Natural Resource Management and Drought Resilience

Survey of farm practices

Robert Coelli
Research by the Australian Bureau of Agricultural and Resource Economics and Sciences

Research Report 21.12
November 2021
Contents

Tables........................................................................................................................................iii
Introduction.................................................................................................................................................. 1
Summary of survey results......................................................................................................................... 2
  Farm management practices — adoption, motivations, and barriers.................................................... 2
  Information and NRM events................................................................................................................ 2
  Drought resilience................................................................................................................................. 3
  Government programs.......................................................................................................................... 3
Methodology............................................................................................................................................ 4
  Survey Design..................................................................................................................................... 4
  Weighting............................................................................................................................................ 4
  Reliability of population estimates ....................................................................................................... 4
  Calculating confidence intervals........................................................................................................... 5
  Comparing estimates between groups.................................................................................................. 5
Appendix A: Survey questionnaire........................................................................................................... 7

Tables

Table 1 NRM and drought resilience survey, population estimates and sample size, by region and industry......................................................................................................................................................... 6
Table 2 Relative standard errors for selected estimates............................................................................. 6
Introduction

In 2021, ABARES conducted a survey of farm practices related to natural resource management (NRM) and drought resilience and preparedness. The survey included questions on management practices relating to farm financial diversification, farm planning and management, and the use of NRM and other farming practices. A copy of the questionnaire can be found as an appendix.

The Natural Resource Management and Drought Resilience survey was funded by the Department of Agriculture, Water and the Environment. The survey provides data to support monitoring of long-term drought resilience indicators alongside the implementation of Future Drought Fund (FDF) activities. The survey will also be used to inform the mid-term evaluation of the Regional Land Partnerships program, and the effectiveness of government natural resource management programs more broadly.

The survey was designed to cover farms in the broadacre, dairy and horticulture industries within each state (Table 1). Further information on the survey design can be found in the methodology section.

ABARES is grateful for the cooperation of landholders who were selected to participate in the survey.
Summary of survey results

Farm management practices — adoption, motivations, and barriers

- The NRM practices with the highest uptake were:
  - retained stubble (84% of farms)
  - optimise pesticide or fertiliser use and reduce reliance (68% of farms)
  - minimising tillage or cultivation (65% of farms).

- The drought preparation practices with the highest uptake were:
  - de-stocking early in low rainfall periods to preserve groundcover (68% of farms)
  - improving soil water retention (64% of farms)
  - increasing fodder and grain storage (58% of farms).

- An estimated 91% of the farms that use retained stubble reported the practise was adopted more than 3 years ago. Reducing long-term stocking rates (27%) and increasing fodder and grain storage (22%) had significant user uptake within the last 3 years.

- Increasing drought resilience was most commonly considered a very important motivator for adopting various farm management practices on broadacre farms (75%). Dairy farms were more commonly motivated by financial considerations (83%) while most sugar and other livestock farms were more motivated by environmental factors (76%).

- The main barriers to practice change were available time (78% of all farms) and lack of funds (73% of all farms). Sugar and other livestock farms also commonly reported legislation or laws as an impediment to practice change (73%).

Information and NRM events

- In implementing NRM and drought preparedness practices, the most used sources of information were peers, neighbours or friends (49%), internet (32%) and private consultants (24%). Only 10% of farms used government extension officers (with the majority of those being broadacre farms).

- The use of industry bodies as a main source of information was more common in the sugar and other livestock industry (36%), compared to horticulture (27%), dairy (20%), and broadacre (8%).

- An estimated 35% of farms attended an NRM information event in the last 3 years. This proportion varied slightly by industry with 41% for dairy, 36% for broadacre, 35% for horticulture and 18% for sugar and other livestock.

- The majority of farms receiving NRM advice from an event indicated the most recent event attended was a field day (46%), followed by meetings (23%) and training courses or workshops (21%).
Workshops and demonstrations were regarded as being most effective at influencing attendees to adopt a new practice, with an estimated 89% of farms who attended a workshop adopting a practice as a result and 87% for demonstrations.

The main groups or organisations delivering these events were private consultants or agribusinesses (28%), local farmer network groups (27%) and Landcare groups (16%).

