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**Australian Bureau of Agricultural and  
Resource Economics and Sciences**



# **Enhanced reporting on industry specific land management practices**

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ABARES research report 11.1

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CARING  
FOR  
OUR  
COUNTRY

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# Foreword

Australian Government Land and Coasts commissioned ABARE to undertake a review of its past surveys on natural resource management (NRM). Over the past two decades, ABARE conducted several surveys to collect information on land management practices and NRM issues. A total of 16 past ABARE surveys that contain questions related to NRM have been identified.

This report has three main aims. First, it aims to collate results from previous ABARE surveys on NRM into a summary for policymakers working on the Caring for our Country initiative. Second, it assesses the capacity of existing ABARE survey data to provide information relevant to the Caring for our Country targets and the associated Monitoring, Evaluation, Reporting and Improvement (MERI) strategy. Third, it provides a framework from which a new NRM survey can be developed.

The Australian Government's Caring for our Country initiative aims to improve the sustainability of land management in Australia. It identifies six individual priority areas. The three areas that are best covered by past ABARE surveys are coastal environments and critical aquatic habitats, sustainable farm practices and community skills, knowledge and engagement.

This report demonstrates the usefulness of survey data to measure the uptake of sustainable practices promoted by initiatives such as Caring for our Country.



Phillip Glyde  
Executive Director  
January 2011

# Contents

Executive summary	1
1 Introduction	2
2 ABARE surveys	3
Surveys assessed in this project	3
Contents of relevant surveys	5
Capacity to generate trends from past ABARE surveys	7
3 Existing ABARE data and links to Caring for our Country	10
Overview of Caring for our Country and the MERI strategy	10
Measurability of Caring for our Country targets	11
ABARE data and Caring for our Country	13
Reviewing Caring for our Country targets	25
4 Designing a new NRM survey	27
Planning and awareness questions	27
Physical practice questions	28
Training and group membership questions	29
Questions on behavioural issues and barriers	29
5 Conclusions	30
References	31
Appendixes	
A Timeline of questions in past surveys	32
B Caring for our Country priorities and targets	41
C Draft survey questionnaire	44
Tables	
1 List of ABARE surveys assessed in this project	4
2 Use of farm management plans	14
3 Landholder awareness of selected degradation issues	15
4 Perceived significance of, and expenditure to mitigate, weed and pest infestation	16
5 Perceived importance of water quality from 2001–02 and 2004–05 resource management surveys	17

6	Land management practices included in GBR survey	18
7	Adoption of land management practices in GBR catchment	19
8	Change practices because of significant degradation	20
9	Uptake of soil testing	21
10	Uptake of selected land management practices, by ABARES zone	21
11	Training data from resource management surveys, all broadacre industries	22
12	National Landcare membership over time	23
13	Responses to selected behavioural questions in past resource management surveys	24

# Executive summary

The aims of this report are threefold. First, it collates results from ABARE (now ABARES) surveys on natural resource management (NRM) into a summary for policymakers working on the Australian Government's Caring for our Country initiative. Second, it assesses the capacity of existing ABARE survey data to inform Caring for our Country targets and the associated Caring for our Country monitoring, evaluation, reporting and improvement (MERI) strategy. Third, it provides a framework from which a new NRM survey can be developed.

Caring for our Country aims to improve the sustainability of land management in Australia. It identifies six individual priority areas, each of which has a series of five-year outcomes and targets. The *Caring for our Country business plan 2009–2010* (Commonwealth of Australia 2008) describes what each priority area and target is hoping to achieve (a brief overview is provided in appendix B).

The six priority areas are:

- the National Reserve System
- biodiversity and natural icons
- coastal environments and critical aquatic habitats
- sustainable farm practices
- northern and remote Australia
- community skills, knowledge and engagement.

Over the past couple of decades, ABARE conducted several surveys to collect information on land management practices and NRM issues. These surveys were implemented for a range of clients with different priorities; as such, questions in past surveys have occasionally been asked in different ways, which can limit the comparability of the surveys. Nonetheless, meaningful trends can be generated from the ABARE surveys examined for this report. For example, analysis of ABARE survey results reveals that the uptake of farm planning has declined since the early 1990s, but that Landcare membership has generally increased over the same time period. A total of 16 past ABARE surveys have been identified that contain questions related to NRM.

Questions about NRM in past ABARE surveys have been separated into four broad categories: planning and awareness, physical practices, training and group membership, and behavioural issues and barriers. ABARE surveys have particular relevance to priorities 3, 4 and 6 of Caring for our Country and the MERI strategy. These surveys can also provide limited information for priorities 1, 2 and 5. Some targets under Caring for our Country cannot be informed from existing ABARE data. In some cases, relevant questions were not asked. In other cases, the relevant Caring for our Country targets are subjective or region specific and do not lend themselves to survey analysis.

A draft survey instrument has been developed which could be used to specifically inform Caring for our Country and the MERI strategy. This survey has aimed to balance the need to maintain consistency (and thus comparability) with past surveys, with the need to monitor progress towards Caring for our Country targets.

# 1 Introduction

On 1 July 2008, the Australian Government launched Caring for our Country, a new natural resource management (NRM) initiative. Caring for our Country brings together various government environmental programs, including the Natural Heritage Trust, the National Action Plan for Salinity and Water Quality, the National Landcare Program, the Environmental Stewardship Program and the Working on Country Indigenous land and sea ranger program. Caring for our Country aims to deliver a range of NRM programs, with a business approach to investment that incorporates priorities, outcomes and improved accountability. To improve accountability there has been emphasis on developing and implementing the monitoring, evaluation, reporting and improvement (MERI) strategy for assessing investments (Commonwealth of Australia 2008). These changes will allow the government to determine whether current investments are achieving their stated goals, and make adjustments to future decisions.

Over the past two decades, ABARE conducted industry-specific surveys to collect data on land management practices and other NRM issues. These surveys have been used to inform a range of natural resource and land management initiatives. Data from these surveys can also provide information for the current MERI strategy and the six national priority areas identified under Caring for our Country.

The first objective of this report is to complete a stocktake of past ABARE surveys that contain questions on NRM. Under the first objective, the comparability of past surveys and the ability to establish meaningful trends over time are assessed. The results of these analyses are included as section 2 of the current paper. The second objective of the report is to assess the capacity of existing ABARES survey data to inform Caring for our Country targets and the MERI strategy. That analysis is included in section 3 of the current paper. Section 4 puts together the findings of the preceding sections to create a new NRM survey that is both comparable with past ABARE surveys and relevant to Caring for our Country. A draft survey instrument is included as appendix C.

In addition to the current paper, ABARES is working on a project entitled Drivers of Practice Change, which focuses on the factors that influence landholders' decisions on land management practices.

# 2 ABARE surveys

Two major surveys are conducted by ABARE (now ABARES) each year: the Australian Agricultural and Grazing Industries Survey (AAGIS) and the Australian Dairy Industry Survey (ADIS). In these surveys detailed financial, physical and socioeconomic data are collected for more than 70 per cent of Australian farm business units in the broadacre and dairy sectors.

Supplementary surveys are conducted alongside the AAGIS and ADIS to help address specific issues. Past surveys on land management practices and the condition of natural resources have been conducted using this approach.

## Surveys assessed in this project

Sixteen ABARE surveys have been identified that may be relevant to reporting against the Caring for our Country initiative and the MERI strategy. A list of surveys examined, and the year in which each of these surveys was conducted, is provided in table 1. This is not an exhaustive list; there are other occasions where a few NRM questions are included in the body of the main ABARE survey or in a supplementary survey. For example, in 2008 the innovation supplement attached to the AAGIS contained three questions related to NRM. Such questions are not considered in this project.

Bureau of Rural Sciences (now ABARES) landholder surveys were undertaken in eight regions between 2003 and 2008. These regions were: the Glenelg Hopkins region, Victoria; the Queensland Murray–Darling region; the South West region, Western Australia; Lachlan catchment, NSW; Border Rivers, NSW; the Northern and Yorke region, South Australia; the Southern region, Tasmania; and the Burnett Mary region, Queensland. The information collected in these surveys relates to the social and economic factors affecting adoption of current recommended practices likely to improve productivity and management of natural resources in each region. These surveys have not been analysed as part of this report, but contain useful information on NRM in the regions surveyed.

Results are also presented from a stand-alone survey covering the Great Barrier Reef catchment (ABARE 2006). However, this survey only considers issues relevant to the Great Barrier Reef catchment and therefore is not directly comparable with other past surveys.

The surveys identified in table 1 were designed for different clients, with differing requirements and objectives. The following paragraphs contain a brief description of the information in each of the surveys as well as the issues covered. Finally, a comparison is made between NRM surveys conducted by ABARE and those surveys conducted by the Australian Bureau of Statistics (ABS).

# 1 List of ABARE surveys assessed in this project

survey name	years conducted
Resource management survey	1998–99; 2001–02; 2004–05
Landcare survey	1991–92; 1992–93; 1995–96
Dairy technology and management practices survey	1991–92; 1993–94; 1995–96; 1997–98; 1999–2000; 2001–02; 2004–05; 2006–07
Nationally Coordinated Industry Survey (NCIS) a	2006–07
Great Barrier Reef	2006

a Separate surveys for the meat and grains industries.

## Resource management surveys

The ABARE supplementary resource management surveys in 1998–99, 2001–02 and 2004–05 were designed to investigate the perceptions of, and responses to, land degradation on Australian broadacre and dairy farms. The surveys were also used to assist in the ongoing evaluation of NRM programs such as the National Landcare Program, the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality. The surveys contained questions on a range of topics, including: the uptake of specific NRM practices; landholders' perceptions of the relative importance of various NRM issues; participation in training activities and commonly used information sources; and behavioural issues behind, as well as barriers to, the uptake of NRM practices.

## Landcare surveys

Prior to the resource management surveys discussed above, ABARE conducted a series of supplementary Landcare surveys. Landcare surveys from 1991–92, 1992–93 and 1995–96 are considered in this report. These surveys were designed primarily to assess community participation in Landcare activities. Many of the questions included in these surveys had a similar focus to those included in the resource management surveys. One difference between the Landcare and resource management surveys is in their treatment of barriers to NRM uptake. The Landcare surveys included specific questions covering barriers to Landcare participation, whereas the resource management surveys included more general questions on barriers to the adoption of NRM practices.

## Nationally Coordinated Industry Survey

The NCIS was a supplementary survey for livestock and grains industries, conducted alongside the 2006–07 AAGIS. It was designed to collect information on landholders' adoption of specific NRM and business management practices and to identify likely barriers or concerns to the adoption of NRM practices. The survey included questions on a number of specific NRM practices which are also covered in the resource management and Landcare surveys. Comparisons of data between the NCIS and the resource management surveys may provide meaningful policy insights for Caring for our Country.

