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SOCIAL BENCHMARKING FOR NATURAL RESOURCE MANAGEMENT: 2019 NORTH CENTRAL VICTORIA

REPORT TO THE NORTH CENTRAL CATCHMENT MANAGEMENT AUTHORITY

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NORTH CENTRAL
Catchment Management Authority
Connecting Rivers, Landscapes, People

Southern Cross University

Charles Sturt University

RESEARCH COMMISSIONED BY:

SOIL COOPERATIVE RESEARCH CENTRE AND THE NORTH CENTRAL CATCHMENT MANAGEMENT AUTHORITY

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Finally we would like to thank all the landholders who took the time to complete the survey. A summary of this report will be prepared and distributed by the North Central CMA in 2020.

LIST OF ACRONYMS

CMA – Catchment Management Authority
SCU – Southern Cross University
CSU – Charles Sturt University
GIS – Geographic Information System
LGA – Local Government Area
North Central CMA – North Central Catchment Management Authority
NRM – Natural Resource Management
RCS – Regional Catchment Strategy
Soil CRC – Soil Cooperative Research Centre
VFF – Victorian Farmers' Federation

EXECUTIVE SUMMARY

THE CONTEXT

This research employed a survey of rural property owners to inform the North Central CMA Board and staff as they develop, implement and evaluate the 2020-2026 North Central Regional Catchment Strategy (RCS). In broad terms, each of Victoria's 10 NRM regions will develop an RCS that identifies regional NRM priorities and describes strategies to achieve those objectives.

CMA typically have limited ability (agency) to accomplish their goals without the support of other stakeholders (e.g. Australian and state governments, Non-Government Organisations or NGO), and especially rural property owners who own most rural land in the North Central region and directly influence the condition of soil, waterways, wetlands and native vegetation. In turn, the condition of those environmental assets influences their livelihoods, well-being and wealth (including property values).

The 2019 North Central social benchmarking survey is part of a Southern Cross University (SCU) project led by Hanabeth Luke, jointly funded by the Soil CRC and the North Central CMA (a CRC partner). Data gathered will contribute to the wider Soil CRC research portfolio. For example, Soil CRC researchers will be able to explore farmer knowledge of soil heath and management; the impact of farmer participation in soil health groups; and the implementation of best practice soil management by farmers.

North Central CMA and Soil CRC staff worked together to review and revise the 2014 survey. A draft 2019 survey was subsequently pre-tested, including with a small group of rural owners. A copy of the final 16 page survey booklet is included in the report.

As in 2014, the 2019 survey was posted to a randomly selected sample of rural property owners (properties of 10 ha and above) identified using local government (i.e. Shire or City) ratepayer lists. The North Central CMA region includes a substantial part of 14 Shire or City local government areas (LGA). Surveys were posted to 2040 property owners. After removing return-to-sender, duplicate ownerships, properties that had been sold, owners who were ill or overseas and other acceptable reasons for a non-response, there were 1862 possible respondents. With 663 returned and completed surveys, the response rate for 2019 is 36%.

Checks for non-response bias included a comparison of the mean property size of respondents and non-respondents (no significant difference). There is also a remarkable level of consistency in the data for the 2014 and 2019 survey for topics where theory and empirical research suggests that is to be expected. For example, the rank order and mean scores for measures of held values (i.e. guiding principles) are almost identical across the two surveys.

For the North Central CMA, the survey process was expected to:

1. Describe the social/farming structure (property size, property subdivision/amalgamation, occupational identity of landholders and extent of absentee ownership) for the region.
2. Gather data to assess progress in the achievement of RCS and specific NRM program objectives (e.g. in the level of NRM knowledge).
3. Inform understanding of landholder adoption of best-practice NRM.

4. Inform Board and staff engagement with rural property owners (e.g. cohorts based on farmer occupational identity).

The survey gathered information about respondent's values; beliefs (e.g. in climate change, the primacy of private property rights); issues of concern (i.e. threats to those values); long-term plans; knowledge of NRM; confidence in best-practices NRM; engagement in NRM platforms and processes; sources of NRM information; land use/enterprises; background personal and property information (e.g. property size, absentee ownership); and implementation of best-practice NRM. With more than 120 survey items across these topics, the report summarises a large data set. The focus in the Executive Summary is on directly responding to the four objectives listed above and identifying key lessons or conclusions.

EXECUTIVE SUMMARY

A DESCRIPTION OF THE SOCIAL AND FARMING STRUCTURE

Information in Table A provides a partial picture of the social and farming structure of the North Central region. Comparing data for 2014 and 2019 suggests that stability rather than change is the dominant theme. To the extent there are trends, in 2019 the median property size is smaller and more property owners are Part-time farmers, Hobby farmers and Non-famers rather than Full-time farmers.

TABLE A: REGIONAL PROFILE: KEY PROPERTY AND PERSONAL ATTRIBUTES, 2019 (N=663)

Key attributes (medians unless indicated)	For all Respondents 2019	For all respondents 2014
Property size (area owned)	228 ha	253 ha
Bought additional land in region past 20 years	45%	47%
Subdivided or sold part of property past 20 years	15%	15%
Property leased, share farmed or agisted by others (mean)	45 ha	80 ha
Property leased, share farmed or agisted from others (mean)	225 ha	200 ha
Irrigated in 2018/19 season	26%	30%
Of those irrigated: surface water/ground water (n=214; n=170)	77%/24%	NA
Age of respondent	62 years	59 years
Farmer by occupation (i.e. Full-time farmer)	49%	52%
Gender of respondent (n=608)	22% female	17%
Resident on property	73%	72%
Length of family ownership	46 years	NA
Other family members working full-time on property	30%	30%
Paid off-property work last 12 months (n=472) mean score	65 days	150 days
Hours work on-property per week (n=572)	32 hours	40 hours
Income from agriculture in North Central region 2018/19	69%	NA
% all survey respondents net profit from agriculture >$50K	24%	NA
Received net off-property income 2018/19	70% me 30% spouse	NA
% all survey respondents net income from off-property >50K	31%	NA
Landcare member/participant	30%	36%
Local commodity group participant	17%	15%
Soil health group participant	5.5%	8%
Completed short course related to property management past 5 years	19%	23%
Property management or whole-farm plan	28%	36%
Attended a field day/farm walk/demonstration on native plants & animals last 12 months	19%	19%
Attended a field day/farm walk on soil health last 12 months	32%	40%

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TOWARDS MULTI-FUNCTIONAL LANDSCAPES

The regional profile in Table A is both limited in scope (I.e. selection of variables) and masks large variations in the social landscapes across the North Central region. Agriculture remains the dominant land use across all areas and Full-time farmers manage about 80% of the land owned by survey respondents. Irrigated agriculture is also important. However, the values being expressed by property owners and the underlying economy (i.e. sources of income) vary significantly with distance from metropolitan areas of Melbourne, Bendigo and Ballarat. What appears as a south to north transect includes a transition in amenity associated with lower rainfall and flatter terrain towards the north. In summary, there are landscapes that remain productivist in character (i.e. the focus is on the business of agriculture) whereas other landscapes are more appropriately described as multi-functional (i.e. a mix of production, environmental and amenity values are expressed).

The summary for the 16 items exploring values attached to the property illustrates the extent a mix of values is important for most respondents across most of the North Central region [Table B]. For example, the three items most frequently given an Important/Very important rating focus on future environmental health/condition, producing food and fibre for others and the amenity value of their property.

TABLE B: VALUES ATTACHED TO PROPERTY, 2019 (N=663)

Attached values	Important/Very important
Ability to pass on a healthier environment for future generations	85%
Sense of accomplishment from producing food and fibre for others ###	69%
An attractive place/area to live ###	83%
A great place to raise a family ###	71%
Sense of accomplishment from building/maintaining a viable business ###	69%
The productive value of the soil on my property *** ###	75%
An asset that is an important part of family wealth ###	74%
Native vegetation provides habitat for birds and animals ###	70%
Native vegetation makes the property an attractive place to live ###	69%
An important source of household income ###	62%
Opportunity to learn new things	67%
A place where I can escape the pressures of life ###	55%
Provides a sense of belonging to a community	61%
A place or base for recreation *** ###	51%
An asset that will fund my retirement	55%
Working on the property is a welcome break from my normal occupation *** ###	35%

*** Significant difference across LGA ### Significant difference across the four farmer identity cohorts

Green shading: environmental. Grey shading: economic. Brown: social. Blue: Amenity/recreation.

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Survey data provide considerable evidence that agriculture does not underpin the economy across much of the North Central region or engagement in NRM best-practice. As identified in Table A, only two-in-three reported any income from agriculture; and only about a quarter of all respondents (24% of 663) said they had a net profit above $50,000 from agriculture. At the same time, about a third of all respondents (31% of 663) said they achieved a net off-property income above $50,000. With one exception (Established an irrigation tailwater system) there are no significant positive relationships between on-property income and implementation over the full-period of management of the 19 NRM best-practices included in the survey. There is also no significant relationship between implementation of best-practice NRM and the importance of Uncertain/low returns limiting capacity to invest in my property. Indeed, this issue has moved from first to last ranking between 2014 and 2019. By comparison, there are significant positive relationships between best-practice implementation and most of the other relevant items in the survey, particularly those items exploring values, knowledge, confidence in best-practices, engagement in NRM platforms and processes.

A USEFUL TYPOLOGY OF PROPERTY OWNERS BASED ON FARMER IDENTITY

When asked to select from one of four farmer identity cohorts, 49% of all respondents identified as Full-time farmers, 19% as Part-time farmers, 13% as Hobby farmers and 19% as Non-farmers. These data suggest that Full-time farmers are now a minority cohort (down from 52% in 2014). Compared to 2014, a larger proportion of respondents identify as Non-farmers and a smaller proportion as Part-time farmers.

Typologies should be theoretically sound, distinguish between property owners and provide practical guidance to NRM practitioners. The four-cohort typology based on farmer identity was developed by Theresa Groth as the key element of her PhD. Theresa applied contemporary occupational identity theory and measurement instruments which were included as a series of items (i.e. a scale) in the 2014 North Central social benchmarking survey. The approach, results and implications for NRM have been peer-reviewed and published in journals.

There are significant differences across the four cohorts based on farmer identity for almost all survey items, suggesting this is a useful framework for those setting out to engage rural property owners in the North Central region. For example, there are significant differences for 12 of the 16 attached values items included in Table B. As might be expected, Full-time and Part-time farmers are more likely to give a higher rating to items focussed on farming as a business and Hobby farmers and Non-farmers to give a higher rating to items focused on environmental condition and amenity. At the same time, there are shared values or common ground. This information, along with other data about issues of concern and beliefs, provide a sound foundation for effectively engaging the different cohorts and making more general appeals to property owners. A summary of differences across key personal and property attributes is provided in Table C.

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TABLE C: SIGNIFICANT DIFFERENCES ACROSS FOUR FARMER IDENTITY COHORTS BY KEY PROPERTY AND PERSONAL ATTRIBUTES, 2019 (N=663)

Key attributes	Full-time (49%)	Part-time (19%)	Hobby (13%)	Non-farmer (19%)
Property size	800 ha	142 ha	30 ha	30 ha
Bought additional land in region past 20 years	71%	35%	10%	12%
Irrigated in 2018/19 season	36%	26%	19%	6%
Irrigated surface/ground water (n=170)	84%/26%	72%/24%	71%/13%	53%/25%
Gender of respondent	12% female	25%	30%	42%
Resident on property	87%	60%	76%	49%
Length of family ownership	74 years	40 years	25 years	21 years
Other family members working full-time on property	52%	14%	5%	2%
Paid off property work last 12 months	12 days	133 days	102 days	114 days
Hours work on-property per week	50 hours	20 hours	10 hours	4 hours
Income from agriculture in North Central region 2018/19	96%	81%	28%	13%
% all survey respondents net profit agriculture >$50K	45%	13%	Nil	Nil
Received net off-property income 2018/19	42% me	88% me	87% me	89% me
% all survey respondents net off-property income >$50K	18%	55%	41%	38%
Landcare member/participant	34%	32%	25%	18%
Local commodity group participant	28%	10%	6%	3%
Soil health group participant	9%	4%	2.5%	Nil
Completed short course related to property management past 5 years	29%	13%	11%	6%
Property management or whole-farm plan	34%	30%	22%	14%
Attended a field day/farm walk on soil health last 12 months	45%	28%	18%	7%

There are significant differences in the implementation of best-practice across the four farmer identity cohorts. Full-time and Part-time farmers are more likely to be implementing almost all practices than are respondents in the other two cohorts (so for 16 of 19 practices). Indeed, there are eight practices where Part-time farmers are at least twice as likely as Hobby farmers to implement that practice. To an extent, these results are somewhat counterintuitive in that Full-time farmers are more likely to implement practices across both the environment and production agriculture. However, this finding is consistent with previous social benchmarking studies and needs to be considered by the North Central CMA.

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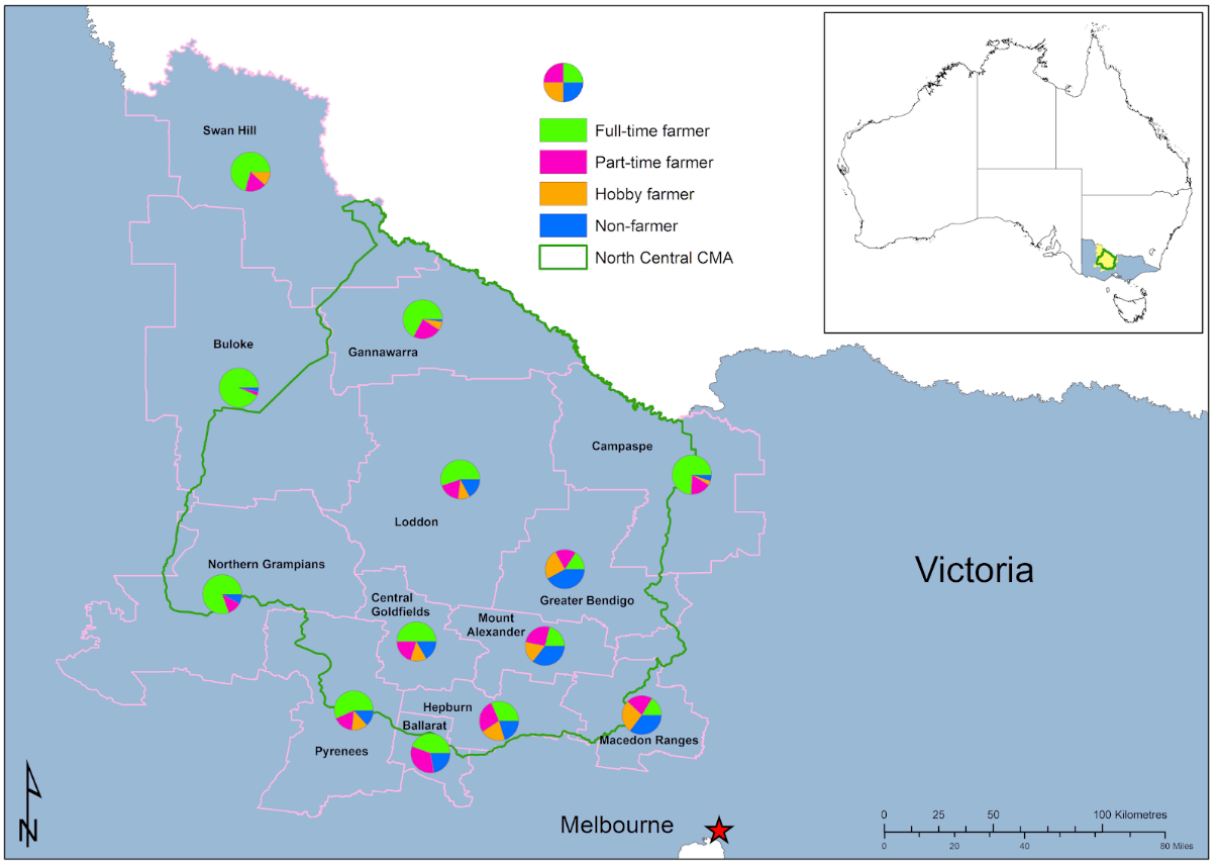
Those self-identifying as Full-time farmers are a minority (slight) of all respondents. Nevertheless, this cohort manages 80% of the land area owned by respondents within the region. Given that <50% of this cohort has implemented 10 of 19 best-practices over their full-period of management, it may seem logical for NRM practitioners to focus engagement on this cohort. Indeed, survey data suggests this is occurring, either by intention or simply as a result of long-established networks between Full-time farmers and NRM extension staff. That may be a sensible approach where Full-time farmers are managing critical parts of a landscape (i.e. high value assets under threat). A nuanced approach should also consider the extent other engagement objectives are relevant. For example, does the North Central CMA want to engage a cross section of property owners to improve NRM literacy, enhance voter commitment to NRM, and motivate people to volunteer to work with local and non-government organisations?

Landcare (a platform) and property management planning (a process) have engaged substantial proportions of Non-farmer cohorts. There are significant positive relationships between engagement in key platforms and processes listed in Table C and implementation of best-practice NRM.

Our view is that the proportion of respondents identifying as Full-time farmers is also a valid and reliable indicator of the extent of multi-functionality. As indicated in Map A there are significant variations across the LGA in the proportion of respondents selecting each of the four farmer identity cohorts.

MAP A: FARMER IDENTITY COHORTS BY LGA, 2019 (N=663)



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UTILITY OF THE CONCEPTUAL FRAMEWORK

The results of analyses exploring relationships between implementation of best-practice NRM and variables expected to influence implementation provide substantial confirmation of the efficacy of the conceptual framework underpinning the choice of survey topics and items. For example, there is consistent pattern of significant positive relationships between attached values and best-practice implementation; knowledge topic items and implementation where there is at least one directly related NRM best-practice; and for confidence in best-practices and implementation of related practices. There is also abundant evidence of significant positive relationships between engagement in NRM platforms and processes and implementation of best- practices.

A key assumption underpinning this research is that there are attributes of property owners (i.e. their values and beliefs) which are relatively constant but critical for engagement; and other attributes that are more amenable to intervention (e.g. knowledge, management skills, confidence in best-practice). We also need to acknowledge that best-practice NRM is established for some topics (e.g. managing riparian areas) but less certain for others (e.g. maintaining the productive capacity of soils). For the more problematic topics, it is important to engage property owners in "dialogue, learning and action" through platforms (e.g. group-based extension) and processes (e.g. trial, field days/farm walks, property planning). About 40% of all respondents are engaged through one or more of Landcare, soil health and commodity groups.

The key elements of a model based on results from the 2019 social benchmarking survey are presented in Figure A. Some notable points based on the 2019 data analysis include:

- There are few significant positive relationships between held values and best-practice items. Given the extensive set of positive relationships between attached values and best-practice items it seems attached values provide a better foundation for NRM practitioners setting out to engage rural property owners.
- Significant positive relationships between the personal norm: *I feel a personal responsibility to maintain my soil's productive capacity* and a number of relevant best-practices.
- Farmer identity encapsulate and shapes important differences in values and beliefs, personal norms, knowledge of NRM and engagement in NRM platforms and processes and in turn, implementation of best-practices.
- Those more likely to accept limits on private property rights are more likely to implement a number of best- practices that have a substantial public benefit element (e.g. those practices linked to improved water quality).
- Significant positive relationships between most issues topics where concern about impact on important values could reasonably be expected to lead to action (e.g. concern about *Stock damage to native vegetation along waterways and wetlands* and *Fenced waterways and wetlands to manage stock access*).
- Significant positive relationships between trust in the North Central CMA and judgements of the trustworthiness of the North Central CMA and a small number of environmental best-practices.

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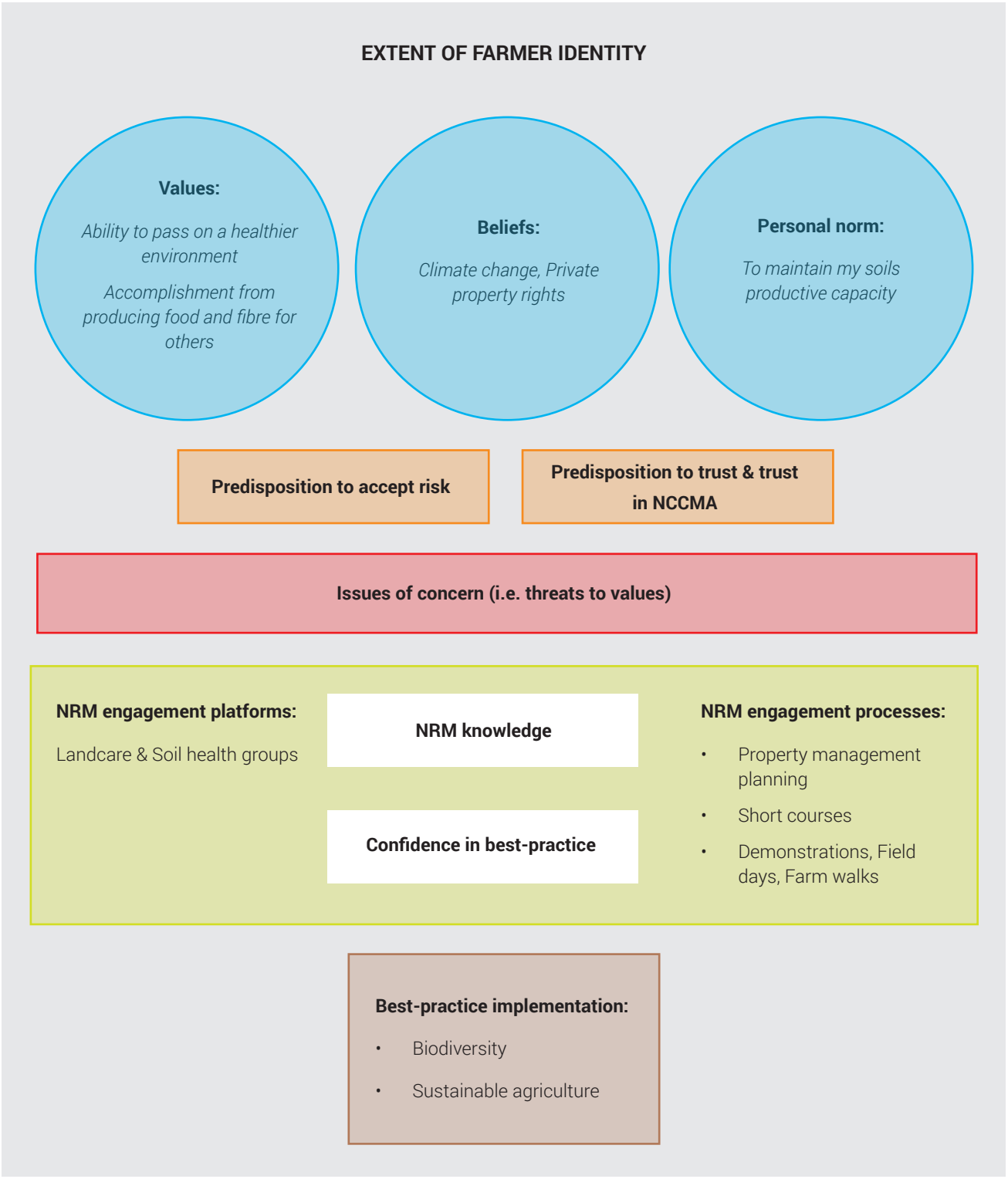
FIGURE A: APPLYING THE CONCEPTUAL FRAMEWORK USING 2019 SURVEY DATA



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TRUST AND TRUSTWORTHINESS

For all items across trust, trustworthiness and predisposition to trust there is a remarkable consistency in the data for 2014 and 2019. That is, there are no substantive differences in the mean scores for items, proportion of respondents selecting each response option or rank order of items by mean score.

It appears that most respondents are not predisposed to trust or rely on others. Those who are more predisposed to trust are less likely to give priority to the primacy of private property rights (e.g. *Landholders should be able to harvest rainfall on their property, even if that action impacts on others*). Those who are more predisposed to trust are also more likely to have positive assessments of the trustworthiness of the North Central CMA.

Respondents were more likely to agree than disagree that they could trust the North Central CMA. The level of trust was higher for the item focussed on providing useful advice than for the item referring to providing appropriate financial assistance. About a third of all respondents indicated they held a neutral view about whether they could trust the North Central CMA, suggesting there is potential to lift the trust rating.

There are significant differences across the four farmer identity cohorts for trust items and the trustworthiness item exploring benevolence.

- Non-farmers and Hobby farmers are more likely to agree that *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management.*
- Full-time farmers are more likely to agree that *I can rely on the North Central CMA to provide appropriate financial assistance for waterways & wetlands management.*
- Non-farmers are more likely to agree that *The North Central CMA keeps landholders' interests in mind when making decisions about waterways & wetlands management.*

There are no significant relationships between predisposition to trust and participation in soil health groups, Landcare groups or commodity groups. There are very few significant relationships between predisposition to trust and the 19 items exploring implementation of best-practice NRM; and no significant relationships between predisposition to trust and the three items exploring adaptation to climate change.

There are two significant positive relationships between items measuring trust in the North Central CMA and implementation of best-practice NRM. In both cases (*Fenced native bush/grasslands to manage stock access; Prepared a habitat assessment of native plants*) there is a significant positive relationship with the item *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management.*

It seems that predisposition to trust needs to be considered when setting out to engage rural property owners, but is not an insurmountable barrier to engagement in NRM platforms/processes or to the implementation of best-practices. Beliefs about private property rights appear to influence trust in the North Central CMA and those concerns need to be considered when setting out to engage property owners. While it doesn't appear that trust is a key to engagement in best-practice NRM, there are many reasons to focus on trust building, especially by demonstrating trustworthiness (i.e. ability, benevolence and integrity). Where trust exists, intentions are

less likely to be misinterpreted, any errors or unforeseen outcomes of actions are more readily forgiven, local knowledge is more likely to be offered, and it is easier/less costly to engage property owners in projects.