**Drought resilience**

Diversification is a way farm households can spread risk and moderate decreases in farm income that come with changing seasonal conditions and fluctuating commodity prices. This can be achieved by either increasing income from non-farm sources or undertaking a wider range of agricultural activities on farm.

Over the last 3 years, an estimated 37% of farms diversified their agricultural enterprises to increase their resilience to drought, while 31% increased their non-farm income.

Around 58% of farms had some non-farm income, on average over the last 3 years. Of those farms, the average proportion of household income from non-farm sources was 38%, making many farms well placed to deal with a short-term downturn in farm income.

An estimated 38% of farmers had a written farm plan with business objectives. The combined planning index shows that, for those farmers with a written plan, around 34% engage in 3 features of farm planning which are important for risk management – their plan includes strategies for coping with drought and addresses other risks, and they actively use the plan to make decisions.

**Government programs**

The survey included questions on the awareness of Australian Government programs aimed at helping farmers manage their natural resources and/or increase drought resilience.

There was relatively high awareness of both the National Landcare Program (NLP) (79%) and the Future Drought Fund (FDF) (60%).

Over the last 5 years, a relatively high proportion of farms participated in NLP, with more than one-half of participants adopting a new management practice as a consequence.
Methodology

Survey Design

The Natural Resource Management and Drought Resilience survey was designed on the basis of a target population which is defined as all farms in Australia excluding farms in the nursery, floriculture and poultry industries and feedlots. The survey was designed from a population list drawn from the Australian Business Register (ABR) and maintained by the Australian Bureau of Statistics (ABS). The ABR comprises businesses registered with the Australian Taxation Office. The ABR–based population list provided to ABARES consists of agricultural establishments with their corresponding geography code (currently Australian Statistical Geography Standard), Australian and New Zealand Standard Industrial Classification (ANZSIC), and a size of operation variable (Estimated Value of Agricultural Operations (EVAO)).

The Natural Resource Management and Drought Resilience survey targeted farming establishments that make a significant contribution to the total value of agricultural output (commercial farms). Farms excluded from the survey (farms with an EVAO < $40,000) are the smallest units and in aggregate will contribute less than 2% to the total value of agricultural production for the industries covered by the survey.

Lighthouse Data Collection was contracted to conduct the fieldwork for this survey, with phone calls used as the method for data collection.

Weighting

The estimates provided in the dashboard are calculated by appropriately weighting the data collected from each sample farm and then using the weighted data to calculate population estimates.

Weights in the Natural Resource Management and Drought Resilience survey were calculated using number raised weights. In the survey design phase, the population of farms was separated into strata based on aggregations of NRM regions, industry (broadacre, dairy, horticulture and other) and size of operation (EVAO) classes.

All farms within a given stratum were assigned an equal weight \( w_i \), determined by:

\[
    w_i = \frac{N_i}{n_i}
\]

where \( N_i \) is the estimated population of farms and \( n_i \) is the number of responding units, in stratum \( i \).

Reliability of population estimates

The reliability of the estimates of population characteristics published by ABARES depends on the design of the sample.

Only a subset of farms out of the total number of farms in a particular industry is surveyed. Estimates derived from these farms are likely to be different from those which would have been
obtained if information had been collected from a census of all farms. Any such differences are called ‘sampling errors’.

The size of the sampling error is most influenced by the survey design and the estimation procedures, as well as the sample size and the variability of farms in the population. The larger the sample size, the lower the sampling error is likely to be. Hence, national estimates are likely to have lower sampling errors than industry and state estimates.

Relative standard errors (RSE) for selected estimates are provided in Table 2 to give a guide to the reliability of the survey estimates. RSEs are standard errors expressed as percentages of the survey estimates. ABARES can provide RSEs for other estimates on request if required.

**Calculating confidence intervals**

RSEs can be used to calculate ‘confidence intervals’ that give an indication of how close the actual population value is likely to be to the survey estimate.

To obtain the standard error, multiply the relative standard error by the survey estimate and divide by 100. For example, if the percentage of farms that have a written business plan is estimated at 38% with a RSE of 5%, the standard error for this estimate is 1.9 percentage points. This is one standard error. Two standard errors equal 3.8 percentage points.

There is roughly a 19–in–20 chance that the census value is within two standard errors of the survey estimate (the 95 per cent confidence interval). In this example, there is an approximately 19 in 20 chance that the census value lies between 34% and 42% (38% plus or minus 3.8 percentage points).

