

# Landcare and farm forestry

Providing a basis for better  
resource management  
on Australian farms

ABARE report to the  
Natural Heritage Trust

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November 2000

**ABARE**

*Innovation in Economic Research*

## *LANDCARE AND FARM FORESTRY*

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### *Foreword*

The Natural Heritage Trust was established in 1996 with the aim of protecting and rehabilitating Australia's natural environment and integrating the objectives of environmental protection, sustainable agriculture and natural resource management. Two Commonwealth government programs funded by the Natural Heritage Trust in particular work toward the goal of promoting sustainable agriculture — the National Landcare Program and the Farm Forestry Program.

Under these two programs ABARE was commissioned to undertake a survey of resource management in 1998-99 as a supplement to ABARE's Australian agricultural and grazing industries survey and Australian dairy industry survey. The 1998-99 resource management survey was the third survey of this type to be conducted during the 1990s. The survey results provide information for the ongoing evaluation of these two programs of the Natural Heritage Trust.

Vivek Tulpulé  
*Acting Executive Director*

November 2000

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### *Acknowledgments*

Participation in ABARE farm surveys is voluntary. The success of the surveys depends on the cooperation of farmers, their accountants and marketing organisations in providing data and information on farm operations. These surveys would not be possible without their full cooperation and assistance.

Landcare and farm forestry questions were included in a broader survey of resource management issues conducted in conjunction with ABARE's national survey of broadacre and dairy industries. The Landcare and farm forestry component was funded by the Natural Heritage Trust, through the National Landcare Program and Farm Forestry Program. At the time the survey was developed, assistance and advice was received from several officers of Agriculture, Fisheries and Forestry – Australia, including Wendy Goodburn, Karen Cody, Quentin Hart, Noel Beynon, Tanja Cvijanovic, Lindsay Nothrop and Ros Waldron. In addition, input was received from Colin Mues, Roger Van Hilst, Adrian Kemp, Jayne Garnaut and Veronica Rodriguez of ABARE's Agriculture and Natural Resources Directorate, and Laurie Cannon and other members of ABARE's Data Management and Collection Section.

ABARE's Statistical Data Analysis Section and the Data Management and Collection Section compiled the survey results. Data collection, entry and editing were undertaken by ABARE's Data Management and Collection Section. ABARE's Statistical Data Analysis Section undertook sample design, sample weights, survey mapping and data handling and compilation. Walter Shafron, Greg Griffiths and Ray Lindsay assisted with estimation and data analysis and provision of statistical advice. The input provided by Lisa Chapman, Steve Beare, Colin Mues, Terry Neeman, Adrian Kemp, Gil Rodriguez and Kevin Burns is also gratefully acknowledged, as is the contribution by the people in AFFA who reviewed this report.

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### *1. Introduction*

In 1996 the Commonwealth government established the \$1.5 billion Natural Heritage Trust. The goal of the trust is to encourage the conservation, sustainable use and repair of Australia's natural environment and to promote sustainable agriculture. A variety of programs, including the National Landcare Program and the Farm Forestry Program, are funded by the Natural Heritage Trust.

The National Landcare Program is a grants program delivered mainly through cooperative agreements with the states and territories. The program aims to promote collective action by government, industry and communities to manage the natural resources of Australia in a sustainable manner and to encourage the adoption of sustainable agricultural practices and property management planning. The aim of the Farm Forestry Program is to encourage the incorporation of commercial tree growing and management into farming systems for the purposes of wood and nonwood production, increasing agricultural productivity and sustainable natural resource management.

ABARE was commissioned under the two programs to undertake a survey on resource management in 1998-99 to provide information to assist with:

- monitoring land management and farm forestry practices on Australian farms;
- monitoring the extent of landholder participation in selected Landcare program sponsored activities;
- the midterm evaluation of the Natural Heritage Trust; and
- monitoring and evaluating outcomes of the two programs.

Programs funded under the Natural Heritage Trust are subject to monitoring, evaluation and review to ensure that the programs are effective in achieving their objectives and the objectives of the trust. The four performance reporting areas are, in context:

- ***awareness*** – the level of understanding of resource management issues on Australian farms;
- ***skills/education*** – of farmers, land managers and community groups and the availability of competent advice;

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- ***participation rate*** – community involvement in Landcare and related groups, property management planning, and catchment and regional planning;
- ***implementation*** – the level of adoption of a set of best management practices for agricultural production and conservation activities.

The results of ABARE's supplementary survey on resource management were analysed to investigate the latter three performance reporting areas.

The objective in this report is to present selected results from the resource management supplementary survey for 1998-99. The results on Landcare participation, training, farm plans, degradation and management practices are presented in chapters 2 and 3. A comparison of key variables over time was also undertaken using the results from ABARE's previous surveys on Landcare and land management undertaken in 1992-93 and 1995-96 (Mues, Roper and Ockerby 1994; Mues, Chapman and Van Hilst 1998). The relationships between resource degradation, the adoption of farm management practices and Landcare membership were investigated and are reported in chapter 4. The results of the survey on farm forestry are reported in chapter 5. The results presented focus on the main functions of trees on farms, the main factors that would encourage greater tree planting and where farmers source their information on farm forestry.

## *2. Landcare membership*

A key element of the National Landcare Program is support for community based Landcare groups and their activities. Participation in Landcare is voluntary and groups generally form as a result of shared concern for local natural resource management problems (Mues, Chapman and Van Hilst 1998). Landcare is primarily focused on supporting the development of sustainable farming systems through the management of land degradation. The benefits of Landcare have penetrated deeply into the farming community, influencing both members and nonmembers (Walker 2000).

An estimated 38 per cent of broadacre and dairy farms had a property representative who was a Landcare member in 1998-99 (table 1). Similar to previous survey results, Landcare membership is highest in the Northern Territory and Western Australia. Landcare membership was also high in Victoria and Tasmania, where membership was estimated at around 40 per cent of all farms. The lowest level of membership was reported in Queensland.

The regional patterns of Landcare membership among the broadacre and dairy industries in 1995-96 and 1998-99 are shown in maps 1 and 2. Between these two surveys, the estimated level of Landcare membership had risen in much of Western Australia, the Northern Territory and north west Queensland. Membership also increased in the north and north east of South Australia. In contrast, parts of central and north west New South Wales have experienced a decline in Landcare membership.

### *Participation in Landcare activities*

The average length of Landcare membership across Australia is six years, with the length of membership being highest in the Northern Territory at eight years (table 1). The average length of Landcare membership was lowest in both New South Wales and Tasmania at five years.

A question that arises about Landcare membership is whether farmer involvement will be maintained in the long term. Approximately 78 per cent of Landcare members questioned in both the broadacre and dairy industries surveys reported that their involvement in Landcare group activities during 1998-99 had either increased or stayed the same compared with that twelve months earlier (table 1). This was a consistent result across all states. Furthermore, farmers who had been Landcare members for six or more years were more likely than more recent members to have not changed their level

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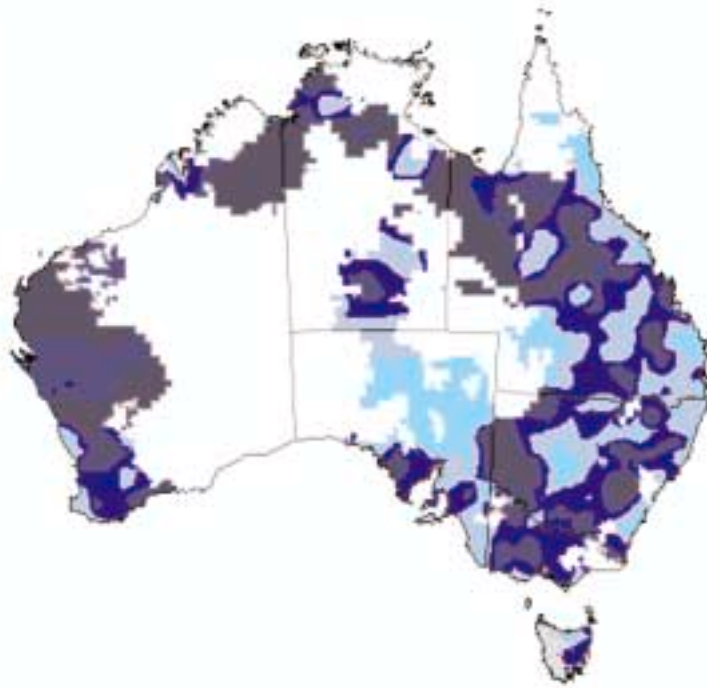
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## 1 Landcare membership, 1995-96

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*Proportion of farms*

- over 75 per cent
- 50 – 75 per cent
- 25 – 50 per cent
- 5 – 25 per cent
- under 5 per cent



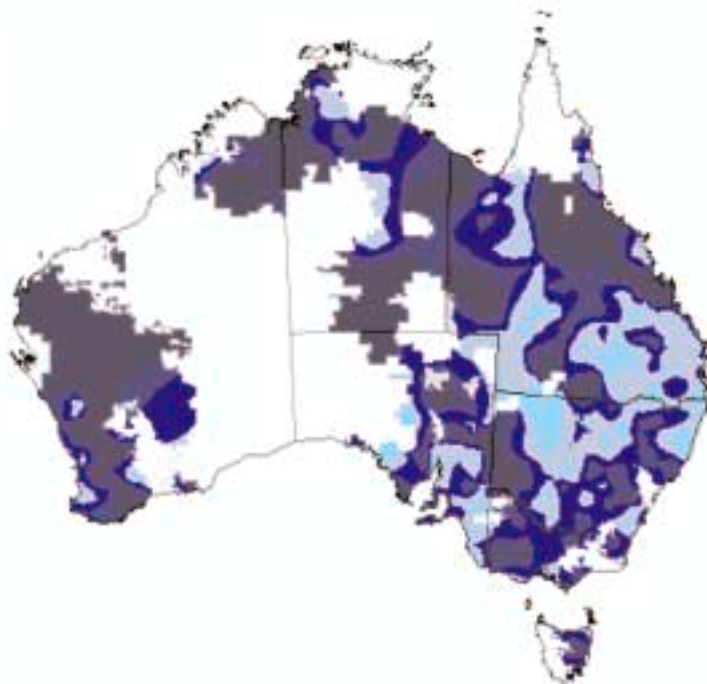
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## 2 Landcare membership, 1998-99

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*Proportion of farms*

- over 75 per cent
- 50 – 75 per cent
- 25 – 50 per cent
- 5 – 25 per cent
- under 5 per cent



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of participation in Landcare group activities over the previous twelve months. Landcare members in both South Australia and New South Wales were most likely to have increased their level of participation in Landcare group activities during the previous twelve months.

### *Landcare membership over time*

Over the past ten years the Landcare program in Australia has grown quite strongly, with approximately 4000 community Landcare groups involving an estimated 12 000 volunteer members operating across Australia in 1998 (Curtis and Van Nouhuys 1999). This is also evidenced in ABARE's national surveys. Growth in Landcare membership across the broadacre and dairy industries was particularly strong between 1992-93 and 1995-96. Landcare membership increased from an estimated 27 per cent in 1992-93, to 34 per

### ***Landcare membership: all broadacre and dairy industries, by state, 1998-99***

		<b>New South Wales</b>	<b>Victoria</b>	<b>Queens- land</b>	<b>South Australia</b>
Farms with a property representative who was a Landcare member in 1998-99	%	34 (11)	42 (9)	26 (14)	29 (18)
Membership of Landcare a	yrs	5 (7)	7 (8)	7 (8)	6 (10)
Participation in Landcare group activities in 1998-99 compared with 12 months earlier					
– decreased	%	25 (27)	17 (32)	25 (30)	22 (33)
– same	%	47 (14)	62 (10)	71 (12)	45 (22)
– increase	%	28 (26)	21 (19)	5 (79)	33 (33)
		<b>Western Australia</b>	<b>Tasmania</b>	<b>Northern Territory</b>	<b>Australia</b>
Farms with a property representative who was a Landcare member in 1998-99	%	57 (10)	39 (15)	62 (10)	38 (5)
Membership of Landcare a	yrs	6 (9)	5 (9)	8 (8)	6 (4)
Participation in Landcare group activities in 1998-99 compared with 12 months earlier					
– decreased	%	23 (29)	19 (27)	14 (39)	22 (14)
– same	%	52 (14)	60 (8)	70 (10)	55 (6)
– increase	%	25 (24)	21 (26)	16 (35)	23 (12)

a Average for members of Landcare in 1998-99.

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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cent in 1995-96 — a growth in membership numbers of 26 per cent (table 2). Since the 1995-96 survey of Landcare and land management, the rate of growth in Landcare membership is estimated to have slowed.

Growth in membership differs by state, however. Since the 1992-93 survey, Landcare membership has grown steadily in Victoria, South Australia and the Northern Territory. In Tasmania, while Landcare membership was unchanged between the 1992-93 and the 1995-96 surveys, the number of properties with a Landcare member is estimated to have almost doubled by the 1998-99 survey. In New South Wales, however, Landcare participation declined from 39 per cent in 1995-96 to 34 per cent in 1998-99.

To investigate whether the fall in Landcare membership in New South Wales was driven by differences in the samples of farms surveyed in the two years, results of the 1998-99 resource management survey were reestimated to include only those farms that took part in both the 1998-99 and 1995-96 surveys (panel data). The results obtained from the panel analysis also showed

### **2** *Landcare membership over time: all broadacre and dairy industries, by state*

	<b>New South Wales</b>		<b>Victoria</b>		<b>Queensland</b>		<b>South Australia</b>	
	%		%		%		%	
Farms with a property representative who was a Landcare member in:								
– 1992-93	22	(11)	34	(12)	18	(11)	18	(18)
– 1995-96	39	(9)	37	(9)	25	(15)	21	(23)
– 1998-99	34	(11)	42	(9)	26	(14)	29	(18)
Length of Landcare membership, in 1998-99	5	(7)	7	(8)	7	(8)	6	(10)
	<b>Western Australia</b>		<b>Tasmania</b>		<b>Northern Territory</b>		<b>Australia</b>	
	%		%		%		%	
Farms with a property representative who was a Landcare member in:								
– 1992-93	46	(10)	21	(28)	47	(16)	27	(6)
– 1995-96	43	(14)	20	(21)	51	(19)	34	(5)
– 1998-99	57	(10)	39	(15)	62	(10)	38	(5)
Length of Landcare membership, in 1998-99	6	(9)	5	(9)	8	(8)	6	(4)

<sup>a</sup> Average for members of Landcare in 1998-99.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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that Landcare membership in New South Wales in 1998-99 was lower than in 1995-96.

A number of factors may have resulted in the decline in Landcare membership in New South Wales. For some, the objective of forming the Landcare group may have been met. For example, the group may have assimilated the necessary information on the farm management issues relevant to them. Others may have dealt with the problems that can be effectively addressed at a local scale, possibly through cooperative action, but the remaining problems may be beyond the resources or scale of influence of the Landcare group.

The decline in Landcare membership in New South Wales may also have been caused by 'burnout' among Landcare members. With reference to Landcare, Curtis and Van Nouhuys (1999) defined burnout as occurring when the intensity of involvement or the magnitude of the task overwhelms the participants to the extent that they become less effective or drop out. Communication and coordination problems, along with resource constraints, may contribute to burnout among Landcare members and groups.

Alternatively, the level of program funding in New South Wales may have been a contributing factor to the decline in membership. Program funding to New South Wales Landcare groups averaged around \$20 million a year in the three years to 1998-99, a drop of 20 per cent compared with the three preceding years. However, this is unlikely to have been a factor as the decline was more than offset by increases in funding to regional and community groups from other programs, such as Rivercare and Murray Darling initiatives.

### *Reasons for nonmembership*

While Landcare membership has been increasing over the past decade, the majority of broadacre and dairy farmers are not members of Landcare. The 1995-96 survey asked farmers for reasons for not joining a Landcare group. The list of possible responses was extensive (see Mues, Chapman and Van Hilst 1998), so it was decided to update information on just two possible reasons for nonmembership. The first was that there was no Landcare group in the farmers' immediate area, a response given by around a quarter of nonmembers (table 3). This may be a sign that there is further potential growth in membership, particularly in New South Wales where 43 per cent of nonmembers gave that response.

The second reason selected for further investigation in the 1998-99 survey was that farmers had left a group. The proportion of nonmembers who gave this response was just 5 per cent, with the Northern Territory and Western Australia

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### *3 Reasons for not participating in Landcare: all broadacre and dairy industries, by state, 1998-99*

		New South Wales	Victoria	Queens- land	South Australia
Not a member of Landcare in 1998-99	%	66 (11)	58 (9)	74 (14)	71 (18)
Reason for not being a Landcare member in 1998-99					
– no group in the immediate area	%	43 (13)	29 (18)	15 (24)	16 (25)
– was a member but left group	%	7 (51)	5 (43)	4 (69)	1 (67)
– other	%	50 (9)	67 (8)	81 (4)	83 (5)
Length of membership before leaving group <sup>a</sup>	yrs	3 (19)	4 (23)	3 (16)	ns
Proportion of farms with a significant land degradation problem in 1998-99	%	32 (17)	24 (21)	18 (26)	26 (27)
– Landcare members	%	68 (9)	45 (15)	50 (21)	43 (28)
– ex-Landcare members	%	41 (54)	16 (104)	18 (259)	77 (40)
– non-Landcare members with no group in immediate area	%	32 (27)	15 (43)	11 (37)	12 (58)
– other non-Landcare members	%	31 (20)	28 (22)	20 (31)	29 (30)
		<b>Western Australia</b>	<b>Tasmania</b>	<b>Northern Territory</b>	<b>Australia</b>
Not a member of Landcare in 1998-99	%	43 (11)	61 (15)	38 (10)	62 (6)
Reason for not being a Landcare member in 1998-99					
– no group in the immediate area	%	14 (37)	21 (35)	24 (39)	28 (9)
– was a member but left group	%	10 (95)	0 (85)	14 (64)	5 (31)
– other	%	77 (14)	78 (10)	62 (19)	67 (4)
Length of membership before leaving group <sup>a</sup>	yrs	3 (13)	ns	ns	3 (11)
Proportion of farms with a significant land degradation problem in 1998-99	%	25 (26)	7 (64)	22 (43)	25 (10)
– Landcare members	%	55 (14)	39 (25)	22 (29)	53 (7)
– ex-Landcare members	%	47 (72)	–	48 (94)	34 (40)
– non-Landcare members with no group in immediate area	%	35 (41)	2 (367)	11 (108)	23 (20)
– other non-Landcare members	%	21 (60)	9 (65)	21 (65)	26 (12)

<sup>a</sup> Average for former members of Landcare. **ns** Sample insufficient to provide results.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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showing the largest proportion of members exiting Landcare. However, further information would be needed before this should be judged as a good or bad result (see previous section).

The majority of survey respondents across the broadacre and dairy industries who were not members of Landcare in 1998-99 cited other reasons for nonmembership (table 3). While these reasons for nonmembership were not investigated in the 1998-99 survey, other reasons for nonmembership given in earlier ABARE surveys include a lack of time, having poor information about Landcare or only having minor degradation problems on their property. Around a third of broadacre and dairy farmers indicated in the 1995-96 survey of Landcare and land management issues that a lack of time precluded them from participating in Landcare. In a survey of Landcare participation across Victoria, Curtis and Van Nouhuys (1999) found that a lack of time along with land degradation not being an issue were the two most common reasons for respondents not participating in Landcare.

### *Characteristics of Landcare farms*

Landcare members across the broadacre and dairy industries in 1998-99, on average, operated larger farms, with more intensive cropping and more live-stock compared with non-Landcare members (table 4). These results are consistent with those of the 1995-96 survey of Landcare and land management practices; however, the overall average farm area operated by Landcare members was lower in 1998-99 than in 1995-96. This may be attributed to newer Landcare recruits (defined as members of up to two years) operating smaller farms, and thus lowering the overall estimated average farm size.

### *New Landcare recruits compared with longer term members*

To assess the characteristics of farmers new to Landcare, members were separated into recent recruits (defined as members of up to two years) and longer term members (defined as members of three years or more). Strong differences in farm characteristics were identified between the two groups, with newer Landcare members displaying similar characteristics to those of non-Landcare members (table 4). Newer Landcare members on average were less likely to be from the pastoral zone, and tended to operate smaller farms with less live-stock compared with longer term members. This pattern was also evident in the results of the 1995-96 survey. This may be further evidence for the hypothesis proposed by Mues, Chapman and Van Hilst (1998) that Landcare has begun to draw members from a broader cross-section of the farming community.

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### **4** *Characteristics of farms, by Landcare membership, all broadacre and dairy industries, 1998-99* Average per farm

		Landcare members			
		Non-Landcare	Landcare	1-2 years	3 or more years
Age owner manager	yrs	55 (1)	52 (2)	48 (3)	53 (2)
Area operated 30 June	ha	3 657 (15)	7 090 (17)	2 331 (24)	7 866 (13)
Wheat area	ha	94 (8)	169 (10)	196 (33)	165 (11)
Area cropped	ha	202 (6)	344 (8)	412 (28)	333 (8)
Beef cattle 30 June	no.	223 (6)	300 (10)	199 (21)	317 (16)
Sheep 30 June	no.	1 025 (6)	1 781 (6)	1 694 (17)	1 795 (9)
Sheep equivalent	no.	5 822 (4)	8 653 (5)	8 824 (18)	8 626 (7)
Weeks worked					
– owner manager	wks	46 (1)	47 (2)	47 (5)	47 (2)
– hired labor	wks	14 (12)	15 (9)	15 (64)	15 (13)
– Total	wks	104 (3)	109 (3)	105 (14)	109 (3)
Total cash receipts	\$	196 029 (4)	231 984 (5)	250 404 (17)	228 981 (6)
Total cash costs	\$	147 981 (4)	182 850 (5)	186 192 (17)	182 305 (7)
Farm cash income	\$	48 048 (6)	49 134 (9)	64 213 (22)	46 676 (10)
Farm business profit	\$	–7 515 (38)	–7 813 (52)	4 912 (306)	–9 887 (44)
Profit at full equity	\$	8 060 (39)	11 567 (38)	21 678 (68)	9 919 (47)
Rate of return – excl. capital appreciation	%	0.7 (40)	0.8 (37)	1.7 (68)	0.7 (46)
Total closing capital	\$	1 208 131 (3)	1 378 550 (4)	1 280 253 (12)	1 394 574 (5)
Farm debt 30 June <b>a</b>	\$	163 205 (6)	206 389 (7)	186 666 (26)	209 292 (8)
Equity ratio at 30 June <b>a</b>	%	87 (2)	84 (1)	84 (4)	84 (1)
Off-farm wages and salaries <b>b</b>	\$	8 621 (12)	9 459 (16)	15 567 (32)	8 531 (20)
Total off-farm income <b>b</b>	\$	18 227 (10)	16 042 (10)	18 061 (30)	15 738 (12)
Estimated expenditure in 1998-99 on:					
– land care related earthworks	\$	531 (22)	564 (25)	555 (24)	533 (22)
– management and control of animal pests/weeds	\$	850 (22)	1 008 (20)	843 (22)	1 023 (15)
– land care related fencing	\$	181 (20)	771 (14)	189 (20)	806 (15)
– tree and shrub establishment	\$	110 (19)	588 (35)	116 (17)	644 (34)
<i>as a percentage of total costs:</i>					
– land care related earthworks	%	0.4 (22)	0.3 (25)	0.3 (24)	0.3 (22)
– management and control of animal pests/weeds	%	0.6 (22)	0.6 (20)	0.5 (22)	0.6 (15)
– land care related fencing	%	0.1 (20)	0.4 (14)	0.1 (20)	0.4 (15)
– tree and shrub establishment	%	0.1 (19)	0.3 (35)	0.1 (17)	0.4 (34)

**a** Average per farm responding on debt. **b** Average per farm responding on off-farm income.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

## *LANDCARE AND FARM FORESTRY*

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### *Selected results by rate of return*

Past analyses by ABARE (Martin 1998, 1999; Connell and Hooper 2000; Martin et al. 2000) have unearthed important differences in the size and production characteristics of farms when they are split by level of financial performance. It was an issue of interest to see whether these differences extended to Landcare and resource management. Characteristics of farmers were investigated by level of performance, where the top performing farms (by rate of return) were compared with the bottom performing farms (by rate of return) (table 5). Farms were ranked at the regional level, with the top and bottom 25 per cent in each region contributing to the aggregate estimates presented in table 5. This ranking was conducted at the regional level to avoid any undue influence of the better performing industries on the results for the top performance group. Better performing farms were larger on average, with higher capital and debt and lower off-farm incomes. Farm cash income was also noticeably larger on the better performing farms, and the average age of the farm owner manager was lower.

