1991 and 2000 (table A12.23).

Consistent with the increasing concerns about agricultural chemicals and their residues, and perhaps reflecting widespread acceptance of the accreditation initiatives established during the 1990s, there has been a the marked increase in the proportion of respondents with favourable views about courses for chemical users. The proportion agreeing with the statement that: *The best way to reduce the mis-use of agricultural chemicals is for there to be courses on safety that are compulsory before you can use a chemical* increased from 49.3 per cent in 1991 to 67.6 per cent in 2000 (table 3.2.11).

However, there were less marked changes in the level of support for other policy initiatives concerning agricultural chemicals. The proportion of respondents in favour of a tax on agricultural chemicals to support research into alternatives declined from 48.5 per cent in 1991 to 42.8 per cent in 2000 (table 3.2.8). There was also a decrease in support for more testing of agricultural produce for residues, from 50.7 per cent in 1991 to 46.9 per cent in 2000 (table 3.2.9). There was no significant difference between 1991 and 2000 in the level of support for more penalties against farmers who produce contains harmful levels of residues (just over 50 per cent), nor in the support for buffer zones around towns in cropping areas (just over 55 per cent).

While there has not been an increase in the level of support for policy measures that involve additional costs or punitive measures, the increasing concerns about agricultural chemicals mean that support for these policy measures may temporarily increase at times when health or environmental problems caused by agricultural chemicals are receiving media attention. The level of support for policy measures based on educational approaches may be more likely to continue to increase over time.

4.2.3 Land Degradation and Extension

At the national level, there appears to have been an overall decrease in the levels of concern about land degradation, as is evident from the shift in the distribution of

scores on the *Seriousness of land degradation* scale (figure 3.2.20). Consistent with this is the decreasing concern about the fragility of marginal lands (figure 3.2.9).

However, at State level, there have been both decreases and increases in the levels of concern about land degradation. In Tasmania, New South Wales and Queensland the levels of concern have decreased, while in Victoria, South Australia and Western Australia, levels of concern have increased (table A12.83). It is likely that this difference is a reflection of the seriousness of salinity problems in these States, and the media attention they have received.

There has been an increase in the proportion of respondents in favour of public subsidy for both remedial and preventative measures against land degradation on rural lands (figures 3.2.4 and 3.2.6, tables 3.2.4 and 3.2.6), although there has been a very slight decrease in the proportion who believe there is little farmers can do in this regard without financial assistance (table 3.2.5). This pattern may reflect increasing awareness of the availability of remedial and preventative measures against land degradation, and of the costs of many measures which may be beyond the reach of individual farmers.

The changes in the responses to a number of attitude statements suggest that farmers are becoming more aware and more favourably disposed towards considering both the impacts that their practices have beyond the farm gate, and the public interest in these impacts that might lead to policy measures to reduce them. For example, the awareness of the potential for agricultural practices to have impacts beyond the farm boundary has increased (figure 3.2.7), and there is increasing acceptance of the need for external expertise in dealing with land degradation problems (figure 3.2.8).

Consistent with these changes, the shift in the distribution of scores on the *External influence on decision-making* scale suggests that there are now slightly more favourable views of such influences (figure 3.2.19). This is mainly a result of increased acceptance of government or public subsidy for property management plans or remedial works (figures 3.2.4, 3.2.6; tables 3.2.4, 3.2.6 and 3.2.17), and an increase in the proportion acknowledging that people other than the property owner may be best qualified to make decisions about land degradation and clearing (figure 3.2.8 and table A10.29). The increase in the average score on the *External influence on decision-making* scale occurred in all States except Queensland, where there was a decrease (table A12.63). The reversal of the national trend in Queensland is consistent with the strong opposition to tree clearing that emerged when the Queensland Government proposed measures to restrict tree clearing. The increase in the score on the *External influence on decision-making* scale was much less among beef producers than among other producers, reflecting the higher incidence of beef production among Queensland respondents (table A12.74).

While the proportion of respondents agreeing that property management plans are essential for sustainable agriculture has remained constant around 69 per cent, the proportion of respondents who supported government subsidy for the preparation of property management plans has increased from 34.7 per cent in 1991 to 41.3 per cent in 2000. Also the proportion of respondents who regarded such plans prepared by

government agencies as an interference in their right to use their land as they saw fit declined from 56.7 per cent in 1991 to 53.6 per cent in 2000.

However, for government extension recommendations generally, there has been a decline in confidence that such recommendations are generally worth following from 52.2 per cent in 1991 to 40.0 per cent in 2000 (figure 3.2.5 and table A10.22)

4.2.4 Conservation and the Environment

Between 1991 and 2000 there has been an increase in the awareness of the policies of environmental organisations (figure 3.2.11), and a less favourable view of them (figures 3.2.10, 3.2.13). However, there has a decline in the proportion who believe that governments are paying too much attention to the environmental movement (figure 3.2.12). The latter is to be expected after the important role that the movement played in electoral politics in the late 1980s.

The distribution of scores on the *Conservation orientation* scale suggests that there has been a slight polarisation of views, with a decline in the proportion of those with scores near the mean and increase in the proportions with extremely high or low scores. In addition, the mean of the distribution has increased, which would indicate slightly more favourable attitudes towards conservation (figure 3.2.18). This increase occurred in all States except Tasmania, where there was a decrease in the average score on the *Conservation orientation* scale (table A12.43). The amount of the increase was also less among beef producers and growers of fodder crops (tables A12.54 and A12.60, respectively).