BELIEF IN CLIMATE CHANGE

Three items in the 2019 survey explored belief in human induced climate change, the extent resulting change is irreversible and the extent impacts will be severe [Figure B]. The 2019 survey also included three items exploring the extent financial or on-property management had changed in the past 12 months as a result of considering climate change; opportunities to capture carbon; and opportunities to reduce emissions.

A small majority (60%) believe humans are changing the climate. It seems these respondents also believe there will be dire consequences if no action is taken but are optimistic that it is not too late to take action. At the same time, about 40% of respondents indicate they do not believe or are uncertain about whether humans are changing the climate [Figure B].

Comparison with 2014 data suggests more respondents believe that human activity is leading to climate change (60% compared to 53% in 2014); and that the impacts of climate change will be severe if no action is taken (55% compared to 45% in 2014). There has also been an increase in the proportion of respondents who agree that it is not too late to take action to address climate change (62% compared to 53% in 2014).

Those with a stronger farmer identity are less likely to believe in climate change but are more optimistic about the capacity of landholders in their region to adapt to expected changes in rainfall patterns. It seems that Full-time and Part-time farmers have distinguished between the extensive list of global impacts of climate change and changes in rainfall patterns that are expected to affect their region and to which they may already be responding.

There are also significant differences across the four farmer cohorts for two items exploring adaptation in the past 12 months. Perhaps contrary to expectations based on differences in beliefs about climate change, the substantive differences for the two adaptation items are between Full-time and Part-time who are more likely to have made changes than Hobby and Non-farmers.

These results appear to have important implications for those engaging property owners around the broad topic of climate adaptation. As social researchers examining this topic, it seems there is more at play than exposure to scientific information. Climate change appears to be a term that arouses intense feelings amongst some property owners who believe farmers are blamed for changes in climate and will be forced to carry more than their fair share of the burden of cutting carbon emissions. NRM practitioner engagement with property owners is increasingly focussed on the adaptations that property owners can and are making in response to changing weather patterns. The term “weather patterns” appears to be less emotive/threatening and perhaps more fitted to the lived experience and the future work and life horizons of most Full-time and Part-time farmers. Evidence from across the survey topics supports this approach, including that:

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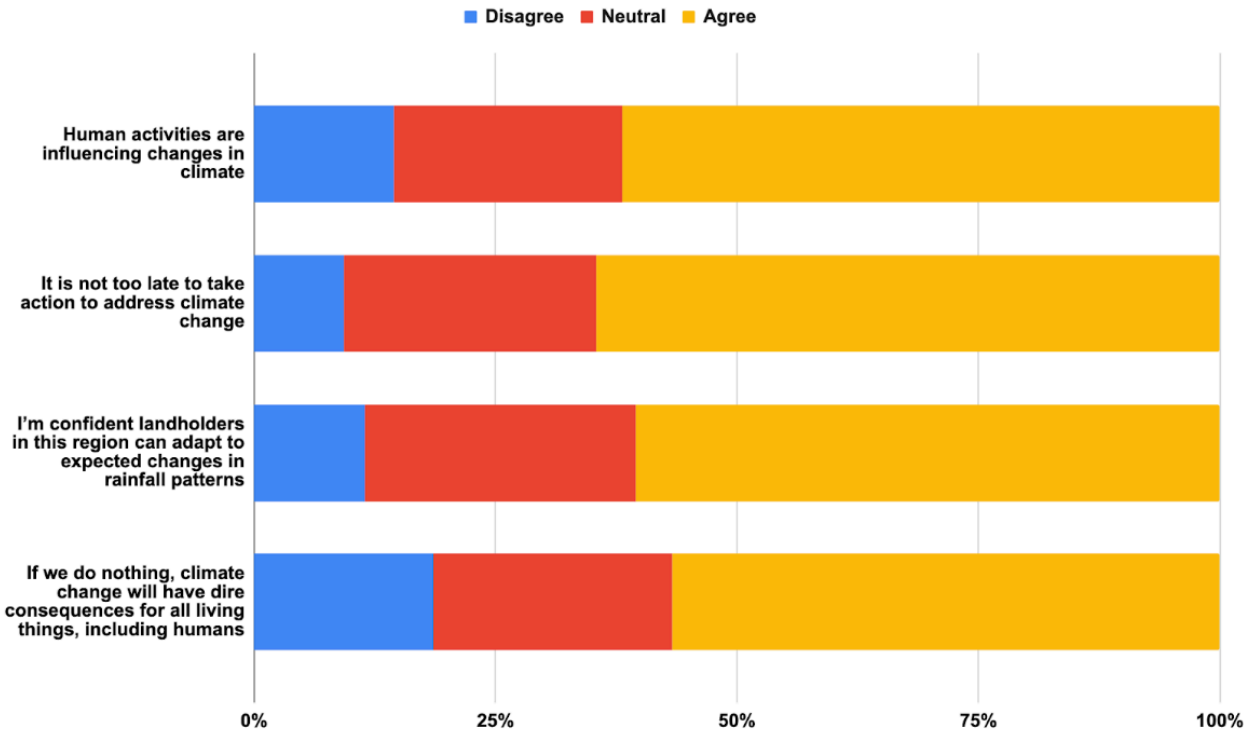
1. *Changes in weather patterns* was the district scale issue listed as important by the most respondents (i.e. 71%).
2. Over 60% of Full-time farmers and over 70% of Part-time farmers agreed that *Primary producers should do all they can to reduce carbon emissions from their activities.*
3. Over half of the Full-time farmers and Part-time farmers in this survey are *Confident landholders in this region can adapt to expected changes in rainfall patterns.*

FIGURE B. BELIEFS ABOUT CLIMATE CHANGE, 2019 (N=663, n=644 TO 638)



1. INTRODUCTION

This research employed a survey of rural landholders to gather data to inform the North Central CMA Board and staff as they develop, implement and evaluate the 2020-2026 North Central Regional Catchment Strategy (RCS). In broad terms, each of Victoria's 10 NRM regions will develop an RCS that identifies regional NRM priorities and describes strategies to achieve those objectives. For the North Central CMA, the key environmental assets are soils, waterways, wetlands and native vegetation.

CMA typically have limited ability (agency) to accomplish their goals without the support of other stakeholders (e.g. Australian and state governments, Non-Government Organisations or NGO), and especially rural property owners who own most rural land in the North Central region and directly influence the condition of soil, waterways, wetlands and native vegetation. In turn, the condition of those environmental assets influences their livelihoods, well-being and wealth (including property values).

The 2019 North Central social benchmarking survey is part of a Southern Cross University (SCU) project led by Hanabeth Luke that is jointly funded by the Soil CRC and the North Central CMA (a CRC partner). Data gathered will contribute to the wider Soil CRC research portfolio. For example, Soil CRC researchers will be able to explore farmer knowledge of soil heath and management; the impact of farmer participation in soil health groups; and the implementation of best practice soil management by farmers. Similar surveys funded by the Soil CRC are underway in South Australia and Western Australia.

The research team includes social scientists from Southern Cross University and Charles Sturt University. The approach draws on a widely accepted approach to social benchmarking for regional NRM developed by Allan Curtis (see Curtis, Byron, & MacKay, 2005). This survey-based methodology has been applied across Australia, including as part of the Australian Government's National Action Plan for Salinity and Water Quality, with case studies in Victoria, New South Wales and Queensland.

The most recent social benchmarking survey was completed in the Wimmera region of Victoria (Curtis and Mendham 2017). With similar surveys in 2002, 2007 and 2011, analysis of Wimmera survey data has provided important insights for NRM practitioners, including trends in social structure (i.e. property size, occupational identity, length of residence, extent of absentee ownership, enterprise mix); and for researchers (e.g. extent of stability and change in values, beliefs and attitudes) (Toman, Curtis & Mendham 2019).

The 2019 North Central social benchmarking survey is based on a similar survey in 2014 (Curtis and Mendham 2015). North Central CMA and Soil CRC staff worked together to review and revise the 2014 survey. A draft 2019 survey was subsequently pre-tested, including with a small group of rural property owners. A copy of the final 16 page survey booklet is included in the report.

As in 2014, the 2019 survey was posted to a randomly selected sample of rural property owners (properties of 10 ha and above) identified using local government (i.e. Shire or City) ratepayer lists. The North Central CMA region includes a substantial part of 14 Shire or City local government areas (LGA) [Map 1]. As in 2014, the intention was to survey approximately 2000 rural property owners from across the region.

The research team worked with Council/City staff to select a random sample of property owners, with the number in each LGA sample reflecting that LGA's proportion of the estimated total number of rural properties in

1. INTRODUCTION

the region. The mailout process occurred over a period of eight weeks, with an initial mailout (including a cover letter, survey booklet and return envelope) followed by three reminder/thank you cards; then a second mailout package to non-respondents followed by two reminder/thank you cards. Mount Alexander LGA was the only exception and Council staff undertook the mailout process for this Shire.

In 2019 surveys were initially posted to 2040 property owners. After removing return-to-sender, duplicate ownerships, properties that had been sold, owners who were ill or overseas and other acceptable reasons for a non-response, there were 1862 possible respondents. With 663 returned and completed surveys, the response rate for 2019 is 36%. The response rate in 2014 was 48% (794 completed surveys returned from an adjusted sample of 1646). The response rate for each LGA is provided in Table 1. The 2019 survey response rate is lower than expected based on previous social benchmarking surveys in the North Central and Wimmera regions. Why the lower than expected response rate and what are the implications for reliability of the data?

TABLE 1: SURVEY RESPONSE RATES BY LGA, 2019

LOCAL GOVERNMENT AREA	POSTED	REMOVED	RETURNED	RESPONSE RATE
Ballarat	29	1	10	35.7%
Buloke	127	12	32	27.8%
Campaspe	200	23	60	33.9%
Central Goldfields	99	8	33	36.3%
Gannawarra	165	15	56	37.3%
Greater Bendigo	282	25	91	35.4%
Hepburn	160	11	54	36.2%
Loddon	361	38	111	34.4%
Macedon Ranges	111	13	38	38.8%
Mitchell	29	9	8	40.0%
Mount Alexander	148	12	64	47.1%
Northern Grampians	172	11	52	32.3%
Pyrenees	84	7	33	42.9%
Swan Hill	73	4	18	26.1%
Unknown	0		3	
Total	**2040**	**188**	**663**	**36%**

1. INTRODUCTION (CONT.)

There is a trend to lower response rates for surveys of property owners in Australia and overseas (Stedman 2016), particularly for surveys that are not directed to a specific audience (e.g. horse owners; cattle producers). This trend may reflect "survey fatigue" across societies, concerns about privacy that have been heightened by recent exposure of "data mining" by Facebook and Google, and lessening of ties with and trust in universities and governments. Contemporary trends of increased absentee ownership of rural properties, including by "land bankers" close to Melbourne, and more rural property owners identifying as non-farmers by occupation also appear to be contributing to lower survey response rates in Victoria.

Non-respondents may be different to respondents and social researchers are often asked about the impact of non-responses on the reliability of survey data (i.e. ability to generalise from the respondents to the larger population). The research team's experience is that non-respondents are not a homogenous group (i.e. there are many reasons for non-responses) and that with a response rate of ~50% it is unlikely that the cohort of non-respondents will be sufficiently different to change results significantly. In the past we have taken steps to compare respondents and non-respondents, including by using available data for property size (based on LGA lists for both cohorts); and age of farmers (using ABS data for the non-respondent cohort and survey data for respondents). Those comparisons have suggested that respondents and non-respondents to the social benchmarking surveys in Victoria are not significantly different.

For the 2019 survey a comparison was made between the mean property size of respondents and non-respondents. The mean property size of respondents is 118 ha (n=608). The mean property size of non-respondents is 127 H (n=1069). These data suggest there is not a significant difference on property size.

When reflecting on the reliability of survey data, social researchers can also draw upon established theory (e.g. are results consistent with contemporary social theory about the stability of values, or the differences between cohorts based on farmer identity); and explore the extent results are consistent with those of previous studies (e.g. 2014 North Central survey). Those assessments suggest the 2019 data are reliable. For example, there is a remarkable degree of consistency in the results (i.e. mean scores of items, rank order of items) for items in the two surveys exploring held and attached values and long-term plans (i.e. for next 10 years). There are also significant differences across most of these items based on the four farmer identity cohorts and these differences in many cases are quite marked, but are as expected.

For the North Central CMA, the survey process was expected to:

1. Describe the social/farming structure (property size, property subdivision/amalgamation, occupational identity of landholders and extent of absentee ownership) for the region and for each LGA.
2. Gather data to be used by the North Central CMA to assess progress in the achievement of RCS and specific NRM program objectives.
3. Inform understanding of landholder adoption of best-practice NRM.
4. Inform Board and staff engagement with rural property owners (e.g. cohorts based on farmer occupational identity).

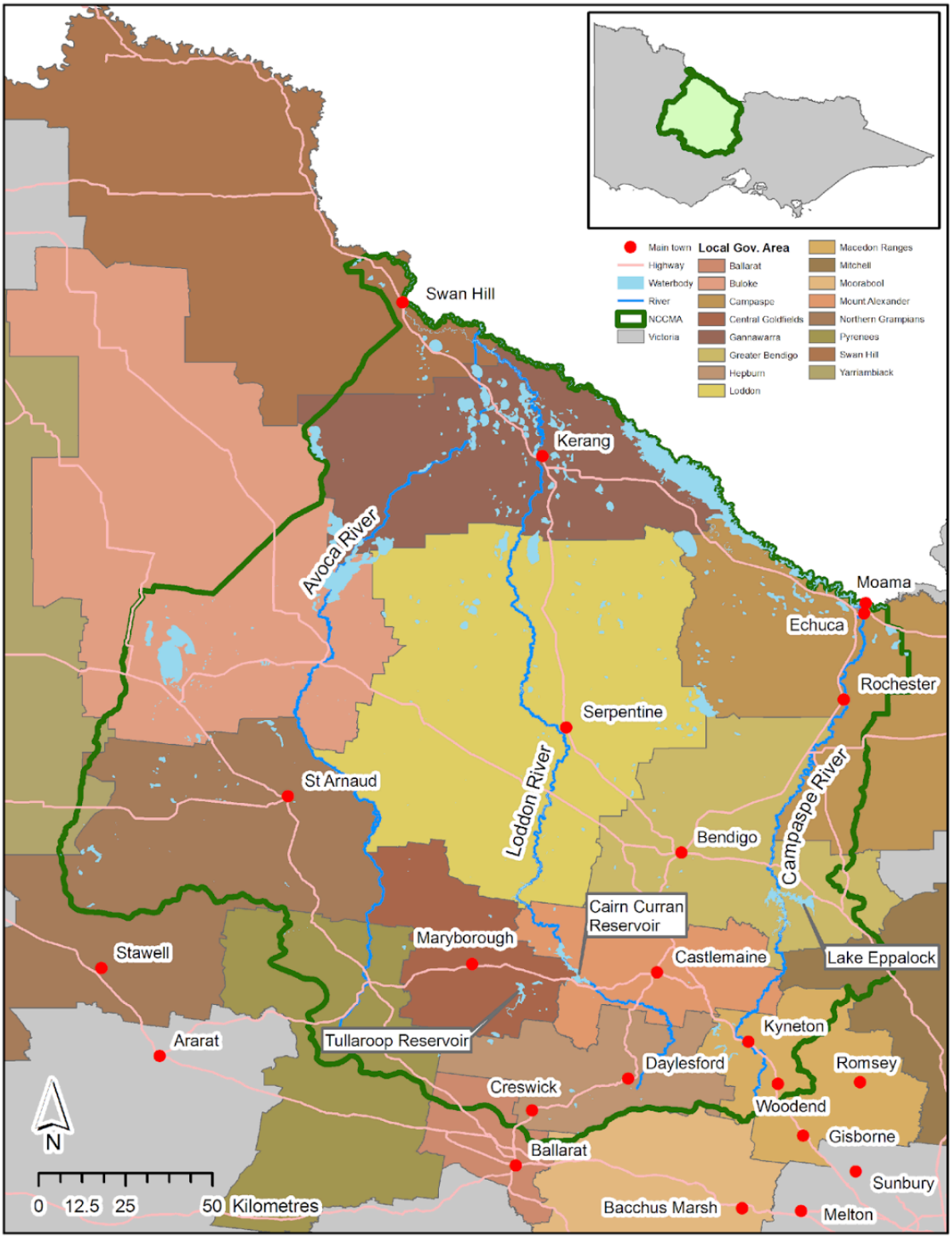
The remaining sections of this report (i.e. outside the Executive Summary and Introduction) provide:

1. INTRODUCTION (CONT.)

1. An explanation of the conceptual framework underpinning the survey.
2. A brief explanation of how survey data were analysed.
3. A summary (tables/figures plus notes) of data for each survey topic that includes a comparison with 2014 data.
4. A discussion of relationships between implementation of best-practice NRM and factors expected to influence implementation.
5. LGA profiles summarising data for key topics.

1. INTRODUCTION (CONT.)

MAP 1: NORTH CENTRAL CMA REGION, VICTORIA: LOCAL GOVERNMENT AREAS



2. CONCEPTUAL FRAMEWORK

This section outlines the conceptual framework underpinning this research. We begin with a lay definition of the concepts used throughout the report.

2.1 LAY DEFINITIONS OF KEY CONCEPTS

Values: guiding principles/what is important to people.
Beliefs: what we think is true.
Norms: how we/others think we ought to behave. These can be personal norms or social norms.
Attitudes: what we think should happen in relation to a specific social issue.
Knowledge: grasp of facts, understanding of process.
Skills: ability to implement or perform a task.
Trust: willingness of those who are vulnerable to rely on others, which in part depends on the trustworthiness of those seeking to be trusted. Trustworthiness is based on assessments by others of our ability, benevolence and integrity.

2.2 RESPONDING TO COMPLEXITY

Changing human behaviour can be difficult, and engaging rural property owners in practice change is no exception. There is a large set of possible factors influencing decisions and these vary according to each technology, property owner, social context, intervention and over time. How then should researchers and practitioners proceed? And what topics should be included in a survey setting out to inform engagement of rural property owners in the North Central region?

Unless there are strong economic drivers supporting implementation, effecting change is often problematic because the private benefits of action by rural property owners to address environmental degradation are often uncertain. There is often limited commitment by governments to legislate and/or enforce compliance. And, with some issues the way forward is uncertain, in part because every landscape has been modified (i.e. we are uncertain about where we are headed and how to get there).

Further complicating the task for those implementing the RCS in the North Central region is the scope and pace of social change in rural areas in much of Victoria. As conceptualised by the Multifunctional Rural Transition (Holmes 2006), many rural areas are shaped by a mix of production (e.g. agriculture), consumption (e.g. recreation) and conservation values (Barr 2005). Agriculture may remain the dominant land use, but primary production is not the principal focus of many landowners.

The scope and pace of these changes is particularly acute in parts of the North Central region, particularly areas close to Melbourne and Bendigo (Curtis and Mendham 2015). There are typically more landowners with diverse interests, increased numbers of smaller land parcels, a large variety of land uses/enterprise types, more non-resident owners and more property owners with limited understanding of natural resource management (NRM) and connection to existing NRM networks (Curtis and Curtis 2018).

2.3 BEST-PRACTICE NRM AND RESPONDING TO UNCERTAINTY

Where NRM practitioners are confident about the appropriateness of the outcomes they are seeking and the science that links proposed interventions and desired outcomes, they can apply best-practice recommendations. For example, with riparian management there are widely accepted best-practices that include fencing to manage stock access, providing off-stream watering points for stock, eradicating pest plants and planting trees and shrubs. Under these circumstances, those setting out to achieve change need to make an assessment of the adoptability of those best-practices and respond appropriately (Pannell, 2011). For example, if awareness, knowledge or management skills are important constraints, then activities that address those topics are appropriate. If the issue is that the change involves considerable expense and appears to offer limited financial returns to landowners, then some form of cost-sharing between government and private landowners might be appropriate.

Curtis and Lefroy (2010) made the additional point that NRM occurs in modified environments where there is often uncertainty about the way forward and even, the desired condition to aim for. They argued that under these circumstances it is important to engage property owners (and other stakeholders) in dialogue, learning and action which typically involves engaging and building human (i.e. knowledge and skills) and social capital (i.e. positive social norms, relationships built on trust and reciprocity, networks as platforms). For example, there is considerable uncertainty about how to maintain soil health under cropping regimes. Experience suggests that farmers will lack confidence in practices that have not been trialled in their local area.

North Central CMA staff identified important constraints to the implementation of best-practice NRM by rural property owners, including lack of awareness of degradation, insufficient knowledge of key threatening processes, insufficient confidence in recommendations and the cost of taking action. Items exploring these constraints were included in the 2019 North Central survey.

2.4 VALUES AND BELIEFS: DIFFICULT TO CHANGE BUT IMPORTANT FOR EFFECTIVE ENGAGEMENT

Researchers typically distinguish between 'assigned values' and 'held values'. Assigned values are those that individuals attach to specific physical goods, activities or services (Lockwood, 1999). 'Held' values are ideas or principles that people hold as important to them (Lockwood, 1999) and are generally highly abstract, generic and conceptual, but guide personal action (McIntyre, Moore, & Yuan, 2008).

Value orientations are the position a person takes when a particular set of held values are more important to them than other held values (Axelrod, 1994). Individuals can hold more than one value orientation simultaneously (Lockwood, 1999; Stern, 2000). This is an important point and one confirmed by results of social benchmarking surveys across Victoria. Indeed, across all regions, almost all survey respondents give a high rating to items measuring social, economic and environmental held and assigned values (Curtis and Curtis 2018).

A number of theoretical approaches have been developed and applied to explain the relationship between values and behaviour. Values-Belief-Norm Theory (VBN) explains an individual's motivation for environmental behaviour. It is an important theory that underpins much contemporary social research, including the 2019 North Central region social benchmarking survey.

VBN theory suggests that individual behaviour is derived from core elements of personality and belief structures. These inform people's specific beliefs about human-environmental interactions, consequences and an individual's responsibility for taking action. VBN theory proposes a chain of elements, with one component influencing the next. The elements of VBN theory include values, beliefs (awareness of consequences or does the condition of the asset affect yourself, others or the environment; ascribed responsibility beliefs; and general environmental concern), personal norms and behaviour (Stern 2000).

VBN theory hypothesises that environmental behaviour is more likely if the individual believes that there may be adverse consequences for something that they value highly (Stern, Dietz, & Kalof 1993). To explore the influence of held values (guiding principles), the 2019 North Central survey employed 10 items based on the scale developed by de Groot and Steg (2007) and adapted from Schwartz's value typology that distinguishes between biospheric, egoistic and altruistic values (Schwartz 1992, 1994).

Items included in the 2019 survey topic also explored attached values focussed on the importance of the farm business, relationships with the family and wider community and the local environment. Those items drew on previous research by those working with Allan Curtis, including in the North Central region (e.g. Seymour, Curtis, Pannell, Allan, & Roberts 2010).

Some beliefs and attitudes related to private property rights appear to be important for some property owners who are likely to be difficult to engage in NRM. For example, results from the 2014 North Central survey suggest about one in four landowners are concerned about protecting private property rights and their beliefs appear to be an impediment to their engagement in government programs (Curtis and Mendham 2015).

The reality is that most landowners have commitments beyond NRM and when there is a conflict between values, family is likely to come first. Indeed, the highest rated held value item in the 2014 North Central survey was *Looking after my family and their needs.*

VBN and related theories arising from the Theory of Planned Behaviour do not account for the larger set of factors, including seasonal conditions and markets that influence land use and management decisions by rural property owners (Pannell et al. 2006). While it is possible that values, beliefs and personal norms (VBN) may mediate or moderate some of these other factors, it is difficult to change these deep-seated personal attributes (i.e. VBN) in the short or medium term. Nevertheless, it is critical to understand the values and beliefs of landowners if they are to be effectively engaged.

2.5 EXTENT OF FARMER IDENTITY: THE BASIS FOR A USEFUL LANDOWNER TYPOLOGY

An increasing proportion of rural property owners in parts of Victoria are identifying as non-farmers by occupation (Curtis and Curtis 2018) and farmer identity is an important influence on the extent landowners are engaged in NRM, their knowledge and management skills and the adoption of best-practices for sustainable farming and biodiversity conservation (Curtis and Mendham 2015; Groth et al. 2014).

An associated trend is for considerable change in rural property ownership, estimated at 4% to 5% per annum across Victoria, including the regions surrounding Melbourne and Bendigo (Mendham and Curtis 2010). That

rate of change suggests 40-50% of rural properties will change ownership in a decade. New and longer-term property owners are different and those differences present both a challenge and opportunity for NRM practitioners. For example, new owners are typically less experienced and less knowledgeable about NRM and less connected to existing NRM networks. At the same time, new owners are typically more committed to environmental values and less reliant on on-property income and are often seeking advice about ways to better manage their properties. Items in the 2019 North Central survey explored these topics.

One of the responses of social researchers tasked with advising NRM practitioners on effective engagement is to develop typologies that distinguish groups/types based on key attributes. Those attributes might include the main industry (e.g. forestry or farming), enterprise type (e.g. dairy, beef, sheep, horticulture), land class (e.g. floodplains or hills), management approaches (irrigation or dryland, adoption of conservation practices), property types (large or small), and/or personal characteristics such as values or attitudes.