## Dairy technology and management practices survey

This survey has been conducted biennially since 1991–92 as a supplement to the ADIS. It was designed to collect information regarding the management practices and technology use on Australian dairy farms. Although these surveys were not designed specifically to deal with NRM issues, they contain a comprehensive set of questions on respondents' primary sources of training and development, similar to those included in the Landcare and resource management surveys. These supplements also include some questions on the uptake of practices such as effluent management.

## Contents of relevant surveys

Questions in the ABARE surveys analysed fall under one or more of the four themes listed below:

- planning and awareness
- physical practices
- training and group membership
- behavioural issues and barriers.

Planning and awareness questions are designed to record the amount of formal planning that goes into farming operations, as well as the relative awareness and perceived importance of different NRM issues. Physical practice questions are designed to determine landholders' uptake of different NRM practices. Training and group membership questions are designed to collect information on the type of training activities landholders undertake and their membership of NRM or industry groups. Questions on behavioural issues and barriers seek to provide an insight into factors that encourage or hinder landholders' uptake of NRM activities.

Grouping the ABARE survey questions into these four themes provides a logical way of describing the context of ABARE surveys. The grouping of questions has been conducted for convenience, simplicity of analysis, and to provide consistency throughout the report. All questions in the surveys analysed have been allocated to one of the four categories. The rationale for each theme is as follows. An individual who is planning NRM activities must be aware of a problem, so planning and awareness questions are grouped together. Physical practices are a well-defined, stand-alone topic, with data collected on the uptake of a broad list of sustainable farming practices. Training and group membership questions provide information on landholders' participation in different types of training activities. NRM groups such as Landcare often conduct training courses for their members; in this context, group membership can be considered as similar to other training activities. Behavioural issues such as lack of incentives or fear of change often present a barrier to NRM uptake, and so discussion of these questions is grouped together.

## Style of question design

A comprehensive list of questions from the ABARE surveys examined, arranged by the four themes discussed above, is provided in appendix A. The different types of questions that may be asked are summarised as follows.

Many questions in the ABARE resource management and Landcare surveys seek binary (yes/no) answers. For example:

- Do you undertake conservation tillage? Yes/No
- Do you monitor pastures and vegetative cover? Yes/No

If required, quantitative data is gathered in a follow-up question. For example:

- If so, on how many hectares did you undertake that practice?
- How much did you spend on that practice?

Other questions give respondents a list of options, asking them to identify which are the most accurate. For example:

- Of the following six issues, which three are most relevant to you?
- Which of the following types of training did you undertake last year?

Behavioural questions, included in the ABARE resource management surveys, gave respondents a list of sentiments and asked them to respond using a five-point Likert scale. This scale required respondents to specify their level of agreement with each statement, ranging from strongly agree to strongly disagree. For example:

- I would be taking a major risk if I changed my management practices.
- I do not have enough incentive to implement change.

## ABARES and ABS NRM surveys

The ABS also conducts NRM surveys. Data are currently available from the 2004–05 and 2006–07 NRM surveys, but are not yet available from a new NRM survey conducted in 2009–10.

The ABS and ABARES both collect information on the uptake of a broad list of NRM practices; however, there are some key differences in the surveys. First, the ABS collects data for a larger sample of the population. Second, the ABS collects data stratified at the Statistical Local Area level, and produces information at the NRM region level to allow comparisons across regions managing natural resources under Caring for our Country. The main strength of the ABS survey is the ability to produce nationwide NRM information for all land managers. ABARES resource management surveys are industry specific, conducted in conjunction with the AAGIS and ADIS. ABARES data may be used to identify industry and region specific land management practices. For instance, ABARES data could highlight a barrier to the adoption of an NRM practice that is

specific to one broadacre industry. Results from the ABS NRM surveys have generally not been reported at an industry level.

The primary advantage of the ABARES resource management surveys is that data from the supplementary surveys are linked to the financial, physical and socioeconomic data collected in the core AAGIS and ADIS surveys. This allows ABARES researchers to conduct detailed analysis of survey data, relating landholders' financial resources with data collected in the NRM supplementary survey. ABS NRM surveys are supplementary surveys to the ABS Agricultural Survey. Data collected in the ABS Agricultural Survey includes information on value of production across a broad range of industries, but excludes financial data on farm costs, assets, liabilities and off-farm income which are collected in ABARES surveys. The collection of financial data allows ABARES researchers to assess the economic, financial and physical capacity of landholders in different industries, geographic zones and regions to implement change.

ABARES and ABS surveys should be viewed as complementary surveys with different emphases. The ABS surveys provide national coverage of issues and broadly highlight areas that require further research. ABARES surveys are designed to drill down into these issues at the industry, state and regional levels to examine the reasons behind the uptake of certain practices and provide insight into industry or region specific factors of interest.

## Capacity to generate trends from past ABARE surveys

This project is the first thorough stocktake of past resource management surveys. It is important to note that the ABARE surveys assessed in this report have been conducted for different clients with different priorities, and therefore differ in sample design, target farms and question structure from year to year. Nonetheless, there is the potential to generate meaningful trends from past ABARE data.

This section contains a preliminary discussion on the comparability of past surveys and consequently the ability to establish trends from past survey data, under each of the four themes identified earlier. It should be read in conjunction with the complete list of questions from the ABARE surveys examined (appendix A).

## Planning and awareness questions

Most surveys have asked respondents if they have a documented farm management plan. Those who answered in the affirmative have generally been asked to specify the components of that plan from a list of different options (see appendix A for the full list of options included in each survey). However, the inclusion of components differs from year to year. For example, in both the 2004–05 resource management survey and the NCIS in 2006–07, respondents were asked if their farm plan included an NRM plan. Respondents were told that an NRM plan could include, among other things: areas of conservation value, Landcare works, maintenance of trees and shrubs, pest or disease management, soil, water, vegetation, and native animals. In 2001–02, and earlier, some of these components were included as separate line items, not as an aggregated NRM plan. Differences such as this can be clearly identified from appendix A and should be considered when comparing past survey data.

In addition to questions about farm planning, the resource management and Landcare surveys asked respondents to identify which natural resource issues posed a significant threat to their farming operations. Although the full list of issues included in the ABARE surveys has differed from year to year, a number of important issues have been consistently included. Some of these issues are dryland salinity; water and wind erosion; soil acidity, sodicity and loss of soil structure; and degradation caused by weeds and pests.

Analysis of the ABARE resource management surveys (1998–99, 2001–02 and 2004–05) has revealed an inconsistency in the questions asked to determine landholders' awareness of, and perceived significance of, different degradation issues. These differences occurred because of different client priorities. The 2001–02 resource management survey asked respondents if they were aware of a certain NRM issue. Respondents who answered in the affirmative were then asked if that issue was a significant concern. The 1998–99 and 2004–05 resource management surveys approached this question slightly differently. Respondents in these surveys were directly asked if the issue was a significant concern without first being asked if they were aware of the issue. Differences in question structure have the potential to create bias in results—this issue is discussed further in section 3.

## Physical practices questions

Past ABARE surveys have consistently asked respondents to identify which NRM practices they most commonly undertake. Valuable insights can be gained from these data. For example, data from the 2004–05 resource management survey revealed that less than half of the respondents who reported some form of degradation on their properties had responded by changing their management practices (Hodges and Goesch 2006).

Two differences have been identified in physical practice questions contained in the 2004–05 resource management survey and earlier versions of the same survey. First, respondents in 2004–05 were asked to identify which soil tillage practices they undertook, using yes/no answers. In earlier years, more detailed questions were included; respondents were asked to estimate the proportion of land devoted to each tillage practice.

Second, the 1998–99 and 2001–02 resource management surveys asked different questions to different farm types (including farms in the pastoral, wheat–sheep and high rainfall zones, as well as irrigation and dairy farms). Results were recorded at the farm category level (for example, the proportion of pastoral farmers controlling water flow from artesian bores). In 2004–05 this categorisation was not applied. Using the above example, the proportion of the whole population controlling water flow was recorded, not just the proportion of pastoral zone farmers. There are two ways to enable comparison: earlier data could simply be converted into percentages of the entire population or 2004–05 data could be further analysed to separate out the different types of farms.

## Training and group membership questions

The treatment of training and group membership questions has been fairly consistent in past surveys and a number of training activities have been specified in each of the resource

management surveys. Hence, the uptake of different training activities over time may be assessed with data from past ABARE surveys.

Past ABARE surveys have commonly sought to identify the level of participation in Landcare and other NRM-related groups. Respondents have also been asked to specify what they had learnt from participation in these groups. Data from these questions can provide insights into the participation in Landcare and other groups over time. However, a compatibility issue exists between the 2001–02 and 2004–05 resource management surveys. This is because of the different treatment of Landcare membership in the two surveys. The 2001–02 survey first asked respondents if they were a member of Landcare; those who answered in the affirmative were asked further questions. This means 2001–02 data only include farms that were a Landcare member. The 2004–05 resource management survey did not include the same split; this means that 2004–05 data include all farms regardless of Landcare membership. Section 3 provides an amendment to these questions, which is expected to solve this discrepancy for future surveys.

## Questions on behavioural issues and barriers

The ABARE resource management surveys included a set of behavioural questions seeking to identify the factors behind the uptake of NRM practices and to highlight any barriers to NRM. Respondents were given a list of statements aimed at identifying sentiments that could imply an unwillingness or inability to partake in NRM activities; for example, 'I do not have enough incentive to adopt NRM practices,' or 'I would be taking a major risk if I changed my management practices'. Respondents were asked to assess the accuracy of statements on Likert scales ranging from strongly agree to strongly disagree. Data from these questions are available from each of the three resource management surveys. Some of the older Landcare surveys asked respondents their reasons for not joining a Landcare group, but these questions were discontinued so the resulting data have limited value for comparisons over time.

## Summary: overall comparability of past ABARE surveys

This section has revealed some inconsistencies and missing information between past surveys that could limit the capacity to identify meaningful trends. These inconsistencies have been a result of past ABARE surveys being conducted for different clients with different priorities. As a result, questions in past surveys are often asked in different ways, making it difficult to draw comparisons. Also, a number of questions have been asked in some years but not in others, meaning there will be data gaps in any trends identified.

Any data gaps identified must be taken into account when designing a new NRM survey. However, the presence of inconsistencies does not necessarily prevent meaningful conclusions from being established. In most cases, further analysis can mitigate the effects of any inconsistencies, as is demonstrated in the following sections.

# 3 Existing ABARE data and links to Caring for our Country

This section extends the work of the preceding section by assessing the relevance of past ABARE survey data to Caring for our Country and the MERI strategy. The section is structured as follows. First, a brief overview of Caring for our Country targets and the MERI strategy is provided, along with examples of the types of data needed to inform the various priorities and targets. Second, specific areas in which ABARE survey data can inform Caring for our Country are discussed. Finally, issues surrounding the measurability and assessability of Caring for our Country targets are examined.

