Landcare in Australia: Does it Make a Difference?

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Victorian landcare groups are increasingly seen as the key element of an emerging Australian success story. The assumptions underlying landcare are that limited funding of group activity will produce more aware, informed, skilled and adaptive resource managers with a stronger stewardship ethic, will increase the adoption of sustainable practices, and will assist the move to more sustainable resource use. A survey of all landholders in 12 subcatchments of north-east Victoria was undertaken in 1993 to assess the impact of landcare participation upon key programme outcomes. Information from the northeast survey indicated that landcare participation had a significant impact upon landholder awareness of issues, level of knowledge and adoption of best bet practices. This information, and earlier research by the authors, suggests that landcare group activity has made an important contribution towards sustainable resource management. However, research findings also suggested a number of flaws in programme logic. Given the low levels of profitability amongst landholders, the vast scale and intractable nature of key issues and the considerable off-site benefits of remedial action, it is problematic whether limited funding of a community development process will effect behavioural changes that are sufficient to make a difference at the landscape level. Programme emphasis upon developing landholders' stewardship ethic also appears misplaced in that there was no significant difference in the stewardship ethic of participants and non-participants. Indeed, to the extent that landcare focuses upon changing individual behaviour rather than societal barriers to rural development, landcare is open to the criticism that it places too much responsibility upon individual landholders.

Keywords: landcare, community participation, rural development, sustainable agriculture, Australia.

1. Introduction

Landcare is seen as an emerging Australian success story and involves a considerable investment of public and private resources. Until recently, there has been little work to assess landcare programme effectiveness, in particular, the assumptions underlying programme logic. Indeed, this research and other work undertaken by the authors (see Curtis et al., 1993c, 1994a-c, 1994d,f) formed an important element of the Commonwealth Department of Primary Industries and Energy (DPIE) 1994 review of...
the Decade of Landcare. Research reported in this paper employed a model of the landcare programme logic (Figure 1) to assess programme impact within one region. The intention was to provide information useful to key stakeholders by exploring the theoretical assumptions underpinning the landcare programme (Chen, 1990; Chen and Rossi, 1983; Rossi and Freeman, 1985). The emphasis was therefore upon formative evaluation that would enlighten stakeholders and assist programme improvement (Cronbach et al., 1980).

2. Background

The landcare programme emerged as a distinctive entity in the state of Victoria during 1986 (Campbell, 1991a) and has been embraced by governments, farmer organisations and conservation groups throughout Australia as offering a model for effective community action to manage land degradation and assist the move to more sustainable resource use. Indeed, by July 1994, there were an estimated 2000 Australian landcare groups (including 500 Victorian landcare groups with two new groups formed each week for the previous 3 years). After lobbying from major farmer and conservation groups, the Commonwealth government committed spending of A$360m in the Decade of Landcare programme announced as part of a major environmental statement by the Prime Minister (Hawke, 1989): landcare was now a national programme. Landcare is intended to achieve more sustainable use of Australia’s farming lands (DCE, 1992) and to enhance biodiversity (Farley and Toynæ, 1989). Whilst governments espoused a “landcare programme” that embraced all facets of sustainable resource use, it was the emergence, growth and activity of these voluntary groups which captured public attention and distinguished landcare from previous efforts to achieve more sustainable resource use.
Most landcare groups have developed in rural areas and group membership is voluntary and open to any member of the local community. Groups frequently operate at catchment or sub-catchment scales and are involved in a variety of activities related to the management of issues affecting agricultural production and biodiversity, such as water quality decline, soil erosion, ground water salinity, soil acidity, vegetation decline and introduced pest animals and weeds. Reports by Campbell (1991b, 1992), Curtis and De Lacy (1994a) and Curtis et al. (1993a, 1994a–d) revealed that, amongst their various activities, landcare groups hold meetings to discuss issues, identify priorities, develop action strategies and debate a range of resource management issues with guest speakers; conduct field days and farm walks and establish demonstration sites; undertake a variety of educational and promotional activities such as hosting tours and involving other community groups in landcare activities, organise conferences, write newsletters and field guides and prepare media releases; undertake a range of on-ground work including seed collection and tree planting, constructing salinity and erosion control structures, coordinating pest animal and weed control activities, erecting fencing to control stock access to creeks and streams and establish wildlife corridors; groups coordinate planning activities related to whole farm or property planning and catchment planning; and some members are involved in the preparation of submissions for government funding.

Campbell (1989), Woodhill (1990), Edgar and Patterson (1992) and Curtis et al. (1993b) discussed the benefits of landcare participation from the landholder perspective in terms of landholders being able to share problems and ideas and, in doing so, gain support and encouragement to push ahead; work together to tackle common problems more effectively; have opportunities for learning about land management and to plan at property and catchment levels so that resource management is based upon a shared understanding of important physical, social and economic processes operating within and beyond the farm gate; obtain financial and technical assistance from government that they would be unlikely to receive as individual landholders; and have increased opportunities for social interaction with other members of their local community. Edgar and Patterson (1992) indicated social learning and social interaction, which was likely to be facilitated by involvement in landcare groups, and was an important ingredient in developing greater awareness of land degradation issues and in promoting better land management. Whilst participants could learn from one another, it was also suggested that peer pressure might encourage the adoption of improved practices and overcome the problem of free-riders in voluntary approaches to common-pool natural resources management.