Typologies appeal as a useful aid for NRM practitioners if they include all rural property owners (e.g. not just farmers by occupation); are soundly based (i.e. grounded in relevant theory); and are constructed using reliable methods (e.g. not based on the intuition of researchers). Unfortunately, there are few examples where those criteria have been met. It is also important that typologies enable NRM practitioners to readily identify different cohorts when they set out to engage rural property owners.

As part of her PhD, Theresa Groth included a series of items in the 2014 North Central survey to measure the extent respondents held a farmer identity. Theresa's Farmer Collective Identity Construct scale (FCIC) has 12 items across seven dimensions (i.e. self-categorisation; behavioural involvement; evaluation; importance; social embeddedness; attachment and sense of independence) (Groth et al. 2016). The technical report (Curtis and Mendham 2015) and five journal papers provide a comprehensive explanation of how the FCIC scale was developed; the items included; the results of tests of scale reliability and validity; the approach to typology development using the scale; the characteristics of the four types of landowners (i.e. Full-time farmers, Part-time farmers, Hobby farmers, Non-farmers); and implications of farmer identity for NRM.

The key points are that:

1. Farmer identity is an important influence on land use and management.
2. Part-time farmers are an important cohort, distinct from Hobby farmers and closer to Full-time farmers in that they typically have a strong business focus.
3. Occupational identity varies spatially with distance from Melbourne and Bendigo, across the three key environmental assets identified by the current North Central RCS and with the agricultural capacity of land (refer to Groth and Curtis 2017).
4. Theresa Groth's typology provides a useful guide (heuristic) for NRM practitioners setting out to engage rural property owners, including because practitioners can readily classify property owners when meeting them.

Given the limitations of space in the 2019 survey and results indicating a strong positive relationship respondent's scores on Groth's FCIC scale and their self-declaration as Full-time farmer (FTF), Part-time farmer (PTF), Hobby farmer (HF) or Non-farmer (NF), the 2019 survey did not include the FCIC scale. Instead, respondents were asked to select from the four categories listed above; and in a later section, to write in their current occupation (e.g. farmer, teacher, retiree).

2.6 EFFECTIVE NRM INTERVENTIONS/ENGAGEMENT

Researchers have also identified what can be considered "levers" to effect change (e.g. improving knowledge and management skills); and processes or platforms that are effective for engaging rural property owners in learning, dialogue and action (e.g. Landcare and commodity groups). Government programs that engage property owners, including through cost-sharing where there are public benefits from work on private property, can also have a positive influence on adoption of best-practice NRM.

The 2019 North Central survey included a topic asking respondents to self-assess their knowledge across 15 items. The survey also included items exploring engagement through various platforms (e.g. Landcare, soil health groups, and commodity groups) and processes (e.g. training, field days, government programs).

Social norms are an important but often neglected aspect of a community's social capital. Of course, social norms can be both positive and negative influences on NRM (Minato et al. 2010). Indeed, a key outcome of Landcare participation has been the establishment of positive social norms about what sustainable farming involves in a local context (Curtis et al. 2014). Social norms are best identified through qualitative research within a community where there are "ties that bind". However it is possible to explore personal norms through surveys and these may reflect social norms. The 2019 North Central survey included two items exploring personal norms related to soil management.

Trust (i.e. willingness to rely on others) is an important element of the social capital of organisations, whether they be government agencies, private businesses or volunteer organisations. Where trust in an organisation is high, partners will be more likely to accept advice, enter partnerships to develop and implement plans, forgive mistakes and provide positive recommendations to others (Sharp and Curtis 2014).

A key point from the limited number of studies examining landowner trust in NRM organisations is that many rural property owners are not predisposed to trust others (e.g. Curtis and Mendham 2017). Judgements about the trustworthiness of individuals and organisations also influence landowner willingness to trust. Trustworthiness involves assessments of three key elements: capability; benevolence; and integrity (Sharp and Curtis 2014; Mayer, Davis and Schoorman 1995).

The 2019 North Central survey included measures of respondent's predisposition to trust (Leahy and Anderson 2008; Smith, Leahy, Anderson and Davenport 2013); judgements of the trustworthiness of the North Central CMA; and trust in (i.e. willingness to rely on) the North Central CMA. The topic of focus is the management of waterways and wetlands. Items also explored predisposition to accept risk (Meertens and Lion 2008).

3. DATA ANALYSIS AND PRESENTATION

3.1. DATA ANALYSIS

Descriptive statistics such as frequencies, means and medians were used to summarise responses to all survey items ("not applicable" and missing responses were removed from the analysis of means). For items that asked respondents to specify an amount (e.g. days of paid off-property work in past 12 months) zeros were excluded in the calculation of means and medians (hence, these were treated as a 'no' response). In these situations, the means and medians should be treated as the mean or median of those who had undertaken the practice.

Further analyses include examination of data for statistically significant differences between different groups (e.g. Full-time farmer, Part-time farmer, Hobby farmer and Non-farmer). Kruskal Wallis Rank Sum Tests were used to test for differences on a continuous variable or a Likert scale variable (e.g. age or agreement with an issue) based on a grouping variable (e.g. farmer identity cohorts). Chi Squared Tests were used to examine dependence between two grouping variables. Similarly, Pearson's Chi-squared test with simulated values was used to test for differences on a Yes/No (i.e. nominal data as for Landcare participant) based on a grouping variable (e.g. the farmer identity cohorts).

To explore relationships between variables in the survey, pairwise comparisons were conducted between each item and all other items in the survey. Kruskal Wallis Rank Sum Tests were used to test for relationships between Likert-type response and a grouping variable (e.g. Full-time farmer, Part-time Farmer, Hobby farmer and Non-farmer) (results in an H value). Chi Squared Tests were used to examine dependence between two categorical (or grouping) variables (e.g. between Yes/No for management action implemented and Landcare member/Landcare non-membership).

Pairwise comparisons tested for relationships (positive and negative) between variables expected to influence adoption (i.e. independent variables) of NRM best-practices (i.e. the dependent variables). Those practices covered both environmental management and sustainable agriculture. Most practices were thought to be relevant to most property contexts. However, respondents were given the opportunity to choose Don't know/ Not applicable. As might be expected, the proportion selecting this option varied across the best-practice items. Those data are reported in the summary tables.

Survey recipients were asked to provide information about implementation of best-practice NRM for both the full-period of their management; and for the past three years. Unfortunately, most respondents only answered for one period and that was typically for the full-period of management. All pairwise comparisons and modelling for implementation of best-practice NRM are focussed on the full-period of management.

Logistic regression modelling was used to explore the extent a small number of independent variables contribute to the presence or absence (as most were assessed using yes/no) of best- practice NRM implementation. Experience with previous reports suggests that a model with from four to 10 variables provides useful guidance for NRM practitioners.

Regression modelling also addresses the thorny question of multicollinearity between independent variables (i.e. where two variables essentially have the same impact). However, experiences with social benchmarking

data suggests that those efforts may lead to important variables being excluded from models. For example, pairwise comparisons may reveal a significant relationship between implementation of a best-practice and both participation in a soil health group and property size. If participation in a soil health group and property size are also correlated, regression modelling may exclude one of these variables. There are sophisticated statistical technique that can help to further tease out causality but these are beyond the scope of this research project.

Interpretation of the results of the pairwise comparisons (e.g. to eliminate significant relationships that were irrelevant/nonsense) allowed the research team to identify a small number (<25) of independent variables to include in the modelling for each best-practice. Some variables were included in most models. The selected variables were then entered by Simon McDonald in a stepwise modelling process using Akaikes (AIC) information criterion as the step criteria.

For logistic regression modelling, the proportion of all responses for the dependent correctly predicted by the model provides an indication of the value of the model. A model is considered useful if it correctly predicts at least 70% of responses to the dependent variable (i.e. each best-practice).

In all analyses the p statistic represents the significance level where a value below 0.05 is considered to be statistically significant. A *p* value below 0.05 means that it is unlikely (probability of less than five percent) that the observed relationship or difference has occurred purely by chance. All statistical analyses were performed using SPLUS software and Microsoft Excel.

3.2 PRESENTATION OF RESULTS

The following sections present key data from the 2019 survey, often with a comparison with 2014 data. Those data are presented using tables and figures and include:

1. descriptive statistics for each survey topic;
2. comparisons across different groups (e.g. those based on extent of farmer identity) and across the 14 LGA;
3. relationships between variables (e.g. influences on best-practice implementation); and
4. profiles for each LGA.

For some survey topics respondents were asked to rate how strongly they agreed with a topic, how important an issue was for them, or how likely an outcome was for them on a Likert-type scale of 1 (not likely, not important, strongly disagree) to 5 (highly likely, very important, strongly agree). Not applicable/don't know was a separate response option (6). To simplify the presentation of these data, the response options have been collapsed into four categories: "unimportant" (combining not important and of minimal importance), "some importance", "important" (combining important and very important) and "don't know/not applicable". For items asking respondents if they agreed with a statement, the response options have been collapsed into "disagree" (strongly disagree and disagree), "unsure", "agree" (combining agree and strongly agree) and "don't know/not applicable". For questions asking the likelihood of a certain outcome, response options have been collapsed into "unlikely" (highly unlikely and unlikely), "unsure", "likely" (likely and highly likely) and "don't know/not applicable".

3. DATA ANALYSIS AND PRESENTATION (CONT.)

Mean values are typically reported in the tables and items in each topic are typically sorted according to means (i.e. from highest to lowest). In each case the mean is calculated from a range between 1 (strongly disagree/ not important/highly unlikely) through to 5 (strongly agree/very important/highly likely). A mean of 4 can be interpreted as a high level of agreement, concern or knowledge, while a mean of 2 can be interpreted as a lower level.

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY

4.1 INTRODUCTION

There are 27 items exploring the importance of issues at the district scale (19) and at the property scale (8). Sixteen of these items were in the 2014 survey. Items new for the 2019 survey largely reflect the increased contemporary relevance of issues (e.g. *Quality of water in farm dams*) and the focus on soils by the Soil CRC.

The 2014 mean scores are included in brackets in the column for mean scores (means are out of 5 as the Don't know/Not applicable responses are not included in those calculations). In Tables 2 and 3 there are large variations in the proportion of respondents selecting Don't know/NA (i.e. from 3% to 40%). These variations are as expected but need to be considered when interpreting data in the tables. For example, *Movement of irrigation water away from this region* is rated in the top five issues on mean score but 33% of respondents to this item selected Don't know/NA.

Notations in Tables 2 and 3 indicate where there are statistically significant differences across geography (i.e. LGA) and the extent of farmer occupational identity. Most differences identified in these tables are based on farmer identity and additional information is provided in Tables 4 and 5.. The LGA profiles presented later identify differences in the importance of issues across LGA.

The 27 items includes some issues where concern about that issue is expected to influence implementation of best-practice NRM. For example, concern about *Changes in weather patterns* (i.e. toward a drier climate) might underpin a decision to establish deeper-rooted pastures such as Lucerne. There is also evidence that Concern about the *Risk to life and property from wildfire* can constrain willingness to fence waterways and wetlands to manage stock access. Pairwise comparisons have been used to test for these expected positive and negative relationships and those results are presented in Table 6. This table also includes some examples where unexpected relationship are evident.

4.2 KEY FINDINGS

The top five issues across district and property scales based on mean score and the proportion selecting an important rating includes two soil management items, *changes in weather patterns* (a climate change proxy) and *dam water quality during drought*. Only the *Soil erosion (e.g. by wind or water)* item was included in the 2014 survey.

There are 15 items where at least 50% of respondents provided an important rating. Those items embrace a mix of economic, social and environmental topics. The ten district scale issues most frequently rated as important are identified in Figure 1.

The five issues receiving the lowest ratings for importance (from 37% to 29%) were all listed at the district scale [i.e. Table 2]. Two of these items explored concern about important contemporary regional NRM issues: *Stock damage to native vegetation along waterways and in wetlands*; and *Dams on rural properties reducing run-off to natural waterways*. It is noteworthy that there were no differences across geography (i.e. LGA) or farmer identity for the *Dams on rural properties* item; but there were differences on these attributes for the *Stock damage to native vegetation* item [Table 4]. However, the stock damage issues was relatively unimportant even amongst the Non-farmers, Hobby farmers and Part-time farmers.

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

At the district scale there has been little change in the level of concern about most issues included in both the 2014 and 2019 surveys. The main exceptions are for *The effect of groundwater extraction on stream flows during drought* and *Dams on rural properties reducing run-off to natural waterways* (both increased in importance) and *Absence or poor quality of important services and infrastructure* (less importance) [Table 2]. At the property scale there has been substantial change in both the level of concern about issues and the relative importance of issues. The key trends between 2014 and 2019 are:

1. There has been a substantial increase in the level of concern for the four soil management issues included in both surveys. For example, *Soil erosion (e.g. by wind or water)* is the highest rated issue and has moved from last of the soil management issues to first.
2. The proportion of respondents identifying Concern about *Uncertain/low returns limiting capacity to invest in my property* has moved from first to last in the list of property scale issues and the proportion of respondents rating this an important issue has declined [Table 3].

There are 19 items where there is a statistically significant difference in the importance of issues based on the extent of farmer occupational identity and 11 instances of a significant difference across the 14 LGA. In all but one case, a difference across LGA was associated with a difference on farmer identity (i.e. A*bsence or poor quality of important services and infrastructure*). Given the nature of the issues and consistent patterns in the nature of relationships with farmer identity (i.e. positive/negative; linear/non-linear); and based on sound theory and prior results (refer to the section on Conceptual framework), it seems that farmer identity is the key driver of those trends. For example:

1. For all the soil management items in Table 5 and Figure 2, there is a consistent positive relationship between stronger farmer identity and concern about issues.
2. With one exception, there is a consistent positive relationship between stronger farmer identity and concern about policies that may affect the livelihoods of farmers [brown shaded items in Table 4]. Similarly for concern about the impact of *Uncertain/low returns limiting capacity to invest in my property* [Table 5].
3. For three of the four district scale items with a focus on biodiversity or water quality (shaded green in Table 4) there is a consistent negative relationship between stronger farmer identity and concern about issues [Table 4].

There are important nuances in the trends based on farmer identity and these need to be taken into account. For example:

1. At least 50% of Hobby farmers and Non-farmers gave an important rating to three of the soil management items [Table 5].
2. Full-time and Part-time farmers provided very similar ratings for all soil management items [Table 5 and Figure 3].
3. Most respondents in each cohort rated *Risk to life and property from wildfires* an important issue but this seems a more important issue for the Hobby and Non-farmer cohorts and may possibly be the most important issue listed in the survey for these respondents.

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

4. *Crop weed resistance to herbicides* was rated an important issue by 76% of Full-time farmers and is possibly their most important issue listed in the survey. Although fewer Part-time farmers rated this an important issue, it is still important to most [Table 4].

There are 16 issues topic items where concern about an issue is expected to influence implementation of best-practice NRM. That is, concern about an issue is likely to represent concern about a threat to an important value. The results of pairwise comparisons [Table 6] indicate there are significant positive relationships between concern for 11 of those issues and implementation of relevant best-practices. There are no expected relationships with best-practices for three items examining soil condition (permeability of subsoil, declining nutrient status, sodicity); or the two items examining risks posed by wildfires and the impact of uncertain/low returns from farming [Table 6]. Together, these results suggest that concern about NRM issues is likely to lead to action to address those issues. At the same time, there is no evidence that concerns about economic returns has been a barrier to implementation. Indeed, there are some practices where those more concerned about economic returns are more likely to implement best- practices.

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

TABLE 2: ASSESSMENT OF ISSUES AT THE DISTRICT SCALE, 2019 (N=663, n=642 TO 636)

ISSUES	MEAN	NOT IMPORTANT	SOME IMPORTANCE	IMPORTANT	DON'T KNOW/ NA
Changes in weather patterns	4.1	9%	15%	71%	4%
Quality of water in farm dams during drought	4.0	11%	14%	66%	9%
Movement of irrigation water away from this region *** ###	4.0	13%	6%	48%	33%
The impact of pest plants and animals on native plants and animals	3.9 (3.8)	9%	21%	67%	3%
Risk to life and property from wildfires *** ###	3.9	16%	15%	64%	5%
Crop weed resistance to herbicide ###	3.9 (3.9)	11%	14%	63%	13%
Public support for agricultural activities/practices, e.g. pesticide use, bare paddocks, mulesing ###	3.8	12%	22%	57%	10%
Absence or poor quality of important services and infrastructure (e.g. health, schools, internet) ***	3.8 (3.9)	12%	20%	60%	8%
Long-term negative impacts of property purchased by absentees	3.7 (3.6)	15%	21%	52%	11%
Modernisation of the irrigation system as part of water reform *** ###	3.7	12%	15%	43%	30%
Loss of native plants and animals in the landscape ###	3.6 (3.5)	17%	24%	52%	7%
Non-agricultural land use (e.g. residential, solar, mining) encroaching on farming land	3.6	19%	18%	49%	14%
The effect of ground water extraction on stream flows during drought *** ###	3.5 (3.1)	19%	16%	44%	21%
Nutrient run-off from rural properties affecting water quality *** ###	3.2 (3.2)	27%	19%	37%	16%
Less water being made available to support recreation on rivers and lakes *** ###	3.1	30%	19%	37%	14%

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

TABLE 2 (CONT.): ASSESSMENT OF ISSUES AT THE DISTRICT SCALE, 2019 (N=663, n=642 TO 636)

Stock damage to native vegetation along waterways and in wetlands *** ###	3.1 (2.9)	27%	22%	33%	18%
*Dryland salinity undermining long-term productive capacity *** ###	3.1 (2.8)	30%	14%	31%	24%
*Irrigation salinity undermining long-term productive capacity *** ###	3.0 (2.6)	25%	12%	23%	40%
Dams on rural properties reducing run-off to natural waterways	2.9 (2.5)	37%	24%	29%	10%

*** Significant difference across LGA, Kruskal-Wallis rank sum tests, chi-square, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum tests, chi-square, p<0.05

* These items included in 2014 survey in the property scale list of issues

() Data for 2014

TABLE 3: ASSESSMENT OF ISSUES AT THE PROPERTY SCALE, 2019 (N=663, n=640 TO 593)

ISSUES	MEAN	NOT IMPORTANT	SOME IMPORTANCE	IMPORTANT	DON'T KNOW/ NA
Soil erosion (e.g. by wind or water)	4.1 (3.2)	10%	12%	72%	6%
Low biological activity in soils ###	4.0	8%	16%	64%	12%
Declining nutrient status of soils ###	3.9 (3.5)	10%	17%	65%	8%
Low organic carbon in soils ###	3.9	10%	16%	61%	13%
Soil acidity (lower pH) undermining productive capacity of soils ###	3.8 (3.4)	13%	16%	57%	14%
Low permeability of sub soil ###	3.8 (3.3)	12%	19%	60%	10%
Soil sodicity *** ###	3.6	15%	18%	48%	19%
*Uncertain/low returns limiting capacity to invest in my property ###	3.5 (3.8)	18%	21%	47%	15%

*** Significant difference across LGA, Kruskal-Wallis chi-square test, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum tests with chi-square, p<0.05

* This issue listed in the 2014 survey as a district scale issue

() Data for 2014

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

FIGURE 1: TOP 10 ISSUES AT DISTRICT SCALE, 2019 (N=663, n=640 TO 593)

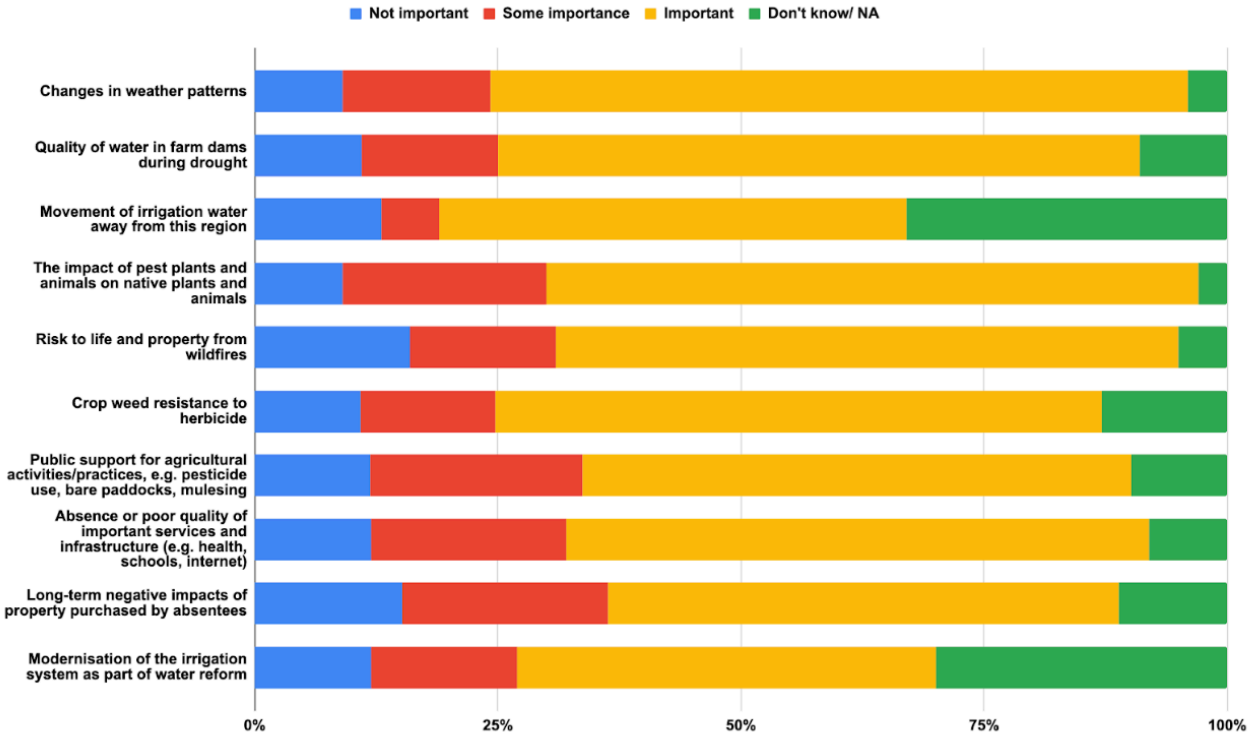
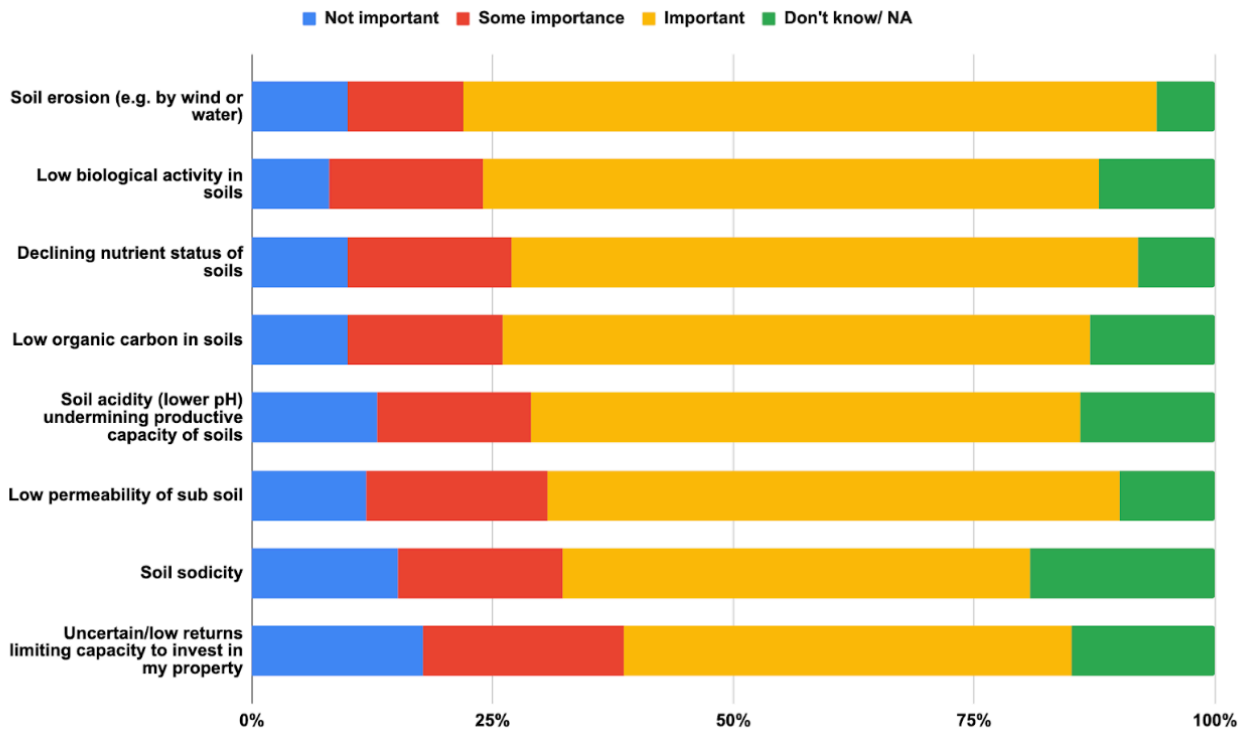


FIGURE 2: ASSESSMENT OF ISSUES AT THE PROPERTY SCALE, 2019 (N=663, n=640 TO 593)



4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

TABLE 4: SIGNIFICANT DIFFERENCES IN IMPORTANCE OF DISTRICT SCALE ISSUES BY FARMER IDENTITY, 2019 (n=642 TO 636)

Issues	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
Public support for agricultural activities/practices, e.g. pesticide use, bare paddocks, mulesing	3.9 68%	3.6 52%	3.6 41%	3.5 43%
Movement of irrigation water away from this region	4.2 54%	3.9 52%	3.7 43%	3.6 35%
Risk to life and property from wildfires	3.7 58%	3.8 65%	4.2 76%	4.2 72%
Crop weed resistance to herbicide	4.1 76%	3.7 59%	3.4 44%	3.9 45%
Modernisation of the irrigation system as part of water reform	3.7 46%	3.4 37%	3.7 42%	3.8 43%
Loss of native plants and animals in the landscape	3.3 44%	3.5 52%	3.9 62%	4.0 67%
The effect of ground water extraction on stream flows during drought	3.3 37%	3.7 53%	3.6 49%	4.0 50%
Nutrient run-off from rural properties affecting water quality	3.0 32%	3.2 44%	3.3 40%	3.6 40%
Less water being made available to support recreation on rivers and lakes	3.2 39%	2.9 29%	3.3 42%	3.1 34%
Stock damage to native vegetation along waterways and in wetlands	2.9 28%	3.2 42%	3.4 41%	3.5 33%
Dryland salinity undermining long-term productive capacity	2.9 31%	3.1 35%	3.2 33%	3.2 27%
Irrigation salinity undermining long-term productive capacity	2.9 22%	3.1 32%	2.8 23%	3.2 19%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Light brown shading: policies that may influence livelihoods. Light green shading: biodiversity and water quality issues.