## Overview of Caring for our Country and the MERI strategy

The aim of Caring for our Country is to invest in activities that achieve sustainable land management outcomes in the following six priority areas (Commonwealth of Australia 2008):

- 1 the National Reserve System
- 2 biodiversity and natural icons
- 3 coastal environments and critical aquatic habitats
- 4 sustainable farm practices
- 5 NRM in northern and remote Australia
- 6 community skills, knowledge and engagement.

Each priority area contains a series of five-year outcomes. Targets are specified for each of the five-year outcomes and are designed to help in achieving those outcomes. A summary of each of the six priority areas, five-year outcomes and targets is provided in appendix B. Caring for our Country identifies both quantitative and qualitative targets. Quantitative targets are generally aimed at conserving an area of land or encouraging landholders to undertake some NRM practice. Qualitative targets, in general terms, aim to increase awareness of natural resource issues in the community or to identify and deal with specific natural resource issues.

The MERI strategy is the Australian Government's plan for monitoring and reporting on the progress against each of the Caring for our Country targets and five-year outcomes. Two major improvements have been made to the MERI strategy following suggestions from the audit of the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality (ANAO 2008). First, the MERI strategy reports on outcomes rather than outputs. Second, it focuses on short-term outcomes (one to five years) rather than long-term outcomes (20 to 50 years), because it considers long-term biophysical outcomes hard to measure. However, the five-year time frame has been criticised as being too short to allow for worthwhile outcomes to be achieved (Pannell 2009).

Each of the priorities and associated targets of Caring for our Country require a range of information to assess their progress and also to inform the MERI strategy. Some targets require detailed, region-specific information. For example, priority 4 (sustainable farming practices) requires data on the uptake of specific NRM practices in relevant regions, such as the percentage of pastoral zone farmers controlling grazing pressure. Other outcomes benefit from information that is collected at a national level. For example, priority 6 (community knowledge and engagement) would benefit from data on the uptake of training activities and community awareness of natural resource issues. Information on social and economic barriers to, and drivers for, NRM practice uptake also inform the MERI strategy.

## Measurability of Caring for our Country targets

Caring for our Country targets are specified in qualitative and quantitative terms, with varying degrees of measurability. See appendix B for an overview of the priorities, outcomes and targets.

This section summarises the capacity for survey data to measure the progress towards achieving targets in each priority area, assesses the applicability of ABARE survey data to measuring specific targets, identifies those targets for which other sources of data are available or should be sought, and highlights targets that may be difficult to measure. In general, there are two main factors that could limit the extent to which ABARE or other survey data are able to inform specific targets: the generic nature and inherent subjectivity of some targets, and the regional specificity of others.

### Priority 1: National Reserve System

Targets under priority 1 are explicit and concise, so monitoring progress towards these targets should be straightforward. However, ABARE did not collect data specific to areas in the National Reserve System, so existing ABARE survey data are unable to inform this priority area. In future NRM surveys, ABARES could collect data specific to the areas required by priority 1.

### Priority 2: Biodiversity and natural icons

ABARE data have the potential to partially assist with measurement and reporting against target 2 of the biodiversity and natural icons priority area. The target states that NRM activities to reduce the effect of invasive species should 'reduce the impact and spread of Weeds of National Significance over the next two years' (Commonwealth of Australia 2008). The current definition of this target is relatively broad and would benefit from further refinement. For example, information on the current status of key weeds, as well as a common measure for reporting the extent of these weeds or a reduction in their severity, could assist in quantifying this target. ABARE data show that awareness of weed issues, and expenditure to mitigate these issues, has generally increased over the past 10 years (see table 4). However, beyond this general insight, it is difficult to draw meaningful conclusions.

### Priority 3: Coastal environments and critical aquatic habitats

Targets 1 and 2 of priority 3 are easily measurable in the sense that they have an explicit, numeric goal of an increased number of farmers adopting certain land management practices. ABARE data can provide useful insights into the uptake of a number of relevant practices, albeit on a broader scale than that specified in the target. The general insights available from ABARE data are still considered relevant; however, it should be kept in mind that these data are not designed to measure the specific areas mentioned in the targets.

Targets 3 and 4 may be difficult to accurately measure. The targets aim to address threats posed by invasive plant and animal species and threats affecting the environmental value of coastal hotspots (Commonwealth of Australia 2008). Similar to the targets under priority 2, further information would enhance the measurability of these targets. For example, the targets could specify exactly what the main threats are, and provide quantitative goals that are consistent with a reduction in those threats. Data from future ABARES surveys could be used to identify particular threats that could be targeted under this priority area.

### Priority 4: Sustainable farm practices

Targets 1 and 2 of priority 4 are explicit and easy to measure with ABARE survey data. Target 3 is also easy to measure; however, some additional detail would enhance the usefulness of this target. Target 3 aims to increase the number of farmers who have 'demonstrated an improvement in knowledge and skills in natural resource management' (Commonwealth of Australia 2008). ABARE survey data can go further than that and provide detail on landholders' knowledge of regional or industry specific issues. This could also be said of targets 1 and 2. The targets could be focused to highlight the types of improvements in NRM knowledge required and also to list the specific issues that the target is seeking to raise awareness of. For example, ABARE data could indicate a need for extension or dissemination of existing knowledge in some regions, and a need for research and development in others.

### Priority 5: NRM in northern and remote Australia

The fifth priority area does not include specific targets of its own and instead seeks to ensure that targets under other priority areas are achieved for northern and remote parts of Australia. Nonetheless, the priority area includes specific outcomes which may be measured with survey data. The first and third outcomes (see appendix B) are subjective and could be improved, as with some other targets, by quantifying exactly what is being targeted and what improvement is being sought. The second outcome is specifically measurable by ABARE data. ABARE surveys have collected information on sustainable land management practices since the early 1990s and some of these data are applicable to northern and remote Australia. The fourth outcome, to expand fire management regimes by 200 000 square kilometres, is clear and concise; however, existing ABARE data are unable to assist with the measurement of this outcome.

## Priority 6: Community skills, knowledge and engagement

Target 1 of priority 6 is equivalent to target 3 of priority 4 (discussed above). Targets 2 and 4 are fairly easily measurable. Target 3 of priority 6, to ensure regional NRM organisations have best practice management arrangements in place, could benefit from some additional detail as to what constitutes best practice. Currently, some disagreement may exist over what constitutes best practice, so the target could contain some degree of subjectivity.

## ABARE data and Caring for our Country

This section focuses mainly on data from the ABARE resource management surveys in 1998–99, 2001–02 and 2004–05. These surveys provide the framework for the draft survey instrument provided in appendix C. Published results from the resource management surveys (see Alexander et al. 2000; Nelson et al. 2004; and Hodges and Goesch 2006) in some cases differ from estimates provided in the current report. Some tables in this report provide more detail than published data as they have been obtained from ABARES databases using Statistical Analysis Software (SAS). Also, data have been re-weighted since the initial publication of results—for a description of the ABARE weighting procedure see ABARE (2003).

Data showing landholders' awareness of degradation issues have been separated into livestock and grain farms to allow comparison with the recent ABARE NCIS. Data on the uptake of specific NRM practices have been disaggregated into three geographic zones: the pastoral zone, the wheat–sheep zone, and the high rainfall zone. A map of these zones can be found at [www.abare.gov.au/ame/agsurf/regions.html](http://www.abare.gov.au/ame/agsurf/regions.html). Data on farm planning, training and group membership, and behavioural issues are provided on an aggregate basis; these data are generic and not specific to any region or industry.

Only a small number of farms out of the total number of farms in a particular industry are surveyed. Therefore, the data collected from each sample farm are weighted to calculate population estimates. 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. Any such differences are called sampling errors.

This report provides standard errors, expressed as a percentage of the estimate. These can be used to calculate confidence intervals or conduct hypothesis tests to check the accuracy of the survey estimate. Confidence intervals can also be used to test whether an observed difference in survey estimates between years is statistically significant. For an explanation of how to calculate confidence intervals see ABARE (2009).

The discussion below is arranged by the four themes of ABARE survey questions and should be read in conjunction with the summary of Caring for our Country priorities and targets (appendix B). Planning and awareness questions are relevant to targets under priorities 2, 3 and 4. Physical practice questions are relevant mainly to priority 4. Training and group membership questions are relevant to priority 6. Questions on behavioural issues and barriers are likely to be relevant for informing the MERI strategy.

## Planning and awareness questions

### Priority 4: Sustainable farming

ABARE data on the uptake of farm planning over time can inform the second outcome of priority 4, which is to increase the number of farmers adopting farm management plans aimed at improving the on-farm and off-farm environment.

#### Use of farm plans

The uptake of farm planning has declined since the early 1990s (table 2). Alexander et al. (2000) noted that it is impossible to determine exactly what is behind a fall in the use of farm plans because ABARE surveys have not asked respondents their reasons for not using a farm plan. Further research would be required to determine what is causing such a drop in the use of farm management plans. Data presented in table 2 for 1995–96 include both broadacre and dairy farms whereas all other years include only broadacre farms. However, this does not change the key insight that the proportion of respondents with farm plans has declined since the early 1990s. The draft NRM survey compiled for this report includes questions aimed at identifying the reasons why some respondents do not have documented resource management plans (see section 4).

## 2 Use of farm management plans

	landcare surveys			resource management surveys			NCIS
	1991 –92	1992 –93	1995 –96	1998 –99	2001 –02	2004 –05	2006 –07
	%	%	%	%	%	%	%
Had a farm plan	32	30	36	27 (7)	18 (10)	22 (8)	17 (10)
<b>Contents (per cent of plans with...)</b>							
Production information, including...	–	–	–	–	92 (10)	81 (9)	–
soils/land capability	58	66	69	69 (9)	73 (11)	–	–
grazing/pasture management	–	–	–	–	59 (14)	–	–
salinity management	–	–	–	–	41 (18)	–	–
NRM plan, including...	–	–	–	–	87 (11)	75 <sup>a</sup>	–
Landcare works	51	61	61	63 (10)	60 (14)	–	–
conservation value	–	–	49	–	52 (14)	–	–
planting of trees/shrubs	–	–	–	–	62 (13)	–	–
pest/weed/disease management	–	–	–	–	66 (13)	–	55 (8)
Other NRM components	–	–	–	–	–	–	–
regional natural resources	–	–	–	–	–	25 (14)	31 (11)
environmental management plan	–	–	–	–	–	–	69 (14)
budget	52	59	58	69 (9)	72 (11)	–	–

<sup>a</sup> Figure taken from Hodges and Goesch 2006.

Notes: 1995–96 data include broadacre and dairy farms; data from other years only include broadacre. A dash indicates that the item was not included in that year's survey. Figures in parentheses are standard errors expressed as a percentage of the estimate.

Sources: Data from the NCIS and resource management surveys have been obtained from ABARES databases using SAS. Earlier data from Nelson and Mues 1992; Mues, Roper and Ockerby 1994; and Mues, Chapman and Van Hilst 1998.