Evaluators can turn to a number of sources in their effort to unravel programme theory: they can approach programme staff, clients and other stakeholders for their views, they can review literature on the programme under scrutiny or similar programmes, examine programme documentation, and observe programme operation. Shadish et al. (1991, pp. 236–237) suggest this process occurs as part of an “evaluability assessment” which is “... a tool to help ameliorate the problems of lack of definition, clear logic, and management ...”. Evaluability assessment aims to explore both programme implementation and clarify program intent (Shadish et al., 1991). Given the lack of explicit programme goals, the diversity of stakeholder opinions about landcare programme objectives, and the heterogeneity of programme implementation at the local level, the authors have devoted considerable energy to unravelling programme logic. To a large extent, this task was accomplished using information collected through the state-wide group activities report process (Curtis et al., 1993a,c), the authors' knowledge
of landcare group activities in north-east Victoria and personal contacts with stakeholders at local, regional, state and federal scales. The key assumptions underlying community landcare (Figure 1) are that, with the limited government funding of a self-help programme, landcare group action will facilitate a process of community participation that will mobilise a large proportion of the rural population and produce more aware, informed, skilled and adaptive resource managers with a strong stewardship or land ethic, and thereby result in the adoption of improved management practices and assist the move to more sustainable resource use.

3. Methodology

During autumn 1993, a 16 page survey was mailed to all rural property owners in 12 small catchments in north-east Victoria; nine catchments where landcare groups had been operating for more than 2 years and three catchments where no landcare group existed (Curtis and De Lacy, 1994b).

The north-east regional survey attempted to:

• Assess the impact of landcare participation, including length of membership and intensity of participation, in making a significant difference to the adoption of best bet practices likely to:
  (i) enhance the economic viability of landholders; and
  (ii) enhance catchment protection and the conservation of biodiversity, through community development processes that make a significant difference to landholders':
    (i) awareness of land degradation issues;
    (ii) development of a stewardship ethic; and
    (iii) level of knowledge of resource management topics.
• Explore whether there are inconsistencies between aspects of landcare programme logic and the practice of landcare. In particular, to explore:
  (i) the linkage between attitudes towards stewardship and the adoption of conservation practices by landholders.
• Explore the characteristics of landcare participants and non-participants. An important step in assessing the impact of landcare was to determine the extent participants and non-participants were similar on key social and farming variables (see Curtis and De Lacy, 1994b).

The intention was to assess the impact of landcare in a single region by comparing:

1. Landcare respondents with non landcare respondents in landcare areas.
2. All respondents in landcare areas with all respondents in areas where landcare groups did not exist.

The north-east study was a cross-sectional, non-randomised study of individuals and properties at January 1993. The researchers proposed to overcome some of the limitations of cross-sectional, non-randomised studies through the inclusion of the non-landcare areas as a control group and by applying bivariate and multivariate statistical procedures to control for the impact of a range of independent variables likely to affect key outcomes. However, the potential for multivariate analysis to accomplish such a task is limited by a researcher’s ability to identify relevant variables and include them in a study. Despite the most conscientious efforts, the limitations of this cross-sectional
study in identifying causal relationships must be acknowledged: factors other than landcare participation may explain significant differences identified.

The decision to run with a regional case study reflected the authors’ view that regional differences limited the effectiveness of surveying across a number of regions. Apart from the obvious biophysical variations, there are considerable regional variations in farm enterprises and profitability, access to off-farm work and administrative arrangements that affect landcare activity. Access to a region where a large number of groups had been operating for a considerable time was an important factor in the choice of the north-east region, as was the authors’ knowledge of the region, landcare groups and agency staff. To enable sufficient time for landcare group activity to affect landholder perceptions, attitudes and actions, only areas where groups had been operating for more than 2 years were included in the nine landcare areas surveyed. At April 1993, these nine areas had groups which had been operating between 6 and 10 years. Information available to the researcher from the group activities reports (Curtis et al., 1993a,c), and from personal contact with group leaders and agency staff, indicated the groups surveyed had received government support slightly above the mean of A$10,657 (Curtis and De Lacy, 1994a) for Victorian groups. Given the information above, it appeared reasonable to claim that, if landcare groups were not effective in the north-east, it was unlikely landcare groups would be effective elsewhere. The three non-landcare areas were selected to provide a spread of land types, agricultural enterprises and distances from regional centres that approximated these characteristics in the landcare areas surveyed.

Survey methodology conformed with Dillman’s (1978) Total Design Method in that the survey questionnaire was a small (B5) booklet with a distinctive, authoritative cover which was posted with an accompanying covering letter and stamped return envelope. A small thank you/reminder card was posted between 8–10 days after the first mail out and a second mail out to all non-respondents occurred 6 weeks after surveys were initially posted. With 352 responses from the 593 land holders in the nine landcare areas, a 59% survey response rate was achieved in the landcare areas. With 48 responses from the 110 land holders in the three non-landcare areas, a 42% response rate was achieved.

The literature on voluntary groups, community participation, the adoption of agricultural innovation and landcare were examined in an effort to identify key social and farming variables that might assist the understanding of landcare participation and the impact of participation upon landholder perceptions of land degradation issues, development of a stewardship ethic, knowledge of resource management and adoption of best bet practices. As Rogers (1983, p. 242) explained, “We know more about innovativeness... than about any other concept in diffusion research.” Buttel et al. (1990), Pampel and Van Es (1977), Rogers (1983) and Nowak (1987) explored the adoption of agricultural/conservation innovations and discussed the findings of a large number of adoption studies. Earle et al. (1978), Vanclay (1986, 1992), Vanclay and Cary (1989), Wilkinson and Cary (1992) and Mues et al. (1994) provided the nucleus of a considerable body of research into the adoption of agricultural innovations in eastern Australia. Reeve and Black (1992) and Black and Reeve (1993) provided a thorough review of much of the literature on the adoption of agricultural/conservation innovations and the only published large scale study investigating factors affecting landcare participation. However, not all landcare members are farmers and landcare group activities extend beyond those related to the adoption of agricultural or conservation practices, such as conservation tillage. Landcare groups are another voluntary