A higher proportion of the better performing farms were members of Landcare and had a farm plan. Expenditure on Landcare related activities during 1998-99 was also greater among the top performing farms. However, when this was measured as a proportion of total cash costs there were no notable differences between the two groups.

With the exception of short courses, all the commonly used training activities were undertaken to a greater extent among the top performing farms. In particular, almost a third of farms in this category had participated in industry grower groups or crop/pasture checking groups, compared with 9 per cent of farmers in the bottom 25 per cent category. Furthermore, a larger proportion of the area of higher performing farms was cultivated using direct drilling or minimum tillage in 1998-99, compared with lower performing farms that were mostly cultivated using traditional techniques.

### *Participation in training activities*

The changing environment of farming, including technological change and emerging resource management issues, means that it is important for farmers to continue to strive to improve their farm management skills. More than half of farmers surveyed across the broadacre and dairy industries had undertaken at least one training activity over the three years to June 1999 (table 6). This is similar to the proportion undertaking at least one training activity in the three years to June 1996 (Mues, Chapman and Van Hilst 1998). Workshops and field days organised by Landcare groups, industry, grower or crop check groups

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## LANDCARE AND FARM FORESTRY

### 5 Characteristics of top and bottom performing farms, by rate of return

	Average	Bottom 25% a	Top 25% a
Farms with a property representative who was a member of Landcare in 1998-99	38 (5)	35 (13)	40 (8)
Farmers who had a farm plan	27 (7)	23 (17)	34 (9)
Farmers participating in courses/training activities, July 1996 to June 1999			
– any course/activity			
in past 3 years	54 (4)	52 (9)	63 (5)
– TAFE course	13 (11)	11 (24)	19 (15)
– distance education	2 (26)	5 (37)	1 (40)
– other tertiary studies	2 (26)	3 (46)	2 (32)
– property management planning workshops	14 (9)	10 (29)	20 (12)
– Landcare group workshop/field days	23 (7)	20 (17)	28 (11)
– other short courses	31 (6)	33 (13)	33 (9)
– industry grower groups	19 (8)	9 (26)	31 (10)
– other	1 (32)	–	2 (47)
Estimated expenditure in 1998-99 on <b>b</b> :			
– land care related earthworks	\$ 544 (16)	254 (37)	1 274 (26)
– management and control of animal pests/weeds	\$ 910 (15)	609 (17)	1 330 (22)
– land care related fencing	\$ 405 (12)	243 (51)	539 (17)
– tree and shrub establishment	\$ 291 (27)	190 (23)	410 (14)
as a percentage of total costs:			
– land care related earthworks	% 0.3 (16)	0.3 (37)	0.4 (25)
– management and control of animal pests/weeds	% 0.6 (14)	0.8 (18)	0.5 (23)
– land care related fencing	% 0.3 (13)	0.3 (51)	0.2 (18)
– tree and shrub establishment	% 0.2 (28)	0.2 (24)	0.1 (14)
Age owner manager <b>b</b>	yrs 54 (1)	56 (2)	51 (1)
Area operated 30 June <b>b</b>	ha 4 960 (8)	3 608 (22)	7 549 (24)
Area cropped <b>b</b>	ha 256 (4)	112 (13)	469 (8)
Beef cattle 30 June <b>b</b>	no. 252 (5)	144 (14)	391 (13)
Sheep 30 June <b>b</b>	no. 1 312 (4)	766 (10)	1 758 (9)
Farm cash income <b>b</b>	\$ 48 460 (5)	–2 800 (91)	132 898 (5)
Farm business profit <b>b</b>	\$ –7 628 (28)	–58 350 (4)	77 043 (8)
Total closing capital <b>b</b>	\$ 1 272 823 (2)	703 903 (5)	1 897 250 (4)
Farm debt 30 June <b>c</b>	\$ 179 645 (5)	80 004 (12)	324 803 (7)
Off-farm wages and salaries <b>d</b>	\$ 8 940 (9)	13 279 (17)	7 090 (24)
Total off-farm income <b>d</b>	\$ 17 396 (7)	24 816 (11)	16 036 (21)

**a** Top and bottom are average for the highest and the lowest 25 per cent of farms, ranked by rate of return at the ABARE regional level. **b** Average per farm. **c** Average per farm responding on debt. **d** Average per farm responding on off-farm income.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

## LANDCARE AND FARM FORESTRY

along with other short training activities were the most common forms of training undertaken (table 6). This indicates the importance of the informal training sector in delivering information compared with more formal training activities such as TAFE courses and other tertiary studies. This was also similar

### 6 Participation in training: all broadacre and dairy industries, by state, 1998-99

	<b>New South Wales</b>	<b>Victoria</b>	<b>Queens- land</b>	<b>South Australia</b>
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	48 (8)	60 (7)	49 (9)	51 (9)
– TAFE course	15 (19)	16 (19)	5 (41)	17 (19)
– distance education	3 (48)	3 (43)	1 (85)	2 (49)
– other tertiary studies	4 (44)	2 (41)	2 (52)	1 (72)
– property management planning workshops	12 (21)	16 (16)	13 (21)	17 (19)
– Landcare group workshop/field days	21 (17)	24 (12)	17 (15)	17 (22)
– other short courses	26 (13)	37 (11)	34 (13)	30 (13)
– industry grower groups	19 (16)	22 (15)	12 (20)	19 (20)
– other	–	1 (64)	–	4 (50)
	<b>Western Australia</b>	<b>Tasmania</b>	<b>Northern Territory</b>	<b>Australia</b>
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	63 (9)	63 (11)	42 (21)	54 (4)
– TAFE course	8 (35)	15 (36)	2 (121)	13 (11)
– distance education	2 (84)	–	2 (89)	2 (27)
– other tertiary studies	2 (67)	2 (105)	2 (88)	2 (26)
– property management planning workshops	16 (31)	12 (22)	11 (43)	14 (9)
– Landcare group workshop/field days	39 (14)	30 (19)	8 (17)	23 (7)
– other short courses	24 (19)	34 (17)	29 (26)	31 (6)
– industry grower groups	24 (20)	21 (19)	3 (119)	19 (8)
– other	1 (72)	–	7 (57)	1 (33)

<sup>a</sup> Farmers could undertake more than one form of training.

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

## LANDCARE AND FARM FORESTRY

to the results of the 1995-96 Landcare and land management survey. The proportion of farmers undertaking at least one training activity in the three years to June 1999 was highest in Tasmania, Western Australia and Victoria, with the Northern Territory reporting the lowest proportion of farmers having involvement in training activities. Low rates of participation in training activities in the Northern Territory may be a consequence of remoteness.

### **7** *Participation in training: all broadacre and dairy industries, by state and Landcare membership, 1998-99*

	New South Wales		Victoria	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	34 (13)	74 (9)	47 (11)	77 (7)
– TAFE course	11 (26)	23 (25)	11 (32)	23 (25)
– distance education	2 (68)	4 (67)	2 (89)	5 (45)
– other tertiary studies	3 (53)	5 (71)	–	4 (44)
– property management				
planning workshops	6 (33)	23 (25)	9 (30)	26 (18)
– Landcare group workshop/field days	6 (29)	49 (15)	9 (29)	44 (13)
– other short courses	20 (19)	39 (18)	33 (15)	42 (15)
– industry grower groups	12 (18)	30 (22)	13 (27)	35 (18)
– other	–	1 (130)	–	3 (71)
	Queensland		South Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	39 (14)	76 (11)	48 (11)	57 (21)
– TAFE course	5 (35)	6 (108)	17 (23)	16 (41)
– distance education	1 (54)	2 (175)	2 (54)	1 (83)
– other tertiary studies	1 (69)	4 (71)	–	3 (87)
– property management				
planning workshops	9 (23)	25 (35)	15 (22)	20 (40)
– Landcare group workshop/field days	6 (34)	47 (15)	10 (31)	35 (30)
– other short courses	30 (17)	44 (17)	31 (16)	26 (33)
– industry grower groups	7 (31)	27 (24)	17 (21)	26 (40)
– other	–	–	4 (43)	4 (132)

*Continued* ⇨

## LANDCARE AND FARM FORESTRY

Landcare members across Australian broadacre and dairy industries were more likely than non-Landcare members to have undertaken at least one training activity in the three years to June 1999 (table 7). This suggests that Landcare may be a key factor influencing participation in training activities. Landcare members also had a greater participation in each specific training

### 7 Participation in training: all broadacre and dairy industries, by state and Landcare membership, 1998-99 *continued*

	Western Australia		Tasmania	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	55 (14)	69 (11)	58 (17)	71 (14)
– TAFE course	3 (105)	12 (37)	19 (43)	9 (63)
– distance education	5 (94)	1 (91)	–	–
– other tertiary studies	–	3 (70)	3 (105)	–
– property management planning workshops	16 (54)	15 (21)	5 (51)	23 (27)
– Landcare group workshop/field days	20 (49)	54 (14)	14 (41)	55 (17)
– other short courses	18 (27)	29 (24)	32 (27)	36 (28)
– industry grower groups	10 (96)	34 (22)	12 (42)	35 (22)
– other	–	2 (69)	–	–
	Northern Territory		Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers participating in courses/training activities aimed at improving farm management skills between July 1996 and June 1999 <sup>a</sup>				
– any course/activity in past 3 years	16 (61)	58 (20)	42 (6)	73 (4)
– TAFE course	–	4 (122)	10 (14)	18 (15)
– distance education	–	3 (88)	2 (38)	3 (36)
– other tertiary studies	–	4 (88)	1 (40)	4 (33)
– property management planning workshops	–	17 (44)	9 (15)	23 (12)
– Landcare group workshop/field days	–	13 (18)	9 (14)	47 (7)
– other short courses	16 (61)	36 (29)	27 (8)	38 (9)
– industry grower groups	–	4 (120)	12 (12)	32 (10)
– other	–	11 (53)	1 (37)	2 (47)

<sup>a</sup> Farmers could undertake more than one form of training.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was

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activity compared with non-Landcare members. Finally, Landcare members in New South Wales, Queensland and Victoria participated in a greater number of training activities than Landcare members in the other states.

### *Farm planning and development*

The Property Management Planning campaign encourages farm managers to plan their business, taking a whole system approach by accounting for factors such as property layout, land use and land capability, financial planning and risk management, as well as the personal goals of those involved in the farm business. To help assess the success of government efforts to encourage farm planning, part of the survey was dedicated to ascertaining the types of farm plans possessed and used by farmers.

### *Use of farm plans*

Just over a quarter of broadacre and dairy farmers are estimated to have had some form of documented farm plan (table 8). Farmers with plans indicated that the use of farm plans during the farm decision making process was widespread. Nearly 80 per cent of broadacre and dairy farmers with a plan indicated that they had used it when making farm management or development decisions in 1998-99, although this proportion ranged from a high of 85 per cent in Victoria and Tasmania to a low of 70 per cent in South Australia.

In the three years between 1992-93 to 1995-96 there was an increase in the proportion of farmers with a documented farm plan in all states except for South Australia and the Northern Territory (table 9). However, in the 1998-99 survey the proportion of farmers with farm plans had declined to levels similar to those reported in 1992-93. The exceptions were South Australia and the Northern Territory, where the proportions of farmers with farm plans remained largely unchanged in the 1998-99 survey.

To dismiss the possibility that this reduction was caused by a change in the sample, a panel sample of farms participating in both the 1995-96 and the 1998-99 surveys was investigated. The panel sample results also indicated that the proportion of farmers with farm plans in 1998-99 had fallen, particularly in Queensland and Western Australia. From the survey results, it was not possible to assess the reason for this fall. For example, it may have been caused by a change in farmer perception over what constitutes a farm plan or may simply have been a reflection that some plans are no longer used. This is an issue that may require additional investigation.

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### *Content of farm plans*

For the purposes of the survey, a farm plan or property management plan was defined as a map and/or some other form of documented record addressing the present farm situation and outlining strategies for future management and development decisions. Seventy per cent of farm plans contained a farm operating budget (table 8), compared with less than 60 per cent in the 1992-93 survey. In contrast, the frequency of information on resource capability and information on land care works being included in farm plans did not rise significantly over the same period.

### 8 *Farm planning: all broadacre and dairy industries, by state, 1998-99*

	<b>New South Wales</b>	<b>Victoria</b>	<b>Queens- land</b>	<b>South Australia</b>
	%	%	%	%
Farmers who had a farm plan	24 (14)	28 (11)	25 (14)	28 (21)
Farmers who used the plan to make management or development decisions <sup>a</sup>	72 (13)	85 (5)	80 (4)	70 (13)
Proportion of farm plans that contained:				
– information on soils/land capability	77 (6)	66 (11)	52 (18)	64 (15)
– information on existing or proposed land care works	71 (9)	67 (8)	43 (19)	72 (7)
– farm operating budget	55 (17)	70 (9)	78 (8)	77 (12)
– farm business plan	50 (18)	65 (9)	64 (12)	55 (19)
	<b>Western Australia</b>	<b>Tasmania</b>	<b>Northern Territory</b>	<b>Australia</b>
	%	%	%	%
Farmers who had a farm plan	37 (15)	17 (17)	26 (17)	27 (7)
Farmers who used the plan to make management or development decisions <sup>a</sup>	82 (9)	85 (9)	73 (13)	79 (4)
Proportion of farm plans that contained:				
– information on soils/land capability	76 (9)	68 (18)	86 (9)	68 (5)
– information on existing or proposed land care works	64 (14)	72 (14)	89 (7)	65 (5)
– farm operating budget	80 (11)	84 (9)	87 (9)	70 (5)
– farm business plan	64 (10)	80 (9)	80 (13)	60 (6)

<sup>a</sup> Proportion of farmers with a farm plan

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### *9 Farm planning over time: all broadacre and dairy industries, by state and Landcare membership*

	Non-Landcare	Landcare	All farms
	%	%	%
<b>New South Wales</b>			
1992-93	19 (15)	53 (12)	27 (10)
1995-96	28 (14)	58 (7)	40 (9)
1998-99	16 (22)	40 (18)	24 (14)
<b>Victoria</b>			
1992-93	16 (19)	43 (17)	25 (13)
1995-96	30 (14)	41 (11)	35 (10)
1998-99	19 (22)	39 (13)	28 (11)
<b>Queensland</b>			
1992-93	10 (25)	48 (13)	17 (14)
1995-96	24 (17)	71 (6)	36 (10)
1998-99	21 (20)	37 (18)	25 (14)
<b>South Australia</b>			
1992-93	24 (17)	28 (20)	24 (14)
1995-96	23 (27)	39 (30)	26 (22)
1998-99	28 (24)	29 (29)	28 (21)
<b>Western Australia</b>			
1992-93	16 (31)	51 (12)	32 (13)
1995-96	22 (34)	65 (14)	41 (11)
1998-99	18 (35)	52 (16)	37 (15)
<b>Tasmania</b>			
1992-93	7 (36)	33 (34)	12 (25)
1995-96	23 (28)	40 (29)	26 (22)
1998-99	10 (39)	28 (22)	17 (17)
<b>Northern Territory</b>			
1992-93	19 (48)	38 (26)	28 (24)
1995-96	6 (57)	36 (36)	22 (32)
1998-99	16 (53)	32 (18)	26 (17)
<b>Australia</b>			
1992-93	17 (9)	46 (7)	25 (6)
1995-96	26 (8)	54 (5)	36 (5)
1998-99	19 (11)	40 (8)	27 (7)

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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A higher proportion of Landcare members possess a farm plan compared with non-Landcare members — 40 per cent compared with 19 per cent (table 10). The farm plans of Landcare members were also generally more comprehensive than those of non-Landcare members with around three-quarters of Landcare members' plans containing information on resource capability and information on existing or proposed land care works. Only around half of non-Landcare members' plans contained such information. In the Northern Territory, all non-Landcare members surveyed had information on their proposed or existing land care works documented in their plans.

### *10 Farm planning: all broadacre and dairy industries, by state and Landcare membership, 1998-99*

	New South Wales		Victoria	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers who had a farm plan	16 (22)	40 (18)	19 (22)	39 (13)
Farmers who used the plan to make management or development decisions <sup>a</sup>	70 (15)	74 (19)	79 (12)	89 (4)
Proportion of farm plans that contained:				
– information on soils/land capability	63 (15)	88 (6)	54 (19)	73 (9)
– information on existing or proposed land care works	51 (21)	85 (8)	53 (21)	76 (7)
– farm operating budget	67 (13)	46 (31)	65 (16)	73 (11)
– farm business plan	61 (16)	42 (27)	60 (19)	68 (11)
	Queensland		South Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers who had a farm plan	21 (20)	37 (18)	28 (24)	29 (29)
Farmers who used the plan to make management or development decisions <sup>a</sup>	89 (8)	68 (14)	68 (23)	76 (26)
Proportion of farm plans that contained:				
– information on soils/land capability	54 (25)	49 (20)	57 (28)	79 (26)
– information on existing or proposed land care works	43 (30)	44 (20)	68 (9)	81 (15)
– farm operating budget	84 (8)	70 (13)	83 (7)	65 (30)
– farm business plan	62 (14)	65 (14)	53 (30)	58 (32)

*Continued* ⇨

## LANDCARE AND FARM FORESTRY

A slightly higher proportion of non-Landcare members' plans contained farm budget and business plan information, but in the Northern Territory this situation was reversed with Landcare members concentrating more on business planning and budgets than did non-Landcare members.

### *Farm management practices*

The adoption of best management practices is one of the four key reporting areas for the Natural Heritage Trust. Consequently, part of the 1998-99

### **10** *Farm planning: all broadacre and dairy industries, by state and Landcare membership, 1998-99* continued

	Western Australia		Tasmania	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers who had a farm plan	18 (35)	52 (16)	10 (39)	28 (22)
Farmers who used the plan to make management or development decisions <sup>a</sup>	72 (31)	85 (8)	100 (0)	77 (16)
Proportion of farm plans that contained:				
– information on soils/land capability	80 (12)	75 (12)	50 (48)	78 (17)
– information on existing or proposed land care works	37 (62)	71 (12)	20 (79)	100 (0)
– farm operating budget	85 (25)	78 (12)	100 (0)	76 (16)
– farm business plan	83 (15)	59 (13)	100 (0)	69 (17)
	Northern Territory		Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers who had a farm plan	16 (53)	32 (18)	19 (11)	40 (7)
Farmers who used the plan to make management or development decisions <sup>a</sup>	66 (31)	76 (12)	76 (7)	81 (6)
Proportion of farm plans that contained:				
– information on soils/land capability	100 (0)	82 (12)	59 (9)	76 (5)
– information on existing or proposed land care works	100 (0)	86 (10)	52 (10)	75 (5)
– farm operating budget	66 (31)	93 (7)	74 (6)	66 (8)
– farm business plan	66 (31)	84 (13)	62 (9)	58 (8)

<sup>a</sup> Proportion of farmers with a farm plan.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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resource management survey was on farm management practices that were part of the respondent's farm management program. While the survey focused on practices that would generally be consistent with sustainable resource management, they may not always be the most profitable. For example, preserving or enhancing farm areas of conservation value may require a farmer to make direct expenditures or forgo income producing opportunities.

All farms were asked about generic conservation practices designed to prevent land and water degradation, or to preserve areas or features of conservation value. Approximately 60 per cent of broadacre and dairy farmers stated that they maintained vegetative cover along drainage lines to minimise water erosion (table 11), while 45 per cent also preserved or enhanced areas of conservation value on their farms. Across Australian broadacre and dairy industries, Landcare members had higher rates of adoption of all farm management programs than non-Landcare members.

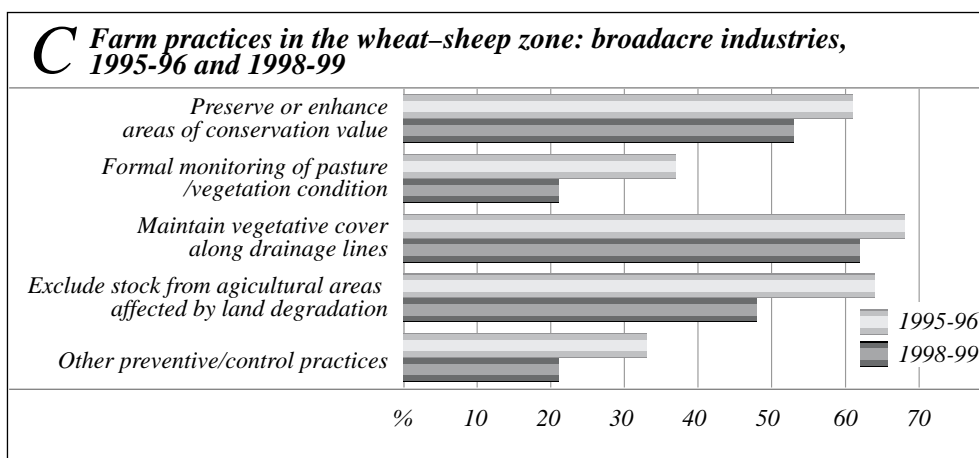
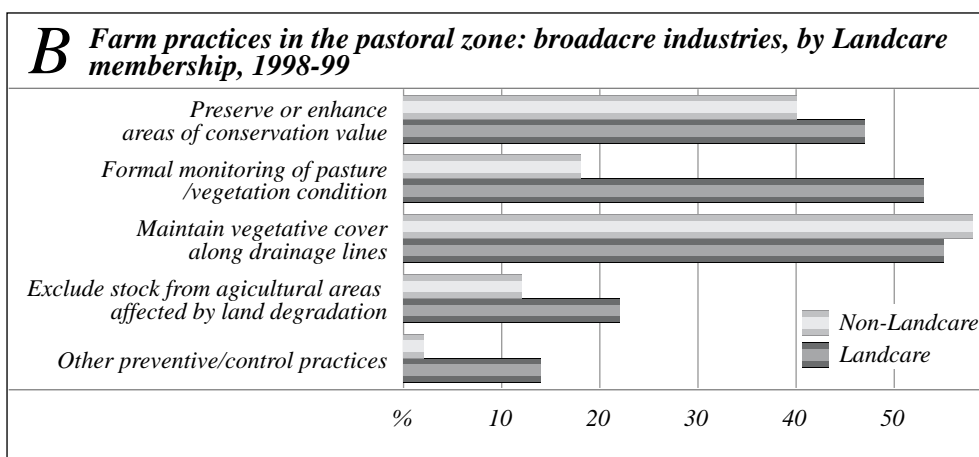
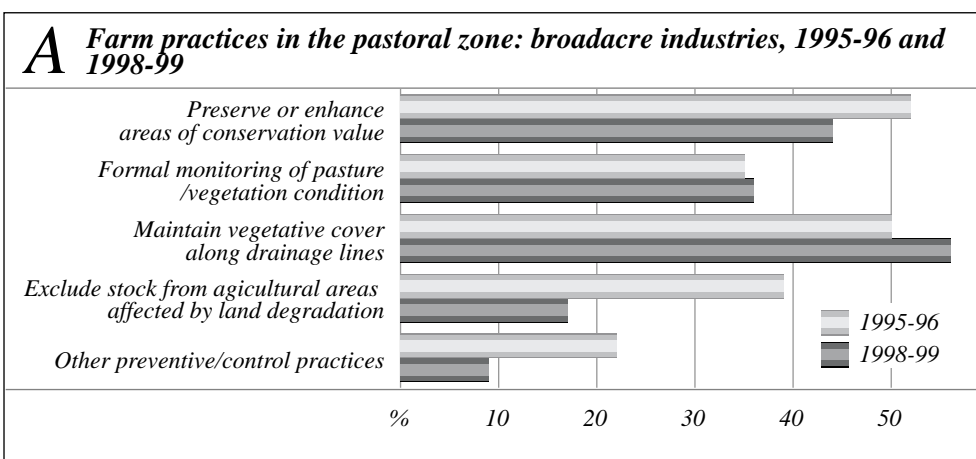
Around 40 per cent of farms in the pastoral zone preserve or enhance areas of conservation value on their properties (figure A). This is a reduction from the 1995-96 survey when 52 per cent of farms reported that they follow this practice. Compared with 1995-96, farmers in the pastoral zone were also less likely to have excluded stock from areas affected by land degradation. Landcare members in the pastoral zone in 1998-99 were almost three times more likely than non-Landcare members to practice formal monitoring of pasture/vegetation conditions (figure B).