### Awareness of degradation

The final target of priority 4 is to improve landholders' knowledge of NRM issues. Owing to the generic nature of this target, it is difficult to assess with certainty the applicability of ABARE data. Given that degradation issues differ by region, state and industry, a target to increase NRM knowledge without being more specific is of limited value.

Presented in table 3 are results showing the issues perceived to be significant by respondents from the 1998–99 resource management survey through to the 2006–07 NCIS. Comparing results from the resource management surveys with the NCIS is difficult because of different survey questions. Core data for the NCIS were obtained from the 2006–07 AAGIS. Two broad industry groups—livestock producers and grain producers—were targeted, and a different survey was conducted on each (Oliver et al. 2009). Data from the resource management surveys have been separated into grain and livestock categories to provide a rough comparison with NCIS data.

The livestock category includes farms in the sheep, beef, and sheep and beef industries. The grains category includes farms from the wheat and other crops industry and farms with a mixture of cropping and livestock production. This is not a perfect comparison, because mixed cropping and livestock farms would technically belong under both the livestock and grain categories. However, the results suggest that this is a reasonable approach to comparing data between the resource management surveys and the NCIS.

As discussed in section 2, respondents in 2001–02 were first asked if they had noticed a particular degradation issue. Those answering in the affirmative were then asked if the issue was significant. For consistency with other years, 2001–02 data have been expressed as the proportion of the population in each category who considered the issue significant. The slightly different results in 2001–02 may be a result of the different question structure.

## 3 Landholder awareness of selected degradation issues

Significant issue (% of farms in each category)	resource management surveys						NCIS	
	1998–99		2001–02		2004–05		2006–07	
	livestock	grains	livestock	grains	livestock	grains	livestock	grains
Wind erosion	2 (36)	4 (23)	1 (56)	3 (27)	–	–	–	–
Water erosion	12 (18)	12 (19)	1 (51)	2 (41)	–	–	–	–
water and/or wind erosion	13 (17)	15 (16)	2 (38)	6 (24)	12 (16)	20 (13)	13 (13)	18 (9)
Soil sodicity	3 (36)	4 (23)	0 (80)	2 (41)	–	–	–	–
Soil acidity	12 (22)	11 (19)	6 (27)	6 (23)	–	–	–	–
Loss of soil structure	3 (28)	8 (17)	1 (56)	3 (34)	–	–	–	–
poor soil quality	14 (19)	19 (12)	7 (23)	8 (19)	21 (11)	28 (9)	11 (18)	17 (8)
Dryland salinity	7 (25)	12 (17)	3 (32)	9 (17)	4 (27)	11 (16)	7 (29)	8 (12)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Source: Data have been obtained from ABARES databases using SAS.

As an example, consider the options available to a farmer who thought dryland salinity was moderately important. If the farmer was only asked whether or not dryland salinity is a significant issue, they may answer yes. However, if given the option, the same farmer may prefer to state that while they had noticed dryland salinity, it was not a significant issue. Section 4 of the current report discusses an amendment for the new survey which is expected to alleviate this compatibility issue.

The proportion of farms in both the livestock and grains categories that identified poor soil quality as a significant issue decreased between 2004–05 and 2006–07 (table 3). While this may simply be because of different survey designs or the rough disaggregation of the 2004–05 results, it may also indicate a need for further analysis. Future ABARES surveys should clarify this.

## Priority 2: Biodiversity and natural icons

Information relevant to target 1 of priority 2, such as the area of managed native habitat and vegetation, is currently not collected by ABARES. Target 2 is partially measurable by ABARE data. Existing ABARE data cannot provide information on targets for cane toads, camels, exotic island rodents and rabbits. Data may be disaggregated to ABARES regions to inform parts of target 2 relating to weeds and pests (discussed below); however, there is a need for more detailed information around the target.

### *Weeds and pests causing degradation*

Results from past ABARE surveys on the perceived significance of weed or pest infestations, and average expenditure on weed or pest control, are presented in table 4. The proportion of livestock and grain farms identifying weed or pest infestation as a significant concern were higher in both the 2004–05 resource management survey and the 2006–07 NCIS than in earlier years. However, the proportion of grain farmers identifying weed or pest infestation as a significant concern fell from 37 per cent in 2004–05 to 28 per cent in 2006–07.

## 4 Perceived significance of, and expenditure to mitigate, weed and pest infestation

	resource management surveys								NCIS							
	1998–99		2001–02		2004–05		2006–07									
	livestock	grains	livestock	grains	livestock	grains	livestock	grains								
	%	%	%	%	%	%	%	%		%						
Significant issue (per cent of farms)	22	(13)	11	(18)	10	(16)	5	(26)	42	(7)	37	(8)	40	(6)	28	(8)
Expenditure to mitigate (average \$ per farm)	1 266	(21)	756	(25)	1 370	(15)	959	(23)	2 175	(9)	2 104	(14)	–		–	

Notes: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Sources: Data from resource management surveys have been obtained from ABARES databases using SAS. NCIS data from Oliver et al. (2009).

## Priority 3: Coastal environments and critical aquatic habitats

### Water quality

Water quality issues, a key focus of priority 3, have been regularly included in past ABARE surveys. However, as discussed in section 2, past surveys have sometimes asked the same questions in slightly different ways, limiting the comparability of past survey data. The ABARE 2001–02 resource management survey asked respondents first if they had noticed poor water quality on their farm, and second if it was a significant issue. The majority of respondents in the high rainfall zone who considered poor water quality a significant issue indicated that they had already changed their management practices in response to that issue.

The 2004–05 resource management survey asked about irrigation water quality instead of poor water quality. In 2004–05, 58 per cent of respondents in the high rainfall zone who considered irrigation water quality a significant issue had already changed their practices (table 5). Of course, irrigation water quality would only be of importance to irrigated farms, whereas poor water quality could be of importance to all farms. Hence, poor water quality is expected to rate higher than irrigation water quality. In aggregate terms, water quality does not rate as a significant issue; the proportion of all farmers in each zone who considered either issue to be significant was less than 5 per cent in both the 2001–02 and 2004–05 surveys.

## 5 Perceived importance of water quality from 2001–02 and 2004–05 resource management surveys

	pastoral zone		wheat–sheep zone		high rainfall zone	
<b>2001–02</b>						
<i>(poor water quality)</i>						
Noticed						
(per cent of population)	9	(46)	14	(14)	8	(23)
Significant issue						
(per cent of those who noticed)	53	(77)	34	(26)	29	(41)
Significant issue						
(per cent of population)	5	(77)	5	(26)	2	(41)
Change practices						
(per cent of those who thought it was significant)	23	(93)	86	(29)	93	(43)
<b>2004–05</b>						
<i>(irrigation water quality)</i>						
Significant issue						
(per cent of population)	2	(77)	1	(45)	3	(43)
Change practices						
(per cent of those who thought it was significant)	26	(123)	34	(68)	58	(52)
Intend to change practices						
(per cent of those who thought it was significant)	26	(123)	41	(64)	45	(57)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Source: Data have been obtained from ABARES databases using SAS.

## Great Barrier Reef lagoon

The first and second outcomes of priority 3, and their associated targets, seek to improve the quality of water flows entering the Great Barrier Reef (GBR) lagoon. In 2006, ABARE conducted a study for the then Department of Environment and Heritage to analyse the potential for economic incentives to be used to improve water quality in the GBR catchment area (ABARE 2006). A survey of 148 farmers, including 56 from the grazing industry, 71 from the sugar industry and 21 from the horticulture industry, was conducted. The study included a number of land management practices in each industry that were identified as being likely to improve the quality of water entering the GBR lagoon (table 6).

## 6 Land management practices included in GBR survey

grazing industry	sugar industry	horticultural industry
Excluding stock from the riparian zone	Water reuse systems	Water reuse systems
Earthworks to control erosion	Laser guided irrigation layout	Laser guided irrigation layout
Routine transfer or sale of stock in dry periods	Irrigation scheduling tools	Irrigation scheduling tools
	Buffer strips	Maintain groundcover
	Early planting of cover crops	

The survey asked landholders which of the practices listed in table 6 they undertook, as well as their reasons for adopting or not adopting each practice. Results from these questions are provided in table 7. For the grazing industry, the main reason for adopting land management practices was found to be improved long-term sustainability of the land. Also, lack of economic returns was a major reason for non-adoption in the grazing industry. The sugar and horticulture industries also indicated sustainability and lack of returns as a main reason for adoption or non-adoption of land management practices, although not to the same extent as the grazing industries. These results suggest that land management practices produce both public and private benefits.

The study also discussed the types of government intervention that may be effective in the GBR catchment. In cases where public benefits accrue from private investment decisions, government intervention is warranted to increase the uptake of land management. Two types of incentive mechanism were discussed: fixed price subsidies and competitive tenders. Fixed price subsidies may be efficient where the private costs of adoption are not likely to vary. Where the private costs of adoption vary, a fixed price subsidy is unlikely to be efficient; only those farmers whose costs were less than the amount of the subsidy would apply for the subsidy. In these cases, competitive tender mechanisms, where farmers put in a bid for funding based on their private costs of adoption, are likely to be more efficient.

## 7 Adoption of land management practices in GBR catchment

	reasons for adoption a				reasons for non-adoption a		
	adoption rate %	farm performance %	farm sustainability %	improved environment %	no economic return %	not sure it would work %	not consistent with other practices %
<b>Grazing industry</b>							
Exclude stock	40	18	82	0	44	11	11
Earthworks	47	0	43	57	33	8	0
Sale/transfer of stock	67	15	65	20	33	33	33
<b>Sugar industry</b>							
Water reuse system	11	14	43	43	9	32	27
Laser guided irrigation	17	36	36	27	37	26	26
Irrigation scheduling tools	7	60	20	20	16	26	26
Buffer strips	66	13	33	54	10	10	40
Early planting	54	53	37	11	26	26	17
<b>Horticulture industry</b>							
Water reuse system	10	0	0	100	6	19	44
Laser guided irrigation	40	38	25	38	18	0	73
Irrigation scheduling tools	35	50	33	17	17	8	50
Maintain groundcover	80	20	27	53	50	0	0

a Only asked of relevant farmers.

Note: More reasons for non-adoption were included in the survey than those reproduced here.

Source: ABARE 2006.

### Other targets

Other targets of priority 3 are difficult to measure with existing ABARE data because they require location-specific data or cover topics that are not directly covered by the ABARE agriculture surveys. In particular, those properties that are separated into areas defined under the Ramsar convention (an international convention regarding the treatment of wetlands, signed in the Iranian town of Ramsar) can be in National parks or other forms of public land.

## Physical practice questions

ABARE surveys have contained questions on a broad range of land management practices which may be useful for measuring progress towards targets under priority 4.

### Priority 4: Sustainable farming

#### Landholders' response to degradation

Of the farmers who reported any signs of significant degradation on their properties in 2001–02, about 80 per cent reported that they had changed farm management practices in

that financial year (Nelson et al. 2004). In 2004–05, only 46 per cent of farmers who had noticed significant degradation reported that they had changed their management practices in that year (Hodges and Goesch 2006). These two datasets appear contradictory. One cause of this could simply be a change in the sample between the two surveys. Another explanation might be that farmers had already changed their management practices by 2004–05 (for example, in 2001–02) and thus would have responded no in 2004–05.