If the attitude statements comprising the *Conservation orientation* scale are examined individually, it appears that farmers' views about conservation organisations and their policies have become less favourable, and their willingness to sacrifice income for environmental protection has decreased. There has also been a slight decline in strength of feeling about agricultural pollution as morally wrong (figure 3.2.14). However, these changes have been offset by a decline in the proportions of respondents with unfavourable views about conservation and an increase in the proportion who were uncertain or neutral on some statements.

4.2.5 Other Policy Issues

In addition to the changes in views about various policy measures noted above, there have been a number of other policy initiatives where the level of support has changed. Generally, the level of support for most policy initiatives has declined. These include:

- producer levies for environmental research and monitoring (from 10.6 per cent in 1991 to 8.2 per cent in 2000 — table 3.2.7),
- additional educational measures for farmers about the environmental impacts of agriculture (from 55.8 per cent in 1991 to 46.4 per cent in 2000 — table 3.2.12),

- rural land zoning (from 46.7 per cent in 1991 to 40.8 per cent in 2000 — table 3.2.14),
- use of remote sensing to monitor land degradation on individual properties (from 57.4 per cent in 1991 to 53.0 per cent in 2000 — table 3.2.16), and
- protection of prime agricultural land against industrial and urban development (from 80.5 per cent in 1991 to 75.1 per cent in 2000 — figure 3.2.15 and table A10.60).

On the other hand there has been a slight increase in the level of support for mandatory environmental impact statements for large feedlot or clearing developments on rural properties, from 53.2 per cent in 1991 to 57.1 per cent in 2000 (table 3.2.13).

4.2.6 Relationships among Attitudes

The overall nature of correlations between attitudinal scales has not changed between 1991 and 2000. As shown in table 3.2.3, the strongest correlations are between the *Chemical residues* scale and the *Agricultural chemicals* scale and between the *Conservation orientation* and the *External influence on decision-making* scale. The former correlation suggest that those who are more concerned about chemical residues in agricultural produce are also more concerned about agricultural chemicals generally, as might be expected. There are also moderate correlations that suggest that those who have more favourable views about conservation and the environment are also more concerned about chemical residues and agricultural chemicals more generally.

However, the strong correlation between the *Conservation orientation* scale and the *External influence on decision-making* scale has more substantial implications. This correlation suggests that favourable views about conservation and the environment are related to favourable views about obtaining information to assist with farm management and about government regulation that affects the farmer's autonomy in making management decisions. Consistent with this there are also moderate correlations between the *Seriousness of land degradation* scale and the *Conservation orientation* scale, and between the *Seriousness of land degradation* scale and the *External influence on decision-making* scale. These correlations support the view that has been put elsewhere (see, for example, Bradsen, 1988 and Reeve, 2001) that ability of Australia to respond to the land degradation problems faced by agriculture is closely connected with to its ability to move away from the absolutist views of property rights⁶ that have their origins in the pioneering and settlement phase of our history.

⁶ The absolutist view of property rights is the view that ownership of property entitles the owner to use the property in any way regardless of the impact on others.

4.2.7 Components of attitudinal change

The attitudinal changes discussed in the previous sections are the aggregate of three components of attitudinal change. The first component is that due to individuals changing their views over time. The second component is that due to population replacement over time. As time goes by, older farmers retire from the population of active farmers, and are replaced by younger farmers. The retiring farmers take their views with them, and the younger farmers bring new views with them to the population of active farmers. As a consequence the aggregate mix of opinions will change due to the loss of some types of opinions and the gain of others. The third component is structural change which is due to farmers in different situations or with different demographic characteristics having different opinions on rural environmental issues. For example, those with mainly cropping enterprises may have different opinions to those with mainly grazing enterprises, or female farmers may have different opinions to male farmers. If the numbers of graziers in the population changes relative to the number of croppers, or if the number of female farmers changes relative to the number of male farmers, then this will have an effect on the overall mix of opinions in the farming population.

The attitudinal change measured by two cross-sectional surveys at different times is the sum of these three components. It is possible that one component might move in one direction, and the other component in the opposite direction, so that the two cancel each other out. For example, if younger farmers are more concerned than older farmers about agricultural chemicals, then the population replacement component will be an increase in concern. However, if croppers are less concerned about agricultural chemicals than graziers, then an increase in the proportion of croppers in the farming population will result in a decrease in concern. Over a given time period in which the proportion of croppers in the farm population increased, it is possible that the increase in concern due to population replacement will be cancelled by the decrease in concern due to structural change.

Because the 1991 and 2000 surveys were cross-sectional surveys, the measured attitudinal changes are comprised of the three components described above. The changes are not necessarily due simply to some people in the farm population changing their opinions. However, it is possible to make a preliminary assessment of the possible magnitudes of the population replacement component and one aspect of the structural change component. As shown in section 3.6.1, younger farmers tend to have more favourable attitudes about conservation. This means that, with time, older farmers with less favourable attitudes are replaced by younger farmers with more favourable attitudes. This effect can be calculated by taking the 1991 sample and grouping respondents into five year age categories. The average score on the *Conservation orientation* scale for 70-74 year old farmers is replaced by the average score for 60-64 year old farmers, the 65-69 year old score is replaced by the 55-59 year old score and so on. The average scores on the 20-24 and 25-29 year old categories are left unchanged. These changes simulate aging the population by ten years, while keeping the structural composition and individuals' attitudes constant. The direction of this population replacement component is, as would be expected, an increase in the average score on the *Conservation orientation* scale from 3.00 to 3.03, *i.e.* a component of +0.03.