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

TABLE 5: SIGNIFICANT DIFFERENCES IN IMPORTANCE OF PROPERTY SCALE ISSUES BY FARMER IDENTITY, 2019 (N=663, N=640 TO 593)

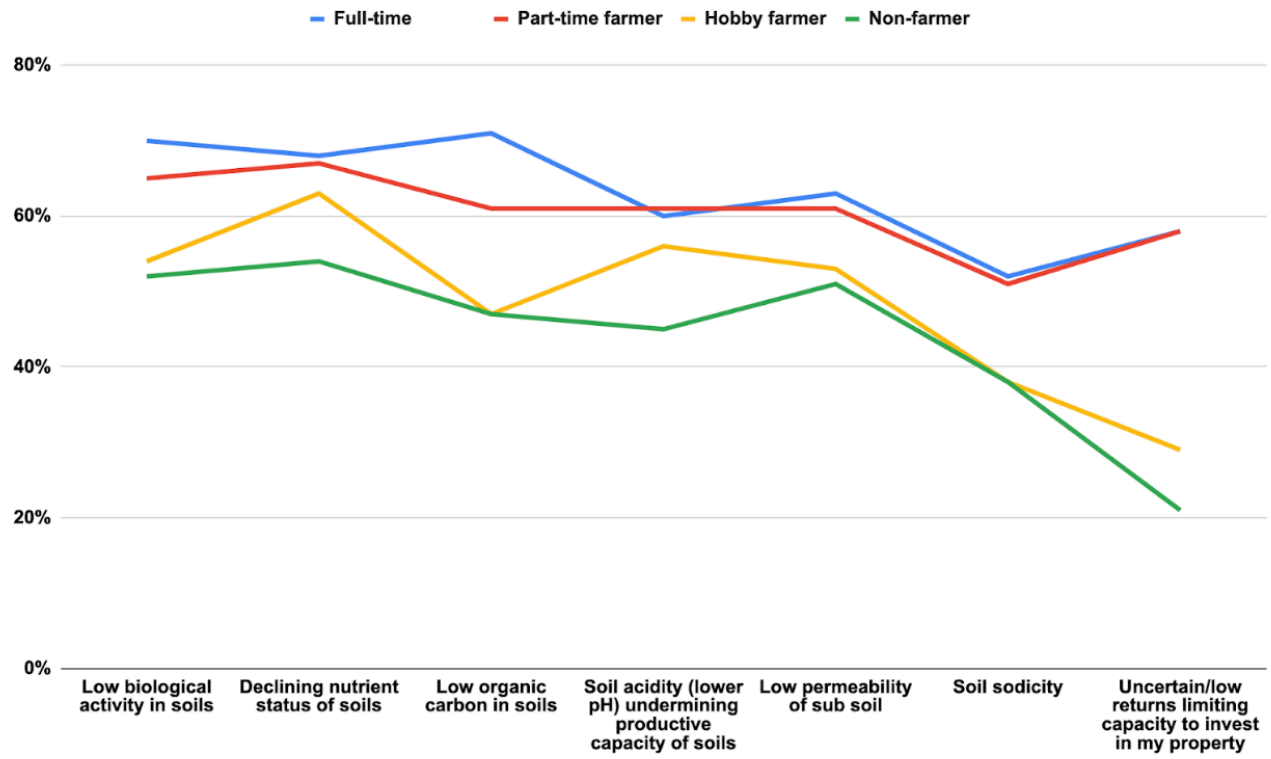
ISSUES	FULL-TIME FARMER	PART-TIME FARMER	HOBBY FARMER	NON-FARMER
Low biological activity in soils	4.0 70%	4.0 65%	3.8 54%	3.9 52%
Declining nutrient status of soils	3.9 68%	4.0 67%	4.0 63%	3.9 54%
Low organic carbon in soils	4.0 71%	3.9 61%	3.7 47%	3.8 47%
Soil acidity (lower pH) undermining productive capacity of soils	3.8 60%	3.8 61%	3.8 56%	3.8 45%
Low permeability of sub soil	3.8 63%	3.8 61%	3.7 53%	3.7 51%
Soil sodicity	3.6 52%	3.7 51%	3.4 38%	3.6 38%
Uncertain/low returns limiting capacity to invest in my property	3.7 58%	3.6 58%	3.1 29%	2.9 21%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

All tests were Kruskall-Wallis rank sum tests with chi-square p values <0.05

4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

FIGURE 3: SIGNIFICANT DIFFERENCES IN IMPORTANCE OF PROPERTY SCALE ISSUES BY FARMER IDENTITY, BY % SELECTED IMPORTANT/ VERY IMPORTANT RATINGS 2019 (N=663, n=640 TO 593)



4. IMPORTANCE OF ISSUES AFFECTING THE DISTRICT AND PROPERTY (CONT.)

TABLE 6: RELATIONSHIPS BETWEEN ASSESSMENTS OF ISSUES AND IMPLEMENTATION OF BEST-PRACTICE OVER FULL-PERIOD OF MANAGEMENT, 2019 (N=663, n=642 TO 636)

Issues item statements	Evidence of expected positive relationships
Changes in weather patterns	• Sown Lucerne (but only item where there is a relationship)
Nutrient run-off from rural properties affecting water quality	• Tested soils for nutrient status in paddocks where have applied fertilizer/soil conditioners in the past
Dryland salinity undermining long-term productive capacity	• Planted trees and shrubs • Sown Lucerne
Irrigation salinity undermining long-term productive capacity	• Planted trees and shrubs • Sown Lucerne
The impact of pest plants and animals on native plants and animals	• Each year worked to control pest animals • Each year worked to control non-crop weeds
Loss of native plants and animals in landscape	• Planted trees and shrubs • Fenced waterways and wetlands to manage stock access • Prepared a habitat assessment for native plants
Stock damage to native vegetation along waterways and in wetlands	• Planted trees and shrubs • Fenced waterways and wetlands to manage stock access
Soil erosion (e.g. by wind or water)	• Used precision farming techniques for cropping
Low biological activity in soils	• Applied soil ameliorants other than fertilizer & lime (e.g. gypsum, organic manure)
Low organic carbon in soils	• Applied soil ameliorants other than fertilizer & lime (e.g. gypsum, organic manure)
Soil acidity (lower pH) undermining productive capacity of soils	• Applied at least one application of lime to arable land • Sown perennial pastures other than Lucerne
No evidence of expected positive relationships	
Low permeability of sub soil	• Deep ripped arable land
Declining nutrient status of soil	• Tested soils for nutrient status in paddocks where have applied fertilizer/soil conditioners in the past • Used precision farming techniques for cropping
Soil sodicity	• Applied soil ameliorants other than fertilizer & lime (e.g. gypsum, organic manure)
No evidence of expected negative relationships	
Risk to life and property from wildfires	• Planted trees and shrubs • Fenced waterways and wetlands to manage stock access
Uncertain/low returns limiting capacity to invest in my property*	• Applied at least one lime application to arable land • Established off-stream watering points

Note: Results of pairwise comparisons (so just two variables) using Kruskall-Wallis rank sum tests, chi-square p values <0.05

5. LONG-TERM PLANS FOR YOUR PROPERTY

5.1 INTRODUCTION

The 12 items in this topic explored the long-term plans of property owners [Table 7]. Long-term was defined as in the next 10 years. The items explored the extent of change in ownership, subdivision and expansion of holdings, changes in enterprise mix and intentions to work off-property. Two additional items explored plans for family succession [Tables 9 & 10).

Three changes from the 2014 survey to the 2019 survey items in this topic include:

1. *The enterprise mix will be changed to less intensive enterprises* has been added;
2. *I will live on the property for as long as possible post age 65* has been deleted; and
3. The item exploring intent to take on more off-property work has been expanded to include both the respondent and their spouse.

5.2 KEY FINDINGS

As in 2014, two-in-three respondents said their long-term plan was for *Ownership of the property to stay within the family*. Only 18% said *The property will be sold* and fewer respondents (7%) said it was likely *The property will be subdivided and a large part of the property sold* [Table 7]. At the same time it seems that for about one-in-three of those intending to pass their property to family members there is a gap between intentions and taking steps to engage family members in succession planning [Table 9].

There is also evidence of many respondents wanting to continue living on their property as long as possible. For example, about half said it is unlikely *I will move off the property around/soon after reaching 65 years.*

It seems that across the respondents there is a diversity of likely futures. For example, respondents were just as likely to say they intend to change their enterprise mix to less intensive options as they were to adopt more intensive options; and as likely to say they intend to lease/share farm all or most of their property as they were to say they intend to lease/share farm additional land [Table 7]. Property owners were more likely to say *Additional land will be purchased* than *The property will be sold* [Table 7].

The most obvious finding from a comparison of data from the 2019 and 2014 surveys is the remarkable degree of stability in the intentions of respondents. Eleven of the 12 items in this topic in 2014 are repeated in the 2019 survey. With only two exceptions, the mean score per item is either the same (6 items) or within 0.1 out of 5.0 [Table 7]. A similar pattern of stability across the two surveys is discernible for the items exploring family engagement in property succession planning.

There are statistically significant differences across the four farmer identity cohorts for 11 of the 12 items in Table 7 and for both items exploring family engagement in succession planning [Tables 9 & 10]. By comparison, there are significant differences across the LGA for only three items in Table 7. Apart from confirming the relevance of the typology, there are useful insights for researchers and NRM practitioners. In almost all instances differences across the farmer identity cohorts are as expected. For example:

5. LONG-TERM PLANS FOR YOUR PROPERTY (CONT.)

1. In the case of six items there is a positive linear relationship between farmer identity and likelihood of taking up an option. Those choices are ongoing family ownership, diversifying enterprises, purchasing additional land, leasing/share farming additional land and both moving to more intensive and less intensive enterprises (i.e. those items with blue shading in Table 8).
2. There is one item where there is a negative linear relationship between farmer identity and likelihood of taking up an option: selling the property (orange shading in Table 8].
3. About a third of Part-time farmers and Hobby farmers said it is likely *Me or my spouse will seek additional off-property work* and these cohorts are almost twice as likely to select this response than either Full-time farmers or Non-farmers.
4. Non-farmers are least likely to say *I will move off the property around/soon after reaching age 65 years*.
5. Non-farmers are almost twice as likely as Full-time farmers to say *Some part of the property will be placed under a conservation covenant.*

There are statistically significant differences across the four farmer cohorts for both items exploring engagement with family for property succession [Tables 9 & 10]. Again, these differences are as expected in that there is typically a positive relationship between farmer identity and having family interested in taking on the property and having family members engaged in that process. However, substantial proportions of Full-time farmers (23%) and Part-time farmers (44%) who have family members interested in taking on their property, have made no progress in developing a plan for succession to occur. Given this finding and the importance of part-time farming, more effort might be directed to engaging this cohort in succession planning.

5. LONG-TERM PLANS FOR YOUR PROPERTY (CONT.)

TABLE 7: LONG-TERM PLANS, 2019 (N=663, n= 649 TO 640)

LONG TERM PLANS	MEAN	UNLIKELY	UNSURE	LIKELY	DON'T KNOW/ NA
Ownership of the property will stay within the family ###	4.0 (4.0)	15%	17%	66%	2%
The enterprise mix will be changed to diversify income sources *** ###	2.7 (2.5)	39%	26%	23%	12%
Additional land will be purchased *** ###	2.5 (2.5)	51%	18%	26%	6%
Additional land will be leased or share farmed *** ###	2.2 (2.2)	56%	18%	17%	10%
The enterprise mix will be changed to more intensive enterprises ###	2.4 (2.3)	52%	22%	14%	13%
The enterprise mix will be changed to less intensive enterprises ###	2.4	50%	24%	12%	14%
Me or my spouse will seek additional off-property work ###	2.3 (2.3)	50%	8%	21%	20%
The property will be sold ###	2.3 (2.1)	57% 69%	21%	18%	4%
I will move off property around/soon after reaching age 65 years ###	2.3 (2.2)	51%	15%	15%	19%
All or most of the property will be leased or share farmed ###	2.2 (2.2)	56%	15%	18%	11%
Some part of the property will be placed under a conservation covenant ###	2.0 (2.0)	67%	15%	11%	8%
The property will be subdivided and a large part of the property sold	1.7 (1.7)	73%	12%	7%	8%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, Kruskal-Wallis rank sum tests, chi-square, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum tests, chi-square, p<0.05

() Data for 2014

5. LONG-TERM PLANS FOR YOUR PROPERTY (CONT.)

TABLE 8: SIGNIFICANT DIFFERENCES IN LIKELIHOOD OF LONG-TERM PLANS BY FARMER IDENTITY, 2019 (N=663, N=649 TO 640)

Long term plans	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
Ownership of the property will stay within the family	4.1 72%	3.9 64%	3.8 65%	3.7 53%
The enterprise mix will be changed to diversify income sources	2.8 31%	2.7 26%	2.2 17%	2.0 7%
Additional land will be purchased	2.9 40%	2.3 16%	1.9 15%	1.7 5%
Additional land will be leased or share farmed	2.5 27%	2.1 10%	1.6 9%	1.5 3%
The enterprise mix will be changed to more intensive enterprises	2.6 19%	2.4 18%	2.0 9%	1.7 3%
The enterprise mix will be changed to less intensive enterprises	2.5 14%	2.3 12%	2.2 9%	2.0 6%
Me or my spouse will seek additional off-property work	2.1 17%	2.8 35%	2.6 32%	2.6 17%
The property will be sold	2.0 13%	2.3 17%	2.6 24%	2.7 31%
I will move off property around/soon after reaching age 65 years	2.3 17%	2.3 14%	2.3 18%	2.1 9%
All or most of the property will be leased or share farmed	2.2 17%	2.4 24%	2.0 11%	2.4 18%
Some part of the property will be placed under a conservation covenant	1.9 9%	2.0 12%	1.8 8%	2.3 16%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue shading: positive linear relationship with farmer identity. Orange shading: negative linear relationship

5. LONG-TERM PLANS FOR YOUR PROPERTY (CONT.)

TABLE 9: FAMILY ENGAGEMENT IN PROPERTY SUCCESSION BY FARMER IDENTITY, 2019 (N=632)

DO YOU HAVE FAMILY MEMBERS INTERESTED IN TAKING ON YOUR PROPERTY IN THE FUTURE?	YES	UNSURE/TOO EARLY TO KNOW	NO
Full-time farmers	49%	31%	21%
Part-time farmers	37%	37%	26%
Hobby farmers	30%	41%	29%
Non-farmers	24%	40%	36%
All respondents	**40%**	**35%**	**25%**

Significant differences using Kruskall-Wallis rank sum tests with chi-square p values <0.05

TABLE 10: STAGE IN PLANNING PROPERTY SUCCESSION BY FARMER IDENTITY, 2019 (N=304)

	NOT STARTED	EARLY STAGES	ABOUT HALFWAY	WELL ADVANCED	COMPLETED/ ONGOING
Full-time farmers	23%	33%	11%	17%	16%
Part-time farmers	44%	18%	14%	9%	16%
Hobby farmers	67%	23%	Nil	3%	7%
Non-farmers	54%	22%	3%	8%	14%
All respondents	**36%**	**27%**	**9%**	**12%**	**15%**

Significant differences using Kruskall-Wallis rank sum tests with chi-square p values <0.05

6. VALUES: HELD AND ATTACHED

6.1 INTRODUCTION

The values (i.e. guiding principles/ what is important) of rural property owners are assumed to have a direct influence on their beliefs, personal norms and then their attitudes/intentions and eventually, their on-property NRM management. An individual's values are assumed to be relatively stable over time: they develop as a result of powerful socialising forces (e.g. family, peers, school, media, church). Having said that, recent analysis of the four social benchmarking surveys in the Wimmera region by Toman, Curtis and Mendham (2019) identified significant change over about twenty years in the values of rural property owners. It seems that changes in the population of rural landholders and wider social trends explain at least a substantial part of that change.

Social benchmarking studies in Victoria have demonstrated that rural property owners have some common or shared values; that most property owners have values consistent with contemporary NRM policies; there are important differences in the values of property owners, including across the four farmer identity cohorts, and those differences influence management practices. For NRM practitioners the focus should therefore be on gaining insights to inform effective engagement rather than setting out to change values.

The 2019 topic exploring the importance of values attached to the property included 16 items, with 13 of those repeated from 2014 and three new items: *An important source of household income; Provides a sense of belonging to a community;* and *An asset that is an important part of family wealth*. The held values (guiding principles) topic repeated the 10 items from the 2014 survey.

The tables below include both mean scores (out of 5, so not including the Not applicable option) and the proportion of respondents selecting different response options (i.e. combined not important/minimal importance; some importance; and combined important/very important). Tables 11 & 12 provide the mean scores for the Values topic items in the 2019 survey but not for items included in the 2014 survey. The Not applicable response option was not included in the 2014 survey. As a result, more of the 2014 respondents selected the Not important option (and those counted towards the mean scores for each item). The net effect is that all of the 2019 items have mean scores higher than in 2014.

6.2 KEY FINDINGS FOR ATTACHED VALUES

As in previous social benchmarking surveys there is a mix of economic, social and environmental values in the top five items in the attached values topic [Table 11]. That 10 of the 16 items have mean scores of 4 and above further emphasises the relevance of a range of attached values for most respondents [Table 11].

The second key finding is that there is much common ground or shared values amongst the respondents. For example:

1. Almost all respondents, irrespective of the extent they identified as a farmer, said their property was important because of their *Ability to pass on a healthier environment for future generations* [Table 11].
2. For three other items there is no difference in the mean scores across the four cohorts based on farmer identity: *Opportunity to learn new things; Provides a sense of belonging to a community;* and *An asset that will fund my retirement*. More than half of the survey respondents said each of these values is important.

6. VALUES: HELD AND ATTACHED (CONT.)

3. Three of the items with significant differences across the four cohorts were rated as important by more than 60% of respondents in each cohort: *An attractive place/area to live; Native vegetation provides habitat for birds and animals; Native vegetation makes the property an attractive place to live* [Table 12].
4. For two items there is an important rating by more than half of the respondents in three cohorts (i.e. not the Non-farmers): A*n asset that is an important part of family wealth*; and *A great place to raise a family* [Table 12].

Given the findings above indicating a commitment to a healthier environment and the importance of native vegetation, it seems reasonable to conclude there is a close alignment of the values most respondents attach to their property and the direction of contemporary NRM policies and strategies.

There is no evidence of significant change from 2014 in the importance of the values included in the two surveys. As explained above, it is not possible to compare the mean scores for the values topics across the two surveys. However it is possible to compare the rank order of the items included in both surveys. The rank order based on 2019 mean scores is almost identical to the rank order based on 2014 mean scores.

There are significant differences between the farmer identity cohorts for most items (i.e. 12 of 16) in Table 11 and Figure 4. Those differences are mostly as expected and include:

1. There is a positive linear relationship between farmer identity and the importance attached to five items (blue shading in Table 12] that focus on the productive value of soil, accomplishment from running a viable business, accomplishment from producing food and fibre and the income and wealth generated by farming.
2. There is a negative linear relationship between farmer identity and importance attached to two items focused on native vegetation (shaded purple in Table 12).
3. There is a negative linear relationship across three of the cohorts for three items focussed on amenity values (shaded orange in Table 12). The exception to the trend for each item is the Non-farmer cohort [Table 12].

There are significant relationships between each of the 16 items measuring attached values and the 19 items measuring implementation of best-practice NRM over the full-period of management. Indeed, for 8 items there is a significant relationship with >50% of the best-practice items [Table 13]. Those trends and the implications for NRM practitioners include:

1. Three values items are positively associated with best-practices across both the environment and agriculture [purple shading in Table 13]. These items are across very different values (i.e. environmental legacy; being part of a community; opportunity to learn) and appear to provide a very sound foundation for practitioners setting out to engage property owners around best-practice NRM. For example, the three items address key aspects of the principal motivations for people to volunteer, including to become Landcare participants.
2. Two values items are negatively associated with best-practices and that pattern holds for practices with an environment and an agriculture focus [yellow shading in Table 13]. Both items are focussed on amenity values (i.e. recreation, escape). While these values might provide useful information for those selling rural property, it appears that property owners expressing these values will be more difficult to engage in best-practice NRM.

6. VALUES: HELD AND ATTACHED (CONT.)

3. Seven values items are entirely/mostly positively associated with either agriculture or environment focussed best-practices [tan shading for agriculture and green for environment in Table 13]. The nature of those relationships is as expected: environmental values (e.g. habitat for birds and animals, native veg makes place attractive) positively associated with environmental best-practices; and values items focussed on building a business, producing food and fibre, source of household income, part of family wealth are positively associated with agriculture best-practices.

TABLE 11: VALUES ATTACHED TO PROPERTY, 2019 (N=663, n= 651 TO 641)

Attached values	Mean	Not important	Some importance	Important	Not Applicable
Ability to pass on a healthier environment for future generations	4.5	3%	10%	85%	2%
An attractive place/area to live ###	4.3	4%	10%	83%	4%
A great place to raise a family ###	4.3	5%	10%	71%	13%
Sense of accomplishment from building/maintaining a viable business ###	4.3	6%	8%	69%	16%
The productive value of the soil on my property *** ###	4.2	6%	12%	75%	7%
Sense of accomplishment for producing food and fibre for others ###	4.1	8%	11%	67%	14%
An asset that is an important part of family wealth ###	4.1	10%	12%	74%	4%
Native vegetation provides habitat for birds and animals ###	4.0	7%	22%	70%	2%
Native vegetation makes the property an attractive place to live ###	4.0	9%	21%	66%	4%
An important source of household income ###	4.0	14%	9%	62%	16%
Opportunity to learn new things	3.9	8%	20%	67%	5%
A place where I can escape the pressures of life ###	3.8	14%	15%	55%	16%
An asset that will fund my retirement	3.8	17%	16%	55%	12%
Provides a sense of belonging to a community	3.7	13%	23%	61%	4%
A place or base for recreation *** ###	3.6	16%	27%	51%	7%
Working on the property is a welcome break from my normal occupation *** ###	3.6	12%	9%	35%	45%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, Kruskal-Wallis rank sum test, chi-square, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test, chi-square, p<0.05

Blue shading: recreation/amenity values. Orange: social. Grey: business. Green: environment.