The *Caring for our Country business plan 2009–2010* (Commonwealth of Australia 2008) states that specific priority will be given to project proposals aimed at preventing poor soil quality, water erosion and wind erosion. In the 2001–02 and 2004–05 resource management surveys, respondents who noted that a particular degradation issue was a significant concern were asked if they had changed their management practices in response to that issue. Presented in table 8 are results showing the responses to this question. Data from 2001–02 highlight the benefits of asking about different items separately. All pastoral zone farmers intended to change their practices in response to significant water erosion, while only 31 per cent intended to address wind erosion (table 8). A similar trend is evident for soil issues in the wheat–sheep zone. The aggregation of water and wind erosion and soil issues in 2004–05 means these issues cannot be assessed individually.

## 8 Change practices because of significant degradation

	pastoral zone		wheat–sheep zone		high rainfall zone	
	2001–02	2004–05	2001–02	2004–05	2001–02	2004–05
	%	%	%	%	%	%
Water erosion	100 (114)	–	56 (36)	–	83 (86)	–
Wind erosion	31 (96)	–	74 (31)	–	96 (66)	–
water or wind erosion	49 (75)	84 (22)	65 (23)	86 (13)	92 (53)	81 (25)
Soil acidity	0	–	81 (23)	–	81 (36)	–
Soil sodicity	0	–	43 (47)	–	83 (79)	–
Loss of soil structure	0	–	91 (34)	–	57 (100)	–
poor soil quality	0	69 (38)	79 (19)	81 (9)	82 (31)	87 (13)
Weeds or pests	86 (26)	68 (13)	79 (22)	80 (8)	75 (27)	84 (12)
Dryland salinity	100 (117)	90 (108)	87 (18)	60 (18)	73 (52)	72 (30)

Notes: Data expressed as the proportion of respondents who said the issue was a significant concern. A dash indicates that the item was not included in that year's survey. Figures in parentheses are standard errors expressed as a proportion of the estimate.

### Poor soil quality

Table 9 presents data indicating the uptake of soil testing in the 1998–99, 2001–02 and 2004–05 resource management surveys. The proportion of respondents undertaking soil tests in the wheat–sheep zone fell between 2001–02 and 2004–05. However, the uptake of soil testing is not necessarily reflective of the awareness or perceived importance of soil quality issues. For instance, farmers that have been in the industry for many years may simply be able to recognise poor soil issues without the need for a formal soil test, or may not see the need for a soil test in each of the survey years.

## 9 Uptake of soil testing

	1998–99	2001–02	2004–05
	%	%	%
Wheat–sheep zone	50 (6)	68 (3)	61 (4)
High rainfall zone	55 (7)	59 (8)	56 (7)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate.

Source: Data have been obtained from ABARES databases using SAS.

### Specific land management practices

Data from the ABARE resource management surveys on the uptake of selected land management practices are presented in table 10. The proportion of pastoral zone farmers who controlled grazing pressure increased significantly from 2001–02 to 2004–05. The proportion of farmers in the pastoral zone installing headworks to control water flow from artesian bores fell between 2001–02 and 2004–05, as did the proportion of all farmers who planted trees or shrubs.

## 10 Uptake of selected land management practices, by ABARES zone

	1998–99	2001–02	2004–05
	%	%	%
<b>Pastoral zone</b>			
Headworks to control flow from artesian bores	13 (28)	30 (14)	17 (19)
Piped bore water for stock	48 (10)	52 (9)	58 (9)
Controlling grazing pressure	26 (29)	24 (25)	70 (6)
<b>Wheat–sheep and high rainfall zones</b>			
Dryland cropping using contour banks	18 (9)	19 (8)	25 (7)
Perennial pasture species	42 (5)	41 (6)	46 (5)
Crop or pasture legumes incorporated into cropping rotations	48 (4)	49 (4)	53 (4)
<b>All broadacre and dairy farms</b>			
Planting trees/shrubs	–	60 (3)	25 (12)
Preservation of conservation value	45 (5)	50 (4)	–
Monitoring of pasture/vegetative condition	23 (8)	25 (7)	24 (6)
Maintaining vegetative cover	60 (3)	66 (3)	–
Excluding stock from degraded areas	36 (5)	53 (4)	50 (3)
Other	15 (10)	8 (16)	9 (13)

Notes: Columns do not add to 100 per cent because some farmers undertake more than one of the practices listed. A dash indicates that the item was not included in that year's survey. Figures in parentheses are standard errors expressed as a percentage of the estimate.

Sources: Data for pastoral and wheat–sheep zones have been obtained from ABARES databases using SAS. Aggregate data from Alexander et al. 2000; Nelson et al. 2004; and Hodges and Goesch 2006.

## Training and group membership questions

ABARE surveys have included a number of questions about the uptake of different training activities. Data from these questions are relevant to priority 6 (community skills, knowledge and engagement) of Caring for our Country, and are highlighted below.

## Priority 6: Community skills, knowledge and engagement

Panel A of table 11 provides results showing the type of training activities most commonly undertaken by all broadacre farms between 1998–99 and 2004–05. The 1998–99 resource management survey was specific about the types of training activities undertaken; for instance, Landcare workshops and property workshops were mentioned separately. Later ABARE surveys have tended to include less specific items. For instance, in 2001–02 respondents were asked if they attended any type of workshop; different types of workshops were not separately mentioned. In 2004–05, the questions were aggregated further. Respondents in that survey were asked if they attended any workshop or conference; those items were not included separately as in earlier years. However, different questions in different years do not detract from the capacity to provide useful insights into the types of training activities most commonly undertaken.

### 11 Training data from resource management surveys, all broadacre industries

	1998–99		2001–02		2004–05	
	%		%		%	
<b>A. Participation in training activities</b>						
Conferences or workshops...	52	(4)	54	(4)	42	(5)
conference	–		32	(7)	–	
workshops/short courses	–		46	(5)	–	
Landcare workshops or field days	25	(7)	–		–	
property workshops	13	(11)	–		–	
other short courses	31	(6)	–		–	
industry grower groups	19	(9)	–		–	
University or TAFE	15	(10)	21	(9)	7	(15)
university or other tertiary	2	(31)	1	(29)	–	
TAFE	13	(12)	20	(9)	–	
distance education	2	(29)	–		–	
Field days	–		66	(3)	64	(3)
Agronomists or other consultants	–		21	(8)	52	(4)
Other	1	(36)	1	(31)	0	(54)

#### B: Participation in training activities, by farm type

	2001–02		2004–05		2006–07 (NCIS)							
	livestock %	grain %	livestock %	grain %	livestock %	grain %						
Conferences or workshops...	45	(7)	65	(5)	38	(8)	48	(7)	35	(7)	50	(4)
conference	25	(11)	39	(8)	–		19	(12)	37	(6)	–	
workshops/short courses	38	(8)	55	(6)	–		24	(6)	36	(5)	–	
Field days	56	(6)	77	(3)	58	(5)	73	(4)	53	(5)	70	(2)
University or TAFE	17	(14)	26	(11)	6	(24)	8	(18)	11	(11)	10	(12)
Natural resource events	–		–		–		–		17	(10)	17	(9)

Note: Figures in parentheses are standard errors expressed as a percentage of the estimate. A dash indicates that the item was not included in that year's survey.

Source: Data have been obtained from ABARES databases using SAS.

Panel B of table 11 provides a comparison between results from the 2001–02 and 2004–05 resource management surveys and the most recent ABARE survey, the 2006–07 NCIS. Data from the 2001–02 and 2004–05 surveys have again been separated into responses by livestock and grain farmers to allow comparison with NCIS results. In each of the three surveys, the uptake of training was lower for livestock farmers than for grain farmers. This is particularly apparent for field day attendance. On average, about 65 per cent of all broadacre farmers attended field days in 2001–02 and 2004–05 (panel A). The break-up into livestock and grain farms revealed that about 20 per cent more grain farmers than livestock farmers attended field days.

Given the total proportion of broadacre farmers who did attend field days, field days that demonstrate NRM practices might be a good way to increase the community's knowledge and awareness of different natural resources issues.

The second target under priority 6 is to increase participation in NRM-related community groups. As with a number of other targets, the absence of a specific numeric target (for example, 50 per cent membership) makes it difficult to truly assess achievement of this target. However, at a national level, membership in Landcare or similar groups increased between 1992–93 and 2004–05, indicating that some progress may already have been made towards achieving this target (table 12).

## 12 National Landcare membership over time

	landcare surveys		resource management surveys		
	1992–93	1995–96	1998–99	2001–02	2004–05
	%	%	%	%	%
Per cent of farms with a Landcare member	28	34	41 (5)	39 (5)	43 (5)

*Notes:* 1995–96 data include broadacre and dairy; other years include only broadacre. Figures in parentheses are standard errors expressed as a percentage of the estimate.

*Sources:* Mues, Roper and Ockerby 1994; Mues, Chapman and van Hilst 1998. Data from resource management surveys obtained from ABARES databases using SAS.

## Questions on behavioural issues and barriers

Although not directly relevant for Caring for our Country priorities and targets, insights into behavioural issues and barriers to NRM adoption from the three most recent ABARE resource management surveys can be useful in informing the MERI strategy. For example, insights from these types of questions could provide administrators with an early warning of any potential barriers to NRM uptake, and will provide them with a better understanding of what drives landholders to implement change. Table 13 contains a summary of landholders' responses to selected behavioural questions.

In each of the three resource management surveys since 1998–99, more than 80 per cent of respondents agreed or strongly agreed with the sentiment 'I farm for long-term productive capacity of the land, even if this means lower short run profits'. This implies that landholders farm for the long term; hence, for some landholders up-front costs may not necessarily

discourage them from adopting more sustainable land management practices that generate private benefits. The results in table 13 suggest that community awareness of degradation issues is generally good. Only about 10 per cent of respondents in each of the resource management surveys agreed or strongly agreed with the statement 'I do not have the information or skills to adequately address land and water degradation on my property'.

## 13 Responses to selected behavioural questions in past resource management surveys

	agree or strongly agree			neutral			disagree or strongly disagree		
	1998	2001	2004	1998	2001	2004	1998	2001	2004
	-99	-02	-05	-99	-02	-05	-99	-02	-05
	%	%	%	%	%	%	%	%	%
Land/water degradation is a big problem	59	65	-	18	16	-	22	19	-
I don't have the skills to address degradation	19	9	10	28	16	10	53	73	77
I want to learn more but don't have time	-	39	-	-	20	-	-	40	-
I don't have the money to address degradation	32	30	-	29	22	-	40	48	-
I don't have the time or money to address degradation <sup>a</sup>	-	-	31	-	-	15	-	-	50
Change is very risky	34	36	32	23	21	19	43	43	46
I farm for long-term productive capacity of the land, even if this means lower short run profits	86	88	83	8	7	9	6	4	4
I don't have enough incentive to change	-	-	39	-	-	21	-	-	37

<sup>a</sup> In 2001–02 time and financial constraints were included as separate questions. Responses have been aggregated using SAS. The aggregation may result in double counting of some responses, which is why 2001–02 data does not sum to 100.