Table 3.3.4 shows that the proportion of older farmers in the population increased between 1991 and 2000, *i.e.* one aspect of structural change in the farm population is the increasing age structure of the farming population. The effect of this change in the age structure can be calculated by assuming that the scores on the *Conservation orientation* scale in each age group in 1991 apply to the number of persons in that age group in 2000. The effect of the change in the age structure is to decrease the average score on the *Conservation orientation* scale from 3.00 to 2.99, *i.e.* a component of – 0.01.

The actual change in the average score on the *Conservation orientation* scale was from 3.00 to 3.12 (see the caption to figure 3.2.18), from which it can be concluded that the component of attitudinal change due solely to individuals changing their views was +0.10. In other words, the effects of the change in the age structure of the population, and of population replacement, are relatively minor compared to the effect of individuals changing their views.

More generally, because there have not been very large changes in the distributions of respondents across categories in the situational variables measured in the two surveys, and because the relationships between age and attitudinal measures are not very strong, the attitudinal changes discussed in the previous sections will largely be due to individuals changing their views on the various rural issues included in the surveys.

4.3 Other Changes, 1991- 2000

4.3.1 Property Management Plans

There has been a substantial increase in the proportion of respondents who indicated they had a property management plan, from 38.9 per cent in 1991 to 55.8 per cent in 2000 (table 3.3.2). Across the States, the greatest increase in the incidence of property management plans was in Tasmania (34.9 per cent) and the lowest was in Queensland (13.4 per cent). The rank order of States with respect to increases in the incidence of property management plans was: Tasmania, South Australia, Western Australia, New South Wales, Victoria, Queensland.

In 1991, the ranking of States with respect to incidence of property management plans was: 1 — Western Australia (45.7 per cent), 2 — Queensland, 3 — South Australia, 4 — New South Wales, 5 — Victoria, 6 — Tasmania (25.6 per cent). The changes in the incidence of property management plans between 1991 and 2000 have resulted in the following changes in ranking: South Australia from third place to second place, Tasmania from sixth place to third place, Queensland from second place to fourth place, Victoria from fifth place to sixth place, New South Wales from fourth place to fifth place. Western Australia has remained in first place in the ranking.

Given that property management planning programs were implemented by the States in various ways, it is likely that the differences partially reflect State differences in implementation. However, however some care should be taken in interpreting the

changes in rankings described above, as the 1991 survey used the term ‘whole farm plan’ and the 2000 survey used the term ‘property management plan’.

4.3.2 Demographic and Financial Changes

There were a number of changes in the responses to various non-attitudinal questions in the 1991 and 2000 surveys that are worth drawing attention to. Firstly, there was an increase in the proportion of older farmers among the respondents and a corresponding decrease in the proportion of younger farmers (table 3.3.4). Secondly, there was an increase in highest level of formal education, with the proportion of respondents with a university degree or post-graduate qualification increasing from 5.6 to 13.1 per cent (table 3.3.5). Lastly, the proportion of respondents with levels of equity at 90 per cent or more decreased from 51.3 per cent in 1991 to 44.8 per cent 2000. The changes in other aspects, such as proportion of respondents working off-farm and the amount of income derived from agriculture have remained relatively constant.

4.4 Main Attitudinal Features — 2000

The preceding sections have focused on changes between 1991 and 2000. The findings that were discussed in these sections were derived from the farmer organisation and Yellow Pages® samples. The additional electoral roll sample used in 2000 arguably provides a better national estimate of the distribution of views and attitudes among farmers in 2000 than does the farmer organisation and Yellow Pages® sample. The following section discusses the main features of the attitudinal findings from the electoral roll sample. These findings can be considered representative of the views of those in rural Australia who derive income from agriculture and/or own properties greater than 50ha in area. Those who own properties greater than 50ha in area but do not derive any income from agriculture comprise 7.5 per cent of the sample on which the findings are based (table 3.5.11). The majority of the 7.5 per cent are employed or self employed (table 3.5.12)

4.4.1 Chemicals and Fertilisers

Just over 40 per cent of respondents agreed with the statement that: *Agricultural pesticides are a serious threat to public health*, while just under 40 per cent disagreed with the statement that: *If you follow the manufacturer's directions, the agricultural chemicals now available will not harm your health* (table 3.4.3). Given an incidence of concern of this magnitude, it is not surprising that there were substantial majorities in favour of a number of policy initiatives relating to agricultural chemicals:

- more testing of agricultural produce for chemical residues and more penalties for exceedances of accepted levels of residues (table 3.4.2),

- tougher penalties for spray drift onto grazing properties or residential areas (table 3.4.22),
- buffer zones around towns where there is a lot of crop spraying in the surrounding areas (table 3.4.23) and
- compulsory safety courses for users of agricultural chemicals (table 3.4.23).