As might be expected, these different sources are often contradictory. However, a number of commonly applied social and property variables which might assist understanding of the nature and impact of landcare participation were identified. Given the vast number of potential sociological, psychological and institutional variables that might explain landcare participation, it is probable that key variables were not included in the study. Questions seeking information about the following variables were included in the north-east sustainable farming survey booklet:

Personal characteristics independent of landcare participation:

- Age
- Sex
- Education
- Length of farming experience
- Length of residence in area (indication of geographic mobility)
- Involvement in other community groups
- Type of off-farm employment
- Extent of off-farm employment (hours worked)
- Amount of off-farm household income
- If the participant has a spouse, then the spouse's education, occupation, extent of influence upon decision-making within farm and household and extent and type of off-farm employment

Personal characteristics hypothesised as not independent of landcare participation:

- Perceived knowledge of land degradation processes and sustainable agricultural practices relevant to north-east Victoria
- Belief about extent of land degradation on property
- Belief about environmental and economic impact of land degradation on property
- Attitude—stewardship ethic
- Attitude—importance of community co-operation in managing land degradation
- Importance of sources of information about sustainable farming practices
- Landcare membership
- Length of landcare membership (relative to period of time group operating)
- Intensity of participation in landcare activities
- Reasons for joining or not joining landcare

Farming variables independent of landcare participation:

- Farm size (all land owned by household in local area)
- Arable farm size (calculated by subtracting area of remnant vegetation from size)
- Land type as a percentage of the total area: steep to moderate slopes, length of frontage to rivers and named creeks; amount of remnant vegetation (accounted for in arable farm size)
A. Curtis and T. De Lacy

- Type of agricultural production
- Did the farm make a profit?
- Net farm income (taxable)

Farming variables not independent of landcare participation:

- Amount of perennial pasture at January 1993
- Perennial pasture established in previous 2 years
- Number of soil tests conducted in previous 2 years
- Number of trees planted in previous 2 years
- Length of fencing erected to control stock access to water courses, native bush/trees or to protect new plantings of trees in previous 2 years
- Area limed in previous 2 years
- Involvement in property management planning

A number of best bet practices were identified which are the focus of considerable landcare group activity and which appeared to be the most useful strategies for effectively managing the major issues confronting Victorian landholders. Whilst there are regional differences in the severity of resource management issues, the strategies likely to manage these effectively are reasonably consistent across the state. The best bet practices included in the north-east study were:

- Perennial pasture establishment
- Tree planting
- Fencing for landcare activities such as controlling stock access to streams, protecting new and remnant vegetation
- Soil testing
- Liming to control soil acidity
- Whole farm planning or property management planning

4. Findings: does landcare participation make a significant difference to behaviour?

4.1. A COMPARISON OF LANDCARE AND NON-LANDCARE PARTICIPANTS IN LANDCARE AREAS

4.1.1. Awareness of land degradation

One of the key assumptions underlying the landcare programme is that landholders who are more aware of land degradation issues are more likely to adopt best bet practices that will assist the move to more sustainable resource management, and that community development processes within landcare can enhance landholder awareness. In his discussion of farmers' concern about land degradation, Vanclay (1992) noted that farmers' perceptions of the severity of land degradation on their properties affected the likelihood of their taking action to prevent it.

Using Likert-type response categories, respondents to the north-east survey were asked to indicate both their perception of the extent key land management issues were a problem on their property and the impact of these issues upon a range of economic and environmental values. Bivariate analysis (Curtis and De Lacy, 1994b) established that landcare and non-landcare participants were engaged in similar types of farming enterprises and their properties were similar in terms of farm characteristic likely to affect the occurrence and severity of land degradation in north-east Victoria. Bivariate
analysis (Table 1) indicated that landcare respondents had significantly higher levels of awareness for almost all of the key land management issues listed, and for an index measuring overall awareness of land degradation. Landcare respondents also had a significantly greater concern for all of the listed potential economic and environmental impacts of land degradation on their property (Table 2). Indices measuring overall concern for both economic and environmental impacts were calculated for use as summary measures in other bivariate and multivariate analyses. Multivariate analyses were conducted using landcare outcomes as the response variables in either logistic or linear regression models with landcare membership as one of the explanatory variables. Results of multivariate analyses are summarised in Figure 2. A significant positive relationship was observed between landcare participation and concern about both the economic and environmental impacts of land degradation issues ($P = 0.0057; P = 0.0546$, respectively).

4.1.2. Development of a stewardship or land ethic

Until recently, the accepted view (Roberts, 1992) was that landcare participants would develop a stronger land ethic, landcare activity would foster the strengthening of the land ethic of others, and a stronger land ethic would affect the behaviour of land managers. For Vanclay (1992, p. 97), “Stewardship refers to the notion that farmers are stewards of the land and that farming is a way of life that places implicit responsibility on farmers to look after the land for future generations.” Vanclay (1986) developed a stewardship/land ethic attitudinal scale utilising a series of statements with five point Likert-type response categories. After appropriate statistical tests for scale reliability and validity, respondents scores for each scale item were computed to provide an index score for each respondent. Vanclay’s (1986) stewardship scale has been adapted for this research project in north-east Victoria. Using statistical procedures for constructing attitudinal scales outlined by De Vaus (1991), three items were eliminated to arrive at a scale of six items with item-to-item Spearman rank correlation coefficients ($P > 0.3$) and a standardised item alpha using an SPSS of $0.6479$ (slightly below the accepted 0.70 standard). Given that the stewardship scale meets requirements for unidimensionality, has been used previously, and a number of relationships were found to be as hypothesised, the authors were confident of scale reliability and validity.