Notes: A dash indicates that the item was not included in that year's survey. Some responses may not sum to 100 because of rounding errors.

Source: Data obtained from ABARES databases using SAS.

## Interpreting past ABARE survey data

The data provided above show some variation in results from different survey years under each of the four survey themes. As discussed earlier in this section, ABARE survey data can be broken up by industry, zone and region. Analysis performed on the resulting data, such as regression analysis or hypothesis testing, can often highlight potential reasons for variation in data between survey years.

The uptake of NRM practices could be viewed as a short-term investment aimed at enhancing long-term productivity. Thus, it will be partially influenced by preferences between current and

future earnings. Farmers who are more concerned about future earnings than current earnings may be willing to sacrifice current income to provide greater certainty over future earnings, and thus may be more likely to undertake NRM practices. On the other hand, farmers who are more concerned about current earnings might borrow against future income to shore up current income, and thus may be less likely to undertake NRM practices.

There are a number of other factors that could explain variations in data between years. First, the data need to be interpreted in the context of the prevailing seasonal conditions at the time the surveys are conducted. The 2006–07 NCIS and 2004–05 resource management surveys were conducted during drought years, whereas 2001–02 had relatively high rainfall. NRM practices are often done in response to certain conditions. For example, during a drought year farmers would not be expected to plant trees or shrubs. Consistent with this, the proportion of landholders planting trees fell from 60 per cent in 2001–02 to 25 per cent in 2004–05 (see table 10). Drought may also explain the increase in the proportion of pastoral zone farmers controlling grazing pressure between 2001–02 and 2004–05 (table 10).

It is important to note that degradation is just one issue which must be interpreted in the context of broader production-related decisions. For example, farmers dealing with the effects of a severe drought may not have the money or time to deal with degradation issues, or may focus on dealing with more pressing production issues.

As previously discussed, ABARE surveys in different years are conducted on different samples. This is done to reduce respondent burden and to ensure an accurate representation of the entire population over time. Changes in data between different surveys may in some cases be a consequence of sample change. Where significant changes have occurred in the past, a sample of farms participating in both surveys has been investigated to determine whether the data change was simply because of a change in sample.

In addition, ABARE surveys include farms above a minimum size threshold to exclude non-commercial businesses (hobby farms). This size threshold is based on the estimated value of agricultural operations (EVAO) as calculated by the Australian Bureau of Statistics. ABARES changed the EVAO cut-off between the 2004–05 and 2006–07 surveys. For the 2006–07 NCIS, the EVAO cut-off was \$40 000; prior to 2006–07 the cut-off was \$22 500 (ABARE 2007). Hence, ABARE surveys are biased towards farms whose primary business activity is agriculture. These farmers may have different attitudes to NRM than hobby farmers.

## Reviewing Caring for our Country targets

A lack of clarity in the requirements of targets could result in targets that are ineffective at achieving relevant outcomes, and ultimately lead to an inefficient allocation of resources. This could happen in two ways. First, poor targets will reduce investment certainty. Investors may be discouraged from submitting project proposals if they are uncertain about the requirements of a specific target, which could prevent optimal investments from taking place. Second, uncertainty over target requirements could result in different administrators having varying opinions on the progress towards achieving targets.

Measurability of targets could be enhanced by clarifying what is being targeted. Different investors or administrators should be able to reach the same conclusions when measuring progress towards a particular target. To achieve this, Caring for our Country targets should, wherever possible, be underlined by quantitative values. For example, the target could specify a desired density of weed coverage per square metre, which could be decided on by using data from the new ABARES NRM survey.

The Australian National Audit Office (ANAO) (2008) found that the regional nature of the Natural Heritage Trust hindered its ability to be truly assessed and recommended that assessment be carried out at a national, not regional, level. To some degree this recommendation has been adopted in Caring for our Country; however, the point made by the ANAO about regional specificity is still valid. Targets should be designed as much as possible to be compatible with existing datasets. Where specific regional data are required this should be clearly noted.

Results from future ABARES surveys could be used to assist in the design of final targets. For example, data could highlight which degradation issues are of particular interest to farmers in different industries, zones or regions. Targets that are aimed at reducing the effect of these issues would have a greater chance of attracting investment proposals. Specific targets, underlined where possible by quantitative goals, could then be designed in collaboration with landholders, policymakers and external advisors. This will help ensure that targets receive enough community interest to generate investment, and also that investments will be effective in dealing with the initial problem.

# 4 Designing a new NRM survey

In developing the new survey, a number of competing factors need to be taken into account. The new survey needs to be designed with the measurement of Caring for our Country in mind—it needs to provide data that is useful and relevant to specific targets and outcomes as well as the MERI strategy. At the same time, consideration should be given to the comparability of the new survey with data from past ABARE surveys. The survey also needs to be designed with time and budget constraints in mind. Questions in a supplementary survey need to provide as much detail as possible, but at the same time need to be clear, concise, and written in a way most suited to farmers.

Provided below is a discussion on the design of the new ABARES NRM survey. A draft survey questionnaire is included as appendix C.

## Planning and awareness questions

Past ABARE surveys provide insights into the uptake of farm planning since the early 1990s. The specific components of farm plans are also able to be analysed, but there is a need to ensure consistency in the list of components. For example, the 2004–05 resource management survey and the 2006–07 NCIS included an NRM plan as one component, which was an aggregation of three separate issues that were included in earlier surveys. Although earlier data can be aggregated to assess the uptake of NRM planning, data from 2004–05 and 2006–07 cannot be split up to assess the uptake of planning for different NRM issues.

It is proposed that the new survey have a greater focus on planning specifically for NRM issues. Farmers who indicate that they have a documented farm plan will also be asked whether their plan includes an NRM plan. Further, it is proposed that respondents be asked which separate NRM issues they include in their NRM plan. Finally, relevant respondents will be asked why their farm plan does not include an NRM plan. It is hoped that this will provide insight into what drives a landholder to actively plan for the management of natural resources.

The new survey may also alter the way awareness of degradation issues is covered. Past surveys have asked respondents to provide binary (yes/no) answers to indicate whether or not they are aware of a particular issue. As discussed in section 4, the 2001–02 survey asked a subset of respondents who were aware of a degradation issue whether or not that issue was significant. In other surveys that subset was not applied. Although the existing ABARE survey data have provided some useful insights into the awareness of degradation issues, the comparability of 2001–02 data with other years' data is limited.

An alteration to these questions is proposed in the new survey, which will extend the capacity of the resulting data to provide meaningful policy insights. Instead of seeking binary

responses to determine whether landholders consider degradation to be a significant concern, respondents will be asked to estimate the area of farm land that has been affected by each specific issue. The list of issues covered is proposed to be broadly consistent with previous surveys. This will reduce the subjectivity involved with asking landholders whether or not an issue is significant. ABARES analysts will then be able to apply a consistent decision rule to determine the relative significance of different issues based on quantitative data.

Respondents who indicate that they have been affected by a particular degradation issue will be asked whether or not they have changed their management practices as a result of that issue. Those who have changed practices will be further asked when they made these changes and how much they spent on the changes. Data from these questions will highlight whether degradation is a predominately private concern or whether there are some public aspects to the issue.

## Physical practice questions

Past ABARE data have included a range of questions relating to the uptake of physical NRM practices and it is not proposed to change the structure of these questions. Data provided in section 3 showed the uptake of specific land management practices, arranged by geographic zones, for each of the past resource management surveys (1998–99, 2001–02 and 2004–05). These data have the potential to be of value to Caring for our Country.

Some additions are proposed for the new survey. Past surveys have asked respondents to estimate the money spent on a number of different NRM practices. These questions have been asked separately from the binary questions. The new survey proposes to amalgamate the dollar value questions with the binary questions. Respondents who indicate that they have undertaken some practice will be further asked how much they spent on that practice. This will allow not only the relative uptake of practices to be assessed, but also the financial capacity of landholders to implement change, particularly by reading results in conjunction with core AAGIS and ADIS data. Also, differences in expenditure by industries or regions will provide insights into the relative capacity of those industries or regions to implement change. These conclusions cannot be drawn from binary data alone.

The 2001–02 resource management survey asked respondents to estimate the proportion of their land that was sown by different tilling methods; for instance, reduced tillage as opposed to traditional cultivation. The 2004–05 survey asked respondents whether or not they applied direct drilling, minimum tillage or conventional cultivation using binary questions. The new survey proposes to go back to the method used in 2001–02, with two small changes. First, it is proposed to ask respondents for the amount of area sown using different tillage methods. Second, it is proposed to ask respondents how many runs over the farm they undertook. This will eliminate the subjectivity caused by different farmers having different opinions on what constitutes minimum or reduced tillage.

## Training and group membership questions

A slight alteration to the structure of training and group membership questions is proposed for the new survey. Membership of an NRM group, such as Landcare, is a form of training activity. Past ABARE surveys have asked respondents what they learned from their Landcare or other group membership, but have not asked what they learned from other training activities.

Past ABARE surveys have asked about group membership and training separately, even though they essentially cover the same issues. To avoid confusion and streamline the two topics, the new survey proposes to amalgamate these questions. It is proposed to first ask respondents whether or not they are a member of a Landcare or production group, then to ask respondents which forms of training activity they undertook. Because Landcare and production group events often include training activities, participation in these events will be included along with the broader list of training activities.

Respondents have sometimes been asked whether they are active or inactive Landcare members. To avoid subjectivity over what constitutes an active membership, the new survey proposes to ask respondents how many Landcare activities they attended. A consistent decision rule can then be applied to separate active and inactive members. It is proposed to further ask how many of these training activities were NRM focused. Finally, questions from past surveys seeking to determine what landholders learned from Landcare or other group events will be extended to determine what they learned from all training activities attended, whether Landcare related or not.

## Questions on behavioural issues and barriers

Past ABARE resource management surveys have sought to determine the factors behind landholders' adoption of NRM practices by seeking responses to a range of statements, such as 'I do not have enough incentive to implement change' or 'change is too risky'. The new survey proposes to include such questions throughout the survey, to assess barriers towards the uptake of specific practices. For example, respondents who do not have an NRM plan are asked why. Similarly, those who indicate that they do not undertake certain practices are asked why.

Feedback from previous ABARE surveys indicates that behavioural questions are best included throughout the survey, rather than as a stand-alone section as in previous years. In the past, respondents may have grown tired of the generic nature of these questions and as a result may be less willing to participate in future surveys. Additionally, insights from these questions can easily be gathered by asking specific questions throughout the survey. For example, respondents without an NRM plan are asked why, as are respondents that do not undertake certain other practices.