Given that there would be even greater majorities in favour of these measures among urban residents (see, for example, Marsh, Burton and Patterson, 2000), it would appear that there would be widespread electoral support for any governments that wished to increase the pace of reform of public policy aimed at protecting the health of users of agricultural chemicals and of consumers of foodstuffs.

4.4.2 Land Degradation, Extension, Regulation and Compensation

Just over 87 per cent of respondents agreed that all rural properties have some form of land degradation present (table 3.4.4). While just over 75 per cent of respondents agreed that a property management plan was essential the landholder who wanted to farm sustainably, just under 50 per cent of respondents regarded government involvement in the preparation of property management plans as an interference with their right to use their land as they see fit (table 3.4.6). Just under 40 per cent of respondents agreed that farming recommendations from government departments were generally worth following (table 3.4.6). However, around 30 per cent of respondents disagreed that farmers were the best persons to decide how land degradation problems on their land should be tackled, and how much of their land should be cleared (table 3.4.6). In addition, just over 46 per cent of respondents agreed that the long term future of agriculture would depend on 'a lot of cleared country' being 'put back to bush and forestry plantations' (table 3.4.9).

In relation to policy measures aimed at preventing or repairing land degradation, there was a substantial majority in favour of zoning of marginal lands to specify permissible forms of agriculture (table 3.4.7). There was also substantial majority support for an urban contribution to the costs of repairing land degradation (table 3.4.14), for financial incentives for soil improving practices (table 3.4.15) and for excluding industrial and residential developments from prime agricultural land (table 3.4.30). Just over 55 per cent of respondents agreed that remote sensing should be used more widely to monitor land degradation on individual properties (table 3.4.31). There were also majorities in favour of additional measures to educate farmers about land degradation (table 3.4.25) and of mandatory environmental impact statements for large scale agricultural developments such as feed lots and major land clearing (table 3.4.26).

Overall, the pattern of attitudinal responses above suggests that policy-making aimed at reducing land degradation through influencing farmers' decision-making will continue to be politically fraught. There is widespread recognition of the existence of land degradation and some acceptance that people beyond the farm gate may have a role to play in some farm decisions, such as dealing with land degradation problems

and land clearing decisions. Support of policy measures will certainly increase if they are accompanied by financial incentives. Until recently though, there has been a great reluctance on the part of governments to have incentives seen as compensation for forgoing the right to use one's land in particular ways. The political sensitivity of absolutist arguments about the rights of land ownership has caused governments since the 1940s to avoid regulatory measures in favour of educational and extension approaches (Bradsen, 1988). However, there is some hope that public debate of compensation issues will aid the transition from the dominance of absolutist views of property rights that had their origins in 19th century pioneering settlement phase of the nation's history, towards a more mature view of land ownership that acknowledges that there are occasions when the public interest should over-ride private interests and autonomy of decision-making.

The responses to the individual statements in the *Compensation for taking of property rights scale* that was introduced in the 2000 survey show that there is very strong support amongst farmers for compensation for loss of income or autonomy of decision-making due to measures taken in the public interest (table 3.4.8). However, there is also substantial, but not majority, support for the view that compensation should be a matter of degree, *i.e.* when the loss of income is relatively small, no compensation should be expected. It is the articulation of issues, such as when and where compensation is warranted, that will aid the emergence social and political norms and reduce the political sensitivity of interventionist policy measures aimed at reducing and preventing land degradation problems.

4.5 Other Aspects — 2000

The 2000 survey included a number demographic and farm situation questions that were not asked in the 1991 survey. Among these was a question on whether it was expected that the farm would be run by close relatives, such as children or siblings, in the future. While 60.9 per cent of respondents indicated that their farm had been owned by parents or parents-in-law in the past, only 29.1 per cent believed that their farm would be run by their siblings or children in the future. This suggests that inter-generational continuity of ownership is declining, although against this should be set the possibility that some children of farming parents who leave farming may return to another farm elsewhere in Australia later in their lives after having established a career in urban employment.

4.6 Attitudinal Correlates

While there have been many changes in attitudes that have taken place between 1991 and 2000, as discussed in previous sections, there are also a number of relationships between attitudes and situational variables that have persisted over the period. As described in section 3.6.1, these relationships are fairly similar across a range of attitudinal areas, including, concern about chemical residues and agricultural chemicals, views about conservation and conservationists, and willingness to contemplate external intervention in farm decision-making. In most cases, those who are more concerned about chemicals, or more favourably disposed towards

conservation issues, or more open to external influences on their decision-making are more likely to be female, younger, have fewer years of farm experience, have regular off-farm employment and have less income from agriculture. There is less concern about chemicals among those who operate enterprises that require the use of chemicals.

Some of these relationships are also to be found among the general population, such as more pro-environmental attitudes among females and younger people (see, for example, NSW Environment Protection Authority and Taverner Research Co 1997). The relationship with off-farm employment raises the possibility that, if there is an increase in the proportion of farm households with one or more members in regular off-farm employment, there will be some convergence between rural attitudes on environmental issues and urban attitudes. However, as farmers have clearly defined interests with respect to some of these issues, complete convergence in the future is highly unlikely.