### **11** *Farm practices: all broadacre and dairy industries, by Landcare membership, 1998-99*

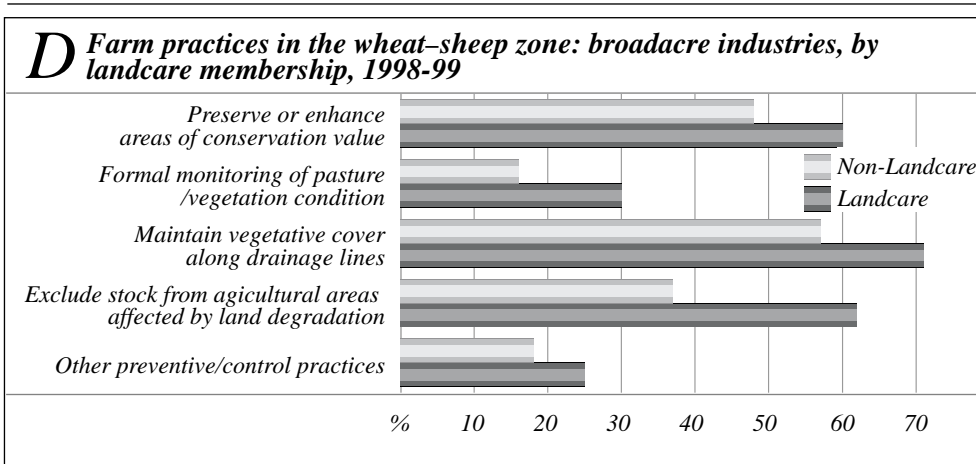
	Non-Landcare	Landcare	All farms
	%	%	%
Farm practices that were part of farmers' farm management program <sup>a</sup>			
– preserve or enhance areas of conservation value	40 (6)	52 (7)	45 (5)
– formal monitoring of pasture/vegetation condition	18 (11)	32 (11)	23 (8)
– maintain vegetative cover along drainage lines	56 (4)	67 (4)	60 (3)
– exclude stock from agricultural areas affected by land degradation	27 (9)	51 (6)	36 (5)
– other preventive/control practices	13 (13)	19 (14)	15 (10)

<sup>a</sup> Proportion of farms that indicated the practice was applicable to the farm's location, enterprise mix or situation.  
*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

## LANDCARE AND FARM FORESTRY

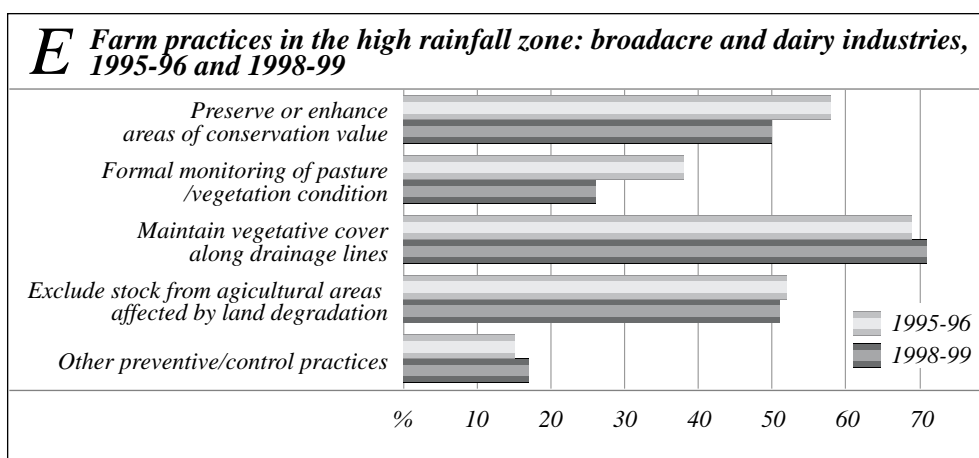


## LANDCARE AND FARM FORESTRY

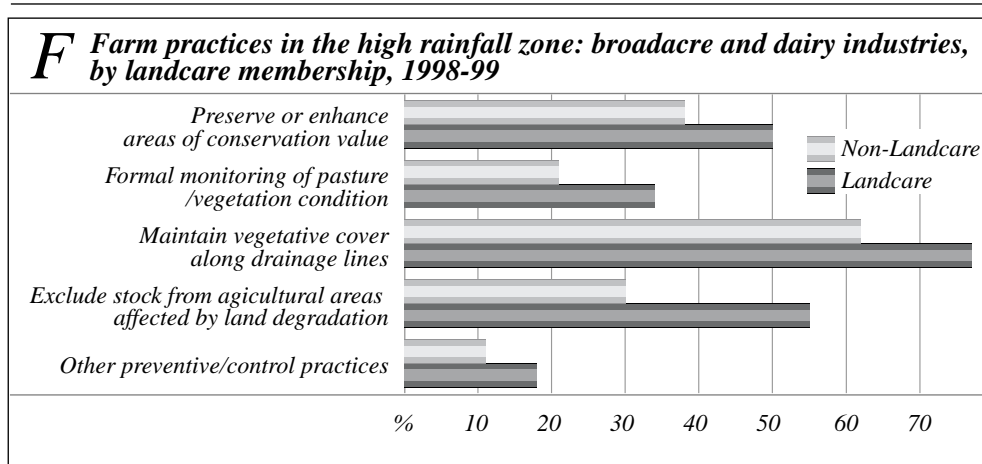


More than half of the farmers in the wheat–sheep zone stated that they maintain vegetative cover along drainage lines (figure C). Preserving or enhancing areas of conservation value was the second most common farm practice across all broadacre farms in the wheat–sheep zone in 1998-99, with nearly half carrying out this practice. However, the proportion of farms in the wheat–sheep zone who reported having this farm practice as part of their overall farm management program has fallen since the 1995-96 survey, when the proportion of farms was 61 per cent. More Landcare members than non-Landcare members undertook preventive or control measures in 1998-99 (figure D).

Broadacre and dairy farmers in the high rainfall zone reported the highest incidence of all the agricultural zones of maintaining vegetative cover along drainage lines (figure E), reflecting the need to prevent water erosion given



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the higher rainfall received in these areas. The use of this farm management practice was also relatively unchanged from the 1995-96 survey. Consistent with the results across other farming zones, a greater proportion of Landcare members than non-Landcare members in the high rainfall zone undertake farm practices which are aimed at preventing and controlling degradation problems as part of their overall farm management program (figure F).

### *Cultivation techniques*

The Landcare and land management survey collected detailed information on crop cultivation techniques in both the 1995-96 and 1998-99 surveys. All farmers who had sown crops in 1998-99 were asked to state the proportion of their crop area prepared using different cultivation methods. For the purposes of the 1998-99 resource management survey, cultivation techniques were defined in greater detail than in the 1995-96 survey. Cultivation techniques in the 1995-96 survey were defined as either direct drilling, minimum/reduced tillage or traditional cultivation techniques. These definitions remained for the 1998-99 survey; however, each definition was separated in two to obtain greater detail on stubble management.

Across all broadacre and dairy industries, traditional cultivation techniques, defined as repeated cultivations to prepare the soil for planting, were the most widely used cultivation technique (figure G). Direct drilling and minimum tillage techniques were equally popular across the broadacre and dairy industries. Minimum tillage and direct drilling aim to reduce soil erosion and maximise moisture retention by retaining ground cover and reducing the frequency of tillage. Landcare members were twice as likely as non-Landcare members to have used direct drilling for cultivation in 1998-99, and less likely

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### **12** Conservation tillage practices on farms that harvested crops in 1998-99: broadacre industries, by state and Landcare membership, 1998-99

	New South Wales		
	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	16 (19)	26 (30)	20 (18)
– direct drilling, stubble burnt/cut/grazed	11 (30)	32 (24)	18 (19)
– minimum tillage, stubble ploughed in	12 (26)	22 (30)	16 (20)
– minimum tillage, stubble burnt/cut/grazed	14 (27)	21 (31)	16 (21)
– traditional cultivation, stubble ploughed in	62 (8)	50 (13)	58 (8)
– traditional cultivation, stubble burnt/cut/grazed	12 (34)	19 (30)	15 (24)
	Victoria		
	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	10 (34)	17 (23)	13 (19)
– direct drilling, stubble burnt/cut/grazed	14 (37)	17 (31)	15 (25)
– minimum tillage, stubble ploughed in	19 (29)	27 (21)	23 (18)
– minimum tillage, stubble burnt/cut/grazed	18 (28)	27 (21)	22 (18)
– traditional cultivation, stubble ploughed in	48 (17)	31 (19)	41 (13)
– traditional cultivation, stubble burnt/cut/grazed	21 (23)	25 (24)	23 (16)
	Queensland		
	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	12 (42)	44 (34)	18 (33)
– direct drilling, stubble burnt/cut/grazed	4 (38)	5 (60)	5 (31)
– minimum tillage, stubble ploughed in	17 (41)	29 (43)	20 (34)
– minimum tillage, stubble burnt/cut/grazed	6 (35)	4 (78)	6 (32)
– traditional cultivation, stubble ploughed in	51 (17)	72 (17)	55 (15)
– traditional cultivation, stubble burnt/cut/grazed	21 (31)	2 (56)	17 (31)

Continued ⇨

## LANDCARE AND FARM FORESTRY

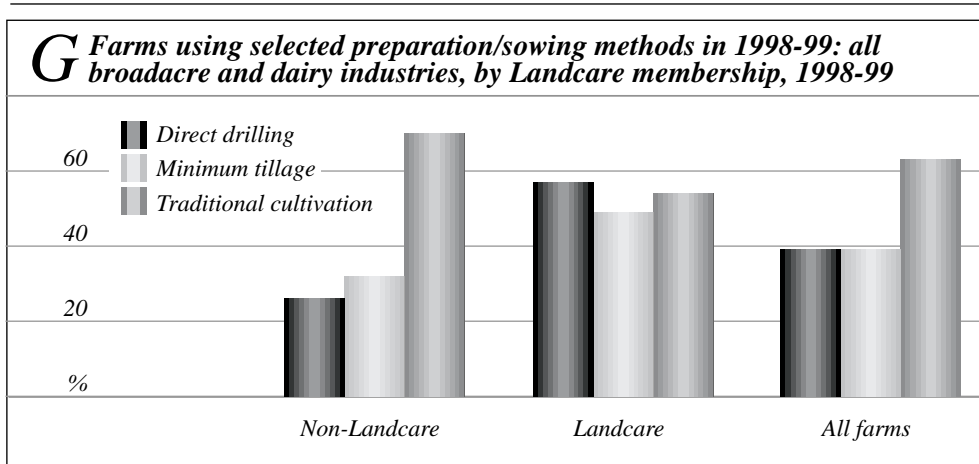
### **12 Conservation tillage practices on farms that harvested crops in 1998-99: broadacre industries, by state and Landcare membership, 1998-99** *continued*

<b>South Australia</b>			
	<b>Non-Landcare</b>	<b>Landcare</b>	<b>All farms</b>
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	18 (28)	24 (36)	20 (21)
– direct drilling, stubble burnt/cut/grazed	21 (37)	15 (51)	19 (35)
– minimum tillage, stubble ploughed in	25 (21)	29 (41)	26 (19)
– minimum tillage, stubble burnt/cut/grazed	29 (21)	61 (21)	39 (19)
– traditional cultivation, stubble ploughed in	24 (23)	22 (40)	23 (19)
– traditional cultivation, stubble burnt/cut/grazed	36 (22)	9 (93)	27 (27)
<b>Western Australia</b>			
	<b>Non-Landcare</b>	<b>Landcare</b>	<b>All farms</b>
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	16 (47)	54 (15)	41 (14)
– direct drilling, stubble burnt/cut/grazed	8 (52)	44 (20)	32 (20)
– minimum tillage, stubble ploughed in	18 (52)	17 (37)	17 (30)
– minimum tillage, stubble burnt/cut/grazed	9 (61)	19 (35)	15 (32)
– traditional cultivation, stubble ploughed in	48 (28)	18 (36)	29 (25)
– traditional cultivation, stubble burnt/cut/grazed	22 (38)	18 (45)	19 (32)
<b>Tasmania</b>			
	<b>Non-Landcare</b>	<b>Landcare</b>	<b>All farms</b>
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 a:			
– direct drilling into previous crop stubble	11 (82)	24 (37)	20 (32)
– direct drilling, stubble burnt/cut/grazed	6 (88)	3 (105)	4 (70)
– minimum tillage, stubble ploughed in	39 (46)	27 (45)	30 (34)
– minimum tillage, stubble burnt/cut/grazed	15 (85)	12 (63)	13 (49)
– traditional cultivation, stubble ploughed in	49 (37)	67 (19)	61 (18)
– traditional cultivation, stubble burnt/cut/grazed	–	–	–

**a** Includes only those farms that cropped in 1998-99. Total may not add up to 100 as farms may use more than one preparation method.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

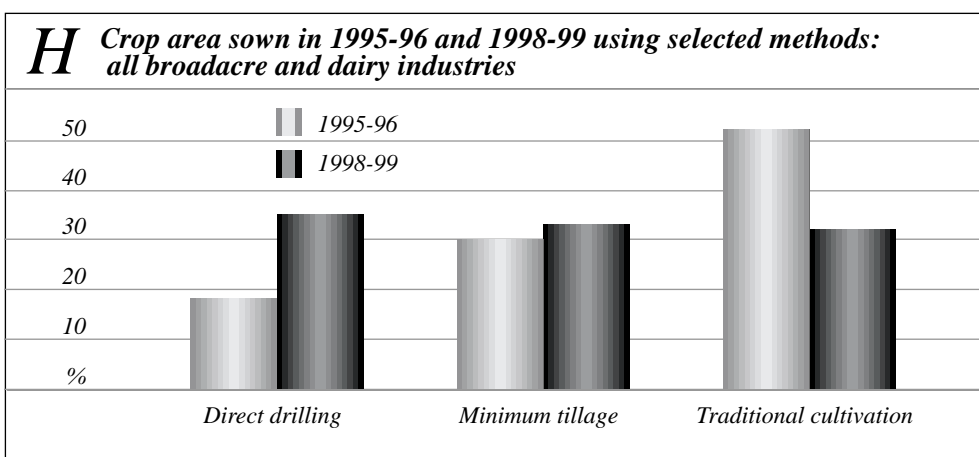
## LANDCARE AND FARM FORESTRY



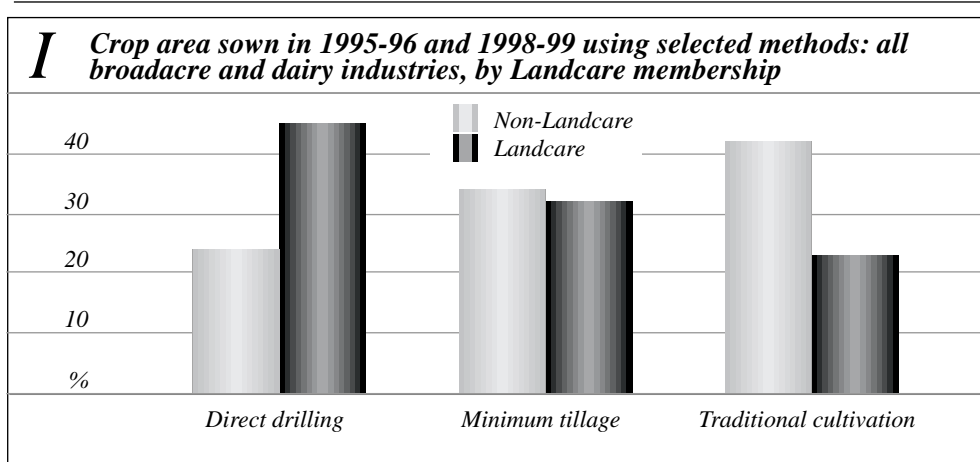
than non-Landcare members to have used traditional cultivation techniques (figure G).

Similar findings are apparent in all states, except Tasmania (table 12). While Tasmanian Landcare members were more likely than non-Landcare members to use direct drilling (as in the other states), they were less likely to use minimum tillage. Also Tasmanian Landcare members were more likely to use traditional cultivation methods than non-Landcare members.

Around a third of the Australian crop area in 1998-99 was sown using traditional cultivation techniques, with direct drilling and minimum tillage each accounting for the other two-thirds (figure H). Traditional cultivation techniques accounted for approximately half of the crop area sown in 1995-96. Landcare members across Australia, on average, prepared a significantly



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greater proportion of their crop area using direct drilling than did non-Landcare members (figure I). The use of direct drilling and minimum tillage is generally higher in Western Australia and South Australia, mainly because these

### **13** *Conservation tillage practices in the pastoral zone on farms that harvested crops in 1998-99: broadacre industries, by Landcare membership, 1998-99*

	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 <b>ab</b> :			
– direct drilling into previous crop stubble	2 (111)	42 (66)	7 (53)
– direct drilling, stubble burnt/cut/grazed	2 (111)	26 (139)	5 (138)
– minimum tillage, stubble ploughed in	39 (24)	30 (74)	37 (22)
– minimum tillage, stubble burnt/cut/grazed	6 (118)	–	5 (117)
– traditional cultivation, stubble ploughed in	40 (31)	45 (76)	41 (31)
– traditional cultivation, stubble burnt/cut/grazed	25 (50)	3 (204)	22 (53)
Total area of crop sown (ha) <b>a</b>	654 (37)	1 064 (56)	708 (32)
Proportion of crop area sown in 1998-99 using the following preparation/sowing methods <b>ab</b> :			
– direct drilling into previous crop stubble	3 (112)	20 (57)	6 (59)
– direct drilling, stubble burnt/cut/grazed	2 (112)	6 (127)	3 (78)
– minimum tillage, stubble ploughed in	42 (42)	32 (60)	40 (37)
– minimum tillage, stubble burnt/cut/grazed	9 (154)	–	7 (159)
– traditional cultivation, stubble ploughed in	27 (53)	38 (77)	29 (46)
– traditional cultivation, stubble burnt/cut/grazed	18 (89)	3 (349)	15 (85)

**a** Includes only those farms that cropped in 1998-99. **b** Total may not add up to 100 as farms may use more than one preparation method.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

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techniques are better suited to the soils found in these states. Stubble retention improves soil structure, increases organic matter and helps to protect soil from erosion (Lal 1990). Around 85 per cent of farms retained or ploughed stubble back in, representing 63 per cent of farm area.

Over 60 per cent of farms in the pastoral zone used traditional cultivation techniques in 1998-99 (table 13), while only a small proportion of farms used direct drilling methods. Traditional cultivation and minimum tillage accounted for the majority of the crop area sown in the pastoral zone in 1998-99. One factor that may explain the emphasis on traditional cultivation techniques in the pastoral zone in 1998-99 is weed problems, with a quarter of all farms in that zone reporting weed infestation problems in 1998-99. Land affected by heavy weed infestations, particularly woody weeds, often requires traditional cultivation in order to prepare the soil for sowing. Notwithstanding, Landcare members in the pastoral zone were more likely to be using direct drilling than non-Landcare members in 1998-99.

### **14** Conservation tillage practices in the wheat-sheep zone on farms that harvested crops in 1998-99: broadacre industries, by Landcare membership, 1998-99

	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 <b>ab</b> :			
– direct drilling into previous crop stubble	18 (15)	35 (12)	25 (10)
– direct drilling, stubble burnt/cut/grazed	12 (22)	27 (15)	18 (13)
– minimum tillage, stubble ploughed in	18 (17)	22 (17)	20 (12)
– minimum tillage, stubble burnt/cut/grazed	15 (17)	27 (16)	20 (12)
– traditional cultivation, stubble ploughed in	49 (9)	37 (11)	44 (7)
– traditional cultivation, stubble burnt/cut/grazed	21 (17)	20 (19)	21 (13)
Total area of crop sown (ha) <b>a</b>	431 (6)	678 (7)	533 (5)
Proportion of crop area sown in 1998-99 using the following preparation/sowing methods <b>ab</b> :			
– direct drilling into previous crop stubble	17 (19)	28 (14)	23 (11)
– direct drilling, stubble burnt/cut/grazed	8 (21)	17 (18)	13 (14)
– minimum tillage, stubble ploughed in	19 (22)	19 (20)	19 (15)
– minimum tillage, stubble burnt/cut/grazed	14 (18)	13 (19)	13 (13)
– traditional cultivation, stubble ploughed in	30 (19)	13 (18)	21 (14)
– traditional cultivation, stubble burnt/cut/grazed	11 (26)	9 (29)	10 (19)

**a** Includes only those farms that cropped in 1998-99. **b** Total may not add up to 100 as farms may use more than one preparation method.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### **15** *Conservation tillage practices in the high rainfall zone on farms that harvested crops in 1998-99: all broadacre and dairy industries, by Landcare membership, 1998-99*

	Non-Landcare	Landcare	All farms
	%	%	%
Proportion of farms using the following preparation/sowing methods in 1998-99 <b>ab</b> :			
– direct drilling into previous crop stubble	7 (28)	17 (30)	11 (22)
– direct drilling, stubble burnt/cut/grazed	12 (33)	23 (28)	16 (22)
– minimum tillage, stubble ploughed in	14 (26)	28 (25)	19 (18)
– minimum tillage, stubble burnt/cut/grazed	16 (24)	21 (30)	18 (20)
– traditional cultivation, stubble ploughed in	53 (12)	33 (19)	46 (10)
– traditional cultivation, stubble burnt/cut/grazed	18 (17)	11 (45)	16 (17)
 Total area of crop sown (ha) <b>a</b>	 105 (9)	 164 (24)	 126 (12)
Proportion of crop area sown in 1998-99 using <b>ab</b> : the following preparation/sowing methods			
– direct drilling into previous crop stubble	8 (37)	22 (82)	15 (63)
– direct drilling, stubble burnt/cut/grazed	14 (38)	15 (47)	14 (30)
– minimum tillage, stubble ploughed in	15 (29)	16 (40)	15 (24)
– minimum tillage, stubble burnt/cut/grazed	15 (25)	22 (34)	18 (22)
– traditional cultivation, stubble ploughed in	37 (17)	23 (34)	30 (17)
– traditional cultivation, stubble burnt/cut/grazed	12 (36)	2 (61)	7 (35)

**a** Includes only those farms that cropped in 1998-99. **b** Total may not add up to 100 as farms may use more than one preparation method.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

Around 60 per cent of broadacre and dairy farms in both the wheat–sheep and high rainfall zones were likely to have used traditional cultivation techniques in 1998-99 (tables 14 and 15). However, Landcare members in these zones appear to have more commonly adopted direct drilling and minimum tillage into their crop management systems than non-Landcare members.