Analysis of survey responses revealed no significant differences in the scores of landcare and non-landcare respondents in landcare areas (Table 3) or between landcare areas and non-landcare areas on the stewardship/land ethic index. These results were consistent with Vanclay’s (1986, 1992) findings that scores on the stewardship ethic do not discriminate between adopters and non-adopters of new agricultural practices. Vanclay (1986, 1992) concluded that most farmers have a strong stewardship ethic and that other factors related to resource availability, farmers’ assessment of risk and other aspects of particular innovations are more important barriers to the adoption of agricultural innovations. The possibility that the stewardship ethic scale was flawed and failed to identify differences which actually exist was also considered. Statistical tests for scale validity and reliability were conducted and have been reported above. Vanclay (1992) discussed the issue of social desirability affecting participant’s responses and concluded this should affect responses from respondents equally. Further bivariate analysis using variables such as age and education, which might reasonably be expected to discriminate respondents, produced a number of significant relationships. As expected, younger and more educated respondents (Table 4) and women (Curtis et al., 1994).
<table>
<thead>
<tr>
<th>Issue</th>
<th>Issue a problem in Landcare (%)</th>
<th>Issue a problem in Non-landcare (%)</th>
<th>Chi-square</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large areas</td>
<td>Significant in some areas</td>
<td>Not/ minor areas</td>
<td>Large areas</td>
</tr>
<tr>
<td>Salinity landcare (N=246) non (N=70)</td>
<td>3</td>
<td>8</td>
<td>88</td>
<td>1</td>
</tr>
<tr>
<td>Soil erosion landcare (N=254) non (N=72)</td>
<td>8</td>
<td>28</td>
<td>64</td>
<td>5</td>
</tr>
<tr>
<td>Tree decline landcare (N=249) non (N=71)</td>
<td>18</td>
<td>23</td>
<td>59</td>
<td>6</td>
</tr>
<tr>
<td>Water logging landcare (N=247) non (N=68)</td>
<td>14</td>
<td>26</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>Soil acidity landcare (N=242) non (N=65)</td>
<td>38</td>
<td>17</td>
<td>45</td>
<td>12</td>
</tr>
<tr>
<td>Rabbits landcare (N=252) non (N=73)</td>
<td>12</td>
<td>19</td>
<td>69</td>
<td>13</td>
</tr>
<tr>
<td>Weeds landcare (N=269) non (N=74)</td>
<td>33</td>
<td>28</td>
<td>39</td>
<td>34</td>
</tr>
<tr>
<td>Decline in soil fertility landcare (N=245) non (N=68)</td>
<td>28</td>
<td>15</td>
<td>57</td>
<td>15</td>
</tr>
<tr>
<td>Soil compaction landcare (N=242) non (N=63)</td>
<td>12</td>
<td>25</td>
<td>63</td>
<td>7</td>
</tr>
</tbody>
</table>

Index score for all issues¹: Mean rank = 165, Mean rank = 205, Z = 3.0445, P = 0.0012

¹ For Likert-type response categories, (1) more important rating than (5), hence lower score on mean ranking indicates a higher ranking for that variable.
TABLE 2. Concern about the impact of land degradation issues—all respondents in landcare areas, north-east Victoria, April 1993 (N=352)

<table>
<thead>
<tr>
<th>Concerned that land degradation will</th>
<th>Extent of concern Landcare (%) N=270</th>
<th>Extent of concern Non-landcare (%) N=77</th>
<th>MWW 1-tailed P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduce current farm income landcare (N=243) non (N=73)</td>
<td>Very 21 Some 48 None 31</td>
<td>Very 13 Some 29 None 58</td>
<td>0-0002</td>
</tr>
<tr>
<td>Threaten long term farm viability landcare (N=250) non (N=70)</td>
<td>Very 29 Some 38 None 33</td>
<td>Very 17 Some 26 None 57</td>
<td>0-0004</td>
</tr>
<tr>
<td>Reduce attractiveness of area as place to live landcare (N=250) non (N=70)</td>
<td>Very 22 Some 36 None 42</td>
<td>Very 10 Some 30 None 60</td>
<td>0-0013</td>
</tr>
<tr>
<td>Reduce current property values landcare (N=50) non (N=70)</td>
<td>Very 17 Some 43 None 40</td>
<td>Very 7 Some 39 None 54</td>
<td>0-0061</td>
</tr>
<tr>
<td>Threaten long term property values landcare (N=248) non (N=70)</td>
<td>Very 23 Some 41 None 36</td>
<td>Very 9 Some 40 None 51</td>
<td>0-0015</td>
</tr>
<tr>
<td>Detrimental effect upon neighbouring farms landcare (N=248) non (N=70)</td>
<td>Very 13 Some 30 None 57</td>
<td>Very 10 Some 17 None 73</td>
<td>0-0129</td>
</tr>
<tr>
<td>Contribute to decline of habitat and wildlife landcare (N=246) non (N=69)</td>
<td>Very 17 Some 32 None 51</td>
<td>Very 7 Some 25 None 68</td>
<td>0-0036</td>
</tr>
</tbody>
</table>

Central tendency

| Index score for concern economic impact issues | Mean 11-28 | Median 12-00 | Mean 12-53 | Median 14-00 | MWW 0-0015 |
| Index score for concern environmental impact issues | Mean 5-89 | Median 7-00 | Mean 6-39 | Median 7-00 | MWW 0-0092 |

1 For Likert-type response categories, (1) more important rating than (5), hence lower score on central tendency indicates a higher ranking for that variable.

scored significantly higher on the stewardship ethic scale and these findings appeared to validate it. Indeed, the scale discriminated respondents on many of the variables for which there had been significant differences between landcare and non-landcare respondents.