6. VALUES: HELD AND ATTACHED (CONT.)

TABLE 12: SIGNIFICANT DIFFERENCES IN VALUES ATTACHED TO THE PROPERTY BY FARMER IDENTITY, 2019 (N=663, n= 651 TO 641)

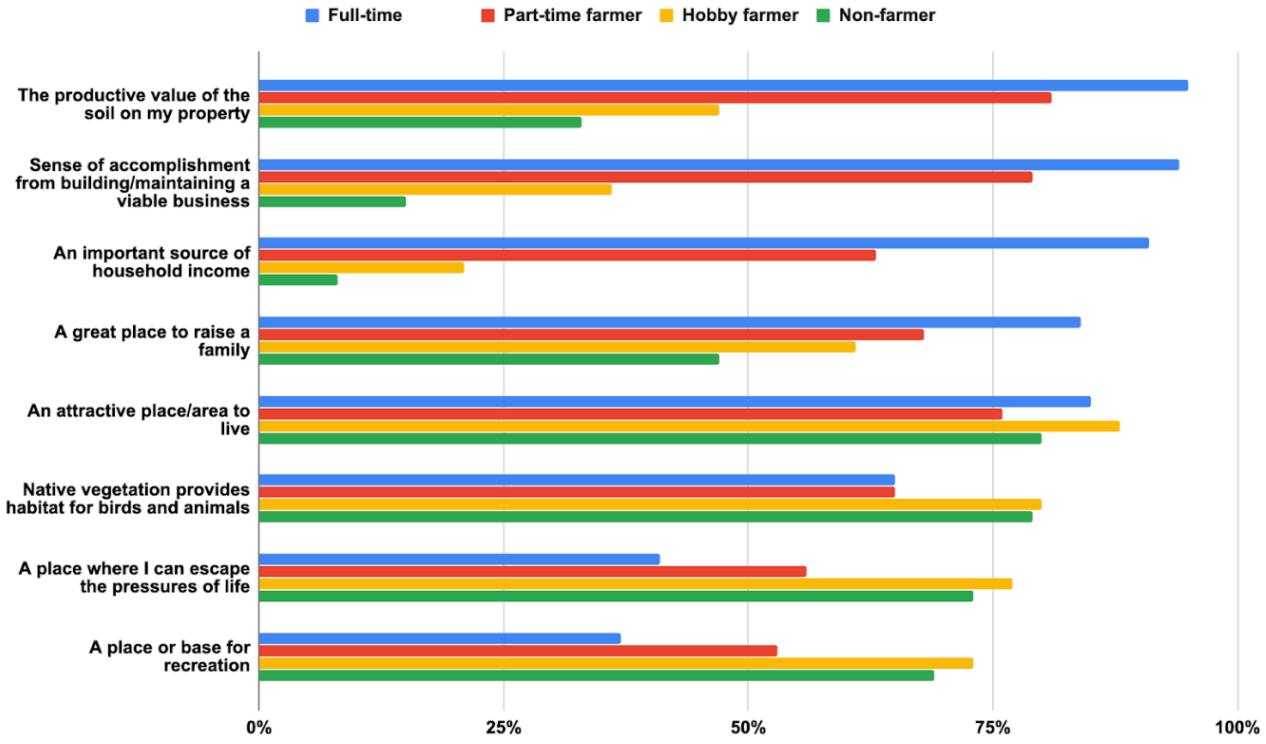
Values attached to the property	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
The productive value of the soil on my property	4.6 95%	4.2 81%	3.7 47%	3.2 33%
Sense of accomplishment from building/maintaining a viable business	4.6 94%	4.2 79%	3.3 36%	3.1 15%
An important source of household income	4.6 91%	3.7 63%	2.7 21%	2.5 8%
An asset that is an important part of family wealth	4.5 90%	3.9 68%	3.8 59%	3.5 49%
Sense of accomplishment from producing food and fibre for others	4.4 88%	4.0 75%	3.3 42%	3.2 20%
A great place to raise a family	4.5 84%	4.0 68%	4.3 61%	4.1 47%
An attractive place/area to live	4.4 85%	4.2 76%	4.6 88%	4.4 80%
Native vegetation provides habitat for birds and animals	3.9 65%	4.0 65%	4.4 80%	4.4 79%
Native vegetation makes the property an attractive place to live	3.8 62%	4.1 72%	4.1 67%	4.2 76%
A place where I can escape the pressures of life	3.4 41%	3.7 56%	4.4 77%	4.2 73%
A place or base for recreation	3.3 37%	3.6 53%	4.1 73%	4.0 69%
Working on the property is a welcome break from my normal occupation	2.9 14%	3.9 55%	4.0 63%	4.0 51%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue shading: positive linear relationship with farmer identity. Purple: negative linear relationship. Orange: partial negative linear relationship.

6. VALUES: HELD AND ATTACHED (CONT.)

FIGURE 4: SIGNIFICANT DIFFERENCES IN VALUES ATTACHED TO THE PROPERTY BY FARMER IDENTITY, 2019 BY % SELECTED IMPORTANT/ VERY IMPORTANT RATINGS (N=663, n= 651 TO 641)



6. VALUES: HELD AND ATTACHED (CONT.)

TABLE 13: SIGNIFICANT RELATIONSHIPS BETWEEN ATTACHED VALUES AND IMPLEMENTATION OF BEST-PRACTICE NRM, 2019 (N=663)

Values statements	Frequency and direction of relationship with 19 best-practices
Significant relationship with most best-practices	
Native vegetation provides habitat for birds and animals	13 practices: 4+ environment; 9- agriculture
A place or base for recreation	13 practices: All negative
Ability to pass on a healthier environment for future generations	12 practices: All positive, environment & agric
Sense of accomplishment from producing food and fibre for others	12 practices: All positive, all agriculture
An important source of household income	12 practices: 11+ agric; 1- environment
A place where I can escape the pressures of life	12: All negative
The productive value of the soil on my property	10 practices: 8+ agric; 1+ env ; 1- environment
Sense of accomplishment from building/maintaining a viable business	10 practices: All positive, all agriculture
Significant relationship with less than half best-practices	
Opportunity to learn new things	7 practices: All positive, environment & agric
Native vegetation makes the property an attractive place to live	6 practices: 4+ environment; 2- agriculture
An asset that is an important part of family wealth	6 practices: 3+ agriculture; 3- environment
Provides a sense of belonging to a community	5 practices: All positive, environment & agric
Significant relationships with a limited number of best-practices	
An asset that will fund my retirement	4 practices: 3- environment; 1+ agriculture
Work on the property is a welcome break from my normal occupation	3 practices: All negative, all agriculture
A great place to raise a family	2 practices: All positive, agriculture
An attractive place/area to live	1 practice: Positive, environment

Results of pairwise comparisons (so just two variables) using Chi square and Kruskall-Wallis rank sum tests, chi-square, p values <0.05

Purple: values positively associated with best-practice. Tan and Green: mostly positive relationship with best-practice. Yellow: negative relationship with best-practice.

6. VALUES: HELD AND ATTACHED (CONT.)

6.3 KEY FINDING FOR HELD VALUES (I.E. GUIDING PRINCIPLES)

The items in this topic are part of an established scale measuring the principles that guide respondents. Items cover three broad value sets: biospheric (green shading), altruistic (blue shading) and egoistic (brown shading). Items are listed in order of mean scores. As with the attached values topic, the response options for the guiding principles topic is different to that used in 2014. A Not applicable option was added in 2019 and so mean scores for items are not comparable, although the rank order of items based on mean scores can be compared across the two surveys [Table 14].

Survey data suggest there is considerable common ground amongst respondents; and there is close alignment between the values of most respondents and the objectives of contemporary NRM policy. For example, there are four items with mean scores of 4.0 and above and three of these items are focused on biospheric values [Table 14]. While there are significant differences for each item across the four cohorts based on farmer identity, at least three quarters of all respondents said each of these values was important [Table 15].

As in 2014, the item identified as important by most respondents was *Looking after my family and their needs* [Table 14]. It seems there remains potential for conflict between the needs of families and NRM objectives and strategies (e.g. livelihoods under threat during drought; capital values threatened by changes to planning regimes) and at least some landholders may place family first. However, the values topics (attached and held) provide information to support effective engagement.

Creating wealth and striving for a financially profitable business was identified as important by almost all Full-time farmers and over two-thirds of Part-time farmers but appears much less important for most Hobby farmers and Non-farmers [Table 15]. This result is consistent with the data presented in Table 12 for attached values and with previous research suggesting that Full-time and Part-time farmers can be distinguished from the other two cohorts based on their much stronger business orientation.

Although Full-time and Part-time farmers are significantly more likely to exhibit a business orientation there is abundant evidence that stronger farmer identity does not mean those individuals are only guided by egoistic principles. For example:

1. Biospheric values are important for almost all respondents.
2. There are no differences for egoistic values in Table 15 other than for the *Looking after my family* item.
3. For the altruistic items, Full-time and Part-time farmers are much more likely to say *Fostering equal opportunities for all community members is important*; and over 60% of respondents across the four cohorts said *Working for the welfare of others was important* [Table 14].

There is no evidence of significant change from 2014 in the importance of the values included in the two surveys. As explained above, it is not possible to compare the mean scores for the values topics across the two surveys. However it is possible to compare the rank order of the items included in both surveys. The rank order based on 2019 mean scores is identical to the rank order based on 2014 mean scores.

6. VALUES: HELD AND ATTACHED (CONT.)

There are significant differences between the farmer identity cohorts for most items (i.e. 8 of 10 items) in Table 14. Those trends are much as expected and are:

1. There are three items across looking after family, farming as a business and equal opportunities for all, (shaded blue in Table 15) where there is a positive linear relationship between farmer identity and the values item.
2. There are three items focussed on biospheric values (shaded purple in Table 15) where there is a negative linear relationship between farmer identity and the values item.
3. There are two items from the altruistic scale focussed on social welfare and social justice (no shading in Table 15) where the real difference is between the Non-farmer cohort compared to the other cohorts.

There is a very limited number of significant positive relationships between the 10 held values items and implementation of the 19 best-practice items. There are no significant, positive relationships for four held values items: *Looking after my family and their needs; Preventing pollution and protecting natural resources; Fostering equal opportunities for all community members*; and *Working for the welfare of others*. There are no significant, positive relationships with six best-practice items, including the control of pest animals and the control of non-crop weeds.

Creating wealth and striving for a financially profitable business is the held values item most frequently (9/19) associated with best-practice implementation; followed by *Respecting the earth and living in harmony with other species* and *Having power and being able to lead others* (both 5/19 and for the same practices). The latter two items are only associated with items with an environmental focus. As might be expected, *Creating wealth and striving for a financially profitable business* is associated with most best-practice items with an agriculture focus.

For three of the top four rated held values items, and this holds across all farmer identity cohorts with a minor exception [Table 15], there are no or very few significant positive relationships with best-practice items. This result is surprising. Given the extensive set of positive relationships between attached values items and best-practice implementation it seems attached values provide a better foundation for NRM practitioners setting out to engage rural property owners.

6. VALUES: HELD AND ATTACHED (CONT.)

TABLE 14: VALUES THAT GUIDE YOUR LIFE, 2019 (N=663, n= 633 TO 618)

Held values/Principles that guide your life	Mean	Not important	Some importance	Important	Not Applicable
Looking after my family and their needs ###	4.8 (4.6)	1%	2%	95%	2%
Preventing pollution and protecting natural resources ###	4.2 (4)	4%	12%	83%	1%
Protecting the environment and preserving nature *** ###	4.2 (3.9)	3%	15%	81%	Nil
Respecting the earth and living in harmony with other species *** ###	4.0 (3.8)	7%	20%	72%	1%
Creating wealth and striving for a financially profitable business *** ###	3.9 (3.7)	10%	20%	65%	5%
Working for the welfare of others ###	3.8 (3.5)	8%	25%	66%	1%
Caring for the weak and correcting social injustice ###	3.6 (3.2)	14%	28%	55%	4%
Fostering equal opportunities for all community members ###	3.4 (3.1)	19%	32%	47%	2%
Being influential and having an impact on other people and events	3.1 (2.9)	28%	35%	35%	2%
Having power and being able to lead others	2.6 (2.4)	45%	33%	18%	4%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, Kruskal-Wallis rank sum test, chi-square, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test, chi-square, p<0.05

() Data for 2014

Green: biospheric values; Brown: Egoistic values. Blue: Altruistic values.

6. VALUES: HELD AND ATTACHED (CONT.)

TABLE 15: VALUES THAT GUIDE YOUR LIFE BY FARMER IDENTITY, 2019 (N=663, N= 633 TO 618)

Held values/Principles that guide your life	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
Looking after my family and their needs	4.9 98%	4.7 97%	4.7 90%	4.8 89%
Preventing pollution and protecting natural resources	4.1 80%	4.3 87%	4.4 84%	4.4 88%
Protecting the environment and preserving nature	4.1 75%	4.3 83%	4.4 86%	4.5 89%
Respecting the earth and living in harmony with other species	3.9 65%	4.1 72%	4.3 80%	4.4 84%
Creating wealth and striving for a financially profitable business	4.3 86%	3.8 68%	3.3 40%	3.0 25%
Working for the welfare of others	3.8 65%	3.8 64%	3.8 60%	4.0 74%
Caring for the weak and correcting social injustice	3.3 45%	3.3 43%	3.4 44%	3.6 55%
Fostering equal opportunities for all community members	4.3 86%	3.8 68%	3.3 40%	3.0 25%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue: positive linear relationship with farmer identity. Purple: negative linear relationship. No shading: Non-farmers different to other cohorts.

7. BELIEFS, PERSONAL NORMS AND ATTITUDES

7.1 INTRODUCTION

Items covered beliefs about the efficacy of best-practices; beliefs about climate change; personal norms focussed on soil health; attitudes towards specific NRM policies (e.g. willow removal; and the primacy of private property rights). Results for these items except for the topic exploring confidence in best-practice are presented and discussed immediately below.

Response options are the same as in 2014 so it is possible to compare 2019 and 2014 results. As with other tables, the five options (there are six with Don't know/NA) have been collapsed into three. Means listed in the tables don't include the Don't know/NA responses.

7.2 FINDINGS FOR BELIEFS ABOUT CLIMATE CHANGE

Three items in the 2019 survey explore belief in human induced climate change, the extent resulting change is irreversible and the extent impacts will be severe [Table 16]. The 2014 survey included these items and the same response options. The 2014 data have been included in Table 16.

The 2019 survey also included three items exploring the extent financial or on-property management has changed in the past 12 months as a result of considering climate change; opportunities to capture carbon; and opportunities to reduce emissions [Table 16]. These items have not been included in previous social benchmarking surveys. Respondents were only able to select from Yes or No.

The first finding is that a small majority (60%) believe humans are changing the climate. It seems these respondents also believe there will be dire consequences if no action is taken but are optimistic that it is not too late to take action [Table 16]. At the same time, about 40% of respondents indicated they did not believe or were uncertain about whether humans are changing the climate.

Less than one-in-five of the 2019 respondents said they had changed their financial or on-property operations in the past 12 months as a result of considering the three climate-related items [Table 16]. It may be that a more extensive list of possible adaptations (e.g. to water supplies, cropping or pasture types and methods of sowing or managing, stock management) will prompt more respondents to indicate they have made changes in response to climate change. It is also possible that nominating a longer-time frame (e.g. five years) will result in more respondents indicating they have adapted their operations in response to climate change.

Data in Table 16 suggests there has been an increase since 2014 in the belief that human activity is leading to climate change; and that the impacts of climate change will be severe if no action is taken [e.g. mean scores and % that agree in Table 16].There has also been an increase in the proportion of respondents who agree that it is not too late to take action to address climate change [Table 16].

There are significant differences across the farmer identity cohorts for each of the three belief items in Table 16 and for three items there are significant differences by LGA. In summary, the key difference across the LGA is that respondents in areas closer to Melbourne and the large regional centres are more likely to accept that human induced climate change is a reality. For example, for the Mt Alexander LGA, 86% agree; Macedon

Ranges LGA, 79% agree; Greater Bendigo LGA, 72%; whereas in the Swan Hill LGA, 39% agree; Buloke LGA, 35%; Campaspe LGA, 42%.

There are some large differences in the proportion of respondents in each farmer identity cohort who agree with each of the statements in Table 17. For example, less than half (48%) of the Full-time farmers compared to 83% of Hobby farmers agree that Human activities are influencing changes in climate [Table 17]. Those with a stronger farmer identity are also more pessimistic about there being time to act and address climate change. However, those with stronger farmer identity are more optimistic about the capacity of landholders in their region to adapt to expected changes in rainfall patterns [Table 17]. It seems that Full-time and Part-time farmers have distinguished between the extensive list
of global impacts of climate change and changes in rainfall patterns that are expected to affect their region and to which they may already be responding.

There are also significant differences across the four farmer cohorts for two items exploring adaptation in the past 12 months as a result of considering climate change; and opportunities to reduce carbon emissions [Table 16]. Perhaps contrary to expectations based on differences in beliefs about climate change, the substantive differences for the two adaptation items are between Full-time and Part-time who are more likely to have made changes than Hobby and Non-farmers [Table 17].

These results appear to have important implications for those engaging property owners around the broad topic of climate adaptation. As social researchers examining this topic, it seems there is more at play than exposure to scientific information. Climate change appears to be a term that arouses intense feelings amongst some property owners who believe farmers are blamed for changes in climate and will be forced to carry more than their fair share of the burden of cutting carbon emissions. We are aware that NRM practitioner engagement with property owners is increasingly focussed on the adaptations that property owners can and are making in response to changing weather patterns. The term “weather patterns” appears to be less emotive/ threatening and perhaps more fitted to the lived experience and the future work and life horizons of most Full-time and Part-time farmers. Evidence from across the survey topics supporting this conclusion include that:

1. *Changes in weather patterns* is the district scale issue listed as important by the most respondents (i.e. 71%).
2. Over 60% of Full-time and over 70% of Part-time farmers agree that *Primary producers should do all they can to reduce carbon emissions from their activities* [Table 17].
3. Over half of the Full-time and Part-time farmers in this survey are *Confident landholders in this region can adapt to expected changes in rainfall patterns*.

There is only one significant, positive relationship between the three items measuring belief in human induced climate change and the 19 best-practice items. That relationship was for *Prepared a habitat assessment for native plants.*

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

TABLE 16: BELIEFS ABOUT CLIMATE CHANGE, 2019 AND 2014 (N=663, n=644 TO 638)

Belief about climate change	Mean	Disagree	Neutral	Agree	Don't know/ NA
Human activities are influencing changes in climate *** ###	3.7 (3.5)	14% (18%)	23% (28%)	60% (53%)	3% (2%)
It is not too late to take action to address climate change ###	3.7 (3.6)	9% (10%)	25% (31%)	62% (53%)	4% (6%)
I'm confident landholders in this region can adapt to expected changes in rainfall patterns *** ###	3.6	11%	27%	58%	4%
If we do nothing, climate change will have dire consequences for all living things, including humans *** ###	3.6 (3.3)	18% (24%)	24% (27%)	55% (45%)	3% (4%)
Change in financial or on-property operation past 12 months as a result of considering:					**% Yes**
Climate change ###					17%
Opportunities to capture carbon (e.g. by revegetation, soil management ###					13%
Opportunities to reduce carbon emissions (e.g. solar, wind, gravity systems)					17%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, Kruskal-Wallis rank sum test, chi-square, p<0.05

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test, chi-square, p<0.05

() Data for 2014

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

FIGURE 5: BELIEFS ABOUT CLIMATE CHANGE, 2019 (N=663, n=644 TO 638)

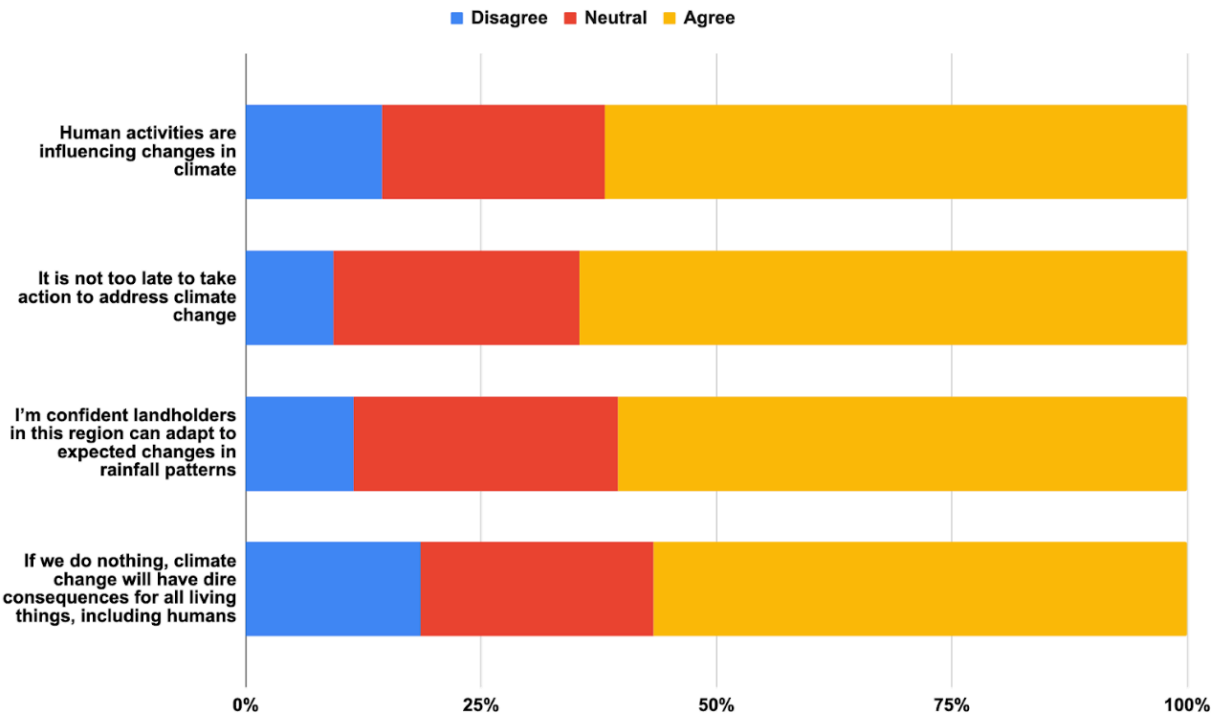


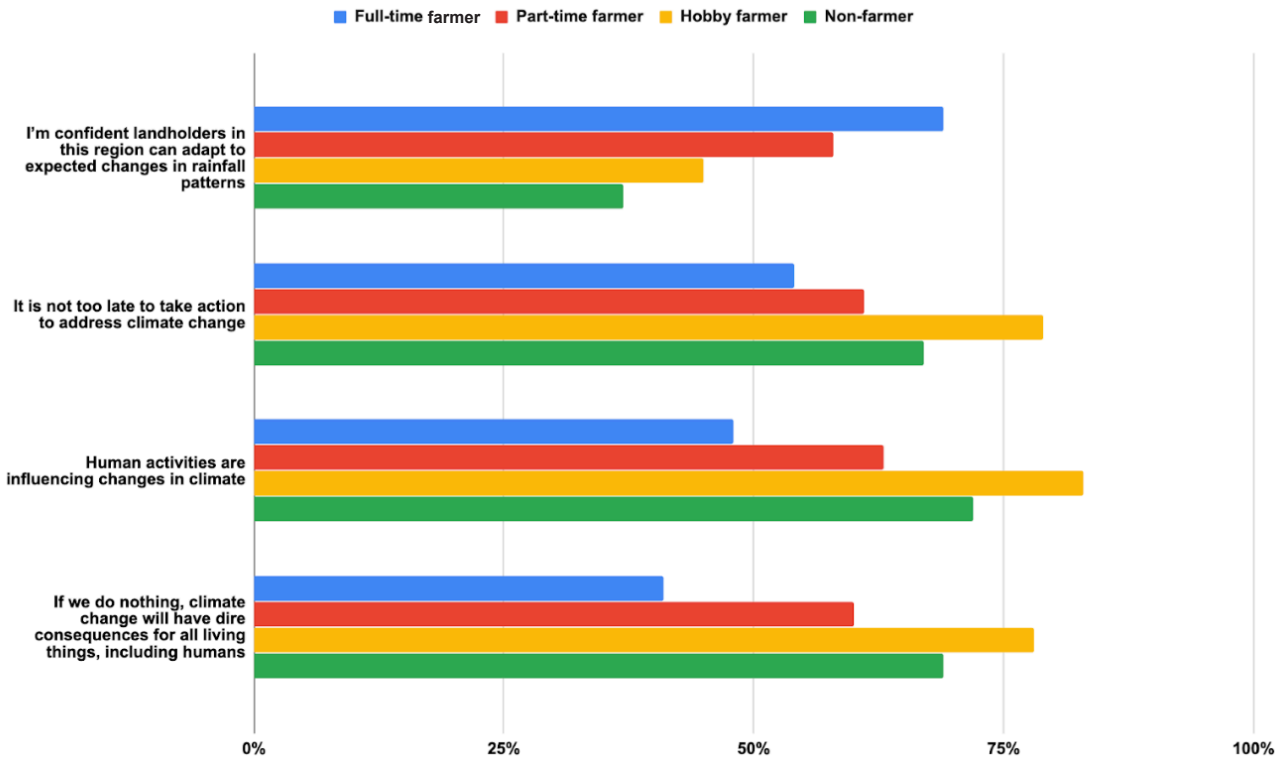
TABLE 17: SIGNIFICANT DIFFERENCES IN BELIEFS ABOUT CLIMATE CHANGE BY FARMER IDENTITY, 2019 (N=663, n=640 TO 638)

Belief about climate change	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
I'm confident landholders in this region can adapt to expected changes in rainfall patterns	3.7 69%	3.5 58%	3.3 45%	3.3 37%
It is not too late to take action to address climate change	3.6 54%	3.6 61%	4.1 79%	3.9 67%
Human activities are influencing changes in climate	3.4 48%	3.7 63%	4.2 83%	4.1 72%
If we do nothing, climate change will have dire consequences for all living things, including humans	3.2 41%	3.7 60%	4.2 78%	4.1 69%
Change in on-property operation past 12 months as a result of considering:				
Climate change	18%	22%	12%	8%
Opportunities to capture carbon (e.g. by revegetation, soil management	15%	19%	8%	7%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue: positive linear relationship with farmer identity. Orange: negative linear relationship. No shading: non-linear negative relationship.

FIGURE 6: BELIEFS ABOUT CLIMATE CHANGE BY FARMER IDENTITY, 2019 (N=663, N=644 TO 638)



7.3 FINDINGS FOR BELIEFS AND ATTITUDES ABOUT NRM POLICY, PLANS AND PRACTICES

7.3.1 Beliefs and attitudes about NRM policy and management

Only one-in-three of the survey respondents believe applying water for the environment under the Murray-Darling Basin Authority (MDBA) Plan will be effective (i.e. improve waterways and wetlands). There is no change since 2014 in the mean score or proportions selecting the different response options for this item [Table 18]. There are significant differences across the LGA and the farmer identity cohorts for this item and this is one of the few instances where those trends appear stronger by geography rather than farmer identity. The pattern is for significantly less acceptance of the efficacy of environmental water in the LGA closer to the Murray River and the major irrigation districts and more acceptance in the LGA closer to major urban areas in the southern part of the region. For example, in the Macedon Ranges LGA the mean is 3.8 and 57% agreed with the statement, Ballarat 3.7, 50%, Mount Alexander 3.6 46%, Greater Bendigo 3.5, 50%; compared to Swan Hill 2.3, 12%, Campaspe 2.3, 14%, Gannawarra 2.4, 23%, Buloke 2.8, 23%). Of course, there are higher proportions of Full and Part-time farmers in the northern LGA and information in Table 19 reveals the significant negative and linear relationship between farmer identity and belief in the efficacy of environmental watering.