Further discussion of the level of adoption of other best farm management practices is presented in chapter 4.

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### 3. Land degradation problems

A goal of the Natural Heritage Trust is to encourage the conservation, sustainable use and repair of Australia's soil, water and vegetation resources. To collect information on the extent and distribution of land degradation problems across Australia, farmers participating in the resource management survey were asked to indicate which, of a number of alternative forms of land degradation, were significant problems on their properties during 1998-99. Respondents were not asked to rank or weight the identified problems in terms of their relative severity.

#### **16** *Reported land degradation problems: all broadacre and dairy industries, by agricultural zone, 1998-99*

	Pastoral zone	Wheat-sheep zone	High rainfall zone	Australia
	%	%	%	%
Farmers reporting significant problems on their property	34 (22)	38 (7)	33 (10)	36 (6)
Significant problems:				
– soil acidity	1 (83)	11 (17)	10 (24)	10 (15)
– water erosion	10 (37)	9 (18)	12 (20)	11 (13)
– wind erosion	4 (41)	2 (25)	2 (35)	2 (19)
– dryland salinity	1 (65)	11 (16)	5 (26)	8 (13)
– irrigation salinity	–	4 (22)	–	2 (21)
– salinity	1 (65)	15 (13)	5 (25)	10 (12)
– soil sodicity	–	4 (24)	2 (35)	3 (20)
– loss of soil structure	1 (51)	7 (17)	3 (26)	5 (14)
– surface waterlogging	1 (57)	9 (17)	5 (26)	7 (14)
– weed infestation	25 (27)	15 (14)	16 (16)	16 (10)
Characteristics of farms reporting degradation problems: <b>a</b>				
– area operated	54 363 (26)	1 792 (9)	914 (18)	3 920 (18)
– area of farm affected by land degradation	10 029 (34)	464 (12)	206 (16)	812 (20)
Farmers' perceived status of degradation problems: <b>a</b>				
– will worsen	54 (32)	11 (20)	9 (36)	12 (16)
– stay the same	23 (36)	29 (13)	33 (15)	30 (10)
– improve	23 (69)	61 (7)	57 (10)	58 (6)

**a** Average for farms reporting degradation.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5

## *LANDCARE AND FARM FORESTRY*

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Over a third of farmers reported that they had significant land degradation problems on their properties (table 16). The incidence of degradation seems to have been the highest in the wheat–sheep zone, with 38 per cent of farmers reporting degradation problems.

The most commonly reported degradation problem on Australian broadacre and dairy farms was weed infestation. However, the incidence differed across the agricultural zones, with weed problems more frequently cited as a problem in the pastoral zone. Other frequently reported degradation problems were water erosion, soil acidity, dryland salinity and surface waterlogging. It is clear from the survey results that farmers in the wheat–sheep and high rainfall zones are confronted with a wider range of degradation problems than their counterparts in the pastoral zone.

### *Differences according to Landcare membership status*

Landcare members were generally more likely than non-Landcare members to have reported several of the degradation problems listed in the survey questionnaire (table 17). The reported incidence of weed infestation, water erosion, soil acidity and dryland salinity was substantially higher on Landcare farms than on non-Landcare farms, with Landcare members three or four times more likely to report these problems than non-Landcare members. Twice as many Landcare farmers reported weed infestation problems in the pastoral and high rainfall zones. In the wheat–sheep zone, however, non-Landcare members were just as likely to report weed infestation problems as Landcare members.

More than half of Landcare members reported land degradation problems on their properties in 1998-99 compared with only a quarter of non-Landcare members. This raises the question of whether Landcare members were more aware of the nature and signs of many of these problems and hence more likely to report them as a problem, or whether degradation problems on their property motivated farmers to join Landcare groups. As suggested by Mues, Chapman and Van Hilst (1998), this question is integral to understanding the role and effectiveness of awareness raising activities conducted under the National Landcare Program and the role of Landcare groups in addressing degradation.

### *State level issues*

Analysing the results by state clearly illustrates the difference in resource management issues across Australia. In New South Wales, weed infestation was the problem affecting the highest proportion of farmers, with water erosion and soil acidity also rating highly (table 18). In Western Australia, dryland

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salinity was the most common degradation problem affecting an estimated 21 per cent of the farm population. Surface waterlogging and soil acidity also affected 20 per cent of farms in Western Australia. Victorian farmers reported soil acidity and water erosion as the most frequently occurring problems. Irrigation salinity was also an issue for many of the irrigated farms in that state. In South Australia, weed infestation and dryland salinity were the most commonly reported problems. In the remaining states weed infestation and water erosion were commonly reported.

When analysing the state data by membership status (table 19), Landcare members were again more likely to report degradation problems than non-

### **17** *Reported land degradation problems: all broadacre and dairy industries, by agricultural zone and Landcare membership, 1998-99*

	Pastoral zone		Wheat-sheep zone	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers reporting significant problems on their property	22 (25)	47 (29)	29 (11)	53 (9)
Significant problems:				
– soil acidity	–	1 (87)	4 (40)	20 (19)
– water erosion	7 (54)	14 (43)	4 (31)	17 (20)
– wind erosion	1 (63)	6 (48)	1 (47)	5 (29)
– dryland salinity	–	2 (65)	5 (35)	21 (18)
– irrigation salinity	–	–	4 (29)	4 (32)
– salinity	–	2 (65)	8 (25)	25 (16)
– soil sodicity	–	–	4 (34)	4 (33)
– loss of soil structure	1 (62)	1 (89)	4 (32)	11 (22)
– surface waterlogging	1 (78)	1 (80)	6 (27)	13 (24)
– weed infestation	17 (34)	34 (38)	15 (18)	14 (22)
Characteristics of farms reporting degradation problems: a				
– area operated	37 835 (17)	61 934 (33)	2 097 (11)	1 542 (15)
– area of farm affected by land degradation	14 858 (55)	7 817 (35)	509 (21)	426 (16)
Farmers' perceived status of degradation problems: a				
– will worsen	53 (59)	54 (23)	10 (29)	12 (31)
– stay the same	30 (78)	20 (46)	35 (18)	23 (20)
– improve	18 (223)	25 (33)	55 (12)	65 (8)

*Continued ⇨*

## LANDCARE AND FARM FORESTRY

Landcare members. The exception was in the Northern Territory where non-Landcare members were equally likely to report problems. Greater numbers of non-Landcare members in the Northern Territory reported erosion as a problem with almost all of those reporting problems suffering water erosion and nearly half reporting wind erosion.

Questions on the presence of degradation problems were also included in the two previous Landcare and land management practices surveys conducted in 1992-93 and 1995-96 (Mues, Roper and Ockerby 1994; Mues, Chapman and Van Hilst 1998). Nine types of degradation were common to both the 1995-96 and the 1998-99 surveys and the reported incidence of most of these fell

### **17** *Reported land degradation problems: all broadacre and dairy industries, by agricultural zone and Landcare membership, 1998-99* continued

	High rainfall zone		Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers reporting significant problems on their property	22 (17)	55 (10)	25 (9)	53 (7)
Significant problems:				
– soil acidity	5 (31)	19 (32)	5 (25)	19 (17)
– water erosion	6 (37)	24 (24)	5 (24)	20 (15)
– wind erosion	1 (57)	5 (43)	1 (35)	5 (23)
– dryland salinity	1 (52)	13 (27)	3 (32)	17 (15)
– irrigation salinity	1 (84)	–	3 (27)	2 (32)
– salinity	1 (47)	13 (28)	5 (23)	19 (14)
– soil sodicity	1 (62)	5 (40)	2 (31)	4 (26)
– loss of soil structure	2 (39)	5 (37)	3 (25)	8 (19)
– surface waterlogging	3 (32)	9 (39)	5 (21)	11 (20)
– weed infestation	11 (26)	25 (23)	13 (14)	20 (15)
Characteristics of farms with degradation problems: <b>a</b>				
– area operated	702 (48)	1 079 (10)	2 747 (11)	4 839 (26)
– area of farm affected by land degradation	191 (30)	219 (23)	866 (42)	770 (22)
Farmers' perceived status of degradation problems: <b>a</b>				
– will worsen	3 (98)	14 (36)	9 (25)	15 (20)
– stay the same	36 (22)	31 (26)	35 (14)	26 (16)
– improve	61 (14)	55 (14)	56 (9)	59 (7)

**a** Average for farms reporting degradation.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

## LANDCARE AND FARM FORESTRY

substantially between the two surveys (table 20). Seven types of degradation problem reported in the 1992-93 survey were also common to the two subsequent surveys and these, too, are reported in table 20. In the 1992-93 survey, the incidence of water erosion was reported to be the highest with weeds the second highest occurring problem. While the reports of several types of degradation problems appeared to increase over the three years between 1992-93 and 1995-96, the most striking increases were weed infestation and soil structure decline, which more than doubled. In the 1998-99 survey, weed infestation and water erosion remained as the most often reported land degradation problems, but their reported incidences dropped by two-thirds. All other reported problems also appear to have declined substantially since the 1995-96 survey.

### *18* Reported land degradation problems: all broadacre and dairy industries, by state, 1998-99

	New South Wales	Victoria	Queens- land	South Australia
	%	%	%	%
Farmers reporting significant problems on their property	44 (9)	33 (12)	27 (17)	31 (18)
Significant problems:				
– soil acidity	12 (26)	11 (28)	2 (61)	5 (43)
– water erosion	15 (21)	10 (30)	9 (25)	4 (62)
– wind erosion	1 (64)	2 (31)	1 (48)	6 (42)
– dryland salinity	7 (37)	8 (20)	–	11 (32)
– irrigation salinity	1 (39)	7 (25)	–	1 (52)
– salinity	8 (32)	13 (16)	–	11 (31)
– soil sodicity	3 (36)	2 (37)	4 (49)	1 (63)
– loss of soil structure	4 (30)	4 (29)	2 (46)	5 (42)
– surface waterlogging	9 (29)	4 (27)	4 (44)	1 (44)
– weed infestation	24 (13)	9 (28)	17 (25)	15 (32)
Characteristics of farms reporting degradation problems: a				
– area operated	1 762 (18)	455 (10)	12 008 (46)	3 933 (27)
– area of farm affected by land degradation	361 (20)	119 (14)	2 421 (50)	878 (29)
Farmers' perceived status of degradation problems: a				
– will worsen	11 (33)	7 (35)	23 (29)	8 (54)
– stay the same	35 (17)	29 (16)	36 (15)	35 (28)
– improve	55 (12)	64 (7)	41 (19)	57 (18)

Continued ⇨

## LANDCARE AND FARM FORESTRY

Across zones, too, results differ between the 1992-93 survey and the 1995-96 survey. Many more farmers in the wheat–sheep and the high rainfall zones had begun to recognise weeds as a problem over that period, while in the pastoral zone the reported incidence of weed problems declined. But the incidence of weed infestation appears to have declined further in all zones since the 1995-96 survey.

Degradation problems reported in all three surveys are shown in table 21 by state. In New South Wales, weed infestation and water erosion were reported to be the most frequently occurring problems across all three surveys. In Victoria, however, soil acidity and water erosion had taken over in importance in the most recent survey from weed infestation and surface waterlogging, the

### **18** *Reported land degradation problems: all broadacre and dairy industries, by state, 1998-99*

	Western Australia	Tasmania	Northern Territory	Australia
	%	%	%	%
Farmers reporting significant problems on their property	42 (12)	20 (27)	22 (29)	36 (6)
Significant problems:				
– soil acidity	18 (23)	2 (54)	–	10 (15)
– water erosion	12 (25)	7 (46)	13 (41)	11 (13)
– wind erosion	6 (33)	–	5 (67)	2 (20)
– dryland salinity	21 (18)	1 (74)	5 (71)	8 (13)
– irrigation salinity	–	–	–	2 (21)
– salinity	21 (18)	1 (74)	5 (72)	10 (12)
– soil sodicity	5 (41)	1 (107)	–	3 (20)
– loss of soil structure	12 (24)	1 (107)	4 (91)	5 (14)
– surface waterlogging	20 (20)	3 (53)	1 (108)	7 (15)
– weed infestation	8 (34)	13 (40)	17 (33)	16 (10)
Characteristics of farms reporting degradation problems: <b>a</b>				
– area operated	6 422 (33)	1 501 (34)	330 457 (22)	3 920 (18)
– area of farm affected by land degradation	1 297 (24)	233 (62)	69 933 (72)	812 (20)
Farmers' perceived status of degradation problems: <b>a</b>				
– will worsen	18 (35)	28 (68)	48 (21)	12 (16)
– stay the same	13 (43)	27 (49)	33 (33)	30 (10)
– improve	69 (11)	45 (35)	19 (50)	58 (6)

**a** Average for farms reporting degradation.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

## LANDCARE AND FARM FORESTRY

more often reported problems in 1995-96. In Queensland, water erosion and wind erosion were reported by many more farmers in earlier surveys, with weed infestation remaining the most often reported problem in all three surveys. Dryland salinity remained an often reported problem in both South Australia and Western Australia in all three surveys.

Differences in survey questionnaire design could account for some of these differences between years. In the 1995-96 survey farmers were asked if they had suffered significant land degradation problems on their properties over the past three years (that is, at any time between 1993-94 and 1995-96). In the 1998-99 survey, however, farmers were only asked to report problems that they had experienced over the 1998-99 survey years. This may account for

### **19** *Reported land degradation problems: all broadacre and dairy industries, by state and Landcare membership, 1998-99*

	New South Wales		Victoria	
	Non-Landcare %	Landcare %	Non-Landcare %	Landcare %
Farmers reporting significant problems on their property	32 (15)	68 (9)	24 (20)	45 (15)
Significant problems:				
– soil acidity	6 (41)	22 (32)	4 (55)	21 (31)
– water erosion	8 (36)	27 (25)	4 (68)	17 (33)
– wind erosion	–	3 (73)	1 (64)	3 (38)
– dryland salinity	3 (66)	14 (43)	3 (44)	14 (23)
– irrigation salinity	1 (65)	3 (48)	8 (31)	4 (44)
– salinity	4 (57)	17 (37)	9 (28)	17 (21)
– soil sodicity	5 (38)	1 (80)	1 (80)	5 (40)
– loss of soil structure	2 (41)	7 (43)	3 (53)	5 (41)
– surface waterlogging	6 (37)	16 (40)	3 (39)	4 (48)
– weed infestation	19 (20)	33 (20)	7 (33)	12 (43)
Characteristics of farms reporting degradation problems: <b>a</b>				
– area operated	1 906 (16)	1 633 (32)	354 (25)	525 (9)
– area of farm affected by land degradation	484 (29)	252 (23)	95 (32)	135 (16)
Farmers' perceived status of degradation problems: <b>a</b>				
– will worsen	9 (41)	12 (45)	3 (92)	10 (40)
– stay the same	35 (25)	34 (24)	34 (24)	25 (28)
– improve	56 (16)	53 (16)	63 (13)	65 (11)

*Continued* ⇨

## *LANDCARE AND FARM FORESTRY*

some of the apparent fall in incidence of land degradation problems, although this is likely to be a less feasible explanation for degradation issues that take considerable time to emerge.

Analysis of the panel sample of farms common to both the 1995-96 and the 1998-99 surveys refutes the proposition that the reduction in the number of farmers experiencing land degradation problems was caused by changes in the survey sample. The panel sample analysis upholds the results of the full sample analysis. That is, the proportion of farmers common to both surveys reporting land degradation problems has declined in all zones for each problem common to the two surveys. The exception, however, is the proportion of (common

### *19* *Reported land degradation problems: all broadacre and dairy industries, by state and Landcare membership, 1998-99* *continued*

	Queensland		South Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers reporting significant problems on their property	18 (26)	50 (21)	27 (23)	43 (28)
Significant problems:				
– soil acidity	–	9 (58)	5 (52)	4 (74)
– water erosion	5 (29)	20 (32)	2 (64)	9 (86)
– wind erosion	–	3 (60)	3 (56)	14 (56)
– dryland salinity	–	–	4 (49)	28 (37)
– irrigation salinity	–	–	1 (58)	–
– salinity	–	–	4 (41)	28 (38)
– soil sodicity	–	14 (44)	1 (98)	1 (81)
– loss of soil structure	2 (61)	4 (69)	2 (64)	14 (50)
– surface waterlogging	4 (50)	3 (83)	2 (44)	–
– weed infestation	12 (38)	30 (31)	16 (36)	14 (54)
Characteristics of farms reporting degradation problems: a				
– area operated	7 441 (22)	16 588 (66)	3 284 (26)	4 880 (47)
– area of farm affected by land degradation	2 726 (93)	2 116 (39)	903 (35)	841 (62)
Farmers' perceived status of degradation problems: a				
– will worsen	13 (44)	33 (35)	13 (63)	2 (92)
– stay the same	51 (28)	20 (79)	36 (32)	33 (77)
– improve	36 (38)	47 (27)	50 (28)	65 (24)

*Continued ⇨*

## LANDCARE AND FARM FORESTRY

sample) farmers reporting irrigation or dryland salinity as a problem in the wheat–sheep zone, which has not declined.

There is a range of possible reasons why the reported incidence of land degradation fell over the period between the two surveys. These include changes in landholder perceptions over what constitutes a significant problem or the adoption of new management practices may be adequately addressing the on-farm problems. Given that more than 80 per cent of farmers expect the status of degradation problem to either improve or stay the same, this may lend some support to the latter. However, more analysis may be required before an unequivocal answer can be given.

### *19* Reported land degradation problems: all broadacre and dairy industries, by state and Landcare membership, 1998-99 *continued*

	Western Australia		Tasmania	
	Non-Landcare %	Landcare %	Non-Landcare %	Landcare %
Farmers reporting significant problems on their property	25 (29)	55 (14)	7 (64)	39 (25)
Significant problems:				
– soil acidity	9 (49)	25 (27)	–	4 (61)
– water erosion	3 (55)	19 (28)	5 (92)	10 (59)
– wind erosion	–	10 (34)	–	–
– dryland salinity	4 (72)	33 (20)	–	3 (75)
– irrigation salinity	–	1 (114)	–	–
– salinity	4 (72)	34 (20)	–	3 (75)
– soil sodicity	5 (65)	4 (56)	–	2 (107)
– loss of soil structure	6 (59)	16 (29)	–	2 (107)
– surface waterlogging	12 (47)	25 (24)	–	8 (52)
– weed infestation	7 (59)	9 (44)	7 (67)	21 (43)
Characteristics of farms reporting degradation problems: a				
– area operated	2 261 (59)	7 868 (34)	1 226 (144)	1 583 (26)
– area of farm affected by land degradation	692 (40)	1 507 (29)	92 (118)	274 (64)
Farmers' perceived status of degradation problems: a				
– will worsen	11 (83)	21 (41)	24 (89)	30 (71)
– stay the same	12 (95)	13 (47)	–	35 (52)
– improve	78 (18)	67 (13)	76 (28)	36 (33)

*Continued* ⇨

## LANDCARE AND FARM FORESTRY

### *Multiple land degradation problems*

The results of the survey indicate that farmers can be dealing with multiple land degradation problems. However, as can be seen in map 3, farmers reporting multiple degradation problems seem to be concentrated in a limited number of regions. In particular, farmers reporting two or more problems are located in the Western Australian agricultural regions north of Perth and south around Albany, the pastoral regions of the Northern Territory, central Queensland around Rockhampton and the Central Tablelands region of New South Wales.

### **19** *Reported land degradation problems: all broadacre and dairy industries, by state and Landcare membership, 1998-99 continued*

	Northern Territory		Australia	
	Non-Landcare	Landcare	Non-Landcare	Landcare
	%	%	%	%
Farmers reporting significant problems on their property	22 (50)	22 (29)	25 (9)	53 (7)
Significant problems:				
– soil acidity	–	–	5 (25)	19 (17)
– water erosion	20 (58)	8 (46)	5 (24)	20 (15)
– wind erosion	10 (84)	2 (88)	1 (35)	5 (23)
– dryland salinity	–	8 (67)	3 (32)	17 (15)
– irrigation salinity	–	–	3 (28)	2 (32)
– salinity	–	8 (67)	5 (23)	19 (14)
– soil sodicity	–	–	2 (31)	4 (26)
– loss of soil structure	9 (84)	–	3 (25)	8 (19)
– surface waterlogging	–	2 (107)	5 (21)	11 (20)
– weed infestation	13 (71)	19 (34)	13 (14)	20 (15)
Characteristics of farms reporting degradation problems: <b>a</b>				
– area operated	239 653 (19)	384 174 (29)	2 747 (11)	4 839 (26)
– area of farm affected by land degradation	94 511 (51)	55 394 (118)	866 (42)	770 (22)
Farmers' perceived status of degradation problems: <b>a</b>				
– will worsen	12 (103)	69 (25)	9 (25)	15 (20)
– stay the same	46 (59)	25 (68)	35 (14)	26 (16)
– improve	42 (64)	6 (119)	56 (9)	59 (7)

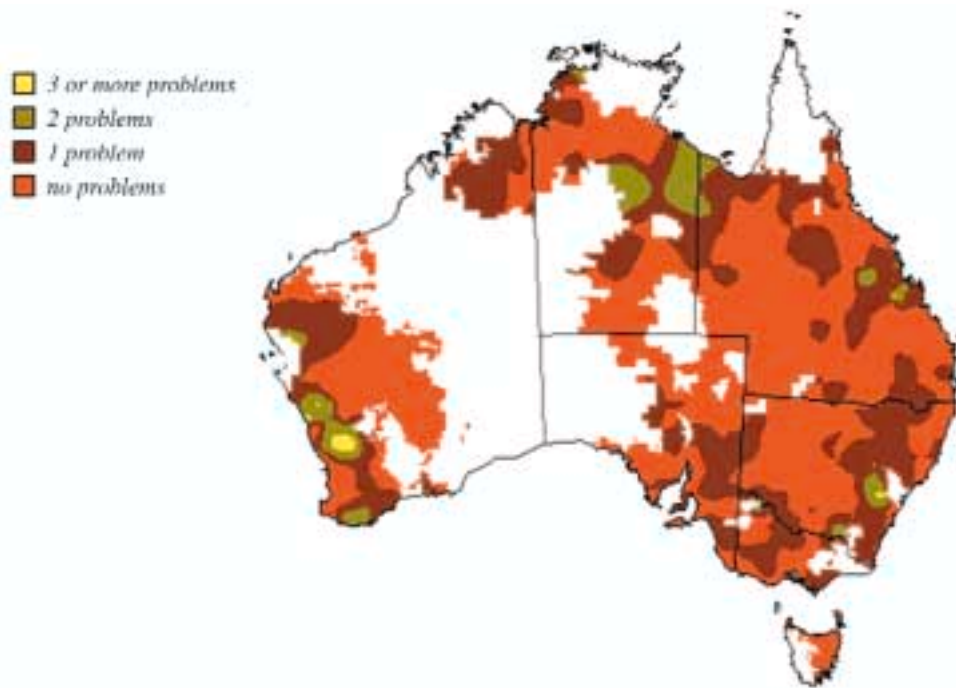
**a** Average for farms reporting degradation.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### 3 Average number of degradation problems on farms, 1998-99

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## LANDCARE AND FARM FORESTRY

### 20 *Reported land degradation problems: all broadacre and dairy industries, by zone, 1992-93, 1995-96 and 1998-99*

	Pastoral zone		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	–	2 (73)	1 (83)
– water erosion	32 (14)	27 (20)	10 (37)
– wind erosion	11 (21)	23 (25)	4 (41)
– dryland salinity	3 (60)	2 (61)	1 (65)
– irrigation salinity	–	–	–
– soil sodicity <b>b</b>	–	2 (73)	–
– loss of soil structure	11 (27)	13 (42)	1 (51)
– surface waterlogging <b>b</b>	–	5 (37)	1 (57)
– weed infestation <b>a</b>	49 (8)	41 (9)	25 (27)
	Wheat–sheep zone		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	14 (11)	23 (8)	11 (17)
– water erosion	28 (7)	30 (8)	9 (18)
– wind erosion	8 (12)	14 (14)	2 (25)
– dryland salinity	16 (10)	16 (13)	11 (16)
– irrigation salinity	6 (17)	6 (19)	4 (22)
– soil sodicity <b>b</b>	–	7 (16)	4 (24)
– loss of soil structure	10 (14)	22 (12)	7 (17)
– surface waterlogging <b>b</b>	–	26 (9)	9 (17)
– weed infestation	15 (9)	50 (5)	15 (14)
	High rainfall zone		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	13 (14)	24 (9)	10 (24)
– water erosion	25 (11)	23 (11)	12 (20)
– wind erosion	3 (30)	3 (23)	2 (35)
– dryland salinity	13 (15)	11 (14)	5 (26)
– irrigation salinity	–	4 (24)	–
– soil sodicity <b>b</b>	–	8 (22)	2 (35)
– loss of soil structure	6 (22)	14 (14)	3 (26)
– surface waterlogging <b>b</b>	–	29 (8)	5 (26)
– weed infestation	21 (13)	45 (6)	16 (16)

Continued ⇨

## LANDCARE AND FARM FORESTRY

### 20 *Reported land degradation problems: all broadacre and dairy industries, by zone, 1992-93, 1995-96 and 1998-99 continued*

	Australia		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	13 (9)	23 (6)	10 (15)
– water erosion	27 (6)	26 (6)	11 (13)
– wind erosion	6 (12)	9 (11)	2 (19)
– dryland salinity	14 (9)	13 (9)	8 (13)
– irrigation salinity	4 (20)	5 (15)	2 (21)
– soil sodicity <b>b</b>		7 (14)	3 (20)
– loss of soil structure	8 (12)	18 (6)	5 (14)
– surface waterlogging <b>b</b>		27	7 (14)
– weed infestation <b>a</b>	19 (7)	47 (4)	16 (10)

**a** In the 1992-93 survey, weed infestation was defined as woody weeds only. **b** Not asked in 1992-93 survey.  
*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

Some types of land degradation problems were also concentrated in certain regions. The proportion of broadacre and dairy farms affected by dryland salinity, for example, is illustrated in map 4. There were significant concentrations in Western Australia, south east South Australia, central and western Victoria, and the south west and central slopes of New South Wales. In some of these regions, up to 80 per cent of farms list salinity as a problem. Also illustrated in map 4 are the regions that state soil conservation agencies thought were affected by seepage salting in 1991 (Commonwealth of Australia 1991). Dryland salinity problems reported in the resource management survey were concentrated in many of the same regions.