4.1.3. Level of knowledge of land management topics

Another assumption underlying landcare is that, through the process of community development, land managers will become more informed, skilled and adaptive and this will assist the move to more sustainable resource management. Using Likert-type response categories, survey respondents were asked to assess their knowledge of topics which have been the focus of landcare group activity attempting to manage the key...
A. Curtis and T. De Lacy

Variables controlled for

- Age
- Education
- Length of farming experience
- Membership other groups
- Arable property size
- Length of residence
- Farm profitability
- Attitude to importance of community cooperation
- Off-farm work
- Stewardship ethic

Landcare outcomes

- Awareness of issues ($P > 0.1$)
- Concern about impact of issues
- Index environmental impact ($P = 0.0546$)
- Index economic impact ($P = 0.0057$)
- Stewardship ethic ($P > 0.1$)
- Level of knowledge ($P > 0.0001$)

Best bet practices

- Perennial pastures at Jan. 1993 ($P = 0.0027$)
- Perennial pasture sown last 2 years ($P > 0.1$)
- Trees planted last 2 years ($P = 0.0001$)
- Soil tests last 2 years ($P = 0.0000$)
- Fencing for landcare last 2 years ($P > 0.1$)
- Lime applied last 2 years ($P = 0.0268$)
- Involvement in property planning at Jan. 1993 ($P = 0.0033$)

Figure 2. The impact of landcare membership on key outcomes using multivariate analysis to control for selected variables.

<table>
<thead>
<tr>
<th>TABLE 3. Stewardship ethic scale scores—all respondents in landcare areas, north-east Victoria, April 1993 ($N=352$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Landcare ($N=268$)</td>
</tr>
<tr>
<td>Non-landcare ($N=75$)</td>
</tr>
</tbody>
</table>

Mann–Whitney U Wilcoxon signed ranks test, $Z = -0.64341, P = 0.2600$ (not significant).

Resource issues in the north-east. An examination of Table 5 revealed that landcare participants reported significantly higher levels of knowledge for all land management topics listed. Using multivariate analysis to control for a range of variables (Figure 2), a significant positive relationship ($P = 0.0001$) was established between landcare participation and scores on the index measuring respondent's level of knowledge for all topics listed in Table 5.

Survey respondents were also asked to assess the impact of various information sources upon their level of knowledge for the topics listed in the previous question. Information in Table 6 provided considerable evidence to support claims that landcare group participation has an important impact upon landholders' level of knowledge. Table 6 shows landcare participants reported that landcare groups, field days, friends, relatives and neighbours, education courses, government department staff, farmer organisations and private farm consultants had a significantly higher impact upon their level of knowledge than did non-landcare respondents. Landcare groups received the
### Table 4. Stewardship ethic and other social and farming variables—all respondents in landcare areas, north-east Victoria, April 1993 (N = 352)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N = 352</th>
<th>Stewardship ethic score</th>
<th>Kruskal–Wallis H</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low &lt;20</td>
<td>Medium 21 to 25</td>
<td>High &gt;25</td>
</tr>
<tr>
<td>Age</td>
<td>340</td>
<td>197 162 164</td>
<td></td>
</tr>
<tr>
<td>Highest level of schooling</td>
<td>336</td>
<td>144 173 180</td>
<td></td>
</tr>
<tr>
<td>Property size</td>
<td>337</td>
<td>208 166 146</td>
<td></td>
</tr>
<tr>
<td>Extent of off-farm work</td>
<td>176</td>
<td>74  86  97</td>
<td></td>
</tr>
<tr>
<td>Concern land degradation as an issue, index score¹</td>
<td>348</td>
<td>180 169 17</td>
<td></td>
</tr>
<tr>
<td>Community co-operation attitude scale</td>
<td>348</td>
<td>120 17 217</td>
<td></td>
</tr>
<tr>
<td>Intensity of participation in landcare activities¹</td>
<td>258</td>
<td>133 129 127</td>
<td></td>
</tr>
<tr>
<td>When joined landcare¹</td>
<td>259</td>
<td>137 129 127</td>
<td></td>
</tr>
</tbody>
</table>

¹ For Likert-type response categories, (1) more important than (5), hence lower score on mean ranking indicates a higher ranking for that variable. For all other variables, higher scores on mean ranking indicates a higher ranking.

### Table 5. Level of knowledge of resource management topics—all respondents in landcare areas, north-east Victoria, April 1993 (N = 352)

<table>
<thead>
<tr>
<th>Land management topics</th>
<th>Level of knowledge Landcare (%)</th>
<th>Level of knowledge Non-landcare (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High/very high</td>
<td>Fair</td>
</tr>
<tr>
<td>Processes leading to soil erosion</td>
<td>62 31 7</td>
<td>44 39 17</td>
</tr>
<tr>
<td>Property management plans on land classes</td>
<td>34 35 31</td>
<td>8 27 65</td>
</tr>
<tr>
<td>Rabbit control methods</td>
<td>72 18 10</td>
<td>59 25 16</td>
</tr>
<tr>
<td>Role perennial pasture in lowering water tables</td>
<td>46 31 23</td>
<td>21 40 39</td>
</tr>
<tr>
<td>How to establish perennial pastures</td>
<td>44 36 20</td>
<td>39 19 42</td>
</tr>
<tr>
<td>How to collect samples for soil tests</td>
<td>54 24 22</td>
<td>32 26 42</td>
</tr>
<tr>
<td>Processes leading to soil acidification</td>
<td>30 40 30</td>
<td>22 27 51</td>
</tr>
<tr>
<td>Role of minimum tillage maintaining soil structure</td>
<td>44 35 21</td>
<td>28 36 36</td>
</tr>
<tr>
<td>Role of tree removal in raising water tables</td>
<td>67 21 12</td>
<td>45 33 22</td>
</tr>
</tbody>
</table>
TABLE 6. Impact of information sources upon level of knowledge—all respondents in landcare areas, north-east Victoria, April 1993 (N = 352)