One of the items in this topic explored both the acceptability of environmental watering and belief in private property rights: *If landholders are informed in advance, it would be acceptable to cause minor floods for*

environmental purposes. Only 29% of respondents agreed with this statement [Table 18]. This item was also included in the 2014 survey and both the mean score and proportion of respondents agreeing with the statement are lower in 2019 [Table 18]. There are significant differences across the LGA and these are consistent with the pattern identified in the previous paragraph. There is also a significant negative linear relationship between farmer identity and support for minor flooding for environmental watering [Table 19].

About half of all respondents agreed that *Aboriginal people should be able to negotiate access with individual landholders to visit cultural sites*. This item was included in the 2014 survey and there is no apparent trend in the data given that the mean score is 0.1 higher in 2019 and 49% of respondents agreed with the statement in both 2014 and 2019 [Table 18]. There are significant differences across LGA and with farmer identity. Those with stronger farmer identity are less likely to support this proposal [Table 19].

Amongst other things, five of the items in Table 18 (all of the items listed under the attitudes section) explore aspects of belief in the primacy of private property rights. As with past social benchmarking surveys, it seems many property owners are concerned about or reluctant to relinquish what they believe is their right to manage the natural resource base of their property as they decide and to control access by others to property they manage. There is only one item where a majority of all respondents agree with a statement that involves action that will infringe on private property rights (i.e. *Primary producers should do all they can to reduce carbon emissions*) [Table 18]. It appears that between 40% and 50% of respondents believe their rights as a private property owner trumps wider or public interests in NRM. For example, 50% disagreed with the statement *The public should be able to access crown land managed by private landholders*. Over forty percent agreed that *Landholders should have the right to harvest rainfall on their property, even if that action impacts on others* [Table 18].

Four items exploring attitudes about private property right have been included in the 2019 and 2014 surveys [Table 18]. There are some trends in these data but these are inconsistent. For example, in 2019 there appears to be less support for environmental watering if it involves flooding private property; but respondents are less likely to agree that Landholders should have the right to harvest rainfall on their property even if that action impacts on others

There are some significant relationships between items exploring attitudes about private property rights and best-practice implementation. Those more likely to accept limits on private property rights are more likely to implement a number of practices. For example, agreement with the statement *The public should be able to access crown land managed by private landholders* is positively associated with being more likely to implement practices that have a substantial public benefit element (e.g. those practices expected to improve water quality), including *Prepared a nutrient budget; Tested soils for nutrient status*; and *Prepared a habitat assessment for native plants.*

There are significant differences across the farmer identity cohorts for eight of the nine items in Table 18. In all but one case there is a distinct linear relationship (positive shaded blue, negative shaded orange). There is a positive relationship between farmer identity and personal commitment to maintain the productive capacity of their soil; and a negative relationship between farmer identity and acceptance of the efficacy of environmental watering as well as with suggestions that would infringe private property rights [Table 19].

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

Most respondents (i.e. 82%) and almost all Full-time and Part-time farmers (93% and 90% respectively) have a personal commitment to maintain the productive capacity of their soil (i.e. a positive personal norm) [Tables 18 &19]. What is just as striking is the extent of significant positive relationships between this personal norm and implementation of best-practice NRM (15/19 practices). These relationships extend across both soil management and biodiversity conservation as more traditionally viewed. The four exceptions are: *Established an irrigation tailwater reuse system; Deep ripped arable land; Planted Lucerne;* and *Fenced waterways & wetlands to manage stock access.*

At the same time, only 30% of all respondents expressed a personal commitment to being part of a soil health group and there is little difference for Full-time and Part-time farmers (35% and 33% respectively) [Table 19]. There are no expected significant relationships between this item and implementation of any of the soil related best-practices.

These results suggests most respondents have a personal commitment to maintaining the productive capacity of their soil and that this is/can be the foundation for taking action to implement best-practices. With just 5.5% (n=637) of respondents engaged through soil health groups, there also appears scope to engage more property owners in those groups, although Landcare groups engage a larger cohort of respondents.

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

TABLE 18: BELIEFS, PERSONAL NORMS AND ATTITUDES ABOUT NRM POLICY AND MANAGEMENT, 2019 (N=663, n=643 TO 635)

Beliefs about NRM	Mean	Disagree	Unsure	Agree	Don't know/NA
Biological activity is an important indicator of the productive capacity of soils ###	4.1	1%	18%	76%	5%
The increased allocation of water for the environment under the Murray Darling Basin Plan will improve the health of waterways & wetlands *** ###	3.1 (3.1)	29%	28%	35%	9%
Personal norms related to soil management					
I feel a personal responsibility to maintain my soil's productive capacity ###	4.1 (4.2)	3%	9%	82%	6%
I feel a personal responsibility to be part of a soil health group ###	3.1 (3.1)	23%	35%	30%	11%
Attitudes towards NRM					
Primary producers should do all they can to reduce carbon emissions from their activities *** ###	3.8	9%	21%	68%	2%
Aboriginal people should have the right to negotiate access with individual landholders to visit important cultural sites *** ###	3.3 (3.2)	23%	25%	49% (49%)	3%
Landholders should have the right to harvest rainfall on their property, even if that action impacts on others	3.2 (3.4)	27%	30%	41% (50%)	2%
If landholders are informed in advance, it would be acceptable to cause minor floods for environmental purposes *** ###	2.9 (3.1)	32%	32%	29% (39%)	7%
The public should be able to access crown land managed by private landholders (e.g. unused roads)*** ###	2.6	50%	24%	24%	2%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, Kruskal-Wallis rank sum test, chi-square, $p<0.05$

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test, chi-square, $p<0.05$

() Data for 2014

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

TABLE 19: SIGNIFICANT DIFFERENCES IN BELIEFS, PERSONAL NORMS AND ATTITUDES ABOUT NRM POLICY AND MANAGEMENT BY FARMER IDENTITY, 2019 (N=663, n=643 TO 635)

Beliefs about NRM	**Full-time farmer**	**Part-time farmer**	**Hobby farmer**	**Non-farmer**
Biological activity is an important indicator of the productive capacity of soils	4.1 83%	4.0 78%	3.9 70%	4.0 60%
The increased allocation of water for the environment under the Murray Darling Basin Plan will improve the health of waterways & wetlands	2.6 22%	3.0 36%	3.8 56%	3.9 52%
Personal norms related to soil management				
I feel a personal responsibility to maintain my soil's productive capacity	4.3 93%	4.2 90%	3.8 80%	3.7 45%
I feel a personal responsibility to be part of a soil health group	3.2 35%	3.1 33%	2.8 18%	3.1 24%
Attitudes towards NRM				
Primary producers should do all they can to reduce carbon emissions from their activities	3.6 63%	3.8 73%	3.9 74%	4.1 76%
Aboriginal people should have the right to negotiate access with individual landholders to visit important cultural sites	3.0 40%	3.4 57%	3.6 54%	3.7 63%
If landholders are informed in advance, it would be acceptable to cause minor floods for environmental purposes	2.6 20%	2.8 29%	3.3 42%	3.5 43%
The public should be able to access crown land managed by private landholders (e.g. unused roads)	2.2 14%	2.7 27%	3.1 37%	3.2 36%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue: positive linear relationship with farmer identity. Orange: negative linear relationship. No shading: non-linear positive relationship.

7.3.2 Confidence in best-practice NRM

There are ten items in this topic exploring confidence in the efficacy of NRM best-practices [Table 20]. The 2014 survey included seven topic and these are all in the 2019 survey. The new items in 2019 examined confidence in deep-tillage and subsoil modification; willow removal; and the application of gypsum.

Respondents were invited to indicate the extent they agreed with each statement. The six response options have been collapsed to present the summary in Table 20.

There will be some best-practices that are not relevant to different property owners because of their enterprise mix, landscape type, the scale of their enterprise or other factors. For example, stubble retention is more relevant to croppers than graziers. However, each of the practice was included because it should be relevant for most properties. Respondents were also able to select the Don't know/Not appropriate response option and from 2% to 15% made that choice for the items in this topic.

The first finding is that more than 50% of respondents agreed with statements supporting the efficacy of eight of the ten best-practices listed. The exceptions were for the new inclusions in the 2019 survey: deep-tillage and subsoil modification); and willow removal [Table 20 and Figure 7]. In the case of deep- tillage and subsoil modification the intention was to benchmark a practice expected to be the focus of future NRM extension effort. The North Central CMA is aware that willow removal is a contentious practice for some rural property owners. The social acceptability of willow removal has been explored in the region in the context of environmental watering in the Gunbower Island forest (Mendham and Curtis 2018).

The second finding is that with the exception of the soil testing item, there were significant differences across the four farmer identity cohorts in the level of agreement (i.e. confidence) in best-practices [Table 20]. The pattern is for the farmer cohorts to exhibit more confidence in practices focussed on agriculture and the non-farmer cohorts to be more confident in practices focussed on the environment [Table 21]. It is important to note that even amongst non-farmers, most respondents did not believe *The cost of willow removal is justified*. Interestingly, there is no significant difference in the low levels of support for willow removal across the LGA. It is also important to note that most farmers exhibit confidence in fencing to manage stock access to waterways and wetlands and watering stock off-stream [Table 21].

A third finding is of no substantive differences in the mean scores or rank order for the eight items included in both the 2014 and 2019 surveys. To the extent there is any trend, it is towards increased confidence in these best-practices [Table 20].

A key finding is there is a consistent trend for confidence in best-practice to be positively associated with adoption of practices across both the environmental management and agriculture themes. Eight of ten items in Table 20 have a companion best-practice item and for six of those there is a significant positive relationship with the most relevant best-practice and for another item, for a directly relevant best-practice [Table 22].

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

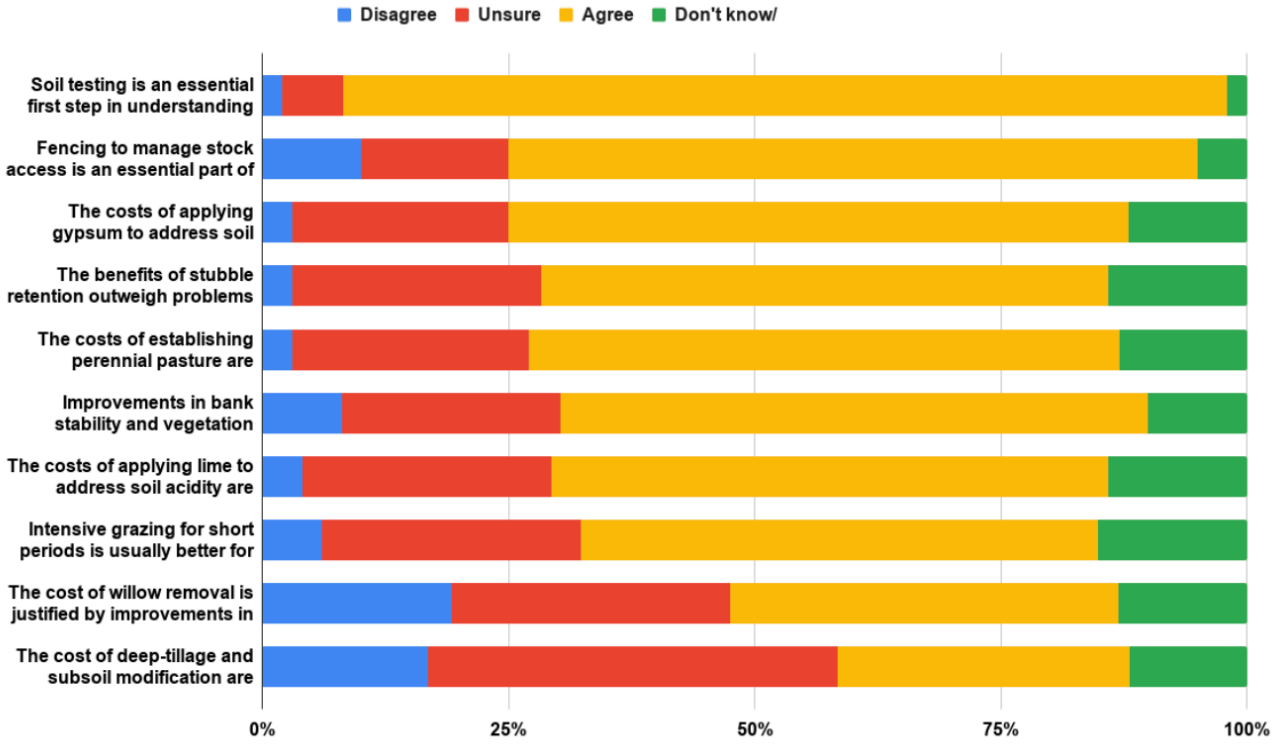
TABLE 20: CONFIDENCE IN BEST-PRACTICE NRM (N=663, n= 643 TO 636)

STATEMENTS ASSESSING CONFIDENCE	MEAN	DISAGREE	UNSURE	AGREE	DON'T KNOW/NA
Soil testing is an essential first step in understanding soil condition	4.2 (4.2)	2%	8%	88%	2%
Fencing to manage stock access is an essential part of the work required to protect the health of waterways and wetlands ###	3.9 (3.8)	10%	15%	70%	5%
The costs of applying gypsum to address soil sodicity are justified by increased production ###	3.9	3%	22%	63%	12%
The benefits of stubble retention outweigh problems arising from the practice ###	3.8 (3.8)	3%	26%	57%	14%
The costs of establishing perennial pasture are justified by the returns *** ###	3.8 (3.7)	3%	24%	60%	13%
Improvements in bank stability and vegetation condition justify the costs of watering stock off-stream ###	3.8 (3.7)	8%	22%	59%	11%
The costs of applying lime to address soil acidity are justified by increased production ###	3.8 (3.7)	4%	25%	56%	14%
Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking ###	3.7 (3.6)	6%	26%	52%	15%
The cost of willow removal is justified by improvements in the condition of river banks & river health ###	3.3	19%	28%	39%	13%
The cost of deep-tillage and subsoil modification are justified by increased production ###	3.2	17%	42%	30%	12%

Significant differences using Kruskall-Wallis rank sum tests with chi-square p values <0.05

7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

FIGURE 7: CONFIDENCE IN BEST-PRACTICE NRM (N=663, n= 643 TO 636)



7. BELIEFS, PERSONAL NORMS AND ATTITUDES (CONT.)

TABLE 21: CONFIDENCE IN BEST-PRACTICE NRM BY FARMER IDENTITY (N=663, n= 643 TO 636)

Statements assessing confidence	Full-time farmer	Part-time farmer	Hobby farmer	Non-farmer
The costs of applying gypsum to address soil sodicity are justified by increased production	4.1 81%	3.8 67%	3.4 41%	3.4 28%
The costs of applying lime to address soil acidity are justified by increased production	4.0 71%	3.7 63%	3.4 38%	3.3 27%
The costs of establishing perennial pasture are justified by the returns	4.0 73%	3.8 68%	3.6 46%	3.6 28%
The benefits of stubble retention outweigh problems arising from the practice	4.0 71%	3.7 59%	3.5 36%	3.6 32%
Fencing to manage stock access is an essential part of the work required to protect the health of waterways and wetlands	3.8 65%	4.0 76%	4.1 82%	4.0 71%
Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking	3.8 56%	3.8 60%	3.6 48%	3.7 35%
Improvements in bank stability and vegetation condition justify the costs of watering stock off-stream	3.7 56%	3.9 66%	4.0 75%	3.9 52%
The cost of deep-tillage and subsoil modification are justified by increased production	3.3 39%	3.1 27%	2.9 14%	2.8 14%
The cost of willow removal is justified by improvements in the condition of river banks & river health	3.2 34%	3.4 43%	3.3 44%	3.6 47%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Blue: positive linear relationship with farmer identity. Orange shading: negative linear relationship

TABLE 22: RELATIONSHIPS BETWEEN CONFIDENCE IN BEST-PRACTICES AND IMPLEMENTATION OVER FULL-PERIOD OF MANAGEMENT, 2019 (N=663, n=643 TO 636)

Confidence measure	Relationships with relevant best-practices
The costs of applying lime to address soil acidity are justified by increased production	Positive: Applied at least one application of lime to arable land
The costs of applying gypsum to address soil sodicity are justified by increased production	Positive: Applied soil ameliorants other than fertiliser and lime (e.g. gypsum)
Soil testing is an essential first step in understanding soil condition	Positive: Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past
The benefits of stubble retention outweigh problems arising from the practice	Positive: Used minimum or no tillage techniques to establish crops/pastures
The cost of establishing perennial pasture are justified by increased production	Positive: Sown perennial pasture other than Lucerne; Sown Lucerne
Fencing to manage stock access is an essential part of the work required to protect the health of waterways and wetlands	Positive: Fenced waterways & wetlands to manage stock access
Improvements in bank stability and vegetation condition justify the costs of watering stock off-stream	No relationship: Established off-stream watering points. Positive: Fenced waterways & wetlands to manage stock access
The cost of deep-tillage and subsoil modification are justified by increased production	No relationship: Deep ripped arable land
Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking	No direct measure.
The cost of willow removal is justified by improvements in the condition of river banks & river health	No direct measure.

Note: Results of pairwise comparisons (so just two variables) using Kruskall-Wallis rank sum tests, p values <0.05

Brown: significant positive relationship with agricultural best-practices. Green: significant positive relationship with environmental best-practices.

8. FARMER IDENTITY

8.1 INTRODUCTION

As explained in the Conceptual framework, the research team has applied a four cohort farmer identity typology in social benchmarking surveys, most recently in the Wimmera and in 2019, the North Central region. The typology is based on research undertake with Theresa Groth during her PhD that drew on 2014 North Central region survey data. More recent workshops with North Central CMA staff, the Victorian Serrated Tussock Working Party and with Landcare facilitators in the Barwon district confirm that the typology can be readily applied by practitioners.

The 2014 survey employed a three cohort typology and 52% of respondents said they were a Full-time farmer, 30% a Part-time farmer and 18% a Non-farmer. However, 75% of those selecting the Part-time farmer option had listed a non-farmer occupation in the open-ended survey item. Reflecting on that information, Theresa subsequently re-analysed the 2014 survey data and developed the four cohort typology employed in the 2016 Wimmera survey and the 2019 North Central survey.

As published in the *Australian Geographer* paper, additional analysis of the 2014 survey data established that 48% of rural property owners were Full-time farmers, 31% Part-time farmers, 11% Hobby farmers and 10% were Non-farmers (Groth and Curtis 2017). The additional analysis also established significant variation in the relative importance of each cohort across the North Central region and these variations were presented using a series of maps. In the paper the authors also identified and explored the key spatial patterns in the distribution of the four-cohorts across the region. In brief, the key patterns reflected distances from major urban centres, the location of irrigation districts and the quality of soils (e.g. areas of poor soils).

The results/findings presented below cover the extent of farmer identity; variation in the distribution of the four cohorts across the LGA; the attributes of each farmer identity cohort; and relationships between farmer identity and implementation of best-practice NRM.

8.2 KEY FINDINGS

8.2.1 The extent of farmer identity

For the open-ended item, there are 604 responses and these individuals listed 124 different occupations or mix of occupations. Farmer was listed by >300 and when combined with three other farmer related listings, there are 326 Farmers, comprising 54% of the total (59% in 2014).

When respondents (n=638) were asked to select from one of the four farmer identity cohorts, 49% nominated as a Full-time farmer, 19% as a Part-time farmer, 13% as a Hobby farmer and 19% as a Non-farmer. These data suggest that Full-time farmers are now a minority cohort (down from 52% in 2014). Compared to 2014 a larger proportion of respondents identify as Non-farmers and a smaller proportion as Part-time farmers.

8.2.2 Distribution of the four farmer identity cohorts by LGA

As expected, LGA located further from Melbourne and the large regional centres of Ballarat and Bendigo have the highest proportion of Full-time farmers and the lowest proportion of Hobby and Non-farmers. Part-time farmers are more evenly distributed with the exception of the Buloke Shire where almost all respondents identified as Full-time farmers [Table 23 and Map 2].

It seems that farmer identity can be used as an indicator of multi-functionality. That is, where a mix of production, amenity (e.g. recreation) and environmental values are expressed in the landscape. It seems there are five LGA that are mostly productivist social landscapes (i.e. agricultural values dominate) and in Table 23 these LGA are shaded tan; and seven LGA that are mostly multi-functional social landscapes (no shading and green shading) [Table 23].

The extent of that diversity is illustrated further in the LGA profiles provided later.

8.2.3 Attributes of the four farmer identity cohorts, including links with best-practice

There are significant differences across the four cohorts based on farmer identity for almost all survey items. Differences across attached and held values, beliefs, personal norms, attitudes, and concern about issues have been presented and discussed in earlier sections of the report. Differences for the risk and trust topics, the knowledge of NRM topic, sources of NRM information topic and enterprise type topic are identified and discussed in later sections. This section provides information about differences in key personal and property attributes [Table 25] and in the implementation of best-practice NRM [Table 24].

Most respondents across the four cohorts reported they had *Planted trees and shrubs*, *Each year worked to control non-crop weeds* and *Each year worked to control pest animals* [Table 24]. A majority of Full-time farmers implemented nine practices, Part-time farmers six practices, Hobby-farmers four practices and Non-farmers two practices. For Hobby-farmers and Non-farmers, those best-practices all address aspects of environmental management.

There are significant differences across the four cohorts for the implementation of 18 of 19 items assessing the implementation of best-practice NRM [Table 24]. Full-time and Part-time farmers are more likely to be engaged in platforms and processes expected to effect change in NRM [Table 25]; and are more likely to be implementing almost all practices than are respondents in the other two cohorts (so for 16 of 19 practices) [Table 25].

For many items there is little difference between the proportion of Full-time and Part-time farmers implementing each practice. However, there are often large differences between the proportion of Part-time and Hobby Farmers implementing practice [Table 24]. For example, there are 8 practices where Part-time farmers are at least twice as likely to implement that practice. This contrast highlights the value of moving from a three cohort typology as in the 2014 report (i.e. based on Full-time, Part-time, Non-farmer) to a four-cohort typology.

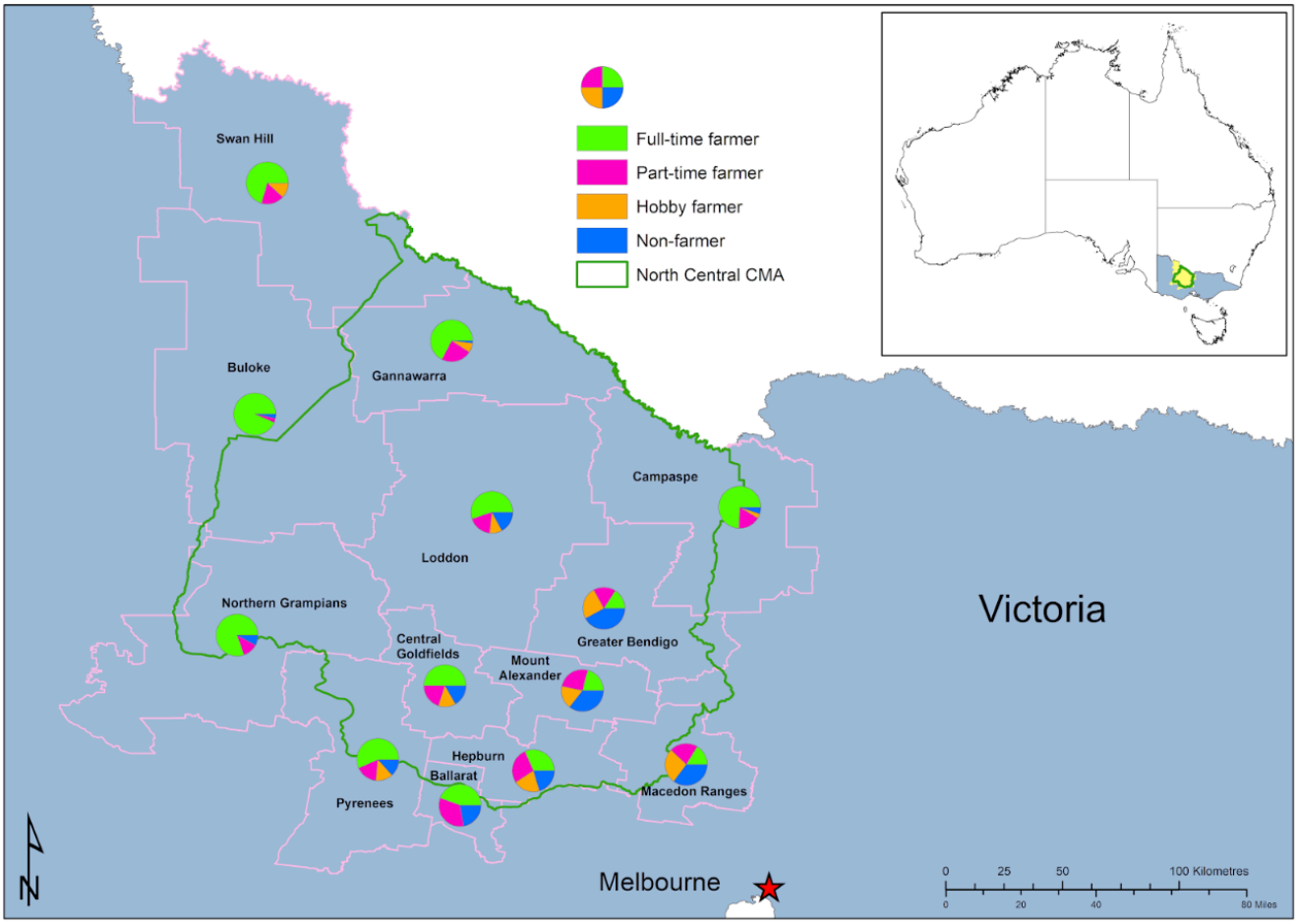
8. FARMER IDENTITY (CONT.)