4.7 Landcare

As mentioned in chapter 1, landcare has been a central plank in Australian policy measures aimed at reducing land degradation. The original logic behind landcare, albeit contested by some, was that participants in landcare projects would develop a 'land stewardship ethic', which in turn would encourage them to adopt more sustainable practices. The 1991 and 2000 surveys both asked whether respondents were members of landcare groups, and the 2000 survey also asked when they had first joined a landcare group and how actively they were involved.

4.7.1 Landcare group membership and activity

The two surveys show that there has been a substantial increase in landcare group membership, from 22.6 per cent of respondents in 1991 to 43.2 per cent of respondents in 2000 (table 3.3.1). Across the States, the greatest increase in the level of membership took place in Tasmania (37.0 per cent) and the lowest was in South Australia (2.8 per cent). The rank order of States with respect to increases in the level of landcare group membership was: Tasmania, Victoria, New South Wales, Western Australia, Queensland, South Australia.

In 1991, the ranking of States with respect to level of membership was: 1 — Western Australia (48.2 per cent), 2 — Queensland, 3 — Victoria, 4 — South Australia, 5 — Tasmania, 6 — New South Wales (12.1 per cent). The changes in the level of membership between 1991 and 2000 have resulted in the following changes in ranking: Victoria from third place to second place, Queensland from second place to fifth place, South Australia from fourth place to sixth place, Tasmania from fifth place to third place, New South Wales from sixth place to fourth place. Western Australia has remained in first place in the ranking.

The maintenance of high rankings by Western Australia and Victoria may be a reflection of the continued high levels of concern about dryland salinity in those States. Queensland's fall in ranking may be a consequence of several factors: a high level of recruitment in the early 1990s (there is anecdotal evidence that some farmer organisations strongly promoted landcare membership at that time), the lack of the spectacular dryland salinity symptoms present in Western Australia and Victoria, and the strong opposition to tree clearing (landcare having had a long association with tree re-establishment).

The membership figures cited above are based on the farmer organisation and Yellow Pages® samples in 1991 and 2000. Table 3.5.1 is based on the electoral roll sample and shows that, if the population of interest is taken as those deriving income from agriculture and/or owning rural properties greater than 50ha in area, then the national level of landcare membership is 28.0 per cent. As more part-time farmers and smaller properties are included in the population of interest, the overall level of membership falls quite rapidly.

The rapid growth in landcare membership during the 1990s is reflected in table 3.5.2, which shows that just over 50 per cent of landcare group members have joined a landcare group in the last five years. However, against the rapid growth of membership must be set the question of how actively members are involved in their landcare groups. As reported in section 3.5.1, there appears to be a tendency for there to be increasing proportions of members reporting 'occasional involvement' among those who have joined landcare groups more recently. Table 3.5.3 shows that just under 45 per cent of members report that they only have 'occasional involvement' in their group. As the questionnaire did not define 'occasional involvement', it cannot be claimed with certainty that those reporting 'occasional involvement' were investing less in sustainable practices on their properties than were those who reported they were 'active involved', although it is reasonable to expect that, in aggregate, there is likely to be a positive correlation between self-reported level of involvement and investment in sustainable practices.

If national level of landcare group membership is accepted as about 30 per cent (*i.e.* the level of membership among all rural landholders, excluding those deriving no income from agriculture on properties smaller than 50 ha), then from table 3.5.3 it can be seen that the overall proportion of rural landholders reporting themselves as 'actively involved', is around eight per cent. The range of values from the eight per cent to the 43.2 per cent for the sample based mainly on farmer organisation membership lists demonstrates how sensitive estimates of the level of landcare membership are to the thresholds used to define the farm population of interest, and to how membership might be defined. Given this sensitivity, great care has to be taken in attempting any assessments about landcare in Australia on the basis of membership levels alone.

4.7.2 Landcare group membership and attitudes

There were two new attitude statements about landcare issues in the 2000 survey (table 3.4.10). The responses to these two questions would suggest that the

bureaucratisation of landcare is not viewed very favourably by farmers. Nearly 60 per cent of respondents believe that it is hardly worth their while being involved in landcare because of the amount of paperwork required, and only slightly less than one quarter regard increased employment of facilitators and State agency staff positively, although this latter figure may have been affected by the wording of the relevant attitude statement as discussed in section 3.7.1. As described in section 3.7.1 and shown in table 3.7.1, there is not very much difference in the responses to these statements between those who have had the experience of participation in landcare and those who have not. The main difference is that among landcare group members there are fewer respondents who are unsure about the paperwork issue and somewhat more respondents who mostly disagree that the time and effort with paperwork outweighs the benefits of being involved. However, the proportion who agree that paperwork is a problem remains at over 50 per cent regardless of whether respondents are landcare group members or not. In other words, among those joining a landcare group, considerably more have their perceptions that landcare is overly bureaucratized confirmed than have their perceptions dispelled.

More generally, landcare group members tend to have higher scores on the *Conservation orientation* scale, the *External influence on decision-making* scale and the *Seriousness of land degradation* scale (section 3.6.1), as well as on the *Landcare orientation* scale (section 3.6.2). These differences extend to the level of involvement in landcare, as shown in figure 3.7.1. For all four scales, there is a consistent trend of increasing scale scores as level of involvement increases. These differences contrast with the findings of Curtis (1997), who failed to find any differences between non-members and members of landcare groups on a stewardship scale. However, the differences between members and non-members on the scores on the *Chemical residues* and *Agricultural chemicals* scales are relatively small, although those who indicated they were actively involved in landcare have a significantly lower score on the *Agricultural chemicals* scale than those who indicated they were members with less involvement or non-members (section 3.7.2).