<table>
<thead>
<tr>
<th>Sources of information</th>
<th>Impact upon knowledge Landcare (%)</th>
<th>Impact upon knowledge Non-landcare (%)</th>
<th>Chi-square (P)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High/very high</td>
<td>Low/none</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fair</td>
<td>Low/none</td>
<td></td>
</tr>
<tr>
<td>Friends, relatives and neighbours</td>
<td>62</td>
<td>26</td>
<td>53</td>
</tr>
<tr>
<td>Radio and television</td>
<td>45</td>
<td>33</td>
<td>22</td>
</tr>
<tr>
<td>Newspapers and magazines</td>
<td>72</td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td>Education courses</td>
<td>60</td>
<td>13</td>
<td>27</td>
</tr>
<tr>
<td>Banks and financial advisers</td>
<td>9</td>
<td>12</td>
<td>79</td>
</tr>
<tr>
<td>Field days</td>
<td>70</td>
<td>19</td>
<td>11</td>
</tr>
<tr>
<td>Landcare groups</td>
<td>84</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>Government department staff</td>
<td>55</td>
<td>27</td>
<td>18</td>
</tr>
<tr>
<td>Farmer organisations</td>
<td>37</td>
<td>28</td>
<td>35</td>
</tr>
<tr>
<td>Farm suppliers and stock agents</td>
<td>32</td>
<td>30</td>
<td>38</td>
</tr>
<tr>
<td>Private farm consultants</td>
<td>17</td>
<td>17</td>
<td>66</td>
</tr>
</tbody>
</table>

Central tendency                          | Central tendency                    | MWW                                    |
Knowledge key land management topics-index  | mean | median | mean | median | 0.0000 |
|                                            | 2.605                              | 2.444                                 | 3.158          | 2.444          |

1. Lower score for high/very high.

highest rating (84% as important/very important influence) from landcare respondents and 36% of non-landcare participants reported landcare groups were an important/very important information source affecting their level of knowledge. Table 6 also shows that newspapers and magazines (69%), field days (54%), friends and neighbours (53%) and radio and television (50%) received the highest ratings from non-landcare respondents as information sources with an important/very important influence upon their level of knowledge. Landcare groups in Victoria have been very active in publicising landcare and field days are a popular activity (Curtis and De Lacy, 1994a), and it is likely that groups are making an important contribution to enhancing the knowledge and skills of land managers through these activities as well as through contact between members, friends, relatives and neighbours.

4.1.4. Adoption of best bet practices

Table 7 shows that landcare participants reported significantly higher levels of adoption for all best bet practices included in the survey with the exception of perennial pasture established in the past 2 years. Further analysis revealed that “early joiners” (a measure of length of membership) and those who had greater intensity of landcare participation had significantly higher levels of adoption for almost all best bet practices (Curtis and De Lacy, 1994b). Using logistic regression to undertake multivariate analysis controlling for a range of variables (Figure 2), a significant positive relationship was observed.
between landcare participation and establishment of perennial pastures at January 1993 ($P=0.0027$), involvement in farm/property planning at January 1993 ($P=0.0033$), planting trees in the past 2 years ($P=0.0001$), undertaking soil tests in the past 2 years ($P=0.0000$), and lime applied in the past 2 years ($P=0.0288$). Multivariate analyses failed to establish any significant relationships between the length of landcare membership and adoption of best bet practices ($P>0.05$), but established significant positive relationships between the intensity of landcare participation and the undertaking of soil tests and the application of lime in the past 2 years, and involvement in farm/property planning at January 1993 ($P<0.05$). Despite the acknowledged difficulties of unravelling causal relationships within a cross sectional study, the weight of evidence from the north-east regional study that suggested that landcare participation makes a difference to the adoption of best bet practices is substantial.

4.2. A COMPARISON OF ALL RESPONDENTS IN LANDCARE AREAS WITH ALL RESPONDENTS IN NON-LANDCARE AREAS

4.2.1. Respondents were very similar on independent social and farming variables

Bivariate analysis of information provided by respondents revealed few significant differences between respondents from landcare and non-landcare areas for the range of independent social and farming variables included in the survey (Curtis and De Lacy, 1994b). Respondents from landcare areas reported significantly higher participation in other community groups and significantly lower proportions of their properties with steep slopes (Curtis and De Lacy, 1994b). Despite these differences, respondents from landcare and non-landcare areas were homogenous for the range of independent social and farming variables included in the survey. To the extent that this is the case, and despite landcare affecting respondents in non-landcare areas, the comparison of

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### Table 7. Adoption of best bet practices—comparison of landcare and non-landcare respondents in landcare areas, north-east Victoria, April 1993 ($N=352$)