With two exceptions (median age and attendance at field days/farm walks/demonstrations in past year), there are significant differences across the four farmer identity cohorts for almost all items exploring property and personal attributes [Table 25]. Mostly those differences are as expected, but provide useful insights about engagement in local organisations (e.g. soil health, commodity and Landcare) and processes (e.g. field days, short courses); capacity to engage in NRM (e.g. time on property, residency on property, on and off-property work, income from agriculture, enterprise scale).

Those self-identifying as Full-time farmers are a minority (slight) of all respondents. Nevertheless, this cohort manages 80% of the land area owned by respondents within the region and Full-time farmers are significantly more likely to manage additional land owned by others (mean of 163 ha). Given that <50% of this cohort implemented 10 of 19 best practices over their full-period of management, it may seem logical for NRM practitioners to focus engagement on this cohort. Indeed, data in Table 24 suggests that this is occurring, either by intention or simply as a result of long-established networks between Full-time farmers and NRM extension staff. That may be a sensible approach where Full-time farmers are managing critical parts of a landscape (i.e. high value assets under threat). A nuanced approach should also consider the extent other engagement objectives are relevant. For example, does the North Central CMA want to engage a cross section of property owners to improve NRM literacy, enhance voter commitment to NRM, and motivate people to volunteer to work with local and non-government organisations?

8. FARMER IDENTITY (CONT.)

MAP 2: FARMER IDENTITY COHORTS BY LGA, 2019 (N=663)



8. FARMER IDENTITY (CONT.)

TABLE 23: DISTRIBUTION OF FOUR FARMER IDENTITY COHORTS BY LGA, 2019 (N=663, n=638)

Local Government Area	Full-time Farmers	Part-time Farmers	Hobby farmers	Non-Farmers
Buloke (n=31)	93%	3%	Nil	3%
Northern Grampians (n=51)	80%	12%	Nil	8%
Campaspe (n=58)	74%	17%	3%	5%
Swan Hill (n=17)	71%	18%	12%	Nil
Gannawarra (n=55)	67%	24%	7%	2%
Pyrenees (n=30)	57%	17%	13%	13%
Loddon (n=105)	55%	18%	10%	17%
Central Goldfields (n=30)	50%	20%	13%	17%
Hepburn (n=54)	32%	28%	20%	20%
Mount Alexander (60)	21%	26%	18%	36%
Macedon Ranges (n=37)	16%	22%	27%	35%
Greater Bendigo (n=88)	16%	17%	25%	42%
Mitchell (n=9)	N/A	N/A	N/A	N/A
Ballarat (n=9)	N/A	N/A	N/A	N/A
Total	49%	19%	13%	19%

Tan shading: productivist (i.e. focussed on agriculture) landscapes. Green shading: multi-functional (i.e. a mix of values) landscapes. No shading: transitional/multi-functional landscapes.

8. FARMER IDENTITY (CONT.)

TABLE 24: IMPLEMENTATION OF BEST-PRACTICE NRM FOR FULL-PERIOD OF MANAGEMENT BY FARMER IDENTITY, 2019 (N=663)

Best-practice NRM	Full-time (n=312)	Part-time (n=121)	Hobby (n==81)	Non-farmer (n=124)
Each year worked to control non-crop weeds	89%	85%	62%	60%
Each year worked to control pest animals	80%	72%	52%	41%
Used minimum or no tillage techniques to establish crops or pastures	75%	53%	25%	14%
Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past	73%	55%	22%	8%
Planted trees and shrubs (n=318)	70%	68%	69%	55%
Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)	67%	40%	22%	17%
Sown Lucerne	58%	41%	14%	7%
Sown perennial pasture other than Lucerne	55%	42%	21%	11%
Applied at least one application of lime to arable land	51%	44%	22%	10%
Fenced native bush/grasslands to manage stock access (n=223)	47%	47%	53%	29%
Used precision farming techniques for cropping	47%	26%	9%	4%
Fenced waterways & wetlands to manage stock access (n=169)	41%	60%	40%	16%
Used time controlled or rotational grazing	42%	45%	27%	14%
Established off-stream watering points (n=145)	35%	34%	26%	13%
Prepared a nutrient budget for all/most of the property	32%	13%	4%	3%
Deep ripped arable land	26%	17%	11%	6%
Established an irrigation tailwater reuse system	21%	12%	2%	3%
Established permanent grassed waterways in drainage lines (n=62)	19%	17%	11%	3%
Prepared a habitat assessment for native plants ***	11%	9%	12%	15%

Shading indicates where >50% of each cohort has implemented a best-practice.

Green shading: environmental best-practices. Brown: agricultural best-practices.

8. FARMER IDENTITY (CONT.)

TABLE 25: SIGNIFICANT DIFFERENCES ACROSS FOUR FARMER IDENTITY COHORTS BY KEY PROPERTY AND PERSONAL ATTRIBUTES, 2019 (N=663)

Key attributes **Medians unless indicated used mean**	**Full-time (49%)**	**Part-time (19%)**	**Hobby (13%)**	**Non-farmer (19%)**
Property size (n=605)	800 ha	142 ha	30 ha	30 ha
Bought additional land in region past 20 years (n=616)	71%	35%	10%	12%
Subdivided or sold part of property past 20 years (n=630)	20%	22%	10%	6.5%
Rural properties owned (n=561) mean score	2.4	2.8	1.2	2.9
Property leased, share farmed or agisted by others (n=662) mean score	34 ha	79 ha	11 ha	66 ha
Property leased, share farmed or agisted from others (n=638) mean score	385 ha	41 ha	11 ha	7 ha
Irrigated in 2018/19 season (n=644)	36%	26%	19%	6%
Irrigated surface/ground water (n=170)	84%/26%	72%/24%	71%/13%	53%/25%
Gender of respondent (n=608)	12% female	25%	30%	42%
Resident on property (n-=630)	87%	60%	76%	49%
Length of family ownership (614)	74 years	40 years	25 years	21 years
Other family members working full-time on property (n=501)	52%	14%	5%	2%
Paid off-property work last 12 months (n=472) mean score	12 days	133 days	102 days	114 days
Hours work on-property per week (n=572)	50 hours	20 hours	10 hours	4 hours
Income from agriculture in North Central region 2018/19 (n=632)	96%	81%	28%	13%
% of all survey respondents net profit agriculture >$50K (n=663)	45%	13%	Nil	Nil
Received net off-property income 2018/19 (n=360)	42% me 58% spouse	88% me 13%	87% me 14%	89% me 11%
% all survey respondents net off-property income >$50K (n=663)	18%	55%	41%	38%
Landcare member/participant (n=645)	34%	32%	25%	18%
Local commodity group participant (n=642)	28%	10%	6%	3%
Soil health group participant (n=637)	9%	4%	2.5%	Nil
Completed short course related to property management past 5 years (n=622)	29%	13%	11%	6%
Property management or whole-farm plan (n=634)	34%	30%	22%	14%
Attended a field day/farm walk on soil health last 12 months (n=629)	45%	28%	18%	7%

Data provided are medians unless mean is indicated. All tests were Kruskal-Wallis rank sum tests, chi-square $p<0.05$.
Orange shading: attributes of enterprise. Tan: attributes of owner(s). Blue: on and off-property work. Purple: engagement platforms and processes.

9. RISK AND TRUST

9.1 INTRODUCTION

The 2014 survey included items exploring both predisposition to accept risk and interpretation of the risks associated with cropping and grazing waterways and wetlands. Items exploring the latter topic are not included in the 2019 survey. A new, additional item in 2019 explores willingness to innovate: *I am an early adopter of new agricultural practices and technologies.*

Both the 2014 and 2019 surveys included items exploring predisposition to trust; and trust in (i.e. willingness to rely upon) the North Central CMA and judgements about the trustworthiness of the North Central CMA. The topic for the trust and trustworthiness measures was the management of waterways and wetlands. As in 2014, a filter item asked if respondents were aware of the North Central CMA before inviting then to proceed with the trust items.

For all trust and risk items in both surveys, respondents were asked to indicate the extent they agreed with statements. A Don't know/Not applicable option was provided. The responses for strongly disagree and disagree have been combined and responses for agree and strongly agree have been combined for the presentation of data and Don't know/Not applicable responses are included in the table(s) but are not included in the calculation of mean scores for each item.

9.2 KEY FINDINGS FOR TRUST, TRUSTWORTHINESS AND PREDISPOSITION TO TRUST

Almost three-quarters (72%) of respondents said they were aware of the North Central CMA (N=624, n Yes=450). The level of reported awareness of the North Central CMA has declined since 2014 (N=749, n Yes 615, 82%). For this item there are significant differences across geography (i.e. LGA) and the four farmer identity cohorts. Awareness varied from Buloke with 100% to the Central Goldfields with 48%. This contrast illustrates the trend to higher recognition of the North Central CMA amongst respondents in LGA further from Melbourne and the major regional cities, where more property owners identify as Full-time and Part-time farmers. Indeed, 84% of Full-time farmers and 77% of Part-time farmers were aware of the North Central CMA compared to 61% of Hobby farmers and 47% of Non-farmers.

For all items across trust, trustworthiness and predisposition to trust [Table 26] there is a remarkable consistency in the data for both 2014 and 2019. That is, there are no substantive differences in the mean scores, proportion of respondents selecting each response option or rank order of items by mean score. It is not surprising that measures of predisposition to trust are stable over a five-year time frame. It is somewhat surprising that the results for measures of trust and trustworthiness have not changed.

Respondents were more likely to agree than disagree that they could trust the North Central CMA. The level of trust was higher for the item focussed on providing useful advice than for the item referring to providing appropriate financial assistance [Table 26 and Figure 8]. About a third of all respondents indicated they held a neutral view about whether they could trust the North Central CMA, suggesting there is potential to lift the trust rating.

9. RISK AND TRUST (CONT.)

There were very similar mean scores for the three items measuring the key elements of trustworthiness: ability; benevolence; and integrity. In brief, positive judgements outweighed negative assessments by more than two to one; and about a third of all respondents selected the neutral option [Table 26].

It appears that most respondents are not predisposed to trust or rely on others [Table 26]. About a third of respondents selected the neutral response option[Table 26].

With one exception, there are no significant differences across the LGA for items exploring trust, trustworthiness and predisposition to trust. The one exception is for the item exploring the benevolence element in trustworthiness [Table 26].

There are significant differences across the four farmer identity cohorts for both trust items and the trustworthiness item exploring benevolence. The key differences appear to be that:

- Non-farmers and Hobby farmers are more likely to agree that *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management.*
- Full-time farmers are more likely to agree that *I can rely on the North Central CMA to provide appropriate financial assistance for waterways & wetlands management.*
- Non-farmers are more likely to agree that *The North Central CMA keeps landholders' interests in mind when making decisions about waterways & wetlands management.*

There are significant positive relationships between items measuring predisposition to trust and willingness to rely (i.e. trust) the North Central CMA. Those who are more predisposed to trust are also more likely to have positive assessments of the trustworthiness of the North Central CMA.

There are significant relationships between items measuring predisposition to trust and items exploring belief about the rights of private property owners. That is, those who are more predisposed to trust are less likely to give priority to the primacy of private property rights (e.g. harvesting rainfall on property even if that impacts on others; public right to access to crown land managed by private landholders, and acceptance of minor flooding as part of environmental watering).

There are no significant relationships between predisposition to trust and participation in soil health groups, Landcare groups or commodity groups. There are very few (2/19) significant relationships between predisposition to trust and the 19 items exploring implementation of best-practice NRM; and no significant relationships between predisposition to trust and the three items exploring adaptation to climate change.

There are only two significant relationships between items measuring trust in the North Central CMA and implementation of best practice NRM. In both cases (*Fenced native bush/grasslands to manage stock access; Prepared a habitat assessment of native plants*) there is a significant positive relationship with the item *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management.*

9. RISK AND TRUST (CONT.)

It seems that predisposition to trust needs to be considered when setting out to engage rural property owners, but is not an insurmountable barrier to engagement in NRM platforms/processes or to the implementation of best-practices. Beliefs about private property rights appear to influence trust in the North Central CMA and those concerns need to be considered when setting out to engage property owners. While it doesn't appear that trust is a key to engagement in best-practice NRM, there are many reasons to focus on trust building, especially by demonstrating trustworthiness (i.e. ability, benevolence and integrity). Where trust exists, intentions are less likely to be misinterpreted, any errors or unforeseen outcomes of actions are more readily forgiven, local knowledge is more likely to be offered, and it is easier/less costly to engage property owners in projects.

TABLE 26: TRUST IN THE NORTH CENTRAL CMA AND ASSESSMENTS OF NORTH CENTRAL CMA TRUSTWORTHINESS, 2019 AND 2014 (N=636, n=434 TO 426)

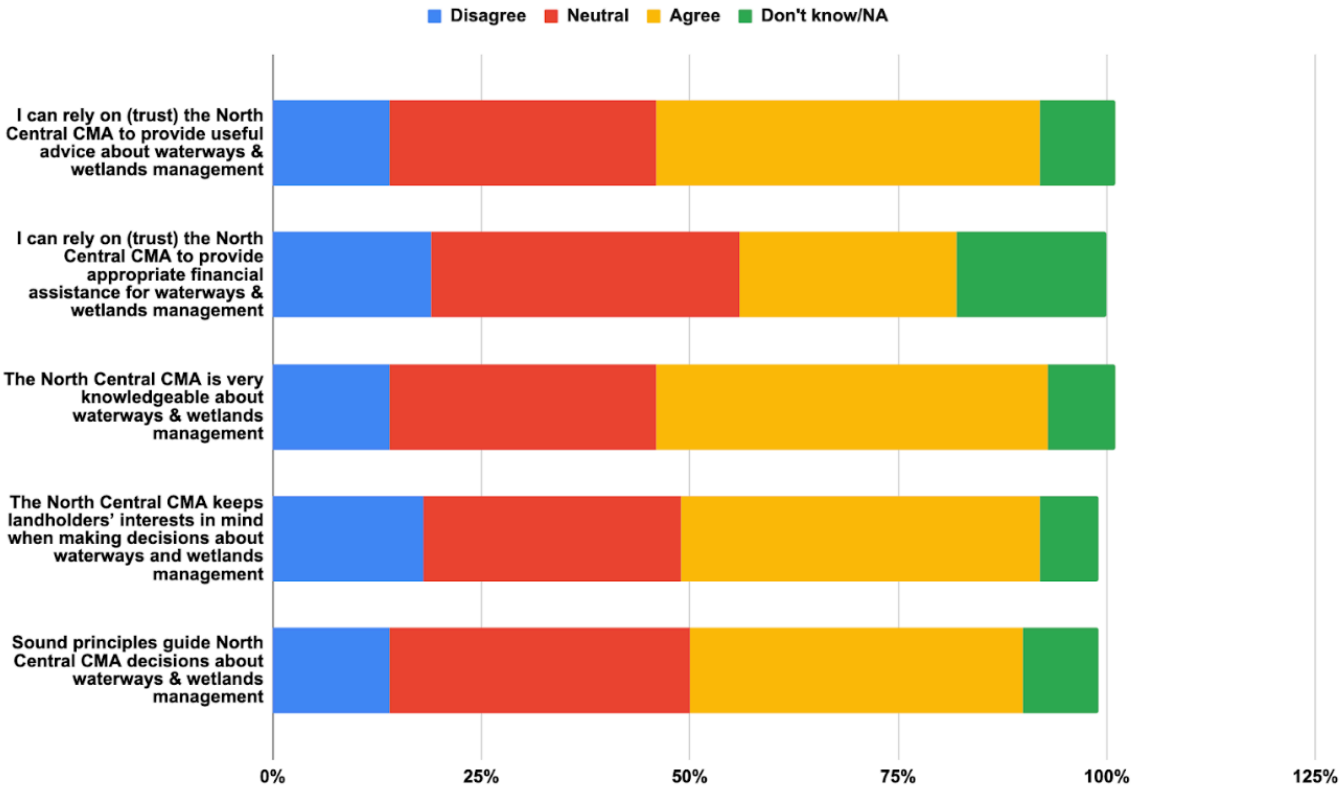
Trust	**Mean**	**Disagree**	**Neutral**	**Agree**	**Don't know/NA**
I can rely on (trust) the North Central CMA to provide useful advice about waterways & wetlands management ###	3.4 (3.4)	14% (14%)	32% (31%)	46% (47%)	9% (8%)
I can rely on (trust) the North Central CMA to provide appropriate financial assistance for waterways & wetlands management ###	3.1 (2.9)	19% (25%)	37% (39%)	26% (22%)	18% (14%)
Trustworthiness	**Mean**	**Disagree**	**Neutral**	**Agree**	**Don't know/NA**
The North Central CMA is very knowledgeable about waterways & wetlands management	3.4 (3.4)	14% (13%)	32% (32%)	47% (49%)	8% (7%)
The North Central CMA keeps landholders' interests in mind when making decisions about waterways and wetlands management *** ###	3.3 (3.3)	18% (18%)	31% (32%)	43% (43%)	7% (6%)
Sound principles guide North Central CMA decisions about waterways & wetlands management	3.3 (3.3)	14% (15%)	36% (38%)	40% (39%)	9% (8%)
Predisposition to trust	**Mean**	**Disagree**	**Neutral**	**Agree**	**Don't know/NA**
You can't be too careful when dealing with people	3.8 (3.8)	7% (8%)	30% (24%)	61% (64%)	2% (3%)
One has to be alert or someone is likely to take advantage of you	3.6 (3.5)	13% (15%)	27% (26%)	58% (57%)	1% (2%)
People are almost always interested only in their own welfare	3.3 (3.3)	24% (26%)	31% (24%)	44% (49%)	1% (2%)

Note: Mean scores calculated after removing N/A responses. So mean out of 5

*** Significant difference across LGA, ### Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum tests, chi-square $p<0.05$.

() Data for 2014

FIGURE 8: TRUST IN THE NORTH CENTRAL CMA AND ASSESSMENTS OF NORTH CENTRAL CMA TRUSTWORTHINESS, 2019 (N=636, n=434 TO 426)



9.3 KEY FINDINGS FOR PREDISPOSITION TO ACCEPT RISK AND IDENTIFYING AS AN EARLY ADOPTER

As in 2014, many respondents appear to be risk averse in that almost half said they prefer to avoid risks and they dislike not knowing what is going to happen. At the same time, almost half said they approach risks as a challenge to embrace [Table 27].

There are no significant differences across the LGA for items in Table 27. There is a difference on farmer identity for two items. For both items the key difference is that Full-time farmers are more likely to say they view risks as a challenge to embrace and are an early adopter of new agricultural practices and technologies.

There are no trends in the data for the predisposition to risk items included in the 2014 and 2019 surveys [Table 27].

There are many significant relationships between the items exploring predisposition to accept or embrace risk and implementation of the 19 best-practices. For 12/19 practices there is a significant relationship with the item *I usually view risk as a challenge to embrace*. Those who agreed with this statement, that is they see risk as a positive, are more likely to implement 10/12 of these practices. For the item *I prefer to avoid risk*, those more concerned about risk were more likely to have *Planted trees and shrubs*; *Fenced waterways & wetlands to*

manage stock access; and *Used minimum or no tillage techniques to establish crops and pasture*. There seems to be pattern here of those more positive about accepting risk being more prepared to implement innovative soil management practices and those more concerned about risk more likely to implement environmental best-practices.

A third of the survey respondents said they are early adopters of agricultural practices and technologies [Table 27]. Early adopters are significantly more likely to be engaged in soil health groups, Landcare and commodity groups. There is also a significant positive relationship between self-identification as an early adopter and in the past 12 months changing on-property operations to respond to climate change; opportunities to capture carbon; and opportunities to reduce carbon emissions. It seems early adopters are in fact taking on cutting-edge innovations. There is also a significant, positive relationship between self-identification as an early adopter and implementation of best-practice NRM over the full period of management. The relationship exists for most best-practice items (i.e.13/19), including those with a focus on the environment and on agriculture; more/less complex; more/less costly; and those practices promoted long-term and more contemporary initiatives.

It seems that self-identifying as an early adopter is a reliable predictor of best-practice NRM implementation. In this study, 47% of Full-time farmers agreed or strongly agreed that they were early adopters. Given that the Full-time farmer cohort owns 80% of the land belonging to all survey respondents, there is grounds for optimism that change can occur across a substantial part of the North Central region over a relatively short time frame. Having said that, much of contemporary NRM requires practice change beyond the early adopter cohort. In part at least, because early adopters have already implemented best-practices and those changes, while important, have not been sufficient to achieve necessary improvements in resource condition across catchments. Note that 27% of Part-time farmers, 19% of Hobby Farmers and 12% of Non-farmers identified as early adopters.

TABLE 27: PREDISPOSITION TO ACCEPT RISK, 2019 AND 2014 (N=636, N=640-636)

Predisposition to accept risk	**Mean**	**Disagree**	**Neutral**	**Agree**	**Don't know/NA**
I prefer to avoid risks	3.4 (3.5)	20% (18%)	30% (23%)	48% (58%)	2% (1%)
I usually view risks as a challenge to embrace ###	3.4 (3.5)	16% (12%)	36% (34%)	47% (52%)	3% (2%)
I really dislike not knowing what is going to happen	3.4 (3.3)	14% (18%)	37% (36%)	47% (44%)	2% (3%)
Identifying as an early adopter	**Mean**	**Disagree**	**Neutral**	**Agree**	**Don't know/NA**
I am an early adopter of new agricultural practices and technologies ###	3.3	14%	39%	33%	14%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test chi-square, p<0.05

() Data for 2014

10. ENGAGEMENT IN PLATFORMS AND PROCESSES

10.1 INTRODUCTION

The 2019 survey repeated seven items exploring engagement in platforms and processes expected to lead to dialogue, learning and action for NRM. Those items examined participation in groups, engagement through field days/farm walks/demonstrations, work on a property management or whole farm plan and completion of short courses [Table 28]. Respondents were simply asked to select from Yes or No.

10.2 KEY FINDINGS

Forty percent of respondents (N=651, n=258) are engaged through at least one of a local Landcare group, a soil health group or a commodity group. So these platforms engage a substantial proportion of the rural property owners in the North Central region.

Respondents are more likely to be Landcare participants than participants in commodity or soil health groups and Landcare continues to engage about 30% of rural property owners in the region. However Landcare is far more likely to engage Part-time farmers, Hobby farmers and Non-farmers than soil health groups or commodity groups [Table 28].

There appears to be little change in the proportion of respondents engaged through Landcare, soil health and commodity groups. To the extent there are any trends, participation in Landcare and soil health groups has declined and commodity groups has increased [Table 28].

There are significant differences across the farmer identity cohorts for engagement through field days/farm walks/demonstrations, short courses relevant to property management and property management/whole-farm planning [Table 28]. Data for those differences are provided in Table 25. Just under half of the Full-time farmer cohort participated in field days/farm walks focussed on soil health (45%); and about a third participated in short courses relevant to property management (29%); and property management or whole-farm planning (34%). Much smaller proportions of Non-farmers and Hobby farmers were engaged through these processes. Non-farmers were more likely to be engaged through property management or whole-farm planning [Table 25].

There is a significant positive relationship between participation in all of the NRM platforms and processes listed in Table 28 and self-identifying as an early adopter of new agricultural practices and technologies. These findings reinforce the importance of those setting out to engage rural property owners thinking carefully about which property owners they intend to engage. That is, engagement needs to be a deliberate process. There is a risk that early adopters will be the ones engaged on a regular basis.

It is always difficult to untangle causality (e.g. Do more knowledgeable property owners join Landcare or does participation improve knowledge of NRM?) but the weight of evidence suggests these group-based approaches to NRM extension are effective. Taking in to account overlapping memberships, these groups have engaged 40% of property owners, so it is likely others will need to be engaged to achieve many NRM objectives across the region. Information in Tables 28 & 25 suggests that Non-farmers, Hobby-farmers and Part-time farmers are far more likely to engage through Landcare and that they will engage in specific activities when those are

of interest to them. For example, in the past 12 months, Non-farmers and Hobby farmers are as likely as Full-time and Part-time farmers to have attended a field day/farm walk/demonstration related to native vegetation. It may be possible to establish new groups or recruit new participants to existing groups. There has been a decline in Landcare participation since 2014 and that should focus attention on the importance of retaining members. However there are limits to participation in group-based extension: some people just don't join groups.