# 5 Conclusions

This report has assessed the comparability of past ABARE surveys with questions related to NRM, including Landcare surveys and resource management surveys, since the early 1990s. Results from past surveys can provide valuable data over time under each of the four themes of ABARE questions: planning and awareness, physical practices, training and group membership, and behavioural issues and barriers.

The ABARE resource management and Landcare surveys were conducted as supplements to the core AAGIS and ADIS surveys, which allow results to be read in the context of broader production and financial results. These supplementary surveys allow for the assessment of the uptake of NRM practices in conjunction with a number of different financial, physical and economic variables that are not always available from other surveys.

Past ABARE surveys have been conducted for different clients with different priorities. As a result, there are some differences in the order and structure of questions. Although there is a potential for some of these inconsistencies to influence results provided in this report, meaningful historical trends can still be established under each of the four themes of ABARES survey questions.

Existing ABARE data are particularly relevant for priorities 4 and 6 (sustainable farming and community skills, knowledge and engagement) of the Caring for our Country initiative and can be used to some extent to inform other priorities. Some Caring for our Country targets require region-specific data. Existing ABARE data can be disaggregated into industries, geographic zones and farm survey regions, but in some cases targets may require information specific to areas within or between ABARES regions.

The draft survey instrument included in this report combines knowledge of the usefulness of existing survey data with an understanding of Caring for our Country needs. The survey has been designed around the four themes. The basic structure of questions is the same as that in earlier resource management surveys. However, a number of amendments have been made to reduce the subjectivity of results and enhance the usefulness of the resulting data for the Caring for our Country initiative.

# References

- ABARE 2003, 'Survey methods and definitions' in *Australian farm surveys report 2003*, available at [www.abare.gov.au/interactive/farmsurveys\\_07/pdf/survey\\_methods.pdf](http://www.abare.gov.au/interactive/farmsurveys_07/pdf/survey_methods.pdf), accessed 27 May 2009.
- ABARE 2006, *Economic incentives to improve water quality in the Great Barrier Reef*, ABARE report to the Australian Government Department of the Environment and Heritage, unpublished report to client.
- ABARE 2007, *Australian farm survey results 2004–05 to 2006–07*, Canberra.
- ABARE 2009, *Australian beef 09.1*, Canberra.
- Alexander, F, Brittle, S, Ha, A, Gleeson, T and Riley, C 2000, *Landcare and farm forestry: providing a basis for better resource management on Australian farms*, ABARE report to the Natural Heritage Trust, Canberra, November.
- Australian National Audit Office (ANAO) 2008, *Regional Delivery Model for the Natural Heritage Trust and the National Action Plan*, Audit report no. 21 2007–08, Commonwealth of Australia, Canberra.
- Commonwealth of Australia 2008, *Caring for our Country business plan 2009–2010*, Commonwealth of Australia, Canberra.
- Hodges, A and Goesch, T 2006, *Australian farms: natural resource management in 2004–05*, ABARE research report 06.12, prepared for the Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, September.
- 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, Alexander, F, Elliston, L and Blias, A 2004, *Natural resource management on Australian farms*, ABARE eReport 04.7 prepared for the Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, May.
- Nelson, RA and Mues, C 1993, *Survey of Landcare and drought management practices 1991–92*, Land and Forestry Economics Section, ABARE, Canberra.
- Oliver, M, Ashton, D, Hodges, A and Mackinnon, D 2009, *Farmers' use of sustainable management practices*, ABARE report to the National Land and Water Resources Audit, Canberra, March.
- Pannell, D 2009, *Making the most of Caring for our Country*, University of Western Australia, paper presented at ABARE National Outlook Conference, Canberra, 3 to 4 March 2009.

# A Timeline of questions in past surveys

PHYSICAL PRACTICES QUESTIONS	Legend	Topic raised in two surveys																				
		2006-07	2004-05	2001-02	1999-2000	1998-99	1997-98	1995-96	1993-94	1992-93	1991-92											
<b>What did you spend on:</b>																						
controlling pests/weeds																						
Landcare related earthworks																						
Landcare related fencing																						
protection/regeneration of trees/ shrubs																						
changing irrigation to address degradation																						
fixing machinery for NRM purposes																						
water storage and farm reticulation																						
pest management																						
weed management																						
<b>Pastoral farms</b>																						
controlled flow from artesian bores																						
piped bore water supply																						
controlled grazing pressure																						
promoting soil conservation/ revegetation																						
<b>Wheat-sheep and high rainfall farms</b>																						
perennial pasture																						
incorporation of crop/pasture legumes																						
dryland cropping																						
strip cropping																						
soil testing																						

continued...

PHYSICAL PRACTICES QUESTIONS *continued*

	2006-07	2004-05	2001-02	1999-2000	1998-99	1997-98	1995-96	1993-94	1992-93	1991-92
<i>Tillage practices a</i>										
direct drilling	■	■	■		■		■		■	
minimum tillage	■	■	■		■		■		■	
conventional cultivation	■	■								
precision agriculture (e.g. GPS guidance)		■								
controlled grazing management systems	■	■								
<b>Dairy farms</b>										
soil testing	■	■	■	■	■	■	■	■	■	■
collection of dairy shed effluent			■							
pumping of effluent onto pasture			■							
water reuse system			■							
per cent of farm area that utilises water reuse system			■							
monitoring water tables		■	■				■		■	
type of grazing system used	■	■	■	■	■	■	■	■	■	■
<b>Irrigation farms</b>										
laser guided irrigation layout		■	■		■		■			
ability to store drainage water		■	■		■		■			
auto-irrigation system		■	■		■		■			
irrigation scheduling tools			■		■		■			
<b>All farms</b>										
planting or maintaining trees and shrubs			■		■		■		■	
enhancing conservation value			■		■		■		■	

*continued...*

PHYSICAL PRACTICES QUESTIONS continued

	2006-07	2004-05	2001-02	1999-2000	1998-99	1997-98	1995-96	1993-94	1992-93	1991-92
maintaining vegetative cover										
monitoring pasture/vegetative condition										
per cent native pasture										
per cent rotationally grazed pasture										
<i>Land management</i>										
excluding stock from degraded areas										
managing native pastures										
fenced off land according to capability										
fenced off vegetation areas										
fenced off water courses										
Landcare related earthworks										
moved roads/stock routes										
added/changed stock watering points										
use of conservative stocking rates										
place water to minimise degradation										
manage crop rotation to minimise degradation										
retain stubble/mulch to minimise degradation										
setting aside farm areas for conservation										
what per cent of farm area is set aside?										
when did you start setting aside areas?										
testing for pests/disease										
testing for weed seedbank										

a 2002 surveys and earlier ask for the proportion of land sown to each type of tillage; the 2005 NRM survey asks yes/no questions. Note: 2002 and earlier surveys categorise practices by type of farm; the 2005 NRM survey does not categorise practices.

PLANNING AND AWARENESS QUESTIONS	Legend		Topic raised in two surveys				
	2006-07	2001-02	1998-99	1995-96	1993-94	1992-93	
<b>Contents of business plan</b>							
people management							
marketing							
production							
budget							
risk management							
farm map							
farm business							
NRM plan a							
regional natural resource priorities							
soil testing/capability							
pest/disease management							
Landcare works							
salinity management							
identify areas of conservation value							
plan for planting/maintenance of trees/shrubs							
grazing/pasture management							
land management							
existing or planned capital improvements							
crop/livestock performance							
drought preparation							
timetable for implementation							
wildlife/vegetation							

continued...

**PLANNING AND AWARENESS QUESTIONS** continued

	2006-07	2004-05	2001-02	1998-99	1995-96	1993-94	1992-93
<b>Which issues had a significant impact on farming operations?</b>							
wind erosion							
water erosion							
water & wind erosion (combined)							
dryland salinity							
irrigation salinity							
irrigation water quality							
surface water logging							
soil acidity							
soil sodicity							
poor soil quality							
loss of soil structure							
weeds and pests causing degradation							
loss of native grass							
loss of water pressure							
reduced surface water quality							
loss of wildlife/biodiversity							
loss of native vegetation							
woody weed spread							
loss in rangeland productivity							

<sup>a</sup> Includes: conservation value, Landcare works, trees/shrubs, pest/disease management, soil, water, vegetation and native animals.

**TRAINING AND GROUP MEMBERSHIP QUESTIONS**      Legend      Topic raised in one survey      Topic raised in two surveys

	2006-07	2004-05	2001-02	1999-2000	1998-99	1997-98	1995-96	1993-94	1992-93	1991-92
<b>Main sources of learning</b>										
demonstrations and industry field days										
TAFE/university/other tertiary										
conferences and seminars										
consultants (e.g. agronomists)										
workshops and short courses										
natural resource events										
marketing events										
production groups										
Landcare events										
distance education										
property management planning										
field days run by public sector										
<b>Sources of advice</b>										
agronomist/consultant										
financial planner										
rural finance consultant										
career/skills assessment										
succession planning										
personal counselling										
suppliers of inputs										
agricultural department staff										
media										
other farmers/friends										
milk company										
fertiliser/chemical company										

continued...

TRAINING AND GROUP MEMBERSHIP QUESTIONS continued

	2006-07	2004-05	2001-02	1999-2000	1998-99	1997-98	1995-96	1993-94	1992-93	1991-92
<b>Landcare membership</b>										
are you a member?										
is your membership active or inactive?										
<i>What have you learned about?</i>										
degradation information										
skills										
contacts										
catchment/regional planning										
tree plantings										
community works										
access to machinery										

BEHAVIOURAL/BARRIER QUESTIONS	Topic raised in one survey		Topic raised in two surveys				
	2006-07	2004-05	2001-02	1998-99	1995-96	1993-94	1992-93
<b>How accurate is this statement</b>							
land and water degradation is a significant problem							
I want to learn more but don't have time							
I don't have the skills to address degradation							
I don't have the money to address degradation							
change is very risky							
I care more about the long run than the short run							
I don't have enough incentive to change							
I think I will make less profit over the next 5 years							
I have a plan and follow it							
I am willing to pay for good advice							
I would like to sell up and leave							
I already operate according to best practice							
community leaders show the way with NRM issues							
<b>Reasons for non-membership of Landcare</b>							
too far away							
used to be but left							
don't have time							
only minor problems exist in my area							
not interested							
don't know what they do							
attempts to start a group in my area failed							

continued..

**BEHAVIOURAL/BARRIER QUESTIONS** continued

	2006-07	2004-05	2001-02	1998-99	1995-96	1993-94	1992-93
<b>Barriers to change to avoid degradation</b>							
lack of time							
lack of money							
lack of skills							
degradation is not a big issue							
uncertain environmental benefits							
unsuitable environment/climate							
uncertain financial markets/return on investment							
what barriers are there to new grazing regimes?							
what barriers are there to conservation set asides?							