**Comparing estimates between groups**

When comparing estimates between two groups, it is important to recognise that the differences are also subject to sampling error. As a rule of thumb, a conservative estimate of the standard error of the difference can be constructed by adding the squares of the estimated standard errors of the component estimates and taking the square root of the result.

For example, the estimates of the % of farms that have a written business plan is 41% in the sugar and other livestock industry and 29% in the dairy industry– a difference of 12 percentage points– and the relative standard error is given as 20% for the sugar and other livestock industry and 19% for the dairy industry. The standard error of the difference can be estimated as:

$$\sqrt{(20 * 41 / 100)^2 + (19 * 29 / 100)^2} = 9.9 \text{ percentage points.}$$

A 95 per cent confidence interval for the difference is:

$$12 \pm 1.96 * 9.9 = (-7.4, 31.4)$$

Hence, if a large number (towards infinity) of different samples are taken, in approximately 95 per cent of them, the difference between these two estimates will lie between -7.4% and 31.4%. Also, since zero is in this confidence interval, it is not possible to say that the difference between the estimates is statistically significantly different from zero at the 95 per cent confidence level.
### Table 1 NRM and drought resilience survey, population estimates and sample size, by region and industry

<table>
<thead>
<tr>
<th>Region</th>
<th>Estimate</th>
<th>All</th>
<th>Broadacre</th>
<th>Dairy</th>
<th>Horticulture</th>
<th>Sugar (and other livestock)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aust.</td>
<td>Population</td>
<td>81,823</td>
<td>62,780</td>
<td>4,479</td>
<td>9,362</td>
<td>5,201</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>2,355</td>
<td>1,530</td>
<td>201</td>
<td>425</td>
<td>199</td>
</tr>
<tr>
<td>NSW</td>
<td>Population</td>
<td>23,712</td>
<td>20,005</td>
<td>570</td>
<td>1,964</td>
<td>1,173</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>568</td>
<td>393</td>
<td>48</td>
<td>88</td>
<td>39</td>
</tr>
<tr>
<td>Vic.</td>
<td>Population</td>
<td>20,111</td>
<td>14,175</td>
<td>3,094</td>
<td>2,167</td>
<td>675</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>412</td>
<td>247</td>
<td>61</td>
<td>75</td>
<td>29</td>
</tr>
<tr>
<td>Qld.</td>
<td>Population</td>
<td>17,717</td>
<td>12,790</td>
<td>325</td>
<td>1,719</td>
<td>2,883</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>478</td>
<td>302</td>
<td>35</td>
<td>72</td>
<td>69</td>
</tr>
<tr>
<td>SA</td>
<td>Population</td>
<td>9,388</td>
<td>7,066</td>
<td>147</td>
<td>2,068</td>
<td>166</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>326</td>
<td>192</td>
<td>23</td>
<td>84</td>
<td>27</td>
</tr>
<tr>
<td>WA</td>
<td>Population</td>
<td>8,280</td>
<td>6,945</td>
<td>100</td>
<td>1,002</td>
<td>233</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>395</td>
<td>279</td>
<td>13</td>
<td>77</td>
<td>26</td>
</tr>
<tr>
<td>Tas.</td>
<td>Population</td>
<td>2,241</td>
<td>1,608</td>
<td>244</td>
<td>342</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>136</td>
<td>88</td>
<td>21</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>NT</td>
<td>Population</td>
<td>374</td>
<td>251</td>
<td>0</td>
<td>100</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Sample</td>
<td>40</td>
<td>29</td>
<td>0</td>
<td>9</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: sample sizes are in parentheses.
Source: ABARES