### *Area of land degraded*

Farmers were also asked what area of their properties was affected by land degradation and, given their current management plans, whether they expected the land degradation problems on their properties to improve, worsen or stay the same. The farms in the wheat–sheep zone reporting degradation problems had, on average, a higher proportion of their farm area affected by degradation (464 hectares out of a total farm area of 1792 hectares or 26 per cent) while farms in the pastoral zone were the least degraded (10 029 hectares out of a total farm area of 54 363 hectares or 18 per cent) (table 15).

Within the agricultural zones, there are regions where degradation is more widespread (map 5). For example, in the areas around Geraldton and Albany,

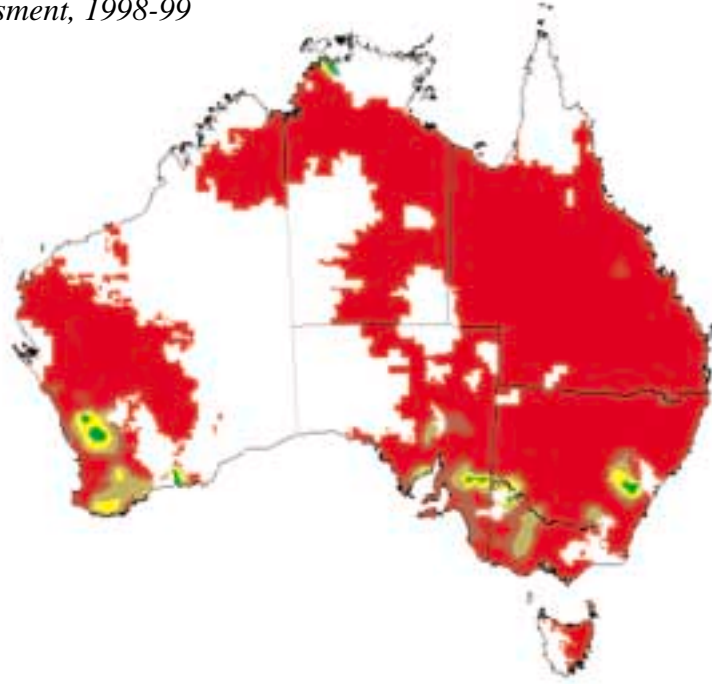
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## 4 Extent of dryland salinity problem

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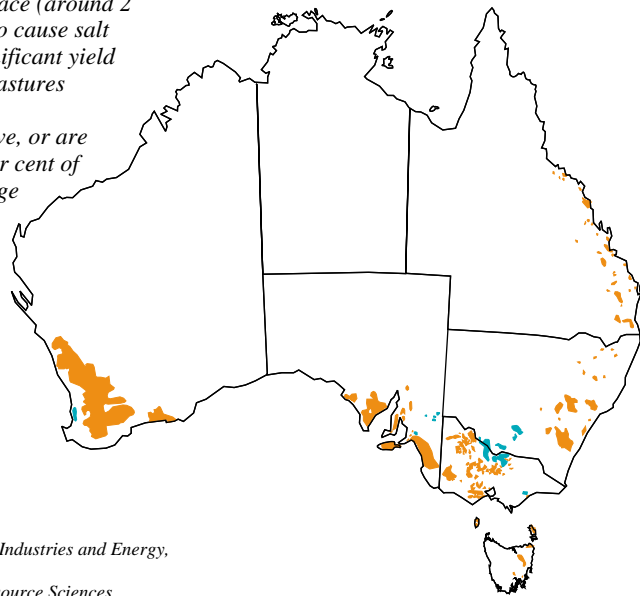
### Landholder assessment, 1998-99

- Proportion of farms
- over 80 per cent
  - 60 – 80 per cent
  - 40 – 60 per cent
  - 20 – 40 per cent
  - 10 – 20 per cent
  - under 10 per cent



### Expert assessment, 1991

- Irrigation areas with water tables close enough to the soil surface (around 2 metres or less depth) to cause salt accumulation and significant yield decline of crops and pastures
- Dryland areas that have, or are likely to have, 1–10 per cent of land affected by seepage salting



Source: Department of Primary Industries and Energy,  
Decade of Landcare Plan, 1991.  
Map compilation: Bureau of Resource Sciences

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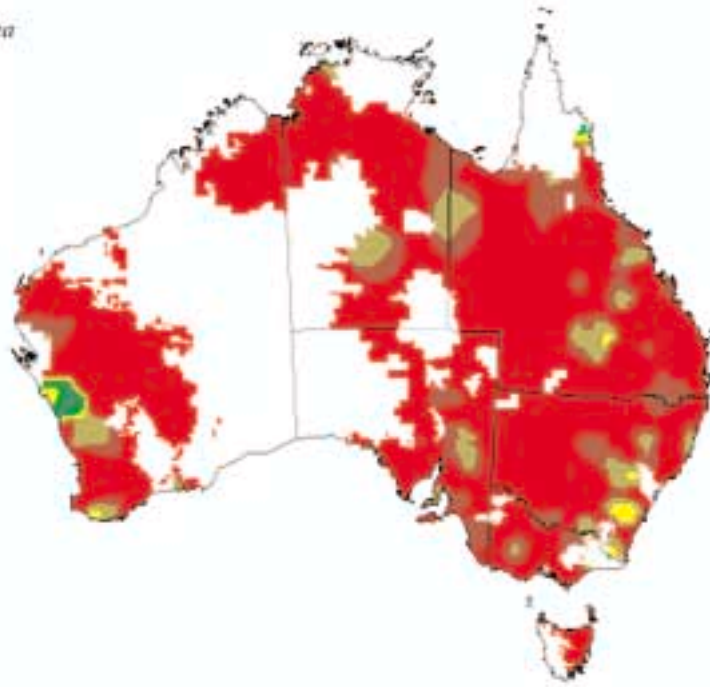
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## 5 *Farm area affected by degradation, 1998-99*

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*Proportion of farm area*

- over 80 per cent*
- 60 – 80 per cent*
- 40 – 60 per cent*
- 20 – 40 per cent*
- 10 – 20 per cent*
- under 10 per cent*



## LANDCARE AND FARM FORESTRY

### 21 *Reported land degradation problems: all broadacre and dairy industries, by state, 1992-93, 1995-96 and 1998-99*

	New South Wales		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	17 (12)	27 (11)	12 (26)
– water erosion	32 (9)	27 (12)	15 (21)
– wind erosion	4 (26)	8 (25)	1 (64)
– dryland salinity	11 (17)	10 (26)	7 (37)
– irrigation salinity	4 (29)	5 (30)	1 (39)
– soil sodicity <b>a</b>		4 (28)	3 (36)
– loss of soil structure	8 (23)	16 (18)	4 (30)
– surface waterlogging <b>a</b>		15 (18)	9 (29)
– weed infestation <b>b</b>	20 (11)	55 (6)	24 (13)
	Victoria		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	14 (18)	29 (10)	11 (28)
– water erosion	27 (11)	22 (15)	10 (30)
– wind erosion	2 (47)	4 (23)	2 (31)
– dryland salinity	16 (18)	13 (17)	8 (20)
– irrigation salinity	7 (19)	8 (19)	7 (25)
– soil sodicity <b>a</b>		13 (22)	2 (37)
– loss of soil structure	8 (24)	19 (17)	4 (29)
– surface waterlogging <b>a</b>		38 (10)	4 (27)
– weed infestation <b>b</b>	16 (21)	47 (7)	9 (28)
	Queensland		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	1 (43)	3 (38)	2 (61)
– water erosion	24 (14)	46 (11)	9 (25)
– wind erosion	8 (19)	9 (29)	1 (48)
– dryland salinity	1 (59)	2 (73)	–
– irrigation salinity	–	1 (55)	–
– soil sodicity <b>a</b>		4 (45)	4 (49)
– loss of soil structure	9 (29)	18 (24)	2 (46)
– surface waterlogging <b>a</b>		10 (25)	4 (44)
– weed infestation <b>b</b>	37 (10)	56 (8)	17 (25)

*continued* ⇨

## LANDCARE AND FARM FORESTRY

### **21** *Reported land degradation problems: all broadacre and dairy industries, by state, 1992-93, 1995-96 and 1998-99 continued*

	<b>South Australia</b>		
	<b>1992-93</b>	<b>1995-96</b>	<b>1998-99</b>
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	8 (29)	11 (28)	5 (43)
– water erosion	16 (20)	19 (29)	4 (62)
– wind erosion	15 (17)	11 (27)	6 (42)
– dryland salinity	15 (21)	9 (32)	11 (32)
– irrigation salinity	2 (43)	1 (50)	1 (52)
– soil sodicity <b>a</b>		1 (54)	1 (63)
– loss of soil structure	7 (25)	11 (32)	5 (42)
– surface waterlogging <b>a</b>		27 (22)	1 (44)
– weed infestation <b>b</b>	11 (21)	25 (19)	15 (32)
	<b>Western Australia</b>		
	<b>1992-93</b>	<b>1995-96</b>	<b>1998-99</b>
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	18 (18)	36 (13)	18 (23)
– water erosion	29 (16)	23 (22)	12 (25)
– wind erosion	8 (27)	28 (23)	6 (33)
– dryland salinity	35 (13)	43 (14)	21 (18)
– irrigation salinity	1 (80)	1 (48)	–
– soil sodicity <b>a</b>		10 (26)	5 (41)
– loss of soil structure	13 (24)	26 (23)	12 (24)
– surface waterlogging <b>a</b>		45 (8)	20 (20)
– weed infestation <b>b</b>	7 (38)	42 (16)	8 (34)
	<b>Tasmania</b>		
	<b>1992-93</b>	<b>1995-96</b>	<b>1998-99</b>
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	13 (32)	18 (25)	2 (54)
– water erosion	17 (29)	10 (39)	7 (46)
– wind erosion	7 (47)	5 (43)	–
– dryland salinity	13 (34)	7 (50)	1 (74)
– irrigation salinity	1 (92)	2 (64)	–
– soil sodicity <b>a</b>		1 (71)	1 (107)
– loss of soil structure	4 (36)	10 (48)	1 (107)
– surface waterlogging <b>a</b>		26 (26)	3 (53)
– weed infestation <b>b</b>	17 (29)	50 (11)	13 (40)

*continued* ⇨

## LANDCARE AND FARM FORESTRY

### 21 *Reported land degradation problems: all broadacre and dairy industries, by state, 1992-93, 1995-96 and 1998-99 continued*

	Northern Territory		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	–	–	–
– water erosion	32 (25)	10 (39)	13 (41)
– wind erosion	8 (45)	5 (43)	5 (67)
– dryland salinity	–	7 (50)	5 (71)
– irrigation salinity	–	2 (64)	–
– soil sodicity <b>a</b>	–	1 (71)	–
– loss of soil structure	15 (46)	10 (48)	4 (91)
– surface waterlogging <b>a</b>	–	26 (26)	1 (108)
– weed infestation <b>b</b>	21 (35)	50 (11)	17 (33)
	Australia		
	1992-93	1995-96	1998-99
	%	%	%
<b>Problems reported as significant</b>			
– soil acidity	13 (9)	23 (6)	10 (15)
– water erosion	27 (6)	26 (6)	11 (13)
– wind erosion	6 (12)	9 (11)	2 (20)
– dryland salinity	14 (9)	13 (9)	8 (13)
– irrigation salinity	4 (20)	5 (15)	2 (21)
– soil sodicity <b>a</b>	–	7 (14)	3 (20)
– loss of soil structure	8 (12)	18 (6)	5 (14)
– surface waterlogging <b>a</b>	–	27 (6)	7 (15)
– weed infestation <b>b</b>	19 (7)	47 (4)	16 (10)

**a** Not asked in 1992-93. **b** In the 1992-93 survey, weed infestation was defined as woody weeds only.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

and in parts of the Central Tablelands and the South West Slopes of New South Wales, farmers reported around half of their farm area as being degraded.

Although Landcare members more commonly reported a degradation problem on their farm, the proportion of their farm affected was lower than for non-Landcare members reporting a problem (table 17). The exception seems to have been the wheat–sheep zone where both Landcare and non-Landcare members reported similar proportions of their farm areas affected by degradation (around a quarter).

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Farms in Victoria reported the largest proportion of their farms affected by degradation — 119 hectares of a total area of 455 hectares or over a quarter of their farm area (table 18). In Victoria, Landcare members and non-Landcare members reported similar proportions of their farm areas as being degraded. In all other states except Tasmania, however, non-Landcare members reported substantially higher proportions of their farms as being degraded. The reverse was true in Tasmania.

### *Perceived status of land degradation problems*

One of the land degradation questions focused on the perceived status of the land degradation problem. Farmers were asked, given their current management plans, whether they expected the land degradation problem on their property to worsen, stay the same, or improve. A problem that is stable or decreasing in severity could be considered to be under control.

A general finding across the broadacre and dairy industries was that a greater number of farmers perceived their land degradation problems to be either stable or improving. The exception is in the pastoral zone where over half of the farmers expect the status of their land degradation problems to worsen. This result is also borne out by the results in Queensland and the Northern Territory where considerable pastoral activities occur.

A higher proportion of Landcare members than non-Landcare members expected that their degradation problems will worsen. This was the case in most states and all agricultural zones. However, these farmers are in the minority, as 85 per cent of Landcare members expect their degradation problems will be no worse in the future.

### *Knowledge gained from Landcare*

The National Landcare Program is widely perceived as having been successful in increasing farmers' awareness of degradation issues and knowledge and adoption of land management practices (Kemp and Alexander 2000; Walker 2000). However, the needs and focus of Landcare participants may differ from group to group. To determine the level of awareness of different aspects of Landcare, farmers were asked what they had learned as a direct result of their involvement in Landcare.

Seventy per cent of Landcare members responded that Landcare provided knowledge of farm practices to treat or avoid degradation (table 22). This was the most often selected response except in South Australia and Tasmania. In South Australia, Landcare members learned more about the agricultural

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### 22 Knowledge gained from Landcare membership: all broadacre and dairy industries, by state, 1998-99 <sup>a</sup>

	<b>New South Wales</b>	<b>Victoria</b>	<b>Queensland</b>	<b>South Australia</b>
	%	%	%	%
Proportion of farmers gaining knowledge as a direct result of involvement in Landcare:				
– causes of degradation	62 (12)	56 (11)	47 (20)	73 (8)
– how to recognise the signs of degradation	67 (10)	51 (14)	42 (22)	74 (8)
– farm practices to treat or avoid degradation	68 (11)	71 (6)	69 (13)	76 (6)
– techniques to monitor resource condition	49 (14)	50 (15)	42 (23)	64 (14)
– agricultural benefits of good resource management	66 (11)	61 (12)	60 (16)	84 (2)
– nonagricultural benefits of good resource management	54 (14)	47 (14)	40 (20)	65 (13)
– involvement in Landcare influenced decisions on farm management practices	64 (12)	55 (13)	63 (14)	80 (8)
	<b>Western Australia</b>	<b>Tasmania</b>	<b>Northern Territory</b>	<b>Australia</b>
	%	%	%	%
Proportion of farmers gaining knowledge as a direct result of involvement in Landcare:				
– causes of degradation	63 (10)	72 (10)	25 (32)	60 (6)
– how to recognise the signs of degradation	59 (13)	66 (11)	28 (29)	58 (6)
– farm practices to treat or avoid degradation	69 (8)	71 (10)	38 (22)	70 (4)
– techniques to monitor resource condition	46 (15)	58 (17)	27 (26)	49 (7)
– agricultural benefits of good resource management	65 (11)	69 (15)	34 (36)	65 (5)
– nonagricultural benefits of good resource management	36 (20)	60 (18)	16 (44)	48 (7)
– involvement in Landcare influenced decisions on farm management practices	58 (12)	77 (11)	30 (23)	62 (6)

<sup>a</sup> Respondents could list multiple issues.

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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benefits of good resource management and in Tasmania knowledge of the causes of degradation scored higher as a response.

Fewer than half of Landcare members responded that they had gained knowledge of the nonagricultural benefits of good resource management. This response was lowest in the Northern Territory and Queensland (16 and 40 per cent respectively).

Just under 50 per cent of Landcare members reported having gained knowledge of techniques to monitor resource condition. However, in the Northern Territory only 27 per cent of members gave this response.

## *4. Degradation, resource management and Landcare*

There is growing public concern about the incidence and severity of land degradation problems. One of the aims of the government funded National Land and Water Resources Audit, currently underway, is to gain a better understanding of the impact of degradation on Australian farms. Increasingly, attention is focusing on the need for farmers to adopt new farm management practices to address these degradation problems.

In this chapter the relationships between on-farm degradation problems and the adoption of appropriate farm management practices to address these problems are analysed. The role that Landcare plays within this is also explored by comparing differences in both awareness and adoption of management practices between Landcare members and nonmembers.

Three case studies are used to demonstrate the generally high level of awareness across Australian broadacre farms about appropriate management practices to address degradation problems. Despite this, however, adoption of those practices is not always very common. Overwhelmingly, Landcare members were more likely to have adopted practices to address their on-farm degradation problems.

### *Dryland salinity in Western Australia's wheat–sheep zone*

Around 1.8 million hectares in the south west agricultural region of Western Australia are affected by salinity and it is estimated that if current agricultural practices are not changed about 3 million hectares will be affected by 2010–15 (Government of Western Australia 2000). Dryland salinity can adversely affect plant growth, affecting agriculture (Gordon 1998a), and can cause damage to downstream water users, aquatic ecosystems and biodiversity. In addition, regional and urban infrastructure can also be affected (Prime Minister's Science, Engineering and Innovation Council 1998).

Dryland salinity occurs when more water enters the groundwater system than is discharged, causing rising watertables and bringing stored salt toward the soil surface or into surface water bodies. Salt is then concentrated in the soil through evaporation (Martin and Metcalfe 1989). The clearing of native vegetation and replacement with crops and pastures that have shallower root systems and different growth patterns has led to rising watertables and salinity (Prime Minister's Science, Engineering and Innovation Council 1998).

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More than 93 per cent of the original vegetation in the Western Australian wheatbelt has been cleared, leaving isolated remnants of bushland (Saunders and Hobbs 1989). As a result, water quality in lakes, rivers and wetlands in the area has also declined (MacGregor and Pilgrim 1998).

To prevent or reduce dryland salinity, groundwater recharge can be reduced in some regions by improving the water use efficiency of pastures or cropping rotations, replacing broadacre agriculture with plantation or agroforestry systems or through the adoption of engineering interventions (Bell, Mues and Beare 2000). The establishment of deeper rooted trees and high water use crops and pastures, including perennial vegetation, reduces the amount of water reaching the watertable through recharge areas because the deeper a plant's roots, the greater it can access and lower the watertable (Gordon 1998b).

Almost a quarter of all farms in the wheat–sheep zone of Western Australia reported dryland salinity as a problem, the overwhelming majority of which were Landcare members (table 23). Overwhelmingly, both Landcare members and nonmembers viewed tree/shrub establishment and maintenance, and the use of deep rooted perennial pasture species, as management practices applicable to their farm. Despite a generally high level of awareness about the appropriateness of planting trees, shrubs or deep rooted perennial pasture species among both Landcare members and nonmembers there were some large differences in the adoption of these practices. Almost all Landcare members had incorporated tree/shrub establishment into their farm management program, compared with only two-thirds of all non-Landcare members. Similarly, Landcare members were more likely to have planted deep rooted perennial pasture species.

Farmers can also plant trees or shrubs or grow perennial pastures to prevent future salinity problems on their farms, or to prevent or reduce problems outside their farms as part of broader catchment management. Of those farmers who did not report dryland salinity as a significant problem on their property in 1998-99, Landcare members were more likely to have established trees or shrubs on their property than non-Landcare members. Additionally, around two-thirds of Landcare members grew deep rooted perennial pasture species compared with a quarter of non-Landcare members. Thus, it appears that Landcare membership is also associated with the adoption of preventive practices against salinity.