# appendix **B** Caring for our Country priorities and targets

## Priority 1: National Reserve System

Outcome	Target	Applicability of ABARE data
1. Expand area protected under NRS to 125 million hectares (25% rise).	1. Increase area protected under NRS by 5 million hectares each year.	Fair
2. Expand indigenous protected areas in NRS by 8–16 million hectares (40% rise).	2. Increase Indigenous protected areas by 2 million hectares per year.	Fair
3. Require all protected areas to have effective management plan (used to be 70%).	3. Complete management plans for all protected areas over the next four years.	Good

## Priority 2: Biodiversity and natural icons

Outcome	Target	Applicability of ABARE data
1. Increase by 1 million hectares the area of managed native habitat and vegetation.	1. Increase by 400 000 over the next two years the area of managed native habitat and vegetation.	Good
2. Reduce the impact of invasive species.	2. Cane toads:  1500 days of cane toad control in 2009–10; R&D to further cane toad mitigation in 2009–10.	Limited
	Camels:  Reduce camel density to less than 0.1/km <sup>2</sup> in biodiversity refuges.	Limited
	Exotic island rodents:  Reduce impact of rodents on high-priority islands to protect endangered species.	Limited
	Rabbits:  Suppress rabbit population to densities that allow regeneration and recovery of biodiversity.	Limited
	Weeds:  Reduce the impact and spread of Weeds of National Significance.	Fair
	3. Secure management for world heritage areas that meet requirements of World Heritage Convention.	3. Identify threats to value of heritage areas each year and mitigate threat.

### Priority 3: Coastal environments and critical aquatic habitats

Outcome	Target	Applicability of ABARE data
1. 25% fall in discharge of dissolved nutrients and chemicals into the Great Barrier Reef lagoon.	1. 1300 more farmers over three years using land management practises to improve the quality of water entering the lagoon.	Good
2. 10% fall in discharge of sediment and nutrients from agricultural lands into Great Barrier Reef lagoon.	2. 1500 more pastoralists over three years to improve ground cover monitoring and management in areas where grazing contributes to sediment loads.	Good
3. Sustain environmental values of priority sites in Ramsar estate, and 25% more priority coastal and inland areas that are not currently covered by the Ramsar convention.	3. Address the threats caused by invasive plant and animal species to Ramsar and non-Ramsar areas over the next two years.	Fair
4. Raise community participation in protecting and rehabilitating coasts.	4. Address threats to coastal hotspots such as poorer water quality, soil or ecosystem disturbance leading to loss of habitat or biodiversity.	Good
	Engage at least 500 community organisations in coastal rehabilitation projects over the next two years.	Fair

### Priority 4: Sustainable farm practices

Outcome	Target	Applicability of ABARE data
1. Assist 30% of farmers to increase uptake of sustainable farming.	1. 42 000 more farmers in identified priority areas that have improved land management.	Good
2. Increased number of farmers adopting stewardship, covenanting, property management plans or other arrangements to improve on and off-farm environment.	2. 6700 more farmers in identified priority areas adopting activities that contribute to conservation and protection of biodiversity.	Good
3. Improve NRM knowledge and skills of at least 30% of land managers.	3. Improve NRM knowledge of 42 000 farmers.	Good

## Priority 5: NRM in northern and remote parts of Australia

Outcome	Target a	Applicability of ABARE data
1. Protect assets in northern and remote Australia, especially the National Reserve System and Indigenous Protected Areas within it.	Ensure that relevant targets in other priorities are being addressed and that indigenous groups are being consulted and included.	Fair
2. Assist 40% of land managers in northern and remote areas to increase uptake of sustainable grazing and land management practices.		Good
3. Reduce impact of invasive species (see priority 2).		See priority 2
4. Expand fire management regimes by 200 000 km <sup>2</sup> to reduce unmanaged fires and assist with entry into emissions trading.		Limited

a Specific targets are not given for this priority area.

## Priority 6: Community skills, knowledge and engagement

Outcome	Target	Applicability of ABARE data
1. Improve access to NRM knowledge and skills.	1. Increased NRM knowledge, by assisting local communities and NRM groups in the provision of free information and training activities.	Good
2. Increased engagement and participation rates in NRM activities.	2. Increased recruitment in NRM related community groups; opportunities for visitors to participate in NRM activities; and provision of support to community groups to do NRM projects.	Good
3. Position regional NRM organisations to deliver best practice conservation and sustainability planning to communities within their regions.	3. Ensure all regional NRM organisations have best practice governance arrangements in place within two years.	Limited
4. Utilise traditional ecological knowledge.	4. Establish 20 indigenous partnerships; develop management plans in 32 new projects in Indigenous Protected Areas; 15 projects to use traditional indigenous knowledge.	Limited

# C Draft survey questionnaire

## Planning and awareness

### Purpose

*These questions seek to determine the uptake of documented farm planning (with a focus on NRM).*

*They also seek to determine the extent of degradation issues in different zones and industries, and whether farmers have made changes in response to these issues.*

### Question

### Rule

Question	Rule
<b>FARM PLANNING</b>	
1 a <i>Do you have a documented farm plan?</i>	Y N If 1a=N go to Q2
b <i>Does your farm plan include an NRM plan?</i>	Y N
c (i) <i>If you do have an NRM plan, does it contain...?</i>	
Salinity management strategy	Y N
Soils/land capability	Y N
Stocking rates/stock rotation	Y N
Areas of conservation value	Y N
Landcare works (existing or proposed)	Y N
Trees and shrubs	Y N
Pest/weed management	Y N
Vegetation	Y N
Water management	Y N
NRM budget	Y N
Training activities	Y N
c (ii) <i>If your farm plan doesn't include an NRM plan, why not?</i> (select from one of the following)	
It's all in my head	
Don't know enough about NRM	
I don't know how to create a documented plan	
Wouldn't use it anyway	
Other (specify)	
<b>AWARENESS OF DEGRADATION ISSUES</b>	
2 a <i>What area of land was affected by the following degradation issues (ha)?</i>	If all Q2a=0 go to Q3
– Dryland salinity	
– Irrigation water quality	
– Water erosion	
– Wind erosion	
– Soil sodicity	
– Soil acidity	
– Loss of soil structure (water repellence/soil compaction)	
– Weeds or pest animals causing degradation	

*continued...*

- b *Have you already made changes to address the degradation?* Y N If 2b=N go to 2c
- b (i) *When did you make those changes?* (choose from)  
 – in the survey year  
 – last year  
 – two or more years ago
- b (ii) *Do you think the changes have worked?* Y N
- b (iii) *How much money (roughly) did you spend on each of these changes?*
- c *If you haven't made any changes, why not?* (select from one of the following)  
 – Don't know what to do  
 – Don't have the money to make the changes required  
 – Don't have the time to make the changes required  
 – It is not an important issue for me  
 – I intend to make changes in the future  
 – Change is too risky  
 – The benefits of changing practices are unclear  
 – Other (specify)

## Physical practices

### Purpose

*These questions ask respondents the physical NRM practices that they undertook throughout the survey year.*

*They also ask the money spent on these practices to assess the economic capacity of landholders to implement change.*

- 3 a *Which of the following practices are part of your farm management program?*

#### Pastoral zone only

Headworks to control water flow from artesian bores	Y	N
Piped bore water for stock (as opposed to open drains)	Y	N
Pitting and opposed disc ploughing to promote soil conservation or revegetation	Y	N
Controlling grazing pressure (domestic and pests)	Y	N

#### Wheat-sheep and high rainfall zones only

Soil or plant tissue tests	Y	N
Regularly monitor watertables	Y	N
Incorporation of crop or pasture legumes into crop rotation	Y	N
Dryland cropping using contour banks	Y	N
Strip cropping	Y	N

*continued...*

	Use deep-rooted perennial pasture species	Y	N
	<b>Dairy farms only</b>		
	Soil or plant tissue tests	Y	N
	Regularly monitor watertables	Y	N
	Collection of dairy shed effluent in:	Y	N
	One pond system	Y	N
	Two or more pond system	Y	N
	Drainage sumps	Y	N
	Other	Y	N
	Pump dairy shed effluent onto pasture	Y	N
	Collection of paddock water run-off in drainage/reuse system	Y	N
	<b>Irrigation farms only</b>		
	Laser guided irrigation layout	Y	N
	Capacity to store and reuse drainage water	Y	N
	Use irrigation scheduling tools	Y	N
	Automated irrigation system	Y	N
	<b>All farms</b>		
	Tree/shrub establishment and maintenance	Y	N
	Preserve or enhance areas of conservation value	Y	N
	Monitor pasture or vegetative condition	Y	N
	Maintain vegetative cover along drainage lines	Y	N
	Exclude stock from degraded areas	Y	N
	Other practices to control/prevent land and water degradation	Y	N
b	<i>How much money (roughly) did you spend on each practice?</i>		
c	<i>What is your reason for not undertaking the practices you said no to?</i>		
	Don't know how		
	Don't have the money		
	Don't have time		
	I don't think it would make a difference		
	It is a short-term problem and will fix itself sooner or later		
	<b>Crop preparation/sowing techniques</b>		
c	<i>What was your total area sown to crops? (ha)</i>		
c (i)	<i>Of the total area sown to crops, what area was sown using (ha)...</i>		
	<b>Reduced tillage</b>		
	No cultivation		

.....  
continued...

One or two cultivations

Three or four cultivations

Five or more cultivations

**Other cultivation methods**

Conventional cultivation with stubble ploughed in

Conventional cultivation with no stubble

Direct drilling into previous crop stubble

Direct drilling with no stubble

Precision agriculture techniques (e.g. GPS guidance, GIS mapping)

d *How much (if any) did you spend on new machinery etc to update or improve your crop sowing techniques?*

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## Training and group membership

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### Purpose

*These questions ask respondents to identify the types of training activities they undertook during the survey year.*

*Data will be used to determine which types of training activity are the most commonly attended and what is generally learned.*

4 a	<b>Are you a member of a Landcare group?</b>	Y	N
a (i)	<b>Are you a member of a production group?</b>	Y	N
b	<b>How many of the following training activities did you undertake in the survey year?</b>		
	<b>Group specific learning activities</b>		
	Attended Landcare events	Y	N
	Attended other group specific events (specify)	Y	N
	<b>General learning activities</b>		
	Demonstration sites or field days	Y	N
	Workshops	Y	N
	Conferences	Y	N
	University course	Y	N
	TAFE course	Y	N
	Received advice from an agronomist or other consultants	Y	N
b (i)	<b>How many of each type of activity identified in 4(b) did you attend?</b>		
c	<b>Of the total number of training activities you participated in (i.e. the sum of 4(b) (i)), how many included NRM topics?</b>		
d	<b>What did you learn about from these training activities (the ones with an NRM focus)</b>		
	Information on the causes and extent of degradation		
	Skills to avoid or treat degradation		
	Networking (inc. meeting other farmers with the same concern, referral to professionals)		

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Australian Government Department of Climate Change and Energy Efficiency	Horticulture Australia Limited
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