<table>
<thead>
<tr>
<th>Best bet practices</th>
<th>Mean rank for each variable</th>
<th>MWW 1-tailed ($P$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perennial pasture at Jan 1993 ($N=305$)</td>
<td>157.6</td>
<td>130.4</td>
</tr>
<tr>
<td>Perennial pasture, past 2 years ($N=323$)</td>
<td>144.2</td>
<td>134.4</td>
</tr>
<tr>
<td>Trees planted past 2 years ($N=322$)</td>
<td>174.5</td>
<td>104.4</td>
</tr>
<tr>
<td>Soil tests past 2 years ($N=352$)</td>
<td>162.5</td>
<td>107.7</td>
</tr>
<tr>
<td>Fencing for landcare past 2 years ($N=322$)</td>
<td>163.8</td>
<td>106.2</td>
</tr>
<tr>
<td>Lime applied past 2 years ($N=278$)</td>
<td>142.3</td>
<td>125.1</td>
</tr>
<tr>
<td>Involvement in whole farm planning ($N=352$)</td>
<td></td>
<td>Chi-square: 13.16552, df 4 0.01049</td>
</tr>
</tbody>
</table>
respondents from landcare and non-landcare areas provided an excellent opportunity to assess the impact of landcare group participation and activity upon key outcomes expected from landcare activity.

4.2.2. **Significant differences between respondents for key landcare outcomes**

Information summarised in Table 8 highlighted the significantly higher scores of respondents in landcare areas for a range of anticipated outcomes of landcare group activity. Again, the complexity of causal relationships and the limitations of a cross-sectional study must be acknowledged. With 48 respondents from non-landcare areas, there were insufficient observations to give robust results from multivariate analyses. However, given that respondents in landcare and non-landcare areas are very similar on a range of independent variables that should have predicated landcare, it seems reasonable to attribute much of the differences highlighted in Table 8 to landcare group participation and activity.

Whilst information in Table 8 indicated respondents in landcare areas were not significantly more aware of land degradation on an index score, analysis of results for component issues revealed landcare area respondents were significantly more aware of salinity, soil fertility decline, soil compaction, soil acidity and weeds (MWW, $P<0.05$), with no significant difference in awareness of soil erosion, tree decline, water logging

### Table 8. Key landcare outcomes—comparison respondents in landcare and non-landcare areas, north-east Victoria, April 1993 ($N=400$)

<table>
<thead>
<tr>
<th>Key outcomes</th>
<th>Mean rankings on outcome</th>
<th>Mann–Whitney (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Landcare $N=352$</td>
<td>Non-landcare $N=48$</td>
</tr>
<tr>
<td>Concern land degradation as an issue-index score $^1$ ($N=400$)</td>
<td>200 ($N=352$)</td>
<td>201 ($N=48$)</td>
</tr>
<tr>
<td>Stewardship ethic scale ($N=400$)</td>
<td>199 ($N=348$)</td>
<td>196 ($N=48$)</td>
</tr>
<tr>
<td>Knowledge key land management topics-index $^1$ ($N=390$)</td>
<td>188 ($N=343$)</td>
<td>247 ($N=47$)</td>
</tr>
<tr>
<td>Perennial pasture at Jan 1993 ($N=344$)</td>
<td>175 ($N=305$)</td>
<td>155 ($N=39$)</td>
</tr>
<tr>
<td>Perennial pasture, past 2 years ($N=323$)</td>
<td>166 ($N=286$)</td>
<td>131 ($N=37$)</td>
</tr>
<tr>
<td>Trees planted, past 2 years ($N=366$)</td>
<td>188 ($N=322$)</td>
<td>152 ($N=44$)</td>
</tr>
<tr>
<td>Soil tests, past 2 years ($N=340$)</td>
<td>175 ($N=303$)</td>
<td>130 ($N=37$)</td>
</tr>
<tr>
<td>Fencing for landcare, past 2 years ($N=344$)</td>
<td>174 ($N=306$)</td>
<td>161 ($N=38$)</td>
</tr>
<tr>
<td>Lime applied, past 2 years ($N=313$)</td>
<td>159 ($N=278$)</td>
<td>142 ($N=35$)</td>
</tr>
<tr>
<td>Involvement in whole farm planning ($N=362$)</td>
<td>185 ($N=321$)</td>
<td>158 ($N=41$)</td>
</tr>
</tbody>
</table>

$^1$ For Likert-type response categories, (1) more important rating than (5), hence lower score or mean ranking indicates a higher ranking for that variable. For all other variables, higher scores on mean ranking indicates a higher ranking.
Landcare: does it make a difference?

and rabbits (Curtis and De Lacy, 1994b). This information suggested respondents in landcare areas had a greater awareness of less obvious issues (weeds are the exception). Comparison of respondents in landcare and non-landcare areas revealed no significant differences in the holding of a stewardship or land ethic (Table 8).

5. Conclusion

Despite the complex nature of causal relationships in the social sciences and the difficulties of attempting to assess the impact of landcare participation upon expected outcomes using a cross-sectional, non-randomised study, the weight of evidence in this study indicated that landcare participation makes a significant difference to a range of outcomes related to landcare participation. Whilst landcare and non-landcare participants in landcare areas were different on key social and farming variables, bivariate analysis established that landcare participants:

- were significantly more aware of land degradation issues;
- reported significantly greater levels of knowledge of resource management topics;
- had significantly higher levels of adoption of almost all best farming practices surveyed.

Furthermore, bivariate analysis revealed significant positive relationships between the length of membership and intensity of participation in group activities and a range of expected landcare group outcomes. Multivariate analyses confirmed that landcare respondents were significantly more concerned about the economic impact of land degradation issues, more knowledgeable on some resource management topics, reported significantly higher levels of perennial pasture establishment and involvement in farm/property management at January 1993, and were significantly more involved in tree planting, conducting soil tests and applying lime in the past 2 years. Multivariate analyses also confirmed that landcare participants who were more intensively involved in landcare group activities were significantly more involved in farm/property management planning at January 1993 and conducting soil tests and applying lime in the past 2 years.