Several other areas of Australia are also known to face problems with dryland salinity. Map 4 in chapter 3 shows a number of regions where higher proportions of farms report dryland salinity, such as in the Mallee region of Victoria and South Australia, and on the central slopes of New South Wales. The same

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### 23 Awareness and adoption of management practices to address dryland salinity in the Western Australia wheat–sheep zone, 1998-99

	Farms not reporting salinity		
	Non-Landcare	Landcare	All farms
	%	%	%
Landcare members			54 (18)
Farm practices applicable to farm a:			
– tree/shrub establishment and maintenance	94 (3)	100	97 (2)
– deep rooted perennial pasture use	94 (3)	92 (7)	93 (4)
Farm practices part of management program a:			
– tree/shrub establishment and maintenance	63 (14)	99 (2)	82 (5)
– deep rooted perennial pasture use	25 (56)	36 (19)	31 (24)
	Farms reporting salinity		
	Non-Landcare	Landcare	All farms
	%	%	%
Landcare members			91 (8)
Farm practices applicable to farm a:			
– tree/shrub establishment and maintenance	100	100	100
– deep rooted perennial pasture use	100	100	100
Farm practices part of management program a:			
– tree/shrub establishment and maintenance	74 (53)	86 (14)	85 (14)
– deep rooted perennial pasture use	–	22 (29)	20 (29)
	All farms		
	Non-Landcare	Landcare	All farms
	%	%	%
Landcare members			63 (12)
Reporting dryland salinity as a problem	6 (72)	34 (25)	23 (21)
Farm practices applicable to farm a:			
– tree/shrub establishment and maintenance	94 (3)	100	98 (1)
– deep rooted perennial pasture use	94 (3)	95 (4)	95 (3)
Farm practices part of management program a:			
– tree/shrub establishment and maintenance	64 (16)	94 (6)	83 (6)
– deep rooted perennial pasture use	23 (40)	31 (28)	28 (24)

**a** Farmers could respond that the farm practice was adopted, not adopted or not applicable to the farmers location, enterprise mix or situation.

*ote:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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analysis that was described above was conducted in these regions and generated similar results. While there were few differences in the perceived applicability of tree/shrub establishment and planting deep rooted perennial pasture species, Landcare members were more likely than nonmembers to have incorporated the practices into their farm management program.

### *Waterlogging*

As well as contributing to salinity, high watertables can lead to waterlogging which can damage plant health and cause an invasion of marsh plants, affecting agricultural production and natural ecosystems (Woods 1984). Waterlogging can also affect infrastructure, causing deterioration and rising damp in bricks and mortar, as well as cracked and collapsed pavements, roads and driveways.

Three management practices that can assist in the management of high watertables were selected for analysis: planting trees or shrubs; the regular monitoring of watertables; and maintaining vegetative cover along drainage lines. Planting trees can help control waterlogging as can improving water use efficiency or the installation of mechanical systems such as deep drainage to lower water levels (Woods 1984; Soil Conservation Service of New South Wales 1989). The regular monitoring of high watertables is an important part of improved water use efficiency or engineering solutions to lower watertables. Overflows or leakage from on-farm drains can also contribute to rising watertables, and maintaining vegetative cover along drainage lines can reduce this problem, as well as minimise the potential for water erosion.

### *24 Adoption of farm management practices to treat waterlogging <sup>a</sup>*

	Non-Landcare	Landcare	All farms
	%	%	%
Farm practices applicable to the farm <b>b</b> :			
– tree/shrub establishment and maintenance	97 (4)	98 (7)	98 (4)
– regularly monitor watertables	100 (6)	98 (7)	99 (4)
– maintain vegetative cover along drainage lines	86 (5)	98 (1)	93 (2)
Farm practices part of management program <b>b</b> :			
– tree/shrub establishment and maintenance	66 (18)	84 (10)	76 (9)
– regularly monitor watertables	16 (40)	25 (43)	22 (32)
– maintain vegetative cover along drainage lines	55 (14)	84 (4)	72 (5)

**a** Farmers who reported waterlogging as a problem. **b** Farmers could respond that the farm practice was adopted, not adopted or not applicable to the farmers location, enterprise mix or situation.

*Note:* Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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Almost all farms reporting waterlogging as a significant problem on their property in 1998-99 saw these practices as applicable to their farm (table 24). Once, again, there were no significant differences in the awareness of these practices between Landcare and non-Landcare members.

Around three-quarters of all farms reporting waterlogging had planted trees or shrubs or maintained vegetative cover along drainage lines. However, only a fifth of these farms monitored their watertables. Landcare members were also much more likely to have adopted these practices than non-Landcare members. For instance, 84 per cent of Landcare members maintained vegetative cover along their drainage lines compared with 55 per cent of non-Landcare members.

### *Great Artesian Basin*

The Great Artesian Basin is the largest artesian basin in Australia, with an estimated water storage of over 8.7 billion megalitres. The basin covers an area of over 1.7 million square kilometres under the arid and semi-arid regions of Queensland, New South Wales, South Australia and the Northern Territory (map 6). Water from the Great Artesian Basin supports a wide range of economic activities and provides water for community uses and recreational activities (Mues and Hardcastle 1998; Great Artesian Basin Consultative Council 1998).

Declining artesian pressures in the Great Artesian Basin has led to increasing concerns about the sustainable use of the resource. The Great Artesian Basin Consultative Council (1998) reported that the excessive extraction of water from the Great Artesian Basin had contributed to a decline in artesian pressure. As a consequence, the environmental integrity of mound springs within the basin have been affected. It is estimated that the natural flows of mound springs have fallen by 30 per cent over the past hundred years, threatening the environmental ecosystems of the springs. The flow in some springs has stopped altogether (Reyenga, Habermehl and Howden 1998). The costs of extracting water for consumption has also increased (Great Artesian Basin Consultative Council 1998).

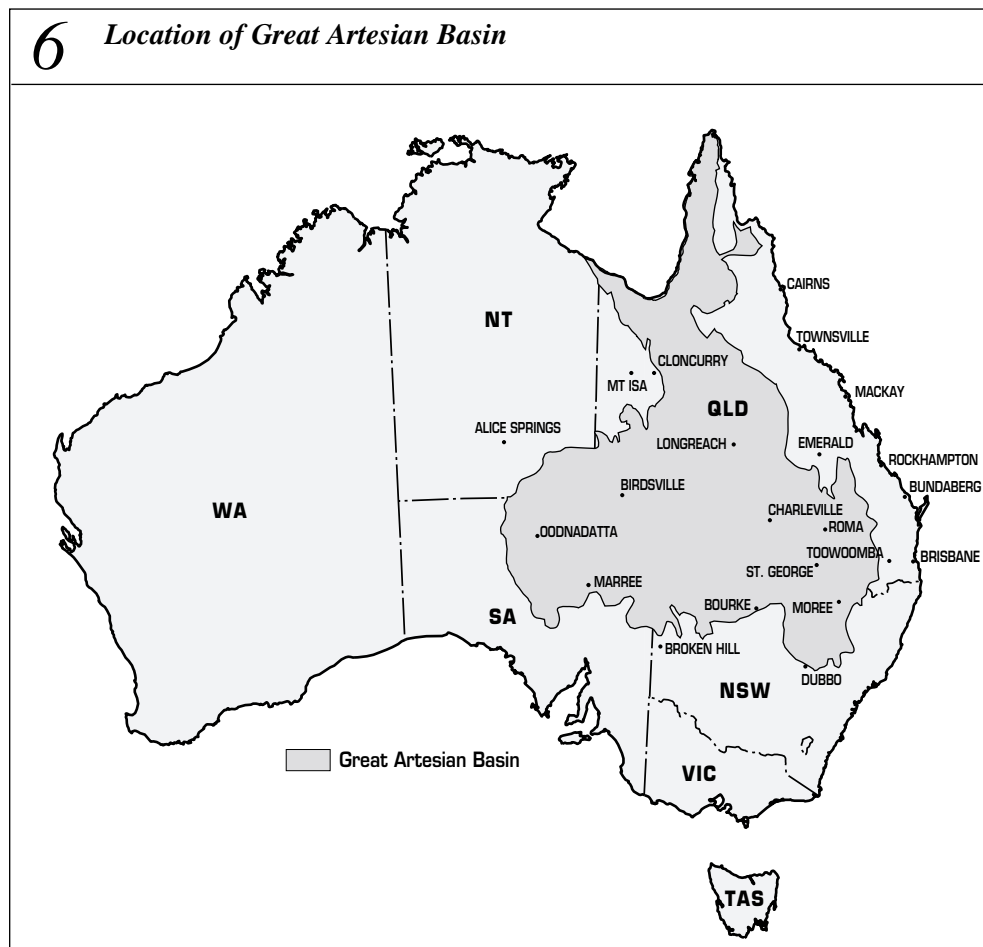
A large proportion of the water extracted from the basin is wasted (Great Artesian Basin Consultative Council 1998). The natural pressure of the groundwater causes the water to flow freely from bores that are not properly cased or do not have headworks fitted to control the flow of water. Poor casing of bores can also result in contamination of good quality water in the deeper aquifers by saline water from shallower aquifers (Great Artesian Basin Consultative Council 1998). Turvey (unpublished) estimated that bore capping

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alone could save about 5 per cent of water losses while bore relining could achieve water savings of around 25 per cent.

Water is also lost along unlined earthen bore drains. Reyenga, Habermehl and Howden (1998) estimate that the installation of a piped reticulation system in conjunction with bore rehabilitation could reduce losses by up to 95 per cent. Reducing these losses would increase artesian pressure and reduce pumping costs.

As well as saving water, bore rehabilitation and piping can help reduce the number of woody weeds and feral animals, allow for better management of grazing pressure and improve stock health by improving the quality of water supplied to stock (Great Artesian Basin Consultative Council 1998). Bore drains can cause soil erosion and salinisation, as well as support woody weeds



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### 25 *Adoption of farm management practices by pastoral farms in the Great Artesian Basin, 1998-99*

	Non-Landcare	Landcare	All farms
	%	%	%
Farm practices applicable to the farm a:			
– headworks to control flow from bores	84 (8)	89 (7)	86 (6)
– piped bore water	89 (7)	96 (5)	92 (4)
Farm practices part of management program a:			
– headworks to control flow from bores	17 (71)	38 (47)	26 (39)
– piped bore water	57 (12)	48 (34)	53 (15)

a Farmers could respond that the farm practice was adopted, not adopted or not applicable to the farmers location, enterprise mix or situation.

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

and increased numbers of both native and feral animals (Great Artesian Basin Consultative Council 1998).

Almost all of the pastoral farms that lie in the Great Artesian Basin considered the installation of headworks to control flow from bores and the piping of bore water as applicable management practices on their farm (table 25). However, only around a quarter of all pastoral farms had installed headworks and half had piped their bore water. Differences are also evident between the proportion of Landcare members and non-Landcare members who had installed headworks or piped the bore water. Landcare members were more than twice as likely to have installed headworks to control flow from bores, but were less likely to have piped their bore water.

### *Implications of case study results*

In the three case study areas selected for analysis, the awareness of the applicability of selected management practices was high among both Landcare members and nonmembers. This may suggest that information provided to Landcare members is being passed to non-Landcare members or alternatively that the general awareness of the appropriate practices in these areas is already high. Landcare members in general were more likely than non-Landcare members to have adopted farm management practices that address the resource degradation issue investigated. This suggests that Landcare may have a positive influence on the adoption of farm management practices specifically to address degradation. However, it may also indicate that those willing to adopt preventive management practices are more likely to join a Landcare group.

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### 5. Trees on farms, 1998-99

To assist with the monitoring and evaluation of outcomes of the Commonwealth's Farm Forestry Program, farm forestry questions were included in ABARE's 1998-99 resource management survey. The aim of the Farm Forestry Program is to encourage the incorporation of commercial tree growing and management into farming systems for the purposes of wood and nonwood production, increasing agricultural productivity and sustainable natural resource management. Consequently, the questions included in the Resource Management survey focused on the extent of remnant vegetation and planted trees on Australian broadacre and dairy farms and the intended purposes and benefits of these trees.

Farm forestry is defined as the use of planted and/or native forests and woodlands for commercial, environmental or other purposes. While most commonly associated with production of wood products, farm forestry can also provide other benefits, including shelter and shade for livestock or the rehabilitation of degraded land. Planted trees may be native or exotic species that are generally suited to producing commercial timber products. Native forests and woodlands are what remains of the regions' tree cover that existed before agricultural development.

Forestry has traditionally been associated with higher rainfall areas where climatic conditions favor tree establishment and growth. Furthermore, farm forestry as a direct income earning activity is better suited to regions with higher rainfall, since this increases growth rates and a broader range of species can feasibly be grown, and to locations closer to principal markets for timber products. The influence of climatic conditions and, to a lesser extent, proximity to markets is reflected in the results presented throughout this chapter.

#### 26 *Proportion of farms with planted trees: broadacre and dairy farms, by zone*

	Pastoral zone	Wheat-sheep zone	High rainfall zone	Australia
	%	%	%	%
1993-94	6 (49)	46 (4)	54 (4)	48 (3)
1998-99	13 (26)	67 (4)	75 (3)	68 (2)

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### 27 Characteristics of farmers participating in farm forestry: broadacre and dairy farms, by zone, 1998-99 Average per farm

	Pastoral zone		Wheat-sheep zone	
	Non-participants	Participants	Non-participants	Participants
Owner managers age yr	52 (3)	48 (3)	54 (2)	53 (2)
Owner manager's education <b>a</b>				
– pre-secondary %	6 (41)	5 (79)	8 (28)	3 (46)
– 1–4 years high school %	38 (22)	39 (16)	50 (10)	49 (9)
– 5–6 years high school %	37 (24)	46 (15)	24 (19)	24 (12)
– trade qualification %	14 (43)	2 (117)	8 (27)	9 (23)
– tertiary education %	5 (45)	8 (68)	10 (30)	15 (20)
Farm area operated ha	75 309 (27)	77 270 (23)	2 200 (8)	1 539 (7)
Crop area harvested ha	49 (48)	337 (35)	420 (8)	421 (6)
Beef cattle on hand no.	1 812 (15)	604 (21)	228 (8)	132 (12)
Sheep on hand no.	3 460 (11)	4 545 (18)	1 294 (10)	1 660 (6)
Farm capital \$	1 708 596 (8)	1 575 231 (16)	1 290 013 (5)	1 303 830 (5)
Farm cash income \$	60 720 (37)	55 363 (38)	59 975 (10)	53 363 (7)
Non-farm income <b>b</b> \$	13 804 (18)	16 549 (26)	11 931 (15)	11 799 (17)
Rate of return on capital %	–0.8 (195)	–11.3 (90)	–1.5 (32)	–0.8 (47)
Farm debt <b>c</b> \$	279 549 (14)	203 274 (37)	181 222 (10)	198 528 (8)
Farm equity ratio <b>c</b> %	82 (3)	78 (11)	85 (2)	85 (2)
Farm business profit \$	37 237 (68)	–32 154 (106)	14 461 (39)	12 611 (35)
	High rainfall zone		Australia	
	Non-participants	Participants	Non-participants	Participants
Owner manager age yr	53 (2)	55 (2)	54 (1)	54 (1)
Owner manager's education <b>a</b>				
– pre-secondary %	11 (23)	9 (38)	9 (17)	6 (30)
– 1–4 years high school %	46 (8)	34 (11)	48 (6)	42 (7)
– 5–6 years high school %	23 (15)	24 (15)	24 (11)	24 (9)
– trade qualification %	8 (25)	12 (24)	9 (17)	10 (16)
– tertiary education %	12 (25)	21 (20)	10 (19)	18 (14)
Farm area operated ha	755 (15)	678 (8)	7 630 (22)	2 188 (12)
Crop area harvested ha	23 (21)	38 (13)	199 (8)	244 (5)
Beef cattle on hand no.	167 (10)	202 (10)	331 (8)	170 (7)
Sheep on hand no.	689 (17)	1 101 (6)	1 186 (7)	1 443 (4)
Farm capital \$	1 138 570 (5)	1 306 993 (6)	1 252 654 (3)	1 309 027 (4)
Farm cash income \$	43 756 (9)	33 986 (13)	52 284 (7)	44 490 (7)
Non-farm income <b>b</b> \$	12 459 (13)	18 375 (19)	12 331 (9)	14 886 (13)
Rate of return on capital %	–1.3 (34)	–2.0 (34)	–1.3 (24)	–1.5 (27)
Farm debt <b>c</b> \$	169 734 (10)	149 894 (12)	183 003 (6)	176 189 (8)
Farm equity ratio <b>c</b> %	84 (2)	89 (1)	84 (1)	87 (1)
Farm business profit \$	6 354 (54)	–65(6 647)	12 492 (29)	6 171 (50)

**a** Proportion of farms which provided education details for owner/manager. **b** Proportion of farms responding on non-farm income. **c** Average per farm responding on debt.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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The proportion of farmers undertaking some form of farm forestry with planted trees in the Australian broadacre and dairy industries increased from nearly half in 1993-94 to over two-thirds in 1998-99 (table 26). In both the high rainfall and wheat–sheep zones the proportion of farms with planted trees grew by around half in the six years to 1998-99. Even in the drier pastoral zone, the proportion of farmers that had planted trees was estimated to have more than doubled between 1993-94 and 1998-99, although this was from a very low base. The state with the largest increase in the proportion of farms with planted trees was Queensland where the proportion increased from around 9 per cent to 34 per cent over the six-year period. This could, at least in part, reflect the influence of programs such as Landcare and the Farm forestry Program in promoting the role of trees in agricultural systems.

However, the results presented in table 26 may not reflect some recent growth in plantation forestry on what was previously agricultural land. This is because between 1993-94 and 1998-99 some broadacre and dairy farms may have changed land use to the stage where the Australian Bureau of Statistics no longer classified them as an agricultural enterprise. These enterprises would not have been in the target population for the 1998-99 ABARE survey.

### *Characteristics of farm forestry participants*

Data on the characteristics of farmers who participated in farm forestry activities compared with nonparticipants are presented in table 27. While there was little difference in the average age of farmers in the two groups, the estimated proportion of farm owner managers engaged in farm forestry who had attained a tertiary education was nearly twice that for nonparticipants (table 27).

Participants in the wheat–sheep zone also operated smaller farms that were cropped more intensively, and participants in the high rainfall zone tended to run more cattle on their properties. However, there were few other notable differences in the characteristics of farm forestry participants and nonparticipants within each agricultural zone.

### *Functions of farm forestry*

Farmers choose to undertake farm forestry activities for various reasons. In the next two sections, two possible influences on that decision are investigated: Landcare membership and problems with land degradation. In particular, associations between these factors and the perceived function of trees on farms are analysed.

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### *Landcare membership*

Across each agricultural zone Landcare members were more likely to have reported that farm forestry plantings had a role in biodiversity conservation or treating land degradation (tables 28 and 29). In addition, Landcare members more commonly reported that planted trees provided shelter or shade on their properties. A farmer's involvement in a group that often deals with sustainable natural resource management issues, like Landcare, may be a factor behind the differences in reported functions of trees between Landcare members and nonmembers. For example, Landcare members may be more aware of land degradation and the potential role, farm forestry can play as a possible solution.

Regardless of Landcare membership, the production of sawlogs, pulpwood, and non-wood products from planted or native trees was less commonly

### **28** *Main functions of planted trees on farms: broadacre and dairy farms, by Landcare membership, by zone, 1998-99<sup>a</sup>*

	Pastoral zone			Wheat-sheep zone		
	Non-Landcare	Landcare	All farms	Non-Landcare	Landcare	All farms
	%	%	%	%	%	%
No functions or very few trees	90 (5)	80 (7)	85 (4)	37 (9)	23 (15)	32 (7)
Rehabilitate degraded land and/or protect from future degradation	3 (64)	4 (46)	4 (37)	33 (10)	54 (8)	41 (7)
Provide shelter or shade (includes grazing)	12 (41)	13 (28)	13 (24)	57 (6)	65 (6)	60 (4)
Conserve native vegetation and wildlife	4 (83)	5 (49)	4 (45)	19 (15)	40 (11)	28 (9)
Produce saw logs for sale	–	1 (86)	–	2 (64)	2 (52)	2 (46)
Produce pulpwood for sale	–	–	–	–	1 (75)	1 (60)
Produce nonwood products for sale (eg oils, wildflowers)	–	–	–	–	–	–
Produce other/unknown wood products for sale or own use (eg posts, firewood)	–	–	–	6 (29)	3 (34)	5 (24)
Produce fodder	–	4 (74)	2 (77)	4 (30)	3 (51)	4 (26)
Other	–	3 (71)	2 (64)	7 (25)	11 (28)	9 (19)

*Continued ⇨*

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reported than indirect benefits such as the treatment of land degradation. While the production of other wood products, such as posts or firewood ranked as the fourth most common function of native forests and woodlands in each zone, the production of any wood or non-wood products from planted trees ranked low relative to the agricultural and environmental benefits.

### *Land degradation*

Maintaining or increasing perennial vegetation cover is one of a number of strategies for treating and preventing land degradation. For example, Wilson, Whitham, Bhati, Horvath and Tran (1995) reported that some farmers recognised environmental benefits from trees on their farms.

### **28** *Main functions of planted trees on farms: broadacre and dairy farms, by Landcare membership, by zone, 1998-99<sup>a</sup>*

	High rainfall zone			Australia		
	Non-Landcare	Landcare	All farms	Non-Landcare	Landcare	All farms
	%	%	%	%	%	%
No functions or very few trees	36 (10)	8 (21)	26 (9)	39 (6)	21 (10)	32 (5)
Rehabilitate degraded land and/or protect from future degradation	19 (18)	43 (15)	27 (12)	25 (9)	47 (8)	33 (6)
Provide shelter or shade (includes grazing)	62 (6)	89 (3)	71 (4)	58 (4)	71 (4)	63 (3)
Conserve native vegetation and wildlife	19 (16)	29 (16)	22 (11)	18 (11)	34 (9)	24 (7)
Produce saw logs for sale	7 (38)	3 (59)	6 (34)	4 (33)	2 (41)	3 (27)
Produce pulpwood for sale	2 (61)	5 (42)	3 (36)	1 (55)	2 (37)	2 (32)
Produce nonwood products for sale (eg oils, wildflowers)	–	1 (62)	–	–	1 (48)	–
Produce other/unknown wood products for sale or own use (eg posts, firewood)	3 (47)	9 (46)	5 (34)	5 (25)	5 (34)	5 (20)
Produce fodder	–	1 (78)	–	2 (31)	2 (39)	2 (23)
Other	2 (28)	6 (60)	3 (40)	4 (21)	9 (26)	6 (17)

<sup>a</sup> Respondents can list up to three main functions.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

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Farmers may become involved in farm forestry activities for a range of reasons. In this section the function of trees on farms was reduced to just four categories: commercial, environmental, other functions and no function or very few trees. A farmer was categorised as having undertaken farm forestry for commercial purposes if at least one of their reported uses of trees was to produce wood products such as saw logs. Farm forestry was classified as being for environmental purposes if the farmer did not undertake any commercial farm forestry but reported using trees for at least one environmental purpose, such as the prevention of land degradation. If a farmer did not undertake farm forestry for environmental or commercial activities but used trees for other purposes, such as providing shelter or shade, then the farmer was classified as having used trees for 'other' purposes. Any remaining farms were classified as 'no functions or very few trees'.