Duration of involvement in landcare appears to have relatively little effect on the scores on most of the attitudinal scales, being mostly overshadowed by the overall differences between 1991 and 2000, and the differences between members and non-members (section 3.7.1). This lack of effect is relevant to the question of whether the more favourable environmental attitudes among landcare group members are due to those with these attitudes being attracted to join groups, or to group members gaining more favourable attitudes once they have joined a landcare group. If favourable environmental attitudes were a consequence of belonging to a landcare group, it would be expected that attitudes would change with duration of membership. The relatively small change with duration of membership compared to differences between members and non-members suggests either that attitudes change relatively quickly as soon as people join landcare groups or, more plausibly, that the more favourable environmental attitudes among members is the consequence of those with these attitudes being attracted to join landcare groups, rather than being developed after joining.

In contrast to the lack of effect of duration of involvement on attitudes, levels of involvement have a significant association with attitudes, with those with greater

intensity of involvement having higher scores on the *Conservation orientation*, *External influence on decision-making*, *Seriousness of land degradation* and *Landcare orientation* scales (figure 3.7.1). However, it is not possible to say whether it is involvement that has changed attitudes, or that those with more favourable attitudes to rural environmental issues are more likely to get closely involved with landcare group activities when they join a group. As the questionnaire did not define 'active involvement', it is not possible to relate self-reported level of involvement directly to other measures of landcare participation such as attendance at meetings or adoption of sustainable practices on members' properties, although it is probably reasonable to assume that, in aggregate, there will be some correlation between self-reported level of involvement and these other measures.

Lastly, the findings enable some light to be cast on the question of whether landcare has made any difference to people's attitudes about rural environmental issues between 1991 and 2000. The findings presented in section 3.6.1 showed that while some variables had a significant interaction with the year of survey for some of the attitudinal scales (see the first paragraph of section 3.6.1 for an explanation of interactions between variables), landcare membership was not amongst these variables. In other words, any changes between 1991 and 2000 in the average scores on attitudinal scales were similar for both landcare group members and non-members. This means that being in a landcare group had no significant effect on attitudinal change over the period 1991 to 2000. This is not to say that there was no difference in the scores of landcare group members compared to non-members. As mentioned above, landcare group members tend to have higher scores on the *Conservation orientation* scale, the *External influence on decision-making* scale and the *Seriousness of land degradation* scale (section 3.6.1), as well as on the *Landcare orientation* scale (section 3.6.2). Rather, the rate of change on these scales over the period is the same for landcare group members and non-members, so that the differential between members and non-members is much the same in 2000 as it was in 1991.

It is difficult to reconcile these findings with the claim by Toyne and Farley (2000) that while land degradation problems have got worse during the Decade of Landcare, at least landcare can be judged a success in terms of the attitudinal change it has achieved. However, given that farmers' environmental concerns may have been at historically high levels in 1991 (as they were among the general population in the late 1980s and early 1990s), it is possible that a much greater change in attitudes among farmers generally would have been found if the first survey had been conducted in the mid-1980s. The fact that there is relatively little difference between the rate of change among landcare group members and non-members could also be a consequence of turnover in landcare group membership, resulting in ex-members with favourable views about environmental issues being counted in the non-member category.

There is some evidence that suggests that the Decade of Landcare may have had some indirect effects across the whole farm population, rather than specifically upon landcare group members. Surveys by the Australian Bureau of Statistics based on national samples show that between 1991 and 1999 there was a decline of about five percentage points in the proportion of respondents in all age groups who said they were concerned about the environment. This decline in environmental concern

among the population as a whole contrasts with the slight increase observed in this study on the *Conservation orientation* scale, and the slight decreases on the scales relating to agricultural chemicals and residues (where a decrease indicates increasing concern about the health and environmental effects). However, there has been a slight decrease on the *Seriousness of land degradation* scale, denoting a decrease in concern about land degradation. Overall, it could be said that while there have been declines nationally in the levels of environmental concern among Australians, the levels have probably remained about constant or increased very slightly among farmers. It is this difference that might well be attributed to an indirect effect of the Decade of Landcare.

4.8 Capacity for Investment in Sustainable Practices

It has been argued by farmer organisations for at least the last ten years that one of the major obstacles to improving the sustainability of agriculture was the poor returns received by many farmers — the catch cry ‘you can’t be green if you’re in the red’. The recent study by VCG and Griffin nrm (2000) provides additional support for this argument, and makes a substantial case for the inability of agriculture in Australia to generate the returns necessary for investment in the maintenance of the productivity of the land resources on which it depends. Under these circumstances, investment in maintaining or restoring the productivity of the land will be difficult, if not impossible, without farmers foregoing income which would have been directed to basic or discretionary household expenditure. The present study includes a number of questions which provide some insights into the change since 1991 in the willingness of farmers to forego income for environmental or other reasons associated with the maintenance of the productivity of land resources. In many cases, these questions have been covered in previous sections of this discussion chapter, so that this section serves mainly to bring together at one point these findings relating to the financial situation of farmers and their willingness to forego income for environmental reasons.