### Table 2 Relative standard errors for selected estimates

<table>
<thead>
<tr>
<th>Industry</th>
<th>Population</th>
<th>Diversified business to increase economic resilience</th>
<th>Received payments for environmental services</th>
<th>Have a written farm plan with business objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no.</td>
<td>%</td>
<td>RSE</td>
<td>%</td>
</tr>
<tr>
<td>All</td>
<td>81,823</td>
<td>37</td>
<td>(5)</td>
<td>5</td>
</tr>
<tr>
<td>Broadacre</td>
<td>62,780</td>
<td>39</td>
<td>(5)</td>
<td>6</td>
</tr>
<tr>
<td>Dairy</td>
<td>4,479</td>
<td>29</td>
<td>(19)</td>
<td>3</td>
</tr>
<tr>
<td>Horticulture</td>
<td>9,362</td>
<td>30</td>
<td>(11)</td>
<td>4</td>
</tr>
<tr>
<td>Sugar (and other livestock)</td>
<td>5,201</td>
<td>41</td>
<td>(20)</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: RSE is the relative standard error which is the standard error expressed as a percentage of the estimate.
Source: ABARES
Appendix A: Survey questionnaire

Q5 On average, over the last 3 years, what proportion of your household's income came from non-farm activities? (for example, non-farm employment, contracting, or other businesses)

_____ %

Q6 Over the last 3 years have you sought to increase your non-farm income to increase your resilience to drought?

1. Yes
2. No

Q7 Over the last 3 years, did you (or did you seek to) diversify your agricultural business to increase your economic resilience in times of drought? (eg commodities produced)

1. Yes
2. No

Q8 In the last 3 years have you received payments for environmental services (for example land stewardship, ecosystem services, offset payments, carbon sequestration)?

1. Yes
2. No

Q9 Do you have a written farm plan with business objectives?

1. Yes
2. No

Q10 Do you actively use this plan to make business decisions about the farm?

1. Always
2. Sometimes
3. Never

Q11 Does this plan include strategies for dealing with drought?

1. Yes
2. No

Q12 Does this plan cover other risks that could affect the farm?, eg. pest or disease outbreak, fires, or floods

1. Yes
2. No
Q13 How confident are you that you can meet your farm business objectives specified in your plan?

1. Not at all confident
2. Somewhat confident
3. Mostly confident
4. Very confident

The next set of questions are about use of NRM and other sustainable agriculture management practices, and the motivations for adopting these practices

Q14 Have you used any of the following management practices as a routine part of your farm management over the last 3 years?

**ANALYST NOTE: ONLY DISPLAY RELEVANT MANAGEMENT PRACTICE BASED ON Q1.**

**Codes 1-8, 10-16, 20 – Cropping**
**Codes 1, 5, 7-20 – Grazing livestock, Other livestock**
**Codes 1-2, 4-8, 10-16, 20 – Horticulture**
**Codes 1-2, 5, 7-20 – Dairy**
**Codes 1-2, 4-5, 7-8, 10-16, 20 – Sugar**

1. Minimising tillage or cultivation (eg permanent beds, direct planting) ........................................ 1
2. Periods of fallow in crop rotation ........................................................................................................ 2
3. Retained stubble ..................................................................................................................................... 3
4. Controlled trafficking (eg constant wheel spacing, traffic lanes) ..................................................... 4
5. Incorporation of organic matter (eg mulch, green manure)................................................................. 5
6. Use of cover crops, inter-row crops, mulching or matting, or other ground cover ................. 6
7. Management practices to optimise pesticide or fertiliser use and reduce reliance ..................... 7
8. Planting or encouraging regrowth of native vegetation ................................................................... 8
9. Cell, strip or rotational grazing ......................................................................................................... 9
10. Setting a long-term minimum ground cover requirement ................................................................ 10
11. Planting or maintaining deep-rooted perennial pastures including fodder shrubs ................. 11
12. Using technologies/tools to support climate related land management decisions (eg APSIM, Climate Kelpie, Yield Prophet) ....................................................................................................................... 12
13. Increasing on-farm water storage ...................................................................................................... 13
14. Improving soil water retention ........................................................................................................ 14
15. Improving soil acidity levels (eg lime application) ........................................................................... 15
16. Using more water efficient crop or pasture varieties ..................................................................... 16
17. Increasing fodder and grain storage .................................................................................................. 17
18. Reducing long-term stocking rates .................................................................................................... 18
19. De-stocking early in low rainfall periods to preserve groundcover .............................................. 19
20. Carbon-farming/sequestration .......................................................................................................... 20

**FOR EACH MENTIONED AT Q14:**

Q15 Would that be across the whole farm, most of the farm, or some of the farm?