### 29 *Main functions of native forests and woodlands on farms: broadacre and dairy farms, by Landcare membership, by zone, 1998-99<sup>a</sup>*

	Pastoral zone			Wheat–sheep zone		
	Non-Landcare	Landcare	All farms	Non-Landcare	Landcare	All farms
	%	%	%	%	%	%
No functions or very few trees	8 (36)	9 (39)	8 (22)	27 (13)	22 (18)	25 (10)
Rehabilitate degraded land and/or protect from future degradation	9 (43)	44 (27)	27 (23)	33 (10)	40 (10)	36 (7)
Provide shelter or shade (includes grazing)	91 (3)	88 (5)	89 (3)	71 (5)	71 (6)	71 (3)
Conserve native vegetation and wildlife	19 (25)	42 (32)	30 (24)	28 (12)	45 (10)	35 (8)
Produce saw logs for sale	–	–	–	3 (53)	2 (46)	2 (37)
Produce pulpwood for sale	–	–	–	–	–	–
Produce nonwood products for sale (eg oils, wildflowers)	2 (63)	1(140)	2 (69)	–	–	–
Produce other/unknown wood products for sale or own use (eg posts, firewood)	11 (48)	16 (71)	13 (46)	18 (16)	11 (20)	15 (13)
Produce fodder	6 (33)	20 (26)	13 (23)	3 (39)	2 (56)	2 (32)
Other	1 (85)	1(105)	1 (60)	5 (32)	5 (33)	5 (23)

*Continued ⇨*

## LANDCARE AND FARM FORESTRY

The results presented in tables 30 and 31 show that farmers are more likely to have reported using trees for environmental purposes if they had more land degradation problems on their farms. This was especially apparent for planted trees. For example, broadacre and dairy farmers with three or more degradation problems were almost twice as likely to have reported planting trees for environmental functions compared with farms reporting fewer degradation problems (table 30).

While the proportion of farms reporting no trees or their trees serving no particular function tends to decline as the number of degradation problems increase, this was not found consistently in all states (figure J). Either the reverse is true or there is no difference on the basis of the number of degradation problems in Queensland, South Australia and the Northern Territory.

### **29** *Main functions of native forests and woodlands on farms: broadacre and dairy farms, by Landcare membership, by zone, 1998-99* <sup>a</sup> *continued*

	High rainfall zone			Australia		
	Non-Landcare	Landcare	All farms	Non-Landcare	Landcare	All farms
	%	%	%	%	%	%
No functions or very few trees	37 (10)	28 (15)	34 (8)	31 (8)	23 (12)	28 (6)
Rehabilitate degraded land and/or protect from future degradation	18 (18)	27 (21)	21 (14)	25 (9)	35 (9)	29 (7)
Provide shelter or shade (includes grazing)	62 (6)	58 (10)	61 (6)	68 (4)	67 (5)	68 (3)
Conserve native vegetation and wildlife	20 (17)	29 (19)	23 (12)	24 (9)	39 (9)	29 (6)
Produce saw logs for sale	4 (37)	9 (59)	6 (36)	3 (30)	5 (45)	4 (27)
Produce pulpwood for sale	–	–	–	–	–	–
Produce nonwood products for sale (eg oils, wildflowers)	–	1 (67)	–	–	1 (54)	–
Produce other/unknown wood products for sale or own use (eg posts, firewood)	18 (17)	22 (26)	20 (14)	18 (11)	15 (17)	17 (9)
Produce fodder	–	–	–	2 (33)	3 (31)	2 (22)
Other	2 (66)	3 (54)	2 (45)	3 (29)	4 (28)	4 (20)

<sup>a</sup> Respondents can list up to three main functions.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

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### *Regional differences in benefits of trees*

The survey results highlight some strong differences in the reported function of planted trees and native forests and woodlands when analysed at the state by agricultural zone level (table 32). For planted trees, the most notable differences were in the Queensland wheat–sheep zone. Farmers in that region were considerably less likely than farmers in that zone in other states to have reported planting trees as a means of treating or preventing land degradation, providing shelter or shade or conserving biodiversity. However, planted trees were less common in that state (figure J) possibly because of the large areas of remnant vegetation. Queensland has been less extensively cleared than the other mainland states (Graetz, Wilson and Campbell 1995).

Compared with farmers elsewhere in the high rainfall zone, farmers in the Victorian high rainfall zone were estimated to have been at least 20 percentage points less likely to have reported using native forests/woodlands for shelter or shade (table 32). This may have been because Victorian farms have relatively less native vegetation cover than farms in other states (Graetz et al. 1995) or because the protection of livestock or crops from the weather is less of an issue in that region.

More than half the farmers in the Western Australian pastoral zone rated native forests and woodlands as a source of fodder (table 32). A possible reason may be that because of the relatively low level of clearance observed in pastoral areas of Western Australia (Graetz et al. 1995), livestock are often fed on the grass understorey of the remaining areas of native forests and woodlands.

### *Factors with the potential to increase farm forestry*

Landholders' views on the factors that would serve to increase participation in farm forestry are an important issue for delivery of the Farm Forestry Program. As part of the survey, farmers were asked to list the primary factor that would encourage them to expand farm forestry. Secondary, but potentially important factors, were not canvassed. Around a quarter of all broadacre and dairy farmers indicated that they were not interested in expanding farm forestry activities, with the proportion in the pastoral zone being around 45 per cent (table 33).

Conversely, in the wheat–sheep zone the equivalent proportion was lowest at around a fifth of farmers. A further 10 per cent of farmers across Australia believed that they already had enough trees on their property.

Factors likely to increase farm forestry activities centred on financial returns. For example, around a fifth of farmers would expand farm forestry if a direct

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### **30** *Main function of planted trees on farms: broadacre and dairy farms, by number of land degradation problems, by zone, 1998-99*

	Number of degradation problems		
	None	1 or 2	3 or more
	%	%	%
<b>Pastoral zone</b>			
No function or very few trees	87 (6)	84 (7)	35 (77)
Commercial function <b>a</b>	–	1 (127)	3 (272)
Environment function <b>b</b>	5 (79)	4 (60)	41 (57)
Other <b>c</b>	9 (39)	11 (57)	21 (65)
<b>Wheat sheep zone</b>			
No function or very few trees	36 (9)	28 (15)	17 (29)
Commercial function <b>a</b>	5 (30)	8 (29)	14 (36)
Environment function <b>b</b>	42 (7)	47 (10)	59 (10)
Other <b>c</b>	17 (12)	18 (23)	10 (49)
<b>High rainfall zone</b>			
No function or very few trees	29 (12)	22 (27)	4 (198)
Commercial function <b>a</b>	12 (25)	16 (40)	9 (70)
Environment function <b>b</b>	29 (13)	30 (15)	85 (11)
Other <b>c</b>	31 (10)	32 (25)	3 (73)
<b>Australia</b>			
No function or very few trees	36 (6)	28 (12)	13 (30)
Commercial function <b>a</b>	8 (20)	11 (27)	13 (32)
Environment function <b>b</b>	35 (7)	37 (8)	66 (8)
Other <b>c</b>	22 (8)	23 (17)	8 (44)

**a** Defined as farmers who have planted trees to produce saw logs for sale, pulpwood for sale, nonwood products for sale or other/unknown wood products for sale or own use. **b** Defined as farmers who did not use planted trees in a commercial function but to rehabilitate degraded land and/or protect from future degradation or conservation of native vegetation and wildlife. **c** Defined as farmers who did not use planted trees in a commercial or environmental function but to provide shelter or shade, fodder production or other.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

financial incentive were offered. Similarly, if there were higher profits from increasing farm forestry activities, an estimated 16 per cent of farmers would plant more trees and/or improve native tree management. These results are broadly consistent across zones and tend to hold regardless of the functions that trees serve on farms (tables 34 and 35).

The importance of financial returns as an incentive to expand farm forestry was not restricted to farmers interested in commercial benefits. Farmers whose trees provide environmental benefits also listed financial reasons as the main factors that would encourage an expansion in their farm forestry activities. For

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### **31** *Main function of native forests and woodlands on farms: broadacre and dairy farms, by number of land degradation problems, by zone, 1998-99*

	Number of degradation problems		
	None %	1 or 2 %	3 or more %
<b>Pastoral zone</b>			
No function or very few trees	9 (29)	7 (44)	–
Commercial function <b>a</b>	19 (30)	6 (82)	4 (519)
Environment function <b>b</b>	31 (26)	60 (13)	63 (40)
Other <b>c</b>	41 (20)	27 (24)	33 (49)
<b>Wheat sheep zone</b>			
No function or very few trees	29 (13)	20 (19)	21 (32)
Commercial function <b>a</b>	13 (17)	23 (16)	17 (54)
Environment function <b>b</b>	39 (9)	42 (11)	52 (18)
Other <b>c</b>	19 (15)	16 (23)	10 (41)
<b>High rainfall zone</b>			
No function or very few trees	40 (8)	22 (27)	21 (20)
Commercial function <b>a</b>	21 (14)	32 (20)	42 (50)
Environment function <b>b</b>	20 (16)	32 (16)	35 (60)
Other <b>c</b>	19 (17)	15 (28)	3 (73)
<b>Australia</b>			
No function or very few trees	33 (7)	20 (16)	21 (2)
Commercial function <b>a</b>	17 (10)	26 (13)	24 (37)
Environment function <b>b</b>	30 (7)	39 (8)	47 (19)
Other <b>c</b>	20 (10)	16 (17)	8 (36)

**a** Defined as farmers who have planted trees to produce saw logs for sale, pulpwood for sale, nonwood products for sale or other/unknown wood products for sale or own use. **b** Defined as farmers who did not use planted trees in a commercial function but to rehabilitate degraded land and/or protect from future degradation or conservation of native vegetation and wildlife. **c** Defined as farmers who did not use planted trees in a commercial or environmental function but to provide shelter or shade, fodder production or other.

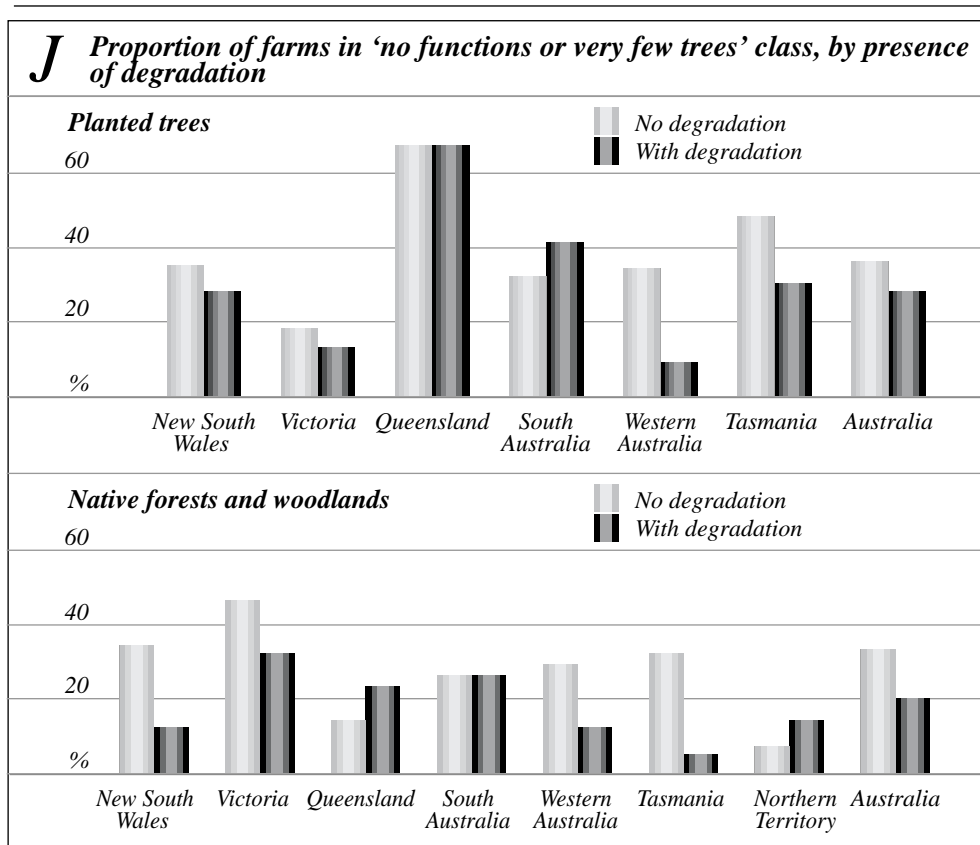
*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in Appendix A. A dash indicates the estimate was below 0.5.

example, only around 5 per cent of farmers whose trees serve an environmental function listed more information on the environmental benefits of trees as the main factor that would encourage them to increase forestry activities. In contrast, between 40 and 50 per cent of farmers in this group cited some form of financial incentive as the principal motivating factor.

### *Sources of information on farm forestry*

Where farmers obtain information on farm forestry is another important issue for delivery of the Farm Forestry Program. The results of the ABARE survey

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suggest that broadacre and dairy farmers seek information on farm forestry from a few key sources (table 36). State agencies, Landcare and land conservation groups, nurseries, contract planters and forest and plantation groups were the principal sources listed by respondents.

A notable result in table 36 is that farmers who thought that their trees provided environmental benefits favored Landcare and similar groups over state agencies and, to a lesser extent, forest and plantation groups as a source of information for farm forestry. Although these farmers were also likely to be Landcare members, this highlights the role that Landcare plays in disseminating information on farm forestry in the wider context of natural resource management.

Another factor that may have influenced a farmer's choice of information source may have been accessibility. For example, State agencies have an extensive network in all farming regions whereas other organisations, such as Greening Australia, may not have the same level of representation.

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### 32 *Differences in reported function of trees: selected states, by agricultural zone, 1998-99*

	Average for region of interest	Range of comparison <sup>a</sup>
	%	%
<b>Planted trees</b>		
Treat or prevent degradation	Queensland wheat–sheep zone 10 (32)	Wheat–sheep zone in other states 29–65
Provide shelter or shade (including grazing)	Queensland wheat–sheep zone 31 (23)	Wheat–sheep zone in other states 54–76
Conserve native vegetation and wildlife	Queensland wheat–sheep zone 4 (47)	Wheat–sheep zone in other states 23–41
<b>Native forests and woodlands</b>		
Provide shelter or shade (including grazing)	Victorian high rainfall zone 42 (16)	High rainfall zone in other states and the Northern Territory 65–84
Produce fodder	Western Australian pastoral zone 56 (35)	Pastoral zone in other states and the Northern Territory 0–17

<sup>a</sup> The range of values of other states' equivalent agricultural zone of interest, excluding the region of interest. The Northern Territory was included only for estimates of native forests and woodlands.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### **33** *Main factor that would encourage greater tree planting and/or improve native forest management on properties: broadacre and dairy farms, by zone, 1998-99* <sup>a</sup>

	<b>Pastoral zone</b>	<b>Wheat- sheep zone</b>	<b>High rainfall zone</b>	<b>Australia</b>
	%	%	%	%
Not interested in planting trees / improving management	45 (17)	20 (10)	32 (10)	27 (7)
Financial incentive	4 (56)	19 (11)	22 (11)	20 (8)
Higher profits from farm forestry activities	13 (48)	18 (11)	15 (15)	16 (9)
More information on, or certainty of, financial returns	2 (67)	6 (19)	7 (22)	7 (14)
More information on environmental benefits	1 (65)	6 (22)	4 (22)	5 (16)
Certainty/consistency of government or legislative controls	1 (75)	5 (26)	3 (37)	4 (21)
Information on farm management practices	1 (100)	4 (31)	2 (42)	3 (25)
Conditions not suitable	21 (19)	7 (23)	2 (43)	5 (17)
Already fully managed	11 (42)	12 (15)	8 (17)	10 (11)
Other	1 (69)	3 (35)	4 (36)	4 (25)

<sup>a</sup> One response per farm.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### 34 *Main factor that would encourage greater tree planting and/or improve management of native forests and woodlands: broadacre and dairy farms, by functions of planted trees, 1998-99* <sup>a</sup>

	No function or very few trees	Commercial function <sup>b</sup>	Environ- mental function <sup>c</sup>	Other function <sup>d</sup>
	%	%	%	%
Not interested in planting trees / improving management	44 (7)	14 (54)	10 (17)	35 (11)
Financial incentive	7 (23)	21 (35)	30 (10)	20 (20)
Higher profits from farm forestry activities	11 (19)	32 (17)	19 (14)	13 (21)
More information on, or certainty of, financial returns	4 (43)	6 (53)	9 (17)	7 (27)
More information on environmental benefits	4 (22)	6 (39)	6 (25)	3 (41)
Certainty/consistency of government or legislative controls	6 (33)	3 (48)	4 (29)	1 (54)
Information on farm management practices	3 (38)	3 (84)	4 (36)	1 (71)
Conditions not suitable	7 (18)	2 (59)	6 (38)	3 (31)
Already fully managed	12 (20)	10 (46)	8 (21)	13 (29)
Other	2 (56)	5 (77)	4 (43)	5 (43)

<sup>a</sup> One response per farm. <sup>b</sup> Defined as farmers who have planted trees to produce saw logs for sale, pulpwood for sale, nonwood products for sale or other/unknown wood products for sale or own use. <sup>c</sup> Defined as farmers who did not use planted trees in a commercial function but to rehabilitate degraded land and/or protect land from future degradation or conservation of native vegetation and wildlife. <sup>d</sup> Defined as farmers who did not use planted trees in a commercial or environmental function but to provide shelter or shade, fodder production or other.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### **35** *Main factor that would encourage greater tree planting and/or improve management of native forests and woodlands: broadacre and dairy farms, by functions of native forests and woodlands, 1998-99* <sup>a</sup>

	No function or very few trees	Commercial function <b>b</b>	Environ- mental function <b>c</b>	Other function <b>d</b>
	%	%	%	%
Not interested in planting trees / improving management	27 (12)	22 (17)	18 (12)	47 (11)
Financial incentive	19 (12)	25 (11)	22 (13)	11 (24)
Higher profits from farm forestry activities	10 (30)	22 (13)	19 (14)	14 (21)
More information on, or certainty of, financial returns	8 (19)	5 (33)	8 (22)	2 (107)
More information on environmental benefits	5 (40)	5 (28)	5 (24)	4 (36)
Certainty/consistency of government or legislative controls	3 (48)	4 (53)	6 (24)	3 (71)
Information on farm management practices	3 (50)	2 (55)	6 (32)	1 (134)
Conditions not suitable	8 (29)	2 (37)	4 (27)	7 (28)
Already fully managed	12 (21)	11 (27)	10 (16)	8 (29)
Other	6 (36)	1 (76)	3 (29)	3 (53)

**a** One response per farm. **b** Defined as farmers who have planted trees to produce saw logs for sale, pulpwood for sale, nonwood products for sale or other/unknown wood products for sale or own use. **c** Defined as farmers who did not use planted trees in a commercial function but to rehabilitate degraded land and/or protect land from future degradation or conservation of native vegetation and wildlife. **d** Defined as farmers who did not use planted trees in a commercial or environmental function but to provide shelter or shade, fodder production or other.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A.

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### 36 Sources of information/advice on farm forestry for farmers: broadacre and dairy farms, by function of trees, 1998-99 <sup>a</sup>

	No function or very few trees	Com- mercial function <b>b</b>	Environ- mental function <b>c</b>	Other function <b>d</b>	Australia
	%	%	%	%	%
State agencies	52 (6)	49 (17)	38 (9)	45 (7)	40 (5)
Landcare, land conservation groups	19 (13)	34 (22)	42 (8)	21 (15)	27 (7)
Forest and Plantations groups	24 (12)	26 (22)	15 (15)	24 (18)	19 (9)
Nurseries, contract planters	14 (16)	13 (28)	27 (11)	20 (17)	18 (9)
Other farmers	7 (26)	12 (34)	17 (16)	6 (31)	10 (12)
Farm journals/papers	6 (38)	20 (41)	12 (21)	2 (49)	8 (16)
Greening Australia	6 (24)	10 (38)	12 (21)	5 (45)	8 (14)
Consultants	1 (39)	6 (64)	11 (22)	5 (69)	6 (18)
Catchment group	2 (44)	5 (62)	4 (28)	3 (26)	3 (23)
Producer groups	3 (43)	5 (56)	3 (25)	1 (38)	3 (24)
CSIRO	2 (40)	1 (83)	3 (48)	3 (72)	2 (33)
Farmers Federation	2 (52)	–	3 (36)	1 (71)	2 (24)
Other	1 (55)	8 (69)	4 (35)	1 (56)	3 (29)
Don't know	13 (15)	6 (96)	5 (40)	10 (29)	8 (15)

**a** Respondents could list up to three main sources. **b** Defined as farmers who have trees to produce saw logs for sale, pulpwood for sale, nonwood products for sale or other/unknown wood products for sale or own use.

**c** Defined as farmers who did not use trees in a commercial function but to rehabilitate degraded land and/or

protects land from future degradation or conservation of native vegetation and wildlife. **d** Defined as farmers who did not use trees in a commercial or environmental function but to provide shelter or shade, fodder production or other.

*Note:* Figures in parentheses are relative standard errors, expressed as a percentage of the estimates. A guide to interpreting these measures of sample variation is contained in appendix A. A dash indicates the estimate was below 0.5.

## *6. Conclusion*

The 1998-99 resource management survey was the latest of three surveys conducted by ABARE during the 1990s investigating Landcare, land management practices, farm planning, training and land degradation. One of the advantages of a series of surveys with consistent questions is the ability to monitor particular issues through time and with the completion of the 1998-99 data two notable results have emerged.

First, analysis of data from the three surveys has highlighted the changing levels of farmer involvement in farm planning in the broadacre and dairy sector over the past decade. The proportion of farmers with a documented farm plan was around 25 per cent in 1992-93 but this rose to an estimated 36 per cent in 1995-96. This may indicate the success of the property management planning campaign conducted over this period.

However, by 1998-99 the proportion of farmers with a farm plan is estimated to have fallen back close to the level seen early in the 1990s. The decline in the number of farm plans may have been caused by a change in farmer perception over what constitutes a farm plan. Alternatively, involvement in farm planning may have enabled farmers to design and implement some important changes to farm layout and management. Once completed, however, the farmer may have little ongoing need for the plan. This is an issue that may warrant further investigation since it has potential implications for the long term role of programs promoting farm planning.

Second, the three years of survey data also suggest Landcare membership has grown during the 1990s though this was not uniform across all states. Between 1995-96 and 1998-99 national Landcare membership is estimated to have risen by 4 percentage points to 38 per cent. However, in New South Wales this trend was reversed; membership fell from 39 to 34 per cent. The number of farmers leaving New South Wales Landcare groups over this period, which was not markedly different in percentage terms to the rest of Australia, outweighed the number of new recruits. The reasons behind the slow down in recruitment may be an issue that warrants further investigation. Given it is obviously unrealistic to have all farmers join a Landcare group, it will also be particularly important to understand the influence of Landcare groups on non-members, including those who were previously part of the group, in defining the long term role of Landcare groups.

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Furthermore, the analysis of the 1998-99 survey results has provided some useful information for the ongoing evaluation of the Landcare program. Even though both Landcare members and non-members appear equally aware of the appropriateness of a range of farm management practices for dealing with resource management problems, a larger proportion of Landcare members had adopted most of these practices. While this in itself is not sufficient to argue that Landcare has had a positive effect on the adoption of best farm management practices, it is a necessary precursor to further work into the causal nature of this relationship.

The reported benefits of planted trees and remnant vegetation on broadacre and dairy farms are many and varied, most often relating to indirect benefits such as providing shelter and shade, or the treatment of degradation. Further, the stated benefits appear related to factors like the presence of degradation problems on the farm and whether the farmer is involved with Landcare. The varied nature of the perceived benefits of trees on farms and their relationship with other farm characteristics has implications for the design of the Farm Forestry Program.

The greatest factor constraining more widespread engagement in farm forestry activities by broadacre and dairy farmers was found to be the perceived financial return. In other studies such as, for example, Nelson and Mues (1993) farmers also commonly cited cash availability or cost as reasons for not addressing degradation problems on their farm. This may support further research into farm forestry options offering greater benefits to the farmer. But some of the benefits of farm forestry and other actions addressing resource degradation may not accrue fully to the farmer bearing the cost of the investment. Hence, there may also be a role for government natural resource management programs, including the Farm Forestry Program, to research policy options for providing farmers with the incentives to take these wider natural resource management benefits into account in their decision making process.