Firstly, it can be noted that the two surveys show that the proportion of respondents with levels of equity of 90 per cent or more has declined (section 4.3.2). As shown in table A10.17, it is clear that farmers’ willingness to sacrifice income to protect the environment has decreased. In 1991, 76.7 per cent agreed it was worth putting up with a small decrease in farm profits to protect the environment, compared to 66.8 per cent in 2000. Consistent with this, there has either been no increase in support, or declining support for those measures that would be likely to increase costs to farmers (sections 4.2.2, 4.2.5). In addition, there has been an increase in support for public subsidy of remedial and preventative measures against land degradation (section 4.2.3).

In aggregate, these findings suggest that the financial position of farmers has generally worsened between 1991 and 2000 and that this is having an effect both on farmers’ willingness to sacrifice income for environmental protection and their support for policy measures that could result in an increase in costs to them.

5 Conclusions

The aim of the study was to provide an accurate and valid assessment of the nature of attitudinal change among primary producers in all States and agricultural zones of Australia. The specific research objectives were:

- to measure the changes that have occurred in attitudes relating to a range of agricultural environmental and land management issues,
- to show how these changes are related to each other and to agricultural and demographic factors,
- to establish additional attitudinal baselines in emerging areas of concern,
- to draw attention to any findings that could reasonably be seen as related in some way to Commonwealth and State policy initiatives in the 90s, and
- to canvass the implications for resource management policy in the next decade.

Overall, the aims and objectives of the study have been achieved. The methods used in sampling design and subsequent analysis have ensured that the findings from the study are as accurate and unbiased as could be achieved within the budget. In addition, where biases are unavoidable, they are clearly identified. The method of sampling from electoral rolls has proved superior in a number of respects to using samples from farmer organisation membership lists and/or the Yellow Pages®, and it is recommended that any subsequent repetitions of the survey use the former method. One finding from the study that was a direct consequence of using electoral rolls to draw a sample of people living in rural areas is the extreme skewness of the distribution of property sizes, with those owning properties under 100ha comprising almost three quarters of the rural population, but owning in aggregate only 0.43 per cent of the land area. In other words, the constituency living in rural areas and presumably with an interest in rural issues is some three times the size of the constituency who has management control of the land. Put another way, farmers have long been a minority within the national population, but now they are also a minority among those who live on the land.

Survey fatigue amongst those being surveyed, and the resultant non-response bias, remains a challenge to any opinion survey work. Response rates among farmers have declined by less than ten per cent over a nine year period, and the methods for adjusting for non-response bias used in the study will remain effective for the foreseeable future.

The study shows that, while there have not been large changes in opinions and attitudes over the Decade of Landcare, there have certainly been many statistically significant changes which, taken together, present a fairly cohesive picture of attitudinal change. Overall, it appears that rural environmental issues are better understood than they were in 1991 — a time immediately after several years in which environmental concern had reached historical highs in most Western countries, and in

which environmental issues had had a marked impact on political agendas and elections. In the nine years since 1991, farmers have gained a fuller appreciation of the policies of environmental organisations but their support for these organisations has declined. For many issues, more farmers appear to be aware of the complexities and uncertainties in these issues, and fewer are inclined to believe there are simple solutions.

There are three mechanisms by which the mix of opinions and attitudes in rural areas changes over time. Firstly, there is individual change, due to individuals changing their opinions on particular issues. Secondly, there is population replacement change, due to older farmers retiring and taking their opinions with them, while younger entrants to farming bring a different set of opinions with them. Thirdly, there is structural change, which is a consequence of, for example, farmers in different industries having different opinions on rural environmental issues. If those with mainly cropping enterprises have different opinions to those with mainly grazing enterprises, then the mix of opinions will change if the relative numbers of croppers and graziers change. The separation of attitudinal changes into the components due to individual, population replacement and structural change is a matter of some statistical complexity which is being further investigated. However, it appears from preliminary work in this study that the greater part of the changes observed between 1991 and 2000 are due to individuals changing their opinions on rural environmental issues.

The main changes in attitudes between 1991 and 2000 were:

- increasing concern overall about chemical residues in agricultural produce and about the environmental and health effects of agricultural chemicals, but with those who are regular users of chemicals, such as cereal or fodder crop producers being less concerned and showing relatively little change over the period,
- increasing concern overall about the seriousness of land degradation, but with decreases in concern in Queensland, New South Wales and Tasmania being offset by increases in Victoria, South Australia and Western Australia,
- increasing awareness that farm practices have impacts beyond the farm boundary, and increasingly favourable views nationally towards consideration of the wider public interest in farm decision-making, although the trend was the reverse in Queensland, and
- increasingly favourable, but slightly more polarised, views about conservation, while there is less support for conservation organisations and their activities.

The magnitude of the increases listed above is relatively small, but it is worth noting in relation to the last dot point, that national levels of environmental concern, as measured by the Australian Bureau of Statistics, have declined over the period. In other words, while there have been declines nationally in the levels of environmental concern among Australians, the levels have probably remained about constant or increased very slightly among farmers.