1. Some of the farm
2. Most of the farm
3. Whole farm
FOR EACH MENTIONED AT Q14:
Q16 Was <INSERT PRACTICE FROM Q14> adopted (or introduced) in the last 3 years or more than 3 years ago?

1. Adopted in the last 3 years
2. Adopted more than 3 years ago

FOR ALL MENTIONED AT Q14 AS AN OVERALL:
Q17 How important were the following motivations for adopting these practices? Would you say not at all important, to some extent or very important?

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Not at all important</th>
<th>To some extent</th>
<th>Very important</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal motivation</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Environmental considerations</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Financial benefits</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>To increase drought resilience</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

FOR ALL MENTIONED AT Q14 AS AN OVERALL:
Q18 What was the main source of information used when adopting these practices?
DO NOT READ OUT BUT PROMPT IF NECESSARY
MULTIPLE RESPONSE

1. Landcare or farmer production group
2. Peers, neighbours, colleagues, friends or family
3. Government extension officers
4. Private consultant or agribusiness agent
5. CMA (Catchment Management Authority)/NRM region employed facilitator
6. Industry Body
7. Research and Development organisation
8. Internet
9. TV/Radio
97. Other, specify: ____________

Q19 How important was the availability of support for change in your consideration of whether or not to adopt a new management practice? Would you say...

1. Not at all
2. To some extent
3. To a great extent
Q20 Did any of the following factors limit your ability to make changes to management practices? Would you say mostly, sometimes or not at all?

<table>
<thead>
<tr>
<th>Mostly</th>
<th>Sometimes</th>
<th>Not at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

1. Available time
2. Financial risks, bank lending
3. Lack of funds/spending, lack of profit
4. Lack of support, advice or training (e.g., government financial support, workshops, field days, extension services)
5. Industry outlook (e.g., commodity prices)
6. Health, Age, Wellbeing, Lifestyle
7. Lack of labour/staff/workers
8. Legislation/laws
9. Would there be any other factors limiting your ability to make changes to management practices? Y/N
   IF YES: Text description: __________________________

Q21 In the last 3 years have you obtained NRM (National Resource Management) practice information or advice from an activity or event?

1. Yes
2. No
9. Don't know

Q22 What type of activity or event was the most recent one you attended?

READ OUT SINGLE RESPONSE

1. Meeting/presentation
2. Field day
3. Demonstration site visit
4. Training course or workshop
97. DO NOT READ OUT Other, specify: _________________________

Q23 What was the main benefit or benefits focused on in this event?

READ OUT MULTIPLE RESPONSE

1. Financial
2. NRM/Environmental
3. Production
4. Personal
5. Recovery from drought
97. DO NOT READ OUT Other, specify:
Q23b Which of these benefits was most important to you?

1. Financial
2. NRM/Environmental
3. Production
4. Personal
5. Recovery from drought
6. Recovery from drought

Q24 Who was responsible for delivering this event?

1. Federal Government agency
2. Landcare group
3. Local farmer network
4. Local government agency
5. Private consultant/agribusiness

Q25 Who was responsible for funding this event?

1. Federal Government agency
2. Landcare group
3. Local farmer network
4. Local government agency
5. Private consultant/agribusiness

Q26 Did you incorporate part or all of this activity into your NRM practices?

1. Yes
2. No

Q27 Are you aware of any of the following Australian Government initiatives/programs?

1. Future Drought Fund
2. Regional Land Partnerships
3. National Landcare Program
4. Smart Farming Partnerships
5. Smart Farms Small Grants
6. Reef Trust
7. Environment Restoration Fund
8. Communities Environment Program

97. DO NOT READ OUT: Other, specify: ______________
99. DO NOT READ OUT None of the above
ASK FOR EACH AT Q27:
Q28 Did you participate in the last 5 years?

1. Yes
2. No
9. DO NOT READ OUT Don’t know

ASK FOR EACH AT Q27:
Q29 Did your participation lead you to adopt any new management practices?

1. Yes
2. No
9. DO NOT READ OUT Don’t know

ASK FOR EACH AT Q27 IF YES AT Q28:
Q30 What were the benefits of participation? DO NOT READ OUT MULTIPLE RESPONSE

1. Gained new skills and knowledge
2. Implemented on ground works
3. Improved community interaction
4. Changed management practices
97. Other, specify: ___________