Respondents from landcare and non-landcare areas were not significantly different on most of the social and farming variables that should have predated landcare. Further analysis revealed respondents in landcare areas:

- were significantly more aware of many land degradation issues, particularly those that are less obvious;
- reported significantly higher levels of knowledge of resource management topics; and
- had significantly higher levels of adoption of almost all best farming practices surveyed.

Over 80% of landcare participants, 39% of non-landcare respondents in landcare areas and 37% of respondents in non-landcare areas indicated that landcare groups were an important/very important influence upon their level of knowledge of listed resource management topics. Field days were rated as an important/very important influence by 70% of landcare respondents and 54% of non-landcare respondents in landcare areas. This information suggested that the involvement of landcare groups in various educational and promotional activities and the interaction of members with friends, relatives and neighbours were important elements of the community development process within landcare and had enhanced the effectiveness of landcare group activity.

Whilst the weight of evidence in this research suggests that landcare participation
A. Curtis and T. De Lacy

makes a significant difference, it is important to establish whether best bet practices are being adopted at a rate which will have an impact at the landscape level. This task was beyond the scope of this study. Indeed, further research is required to develop biological indicators of sustainable resource management at the catchment level and standards to indicate the extent to which best bet practices need to be adopted to effect improvements over time. However, the authors used the extent of non- or very low adoption of best bet practices as a preliminary and very crude measure of the extent to which practices are being adopted at levels likely to make a difference to the landscape in the north-east over the next 10 years. Survey analysis revealed that over 50% of landcare respondents had never been involved in whole farm planning/property planning, and 44% had planted no more than 100 trees over the same period. Given that landcare participants have adopted best bet practices at significantly higher rates than non-landcare participants and that 30% of properties in the north-east (62% across Victoria—Mues et al., 1994) do not have a landcare participant, a substantial proportion of Victorian landholders appear to be undertaking limited amounts of landcare work. It is probably fair to conclude that, with limited resources, landcare group participants are undertaking substantial landcare work and have “pulled down” considerable additional resources for landcare in local communities (Curtis et al., 1993c). However, given the number of landholders not adopting best practices it would be difficult to sustain an argument that practices are being adopted at rates likely to produce major benefits at the landscape scale during the 10-year period of the Decade of Landcare Plan. Furthermore, much of the fencing and tree planting work undertaken by landcare group participants in the north-east would appear to be underpinned by government assistance through the National Landcare Program and the Murray-Darling Basin Commission’s Natural Resources Management Strategy. Information provided by the Victorian group activities report process (Curtis et al., 1993c) supported these findings in that groups had successfully undertaken a vast array of community development activities; however, only 20% of streams in landcare areas had been fenced to control stock access, 45% of groups reported that government assistance with materials and funds to manage land degradation was inadequate, and there was a significant positive relationship between group performance on an index of work undertaken and the amount of government funding received.

A central element of the landcare model outlined earlier (Figure 1) is the assumption that changes in attitudes, particularly the development of a stronger stewardship ethic, would produce significant changes in the management practices of landholders. Clearly, this research indicated that there were no significant differences in the stewardship/land ethic of landcare and non-landcare participants. Indeed, a persuasive argument can be advanced that much of the appeal of landcare is that it reflects values already widely held in the rural community, including a strong stewardship ethic. Attempts to manage land degradation by changing landholder attitudes appear misguided.

Given the intractable nature of many natural resource management issues, the marginal viability of many farms, and the considerable off-site benefits of many best bet practices, it is problematic whether limited funding of a community development process will effect behavioural changes sufficient to achieve sustainable resource management at the landscape level. To the extent that landcare focuses upon changing individual behaviour rather than societal barriers to rural development, landcare is open to the criticism that it places too much responsibility upon individual landholders. Indeed, it can be argued that farmer organisations and government have embraced landcare as a strategy to deflect criticisms of structural impediments to sustainable
resource management and defer taking hard decisions about farm and regional viability, 
land tenure systems, allocations of river water for irrigation and vegetation clearing.

As a programme that involved only limited funding of a community development process, landcare has probably exceeded any realistic goals established at the start of the Decade of Landcare. However, as the middle of the Decade of Landcare is approached, it is time to adopt a different landcare model. It is time to acknowledge that changing attitudes is not the key to changing resource management practices. Whilst funding of community development processes is a fundamental element of landcare and must be maintained, additional resources are required to increase landholder adoption of best bet practices and landcare group activity needs to be more closely integrated within regional landcare planning processes. Arguments that increased funding to landcare is a handout to land managers ignore the community benefits of important landcare work such as revegetation, fencing water courses and establishing perennial grasses on steep hills. They fail to acknowledge that most land degradation problems have been inherited from previous generations, they deny the responsibility of government when government policies have contributed to many land degradation issues, and fail to grasp the important link between the conservation of native flora and fauna and the condition of privately owned agricultural land. It is time to build upon the successes of landcare. Legislative initiatives in New South Wales, Queensland and Victoria have established or are about to establish integrated catchment management processes in which representatives from regional communities have a key role in natural resource management decision-making. These regional bodies can provide the missing links in landcare, linkages between landcare groups in regional communities, and a regional perspective that is becoming essential for the effective management of key resource management issues. Whilst a mix of measures may be employed, regional catchment boards provide the best mechanism by which additional resources can be targeted through regional plans to produce maximum effect, to provide accountability for funds expended, to support existing programmes such as regional development and to enhance the community development processes initiated by landcare.

References


Rural Planning and Management

A. Curtis and T. De Lacy