There have also been changes in the level of support for various policy instruments aimed at addressing the problems of land degradation and making agriculture more sustainable. There was less support for policies likely to increase costs in farming, but increased support for policies involving public subsidies for preventative or remedial measures against land degradation. Consistent with this, the proportion of respondents with levels of equity of 90 per cent or more has declined by six per cent, while the proportion of respondents who agreed it was worth putting up with a small decrease in farm profits to protect the environment has decreased by ten per cent. These findings suggest that, unless there is a significant, widespread and sustained improvement in the profitability of agriculture, land resource management policy will have to take careful consideration of farmers' capacity to invest in maintaining the productivity of their land and in preventing off-farm environmental impacts.

For the sample drawn mainly from farmer organisation membership, the proportion of farmers who were members of a landcare group increased from 23 per cent in 1991 to 43 per cent in 2000. For the electoral roll sample, and excluding those with properties smaller than 50 ha and deriving no income from agriculture, the proportion who were members was 28 per cent. The study has found that the amount of change in environmental attitudes between 1991 and 2000 is about the same among landcare group members and those who are not members. While landcare group members generally have somewhat more favourable views than non-members, the differential between the two groups has remained approximately constant. Consistent with this, it was found that length of time in landcare has little effect on environmental attitudes.

At face value, these findings appear not to support the view held by some in the formative years of landcare in the late 1980s and early 1990s, that those participating in landcare projects would develop a 'land stewardship' ethic. However, given that farmers' environmental concerns may have been at historically high levels in 1991 (as they were among the general population in the late 1980s and early 1990s), it is possible that a much greater change in attitudes among farmers generally would have been found if the first survey had been conducted in the mid-1980s. The fact that there is relatively little difference between the rate of change among landcare group members and non-members could also be a consequence of turnover in landcare group membership, resulting in ex-members with favourable views about environmental issues being counted in the non-member category. In addition, the increasingly favourable views among non-members could reasonably be seen as a consequence of the widespread publicity and acceptance of landcare in rural Australia.

The findings clearly show more favourable environmental attitudes with increasing level of involvement in landcare, although among all rural landholders with income from agriculture and/or properties larger than 50ha, those who rated themselves as 'actively involved' amounted to eight per cent of landholders. As the questionnaire did not define 'actively involved', it is not possible to relate with certainty self-reported level of involvement to measures of landcare participation such as attendance at meetings or adoption of sustainable practices on members' properties. However, the marked difference between the eight per cent figure immediately above and the membership levels of 28 per cent and 43 per cent mentioned above highlights the

sensitivity of estimates of landcare group membership to both the definition of the base population and of participation in landcare. Given this sensitivity, great care has to be taken in attempting any assessments about landcare in Australia on the basis of membership levels alone.

With regard to opinions in 2000, there are several aspects that are relevant to future agricultural and resource management policies. Firstly, about 40 per cent of landholders have serious concerns about the safety of agricultural chemicals, and there is majority support for measures such as more testing of agricultural produce for chemical residues, more penalties for exceedances of accepted levels of residues, tougher penalties for spray drift onto grazing properties or residential areas, buffer zones around towns where there is a lot of crop spraying in the surrounding areas and compulsory safety courses for users of agricultural chemicals.

Secondly, new questions about compensation issues introduced in the 2000 survey show that there is very strong support for the view that farmers should be compensated for loss of income or autonomy of decision-making due to measures taken in the public interest. However, there is also substantial, but not majority, support for the view that compensation should be a matter of degree, *i.e.* when the loss of income is relatively small, no compensation should be expected. There also appears to be widespread acceptance that there will have to be major transformation of agricultural landscapes if farming is to be sustainable, with just over 46 per cent of respondents agreeing with the proposition that: *If Australian agriculture is going to have a long term future, there will have to be a lot of cleared country put back to bush and forestry plantations.* These findings would suggest that if future policy is to bring about the necessarily substantial transformations of agricultural landscapes, it is imperative that governments reverse their past unwillingness to engage in discussion about compensation issues. However, it will also be necessary for farmers and their representatives to refrain from framing issues in terms of absolutist property rights rhetoric which attempts to link civil liberty with the rights of landholders to use their land in any way they see fit, regardless of the effects on the broader community.

In this regard, the 2000 survey has confirmed the finding of the 1991 survey that those with more favourable views about environmental issues tend also to be less concerned about external influences on their decision-making. This relationship has become stronger over the period between the two surveys and highlights the central issue in land resource management that has generally been skirted around in the past — the question of how the institutions of property ownership might accommodate the increasing number of ways in which the public interest is affected by private land use decisions.

Finally, although the main focus on the study was on attitudinal changes over the Decade of Landcare, there were several changes in other respondent characteristics that are worthy of mention. Firstly, the proportion of older farmers has increased: for example, the proportion of respondents aged 60 years or more has increased from 24.1 to 30.4 per cent. Secondly, the proportion of respondents with a tertiary or postgraduate qualification has increased from 5.6 to 13.1 per cent. Lastly, a new question introduced in the 2000 survey shows that inter-generational continuity of ownership is declining. Just under 61 per cent of respondents indicated that their farm

had been owned by parents or parents-in-law in the past, but only 29.1 per cent believed that their farm would be run by their siblings or children in the future. These findings all point to a period of rapid structural change in agriculture in the coming decade or so. The challenge for land resource management policy is to have the institutions in place to reduce the social costs of this period of change, and to halt the growth of land degradation and restore the productivity of the nation's agricultural and pastoral lands.

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