Finally, the results from the farm forestry questions provide an insight into where farmers obtain their information about farm forestry activities. State agencies, plantation groups, and nurseries or contract planters were commonly listed as sources of farm forestry information regardless of the type of benefits derived from the farm's trees. But Landcare groups were particularly favoured by farmers who perceive environmental benefits from their trees. This provides some evidence on the potential value of Landcare groups in disseminating information about the environmental benefits of farm forestry.

## *Appendix A: ABARE farm survey methods and definitions*

### *ABARE farm surveys*

Farm surveys conducted by ABARE have been a prime source of physical and financial information for the Australian farm sector for the past forty years. This information has been collected through close cooperation, in operational and financial terms, between ABARE and key research and development funding organisations. It has been used to undertake economic research into industry and government policy areas.

Surveys undertaken for 1998-99 included the Australian agricultural and grazing industries survey, which covers much of the broadacre sector of agriculture, and the Australian Dairy Industry Survey. These form the basis for much of the data presented in this report. ABARE's annual surveys of Australian broadacre industries provide a unique database that integrates detailed financial and physical information for just over 70 per cent of Australian farm business units.

Between June and November, ABARE survey officers visit sample farms. These officers interview farmers to obtain physical and financial details of the farm business for the latest financial year ended 30 June. Further information is subsequently obtained from accountants, selling agents and marketing organisations on the signed authority of responding farmers.

Information is collected on production, sharefarming, livestock, cropping, irrigation, fertiliser, land tenure, labor, costs, returns, debts and capital inventory. Considerable effort is made to reconcile the information obtained from the various sources to produce an accurate description of the physical and financial characteristics of each sample farm in the survey. Respondents to the surveys are also contacted by telephone in October each year to obtain estimates of production and expected receipts and costs for the current financial year. ABARE used the responses received in October 1998 to calculate estimates for 1998-99.

### *Target populations*

ABARE surveys are designed and samples selected on the basis of a framework drawn from the Business Register maintained by the Australian Bureau of Statistics (ABS). This framework includes agricultural establishments in each statistical local area classified by size and major industry.

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The estimates published in this report cover establishments with an estimated value of agricultural operations of \$22 500 or more. A definition of the estimated value of agricultural operations is given in ABS, Australian Standard Industrial Classification, 1983 (ABS cat. no. 1201.0). The estimated population and sample sizes for all broadacre and dairy industries, by state and geographic zone, in 1998-99 are given in table 37.

### *Definitions of industries*

Industry definitions are based on the Australian and New Zealand Standard Industrial Classification (ANZSIC). This classification conforms to an international standard that is applied comprehensively across Australian industry, permitting comparisons between industries, both within Australia and internationally.

Farms assigned to a particular ANZSIC class have a high proportion of their total output characterised by that class. Further information on ANZSIC and on the farming activities included in each of these industries is provided in ABS, *Australian and New Zealand Standard Industrial Classification*, 1993 (ABS cat. no. 1292.0).

### *Enterprise changes and movement in industry classification*

Farms classified to a particular industry in one year do not necessarily maintain that classification in the following year. Changes in industry classification occur as a result of changes in commodity prices and enterprise mix. If the price of output from one industry rises, for example, relatively more farms are likely to be classified as being in that industry. Similarly, in years of high production and/or prices, more farms are likely to exceed the EVAO threshold. Farm amalgamations and part ownership changes can also lead to industry changes and changes in EVAO.

Analysis of data on farm numbers and EVAO over the past few years has shown a considerable degree of mobility between the broadacre industries, particularly between the wheat and other crops and mixed livestock-crops industries, the beef and sheep-beef industries, the sheep and sheep-beef industries, and between the sheep and mixed livestock-crops industries.

Further discussion of enterprise changes and movement in industry classifications can be found in ABARE's *Australian Farm Surveys Report 2000* (ABARE 2000).

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### 37 *Population and sample numbers for all broadacre and dairy industries, 1998-99*

	New South Wales	Victoria	Queensland	South Australia
Population	26 423	24 271	13 086	9 478
Sample	349	295	300	218
	Western Australia	Tasmania	Northern Territory	Australia
Population	9 979	2 139	198	85 574
Sample	175	88	46	1 471
	Pastoral zone	Wheat-sheep zone	High rainfall zone	
Population	4 228	44 776	36 570	
Sample	210	667	593	

### *Reliability of estimates*

The reliability of the estimates of population characteristics presented in this report depends on the design of the sample and the accuracy of the measurement of characteristics for the individual sample farms.

### *Sample design and estimation*

Only a small number of farms out of the total number of farms in a particular industry are surveyed. Estimates derived from these farms are likely to be different from those that would have been obtained if information had been collected from a census of all farms. How closely the survey results represent the population is influenced by the number of farms in the sample, the variability of farms in the population and most importantly the design of the survey and the estimation procedures used.

In the design for the broadacre survey the population is stratified

#### *Broadacre industries*

The broadacre industries in ABARE's Australian agricultural and grazing industries survey are:

**Wheat and other crops industry** (ANZSIC class 0121): farms engaged mainly in growing cereal grains, coarse grains, oilseeds and/or pulses.

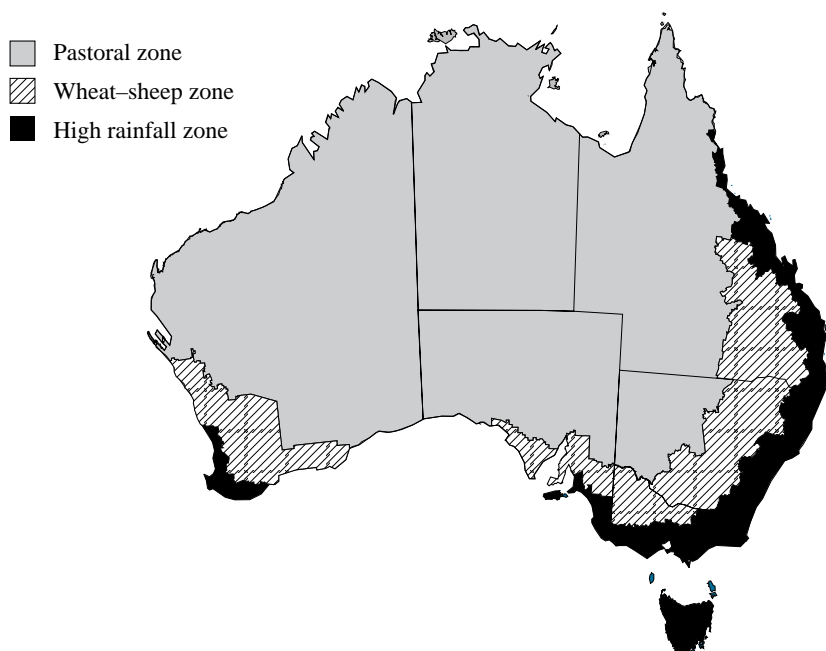
**Mixed livestock-crops industry** (ANZSIC class 0122): farms engaged mainly in running sheep or beef cattle and growing cereal grains, coarse grains, oilseeds and/or pulses.

**Sheep industry** (ANZSIC class 0124): farms engaged mainly in running sheep.

**Beef industry** (ANZSIC class 0125): farms engaged mainly in running beef cattle.

**Sheep-beef industry** (ANZSIC class 0123): farms engaged mainly in running both sheep and beef cattle.

## Australian broadacre zones



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according to farm size, industry and region to ensure a broad representation of farms across Australia. The data collected from each sample farm are weighted to calculate population estimates. To increase the efficiency of the estimation process in generating measures of farm financial performance, the sample weights are based on variables that are linked to farm income and profits. Broadly, sample weights are calculated so that sample estimates of numbers of farms, areas of crops and numbers of livestock in various geographic regions and industries correspond as closely as possible to Australian Bureau of Statistics data and/or to reliable data obtained from other sources (Bardsley and Chambers 1984).

### *Measures of reliability*

Despite the use of efficient sample design and estimation techniques, the estimates presented in this report are likely to be different from those that would have been obtained if information had been collected from all farms. To give a guide to the reliability of the survey estimates, measures of sampling variation have been calculated. These measures, expressed as percentages of the

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## LANDCARE AND FARM FORESTRY

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survey estimates and termed 'relative standard errors', are given next to each estimate in parentheses.

These relative standard errors can be used to calculate 'confidence intervals' for the survey estimate. The standard error can be calculated by multiplying the relative standard error by the survey estimate and dividing by 100. For example, if average total cash receipts are estimated to be \$100 000 with a relative standard error of 6 per cent, the standard error for this estimate is \$6000. There is roughly a two in three chance that the 'census value' (the value that would have been obtained if all farms in the target population had been surveyed) is within one standard error of the survey estimate. There is roughly a nineteen in twenty chance that the census value is within two standard errors of the survey estimates. Thus, in this example, there is approximately a two in three chance that the census value is between \$94 000 and \$106 000, and approximately a nineteen in twenty chance that the census value is between \$88 000 and \$112 000.

### *Comparing estimates*

When comparing estimates between different groups of farms, it is important to recognise that the differences are also subject to sampling variation. As a rough rule of thumb, a conservative estimate (an overestimate) of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and then taking the square root of the result. An example is given below.

Suppose estimates of total cash receipts for farms in two different regions were \$100 000 and \$125 000 — a difference of \$25 000 — and the relative standard error is given as 6 per cent for each estimate. The standard error of the difference can be estimated as

$$\begin{aligned} &\sqrt{[(0.06 \times \$100\,000)^2 + (0.06 \times \$125\,000)^2]} \\ &= \$9605 \end{aligned}$$

so the relative standard error of the difference is:

$$(\$9605 / \$25\,000) \times 100 = 38 \text{ per cent.}$$

Similar calculations can be made when comparing estimates across time periods. However, it should be noted that any differences may be caused by changes in the populations across time rather than by actual changes in the estimates of interest. There may also be differences in data quality between the two estimates being compared: final estimates are more reliable than preliminary estimates.

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### *Data quality*

The values obtained in a survey or a census can be affected by errors of measurement and reporting. To minimise these sources of error, ABARE obtains data from a range of sources and crosschecks the data for consistency. The data sources include farmer estimates obtained in face to face interviews, farm business records, various sales outlets, and callbacks when inconsistencies are identified. Consistency checks are made progressively as information becomes available with the result that final estimates for a year are generally based on more accurate data than either the 'preliminary' or 'provisional' estimates.

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### *Definitions*

***Owner manager*** The primary decision maker for the farm business. This person has some share in the farm business and is identified by discussion between interviewer and interviewee as (one of) the key decision maker(s) in the farm business. This person is usually responsible for the day to day operation of the farm. Previously termed 'owner manager' or 'cooperator' in ABARE publications.

***Landcare member*** A property representative who was a member of Landcare or similar group, such as tree care or dune care, in 1998-99.

### *Physical items*

***Owner manager labor*** Measured in work-weeks, as estimated by the owner manager. It includes all work on the farm by the owner manager.

***Hired labor*** Excludes labor of the farm business manager, partners and family, and work undertaken by contractors, such as contract shearing. Expenditure on contract services appears as a separate item.

***Total labor*** Measured in work-weeks, as estimated by the owner manager. It includes all work on the farm by the owner manager, partners, family, hired permanent and casual workers, and sharefarmers but excludes work done by contractors.

***Total farm area*** Includes all land operated by the farm business, whether owned or rented by the business. Land share-farmed on another farm is excluded.

***Sheep equivalent*** Calculated as the number of sheep, plus the number of beef cattle multiplied by 8, plus the area cropped multiplied by 12, plus the number of dairy cattle multiplied by 12.

## *LANDCARE AND FARM FORESTRY*

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### *Financial items*

#### ***Capital***

The value of farm capital is the value of all the assets used on a farm, including the value of leased items but excluding machinery and equipment either hired or used by contractors. The value of 'owned' capital is the value of farm capital excluding the value of leased machinery and equipment.

ABARE uses farmer valuations of sample properties. The valuation includes the value of land and fixed improvements used by each farm business in the survey, excluding land sharefarmed off the sample farm. Residences on the farm are included in the valuations.

Livestock are valued at estimated market prices for the land use zones within each state. These values are based on recorded sales and purchases by sample farms and on information from state agriculture departments.

ABARE maintains an inventory of plant and machinery for each sample farm. Individual items are valued at replacement cost, depreciated for age. Each year, the replacement cost is indexed to allow for changes in that cost. The total value of items purchased or sold during the survey year is added to or subtracted from farm capital at 31 December of the relevant financial year, irrespective of the actual date of purchase or sale.

#### ***Debt and assets***

Debt information is collected at the survey interview, supplemented by information contained in the farm accounts.

#### ***Receipts and costs***

Receipts for livestock and livestock products sold are determined at the point of sale. Selling charges and charges for transport to the point of sale are included in the costs of sample farms.

Receipts for crops sold during the survey year are gross of deductions made by marketing authorities for freight and selling charges. These deductions are

## *LANDCARE AND FARM FORESTRY*

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included in farm costs. Crop receipts include amounts received in the survey year for crops harvested and delivered in previous years. Receipts for other farm products are determined on a 'farmgate' basis.

Farm receipts and costs relate to the whole area operated, including areas operated by on-farm sharefarmers. Thus, cash receipts include receipts from the sale of products produced by sharefarmers. On-farm sharefarmers' costs are amalgamated with those of the sample farm where possible; otherwise, the total sum paid to sharefarmers is treated as a cash cost.

Some sample farm businesses engage in off-farm contracting or sharefarming, employing labor and capital equipment also used in normal on-farm activities. Since it is not possible to make an accurate allocation of costs between off-farm and on-farm operations, the income and expenditure attributable to such off-farm operations are included in the receipts and costs of the sample farm business.

### ***Total cash costs***

Payments made by the farm business for materials and services and for permanent and casual hired labor (excluding owner manager, partner and other family labor). It includes the value of livestock transfers onto the property as well as any lease payments on capital, produce purchased for resale, rent, interest, livestock purchases and payments to sharefarmers. Capital and household expenditures are excluded from total cash costs.

- Handling and marketing expenses include commission, yard dues, levies etc. for farm produce sold.
- Administration costs include accountancy fees, banking and legal expenses, postage, stationery, subscriptions and telephone.
- Contracts paid refers to expenditure on contracts such as harvesting, etc. Capital and land development contracts are not included.

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- Other cash costs include stores and rations, seed purchased, electricity, artificial insemination and herd testing fees, advisory services, motor vehicle expenses, traveling expenses and insurance. While ‘other cash costs’ comprise a relatively large proportion of total cash costs, individually the components are relatively small overall, and as such, have not been listed.

### ***Total cash receipts***

Total of revenues received by the farm business during the financial year, including revenues from the sale of livestock, livestock products and crops, plus the value of livestock transfers off a property. It includes revenue received from agistment, royalties, rebates, refunds, plant hire, contracts, sharefarming, insurance claims and compensation, and government assistance payments.

### ***Financial performance measures***

#### ***Capital appreciation***

Change in the value of land and improvements, plant, livestock and other tradable stocks, such as wool and grain, arising from changes in their prices during the financial year

#### ***Farm business equity***

The value of owned capital, less farm business debt at 30 June. The estimate is based on those sample farms for which complete data on farm debt are available.

#### ***Farm equity ratio***

Calculated as farm business equity as a percentage of owned capital at 30 June.

#### ***Farm business profit***

Farm cash income plus buildup in trading stocks, less depreciation, less the imputed value of the owner manager, partner(s) and family labor. The buildup in trading stocks is the imputed value of all changes in the inventories of trading stocks during the financial year. If this figure is negative, then inventories are being run down. Note that ‘buildup in trading stocks’ refers to the change in trading stocks, not the level of inventory.

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<i>Farm cash income</i>	The difference between total cash receipts and total cash costs.
<i>Off-farm wages And salaries</i>	Collected for the owner manager and spouse only, this measure includes income from wages and salaries.
<i>Off-farm income</i>	Collected for the owner manager and spouse only, this measure includes income from wages, other businesses, investment and social welfare payments. The results shown are averages for those farms for which off-farm income information is available for both the owner manager and spouse.
<i>Profit at full equity</i>	Farm business profit, plus rent, interest and finance lease payments, less depreciation on leased items. It is the return produced by all the resources used in the farm business.
<i>Rates of return</i>	Computed by expressing profit at full equity as a percentage of total opening capital.

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### *Appendix B: Nonresponse in natural resource management supplementary survey*

Nonresponse to a survey can lower the quality of the survey's results. Therefore, before analysing survey results it is important to determine if there is a problem with nonresponse and to resolve any nonresponse problems. There are a variety of types of nonresponse that can occur with surveys.

First, the people selected for interview may choose not to participate in the entire survey. If the reason a person did not respond to the entire survey is related to the questions being asked in that survey, then this can lead to biased estimates. For instance, if farms with higher debt levels were more likely not to respond to the survey, then the estimated debt levels for the respondents would be lower than that for the actual population. This selection nonresponse bias was not considered a concern for ABARE's national survey of broadacre and dairy industries collected in 1998-99.

Second, participants may elect not to respond to certain questions within either the main or supplementary surveys. Again, if the nonresponse is linked to the variable in question then this will result in a bias in the results. A good understanding of the nonresponse drivers is needed to identify if a bias is likely, the possible impact of this bias and the correction for the bias where appropriate.

Finally, people who participate in the main survey may choose not to respond to the supplementary surveys. Supplementary surveys, such as the resource management survey, are additional to the main survey, but asked of participants at the same time as the main survey. As before, biases in the estimates can occur if the reason a person does not respond to the survey is related to the questions asked. This nonresponse means that the weights generated on the basis of variables collected from the main questionnaire may not be appropriate to obtain population estimates for variables in the supplementary survey.

This type of nonresponse was of concern for ABARE's resource management supplementary survey. ABARE undertook the resource management survey in conjunction with the surveys of broadacre and dairy farms. While there was minimal nonresponse from dairy farms, around 6 per cent of farms who responded to ABARE's survey of broadacre farms did not respond to the resource management survey.

When the reason for nonresponse can be linked to the known characteristics in the farm population the survey weights can be adjusted to correct for bias, and ABARE selected this approach. The surveys were first manually checked

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to investigate why people may not have responded. Inferences from this investigation were then incorporated into a model investigating nonresponse through logistic regressions. Using the modeled response mechanism, weights were first adjusted to account for nonresponse. These weights were then recalibrated to ensure the weighted sample conformed to the known population for selected characteristics (Lundstrom and Sarndal 1999).

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### *Appendix C: Resource management survey data package on the web*

The resource management survey data package (RMSDP) is a web based package that provides data from the 1999 survey of resource management on Australian grazing, cropping and dairy farms.

RMSDP allows users to select measures of farm performance that are collected annually as part of ABARE's farm surveys as well as questions from the 1998-99 resource management supplementary including:

- Landcare membership and lessons learned through participation in Landcare activities;
- existence and components of farm plans;
- farm training activities in the past three years;
- farm management practices;
- significant land degradation problems experienced in 1998-99;
- expenditure on land care related activities;
- farmer attitudes to a range of resource management issues;
- significant changes to the enterprise in the past three years and reasons for these changes;
- trees on farms – the main functions that trees serve on farms, the main factors that would encourage greater tree planting, and the main sources of information on farm forestry.

Survey results are provided at the national level, as well as by state, agricultural zone and state by zone. Additionally the RMSDP package enables the user to split farms into two groups, Landcare members and nonmembers, so that results can be compared.

RMSDP is produced by ABARE using funding from the National Landcare Program and Farm Forestry Program components of the Natural Heritage Trust.

*References*

- ABARE 2000, *Australian Farm Surveys Report 2000*, Canberra.
- Bardsley, P. and Chambers, R.L. 1984, 'Multipurpose estimation from unbalanced samples', *Journal of the Royal Statistical Society, Series C (applied statistics)*, vol. 33, pp. 290–9.
- Bell, R., Mues, C. and Beare, S. 2000, 'Salinity management: some public policy issues in the Murray Darling Basin', in *Outlook 2000*, Proceedings of the National Outlook Conference, Canberra, 29 February – 2 March, vol. 1, *Natural Resources*, ABARE, Canberra, pp. 151–63.
- Curtis, C. and Van Nouhuys, M. 1999, 'Landcare participation in Australia: the volunteer perspective', *Sustainable Development*, vol. 7, pp. 98–111.
- Connell, P. and Hooper, S. 2000, *Australian Grains Industry 2000*, A Supplement to the *Australian Farm Surveys Report 2000*, Canberra.
- Gordon, I. 1998a, 'Salinity in Queensland', DNR Land Facts, Resource Processes, Department of Natural Resources, Queensland ([www.dnr.qld.gov.au](http://www.dnr.qld.gov.au)).
- 1998b, 'Managing salinity with vegetation', DNR Land Facts, Resource Processes, Department of Natural Resources, Queensland ([www.dnr.qld.gov.au](http://www.dnr.qld.gov.au)).
- Government of Western Australia 2000, *Natural Resource Management in Western Australia, Salinity: A Guide for Land Managers*, Perth, March.
- Graetz, R., Wilson, M. and Campbell 1995, *Landcover Disturbance Over the Australian Continent: A Contemporary Assessment*, Department of the Environment, Sport and Territories, Canberra.
- Great Artesian Basin Consultative Council 1998, *Great Artesian Basin Strategic Management Plan*, Draft, Queensland, November.
- Kemp, A. and Alexander, F. 2000, 'Land care and degradation', *Australian Farm Surveys Report 2000*, ABARE, Canberra, pp. 37–9.

## LANDCARE AND FARM FORESTRY

---

- Lal, R. 1990, *Soil Erosion in the Tropics: Principles and Management*, McGraw-Hill Inc., New York.
- Lundstrom, S. and Sarndal, C.E. 1999, 'Calibration as a standard method for treatment of nonresponse', *Journal of Official Statistics*, vol. 15, no. 2, pp. 305–27.
- MacGregor, C. and Pilgrim, A. 1998, 'Is Landcare funding hitting the target?', in *Natural Resource Management*, March, vol. 1, no. 1, pp. 4–7.
- Martin, L. and Metcalfe, J. 1998, *Assessing the Causes, Impacts, Costs and Management of Dryland Salinity*, LWRRDC Occasional Paper 20/98 Revision Number One, Land and Water Resources Research and Development Corporation, Canberra.
- Martin, P. 1998, 'Financial performance of surveyed industries', *Australian Farm Surveys Report 1998*, ABARE, Canberra, pp. 1–21.
- 1999, 'Financial performance of surveyed industries', *Australian Farm Surveys Report 1999*, ABARE, Canberra, pp. 1–22.
- Martin, P., Lubulwa, M., Riley, C. and Helali, S. 2000, 'Farm performance', *Australian Farm Surveys Report 2000*, ABARE, Canberra, pp.1–19.
- Mues, C. and Hardcastle, S. 1998, 'Resource management in the Great Artesian Basin', in *Outlook 98*, Proceedings of the National Agricultural and Resources Outlook Conference, Canberra, 3–5 February, vol. 1, *Commodity Markets and Resource Management*, ABARE, Canberra, p. 93–102.
- Mues, C., Chapman, L. and Van Hilst, R. 1998, *Promoting Improved Land Management Practices on Australian Farms: A Survey of Landcare and Land Management Related Programs*, ABARE Research Report 98.4, Canberra.
- Mues, C., Roper, H. and Ockerby, J. 1994, *Survey of Landcare and Land Management Practices: 1992-93*, ABARE Research Report 94.6, Canberra.
- Nelson, R. and Mues, C. 1993, *Survey of Landcare and Drought Management Practices 1991-92*, Land and Forestry Economics Section, ABARE, Canberra.