TABLE 28: ENGAGEMENT IN PLATFORMS AND PROCESSES LEADING TO LEARNING AND ACTION, 2019 AND 2014 (N=636)

Group-based extension	**% Yes 2019**	**% Yes 2014**
Landcare groups (n=645) *** ###	30%	36%
Soil health groups (637) ###	6%	8%
Commodity groups (n=642) *** ###	17%	15%
Field days, farm walks and demonstrations past 12 months		
Focussed on soil health (n=629) *** ###	32%	40%
Focussed on native vegetation (n=643)	19%	19%
Farm plans and short courses		
Completed short course relevant to property management past 5 years (n=622)	19%	15%
Prepared/preparing a property management or whole-farm plan that involves a map or other documents that address the existing property situation and include future management and development options (n=634) ###	28%	33%

*** Significant difference across LGA, Pearson's Chi-squared test, p<0.05

Significant difference across farmer identity cohorts, Pearson's Chi-squared test, p<0.05

TABLE 29: SIGNIFICANT POSITIVE RELATIONSHIPS BETWEEN INTERMEDIATE NRM OUTCOMES AND ENGAGEMENT IN LANDCARE, COMMODITY AND SOIL HEALTH GROUPS, 2019 (N=663)

Group type	**Personal norms: soil**	**NRM knowledge**	**Confidence best-practice**	**Implemented best-practice Full period of management**	**Adaptation to climate Change 12 months**
Landcare	2/2	15/15	5/10	15/15	3/3
Commodity	1/2	13/15	3/10	16/19	2/3
Soil	2/2	14/15	6/10	19/19	2/3

Pearson's Chi-squared test, p<0.05

2/2 indicates a significant positive relationship between Landcare participation and both of the items exploring personal norms focused on soils

11. SOURCES OF INFORMATION ABOUT PROPERTY MANAGEMENT

11.1 INTRODUCTION

Respondents were provided a list of 29 possible sources of information about their property that they may have used over the past 12 months. Some sources in the list refer to platforms where information can be sourced or interactions occur with other people; other sources listed are organisations that create and disseminate information.

The 2019 survey includes a larger number of items than did the 2014 survey, mostly as a result of separating the different types of printed material and social media and including banks, Soil CRC and Rural R&D corporations (19 sources listed in 2014). The 2019 survey also asked respondents to nominate their "preferred top source". Only 342 out a possible 662 responses were provided to that invitation. There is some additional information in those responses, but little that is new (e.g. ABC radio, Weekly Times) and often respondents simply repeated a source listed in Table 30 (e.g. radio, newspapers, agronomists, rural R&D corporations, BOM, Websites, North Central CMA, Landcare).

11.2 KEY FINDINGS

The three most frequently listed sources of information about property management are the Bureau of Meteorology (BOM), Newspapers and Friends & neighbours [Table 30 and Figure 9]. Those sources were identified by more than 50% of respondents. Television, Websites, Agriculture consultants, Field days, Radio and Magazines are listed as important sources by from 40% to 50% of respondents [Table 30].

These data highlight the importance of what might be considered legacy or traditional sources of information. Having said that, there appears to be increased use of social media for information about property management, albeit from a very low base [Table 30].

For 22 of the 29 sources of information in Table 30, there is a significant difference across the four farmer identity cohorts. Invariably, a higher proportion of Full-time farmers and, to a lesser extent, Part-time farmers identify those sources as important. This pattern suggests Full-time and Part-time farmers are more committed to and engaged in property management. This is not surprising given their livelihoods are often based on farming enterprises. This finding suggests NRM practitioners will have to work harder to engage the Hobby-farmer and Non-farmer cohorts in NRM.

Friends/neighbours/relatives and Facebook are identified as important sources of information by a higher proportion of Hobby farmers than Full-time farmers. In addition, there are no significant differences across the four cohorts for five sources of information: Websites, Landcare, YouTube, Twitter and Instagram. Only small proportions of any cohort access information through social media, but the level of engagement with property management topics through social media appears to be trending up. It is also worth noting that the BOM is an important source for >60% of respondents in each farmer identity cohort.

11. SOURCES OF INFORMATION ABOUT PROPERTY MANAGEMENT (CONT.)

TABLE 30: SOURCES OF INFORMATION ABOUT PROPERTY MANAGEMENT, 2019 AND 2014 (N=663, n=662)

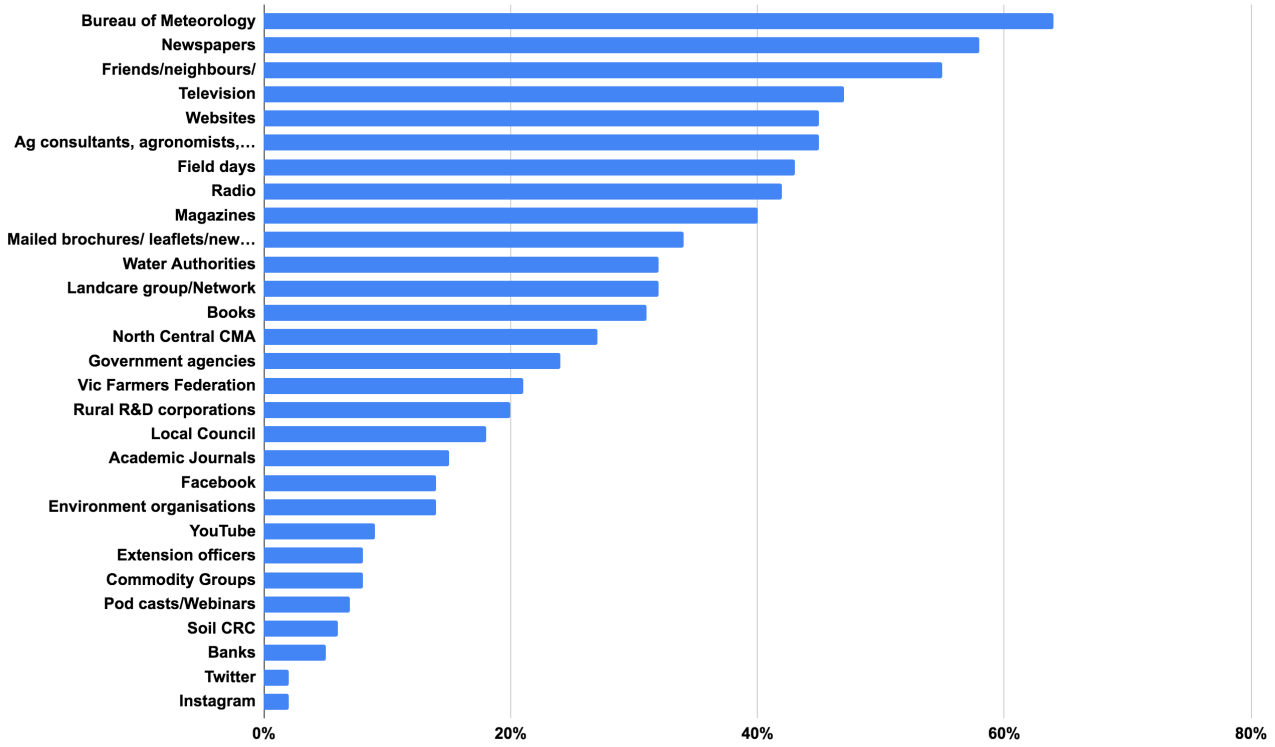
Source	% yes 2019	% yes 2014	Source	% yes 2019	% yes 2014
Bureau of Meteorology	64%	52%	Vic Farmers Federation	21%	28%
Newspapers	58%	76%	Rural R&D corporations	20%	N/A
Friends/neighbours/ relatives	55%	71%	Local Council	18%	32%
Television	47%	45%	Academic Journals	16%	N/A
Websites/Internet	45%	40%	Facebook	14%	N/A
Ag consultants, agronomists, stock agents	45%	23%	Vic Farmers Federation	21%	28%
Field days	43%	47%	Environment organisations	14%	22%
Radio	42%	54%	YouTube	9%	N/A
Magazines	40%	N/A	Commodity groups	8%	16%
Mailed brochures/ leaflets/newsletters	34%	65%	Extension officers	8%	12%
Water Authorities	32%	N/A	Podcasts/Webinars	7%	26%
Landcare group/Network	32%	39%	Soil CRC	6%	N/A
Books	31%	N/A	Banks	5%	N/A
North Central CMA	27%	52%	Twitter	2%	N/A
Government agencies & departments	24%	43%	Instagram	2%	N/A

No Shading: Larger proportion of Full-time and Part-time farmer cohorts than proportion of other cohort. Blue shading: >% Hobby farmer than % Full-time farmer cohort. Orange shading: No significant difference in % across four farmer identity cohorts.

*** In 2014 the total for books, magazines & journals was 70%; social media (Twitter, Facebook) was 6%.

11. SOURCES OF INFORMATION ABOUT PROPERTY MANAGEMENT (CONT.)

FIGURE 9: SOURCES OF INFORMATION ABOUT PROPERTY MANAGEMENT, 2019 (N=663)



12. KNOWLEDGE ABOUT NRM

12.1 INTRODUCTION

Self-assessment is an accepted approach to gathering information about NRM knowledge when using mail surveys. This approach, including the response options listed below, has been employed many times over the past 20 plus years in social benchmarking surveys and published in reports and peer-reviewed papers.

As in 2014, survey respondents are asked to self-assess their knowledge across different NRM themes. Most items were expected to apply to most rural property owners (e.g. *Soil testing is an essential first step in understanding soil condition*). However, some items are expected to be less relevant to most Non-farmers and many Hobby farmers (e.g. *The role of soil carbon in maintaining soil health*). Respondents could choose the *Not applicable* response option for items that were not relevant to their property context and these data are presented in Table 31.

The set of response options for the Knowledge topic are: No knowledge (1), Very little knowledge (2), Some knowledge (3), Sound knowledge (sufficient to act) (4), and Very sound knowledge (could give a detailed explanation, (5), and Not applicable (6). Response options 1 & 2 and 4 & 5 have been collapsed to present data in Table 31. Mean scores presented in Table 31 do not include the Not applicable responses (so out of 5).

The 11 items common to 2014 and 2019 surveys have mean scores for both years included in Table 31. Three of the four new items in 2018 focussed on soils and one item explored knowledge of pre-European land use and management.

The previous section identified a significant positive relationship between participation in Landcare and all 15 knowledge topic items; between soil health groups and 14/15 knowledge items; and between commodity groups and 13 of 15 items. Table 32 provides additional information about relationships between knowledge items and farmer identity cohorts.

12.2 KEY FINDINGS

For 11 of the 15 items in Table 31 the mean score is 3.0 or above (out of 5) suggesting that most respondents have "some knowledge" or better for most of the knowledge items. Very small proportions of respondents selected the Not applicable option (i.e. from 1% to 7%) [Table 31].

If the criterion for taking action is having at least "sound knowledge", and this is included in the explanation of the response options, there are only two items where that threshold is met: *Strategies to maintain groundcover to prevent erosion*; and *How to establish introduced perennial pastures* [Table 31]. For three additional items almost half the respondents have at least "sound knowledge": *Preparing a farm/property plan; Production benefits of applying soil amendments and supplements*; and *How to identify the main constraints to soil productivity*.

There is a pattern for self-assessed knowledge to be lower for items focussed on environmental management (shaded green in Table 31). The obvious exception is the item, *Strategies to maintain groundcover to prevent erosion.*

12. KNOWLEDGE ABOUT NRM (CONT.)

The items with the lowest mean scores explore knowledge of *Which Aboriginal group is connected to the area where your property is* and *How land was used and managed before European settlement*. For both items about half the respondents say they have "no knowledge" or "little knowledge". For the repeated item in 2019, there is an improved mean score and a larger proportion indicating they have at least "some knowledge" [Table 31]. Eleven items in the 2019 survey repeat items from the 2014 survey. The mean score for these items is either the same (2 items), marginally higher (5 items) or substantially higher (4 items). There is no evidence of a decline for any of the repeated items [Table 31].

For 11 of the 15 items there is a significant difference in self-reported knowledge across the four farmer identity cohorts. In every case, a higher proportion of Full-time farmers report "sound knowledge" or "very sound knowledge" than is the case for the other three cohorts. Indeed, for eight of the 11 items, at least half of the Full-time farmer cohort say they have "sound knowledge" or "very sound knowledge". For four of those items, at least half of the Part-time farmer cohort say they "sound knowledge" or "very sound knowledge". By comparison, there is no item where at least 40% of either Hobby farmers or Non-farmers say they have "sound knowledge" or "very sound knowledge" [Table 32 and Figure 10]. This is another finding that illustrates the extent Full-time and Part-time farmers are similar, and at the same time, are very different to Hobby and Non-farmers.

Even amongst the Full-time and Part-time farmer cohorts there are knowledge gaps across most items for many respondents (i.e. about 50%). Those knowledge gaps are likely to constrain commitment and capacity to implement best-practice NRM. This information should provide useful guidance for NRM practitioners working with groups and individual property owners.

For every knowledge item where there is at least one directly related NRM best-practice (i.e. 12 of 15 knowledge items) there is a significant, positive relationship with all relevant best-practices. The three items not considered are: *The effect of fertilizer application on the persistence of native grasses in this area; How land was used and managed before European settlement*; and *Which Aboriginal group is connected to the area where your property is.* The key relationships for the other 12 items are illustrated in Table 33. For most items, there are multiple significant positive relationships with best-practices and these relationships span almost all of the best-practices.

12. KNOWLEDGE ABOUT NRM (CONT.)

TABLE 31: SELF-ASSESSED KNOWLEDGE OF NRM, 2019 AND 2014 (N=663, n= 627 TO 612)

Knowledge topic	Mean	Little knowledge	Some knowledge	Sound knowledge	Not applicable
Strategies to maintain ground cover to minimise soil erosion in this area *** ###	3.8 (3.5)	8%	29%	62%	1%
How to establish introduced perennial pastures (e.g. Lucerne) in this area *** ###	3.6 (3.4)	19%	21%	53%	7%
Preparing a farm/property plan allocating land use according to land class *** ###	3.4 (3.3)	18%	29%	47%	6%
Production benefits of applying soil amendments & supplements (e.g. compost, manure, microbial inoculants) ###	3.4	16%	34%	48%	3%
How to identify the main constraints to soil productivity on your property *** ###	3.4	17%	30%	49%	4%
Processes leading to soil structure decline in this area *** ###	3.2 (3.2)	21%	36%	39%	3%
Role of logs & river-side vegetation in supporting native fish	3.2 (2.9)	21%	37%	35%	7%
Role of understorey plants in maintaining native birds	3.1 (3.0)	25%	39%	35%	1%
Role of soil carbon in maintaining soil health *** ###	3.1 (3.0)	29%	32%	38%	1%
How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off *** ###	3.0 (2.9)	34%	30%	33%	4%
Extent and type of biological activity in soils on your property *** ###	3.0	29%	39%	31%	1%
Effect of fertiliser application on the persistence of native grasses in this area *** ###	2.9 (2.8)	34%	36%	27%	3%
Extent of native vegetation cover in the North Central region before European settlement ***	2.7 (2.7)	40%	37%	23%	1%
Which Aboriginal group is connected to the area where your property is located ***	2.5 (2.2)	48% (61%)	26%	21%	4%
How land in your district was used and managed before European settlement *** ###	2.4	54%	32%	14%	1%

Note: Mean scores calculated after removing N/A responses. So mean out of 5

Significant difference across farmer identity cohorts, Kruskal-Wallis rank sum test chi-square, p<0.05.

() Data for 2014

12. KNOWLEDGE ABOUT NRM (CONT.)

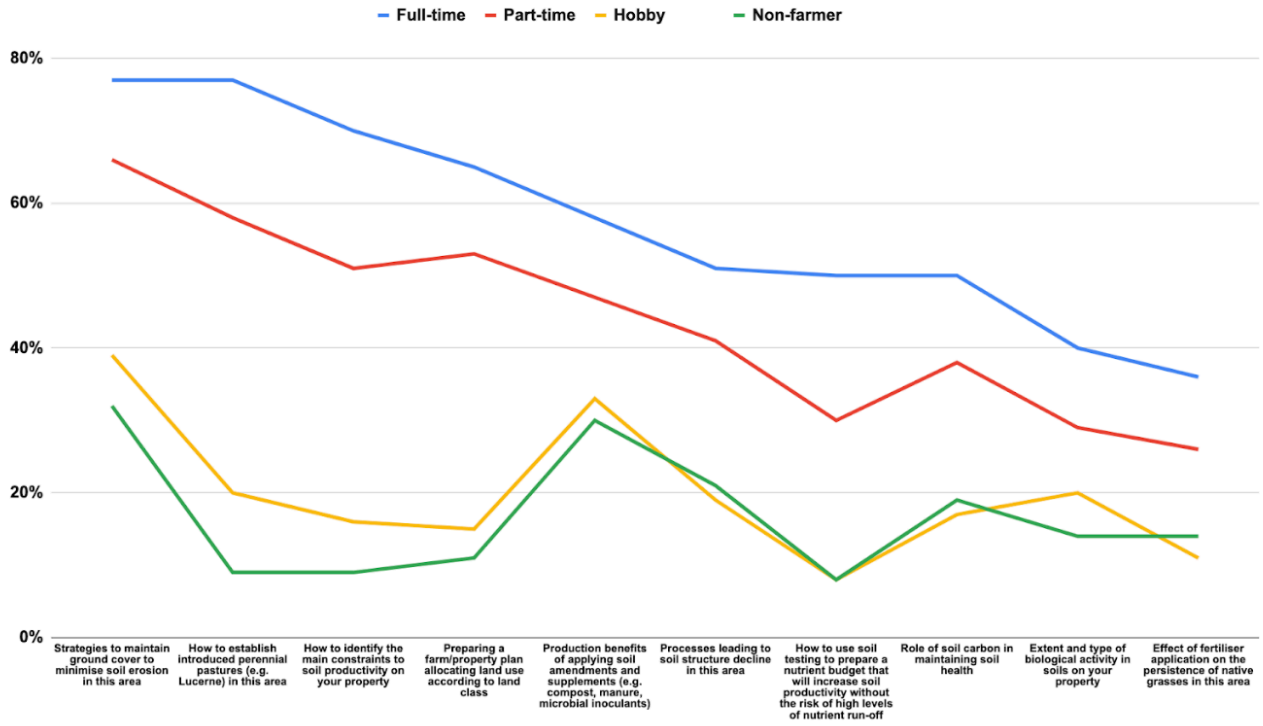
TABLE 32: SIGNIFICANT RELATIONSHIPS BETWEEN FARMER IDENTITY COHORTS AND SELF-ASSESSED KNOWLEDGE OF NRM, 2019 (N=663, N=627 TO 612)

Knowledge topic	Full-time (49%)	Part-time (19%)	Hobby (13%)	Non-farmer (19%)
Strategies to maintain ground cover to minimise soil erosion in this area	4.1 77%	3.8 66%	3.3 39%	3.1 32%
How to establish introduced perennial pastures (e.g. Lucerne) in this area	4.1 77%	3.7 58%	2.8 20%	2.1 9%
How to identify the main constraints to soil productivity on your property	3.9 70%	3.5 51%	2.8 16%	2.2 9%
Preparing a farm/property plan allocating land use according to land class	3.8 65%	3.5 53%	2.8 15%	2.4 11%
Production benefits of applying soil amendments and supplements (e.g. compost, manure, microbial inoculants)	3.7 58%	3.5 47%	3.2 33%	2.8 30%
Processes leading to soil structure decline in this area	3.6 51%	3.3 41%	2.7 19%	2.6 21%
How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off	3.4 50%	3.0 30%	2.3 8%	1.9 8%
Role of soil carbon in maintaining soil health	3.4 50%	3.2 38%	2.7 17%	2.5 19%
Extent and type of biological activity in soils on your property	3.3 40%	3.1 29%	2.7 20%	2.4 14%
Effect of fertiliser application on the persistence of native grasses in this area	3.2 36%	2.9 26%	2.4 11%	2.3 14%
How land in your district was used and managed before European settlement	2.5 17%	2.4 14%	2.2 5%	2.1 10%

Tan shading: soils related topic

12. KNOWLEDGE ABOUT NRM (CONT.)

FIGURE 10: SIGNIFICANT RELATIONSHIPS BETWEEN FARMER IDENTITY COHORTS AND SELF-ASSESSED KNOWLEDGE OF NRM, 2019 (N=663)



12. KNOWLEDGE ABOUT NRM (CONT.)

TABLE 33: SIGNIFICANT POSITIVE RELATIONSHIPS WITH SELF-ASSESSED KNOWLEDGE AND IMPLEMENTATION OF BEST-PRACTICE NRM, 2019 (N=663)

Knowledge items	**Examples of direct relationships with best-practice NRM**
Strategies to maintain ground cover to minimise soil erosion in this area	Established permanent grassed waterways in drainage lines; Used time controlled/rotational grazing; Used minimum/no tillage techniques to establish crops and pastures; Each year worked to control non-crop weeds
How to establish introduced perennial pastures (e.g. Lucerne) in this area	Sown perennial pasture other than Lucerne; Sown Lucerne; Applied lime to arable land
Preparing a farm/property plan allocating land use according to land class	Planted trees and shrubs; Fenced waterways and wetlands to manage stock access (significant positive relationship with 17 of 19 best-practices)
Production benefits of applying soil amendments & supplements (e.g. compost, manure, microbial inoculants)	Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)
How to identify the main constraints to soil productivity on your property	Tested for nutrient status in paddocks where have applied fertiliser/soil conditioners
Processes leading to soil structure decline in this area	Used minimum or no tillage techniques; Applied soil ameliorants other than fertiliser and lime
Role of logs & river-side vegetation in supporting native fish	Fenced waterways and wetlands to manage stock access; Established off-stream watering points
Role of understorey plants in maintaining native birds	Planted trees and shrubs; Fenced native bush/grasslands to manage stock access; Each year worked to control pest animals
Role of soil carbon in maintaining soil health	Sown perennial pasture other than Lucerne; Tested for nutrient status in paddocks where have applied fertiliser/soil conditioners
How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off	Tested for nutrient status in paddocks where have applied fertiliser/soil conditioners; Prepared a nutrient budget for all/most of the property; Used precision farming techniques for cropping; Established an irrigation tailwater reuse system
Extent and type of biological activity in soils on your property	Applied soil ameliorants other than fertiliser and lime; Tested for nutrient status in paddocks where have applied fertiliser/soil conditioners
Extent of native vegetation cover in the North Central region before European settlement	Planted trees and shrubs; Prepared a habitat assessment for native plants

Green shading: environmental management. No shading: soil and farm management topics.

13. LAND USE AND ENTERPRISE MIX

13.1 INTRODUCTION

The 2019 survey includes a list of 18 possible land uses/enterprises and respondents are asked to tick those relevant in 2019. Given the availability of detailed information on this topic through ABS Farm Surveys, and the focus in this survey on the social dimensions of NRM, no attempt was made to capture data about the area of land allocated to land uses or the number of stock or type of crops and trees. The 2014 survey covered 15 possible land uses/ enterprises. Information for the repeated items is presented in Table 34.

13.2 KEY FINDINGS

The patterns in land use and enterprises evident in Table 34 are consistent with the region being a mix of social landscapes. Agriculture and farming is the dominant value expressed in some parts of the region. However, across most of the region, especially those areas within commuting distance of Melbourne, Ballarat and Bendigo, near the Murray River or that include other attractive landscapes, a multiplicity of agriculture, biospheric (environment) and amenity values influence land use, enterprise mix and management practices. Differences across geography and the four farmer identity cohorts are consistent with this narrative.

13. LAND USE AND ENTERPRISE MIX (CONT.)

TABLE 34: LAND USE AND ENTERPRISE MIX, 2019 AND 2014 (N=663, n= 661 TO 638)

Land uses and enterprise types	% Yes 2019	% Yes 2014	Difference by LGA	Difference by farmer identity cohort
Pasture	60%	82%	***	###
Sheep for wool or meat	56%	62%	***	###
Cropping	50%	60%	***	###
Area of remnant native vegetation (e.g. trees, grasslands, wetlands)	46%	79%	Nil	### PTF #1, FTF #2
Other tree planting (e/g shelter, habitat, erosion or recharge control, carbon)	37%	65%	Nil	Nil
Area set aside for living/recreation (e.g. gardens, pets, water bodies, vehicles)	36%	80%	***	### NF #1
Hay production for sale	28%	N/A	***	###
Beef cattle	25%	41%	***	### PTF #1
Irrigated agriculture	22%	35%	***	###
Other commercial livestock (goats, pigs, deer, horse studs, poultry, alpaca, dogs)	8%	13%	Nil	### HF #1, PTF #2
Farm forestry	5.4%	8%	Nil	Nil
Horticulture	5.3%	8%	***	Nil
Conservation covenant attached to property title (e.g. Trust for Nature)	5%	10%	Nil	### NF #1, FTF #2
Dairying	4.4%	8%	***	###
Farm-based tourism (e.g. farm stays, B&B)	4.1%	3%	***	Nil
Vegetation offsets	2.7%	N/A	***	### PTF #1, HF #2
Viticulture	2.4%	4%	***	### HF #1
Carbon farming	2.1%	N/A	NIL	### PTF #1

All tests for differences used Pearson's Chi-squared test with p-value <0.05

14. IMPLEMENTATION OF BEST-PRACTICE NRM

14.1 INTRODUCTION

It is unlikely that 100% implementation of a bests-practice is the target for any NRM program or project. It is possible that desired improvements in resource condition can be accomplished with much lower levels of implementation. And NRM organisations are unlikely to have sufficient resources to engage all property owners. The key is that NRM organisations commit to and undertake strategic thinking about the level of change required to accomplish condition targets for different landscape assets and which property owners to engage to achieve that level of change.

The social benchmarking survey has allowed the North Central CMA to benchmark and track trends over time in best-practice implementation and the elements of a causal chain expected to lead to implementation.

It is also important to acknowledge that best-practices are just the approaches to threatening processes that we have settled on given current knowledge and experience. For some issues, such as poor streamside vegetation condition, there are widely accepted best-practices. That is not always the case, especially for managing soils in cropping contexts.

The 2019 survey has 19 items in this topic [Table 35]. Most items were also included in the 2014 survey. A key difference is that in 2019 respondents are only asked to indicate if they have implemented each of the listed practices (i.e. select Yes). In 2014 respondents were also asked to list the amount of work completed. A second contrast is that the two surveys asked for information across slightly different time periods. The 2019 survey focussed on the full-period of management. Where there are comparable data those are provided.

The 2019 survey asked respondents to tick a circle for relevant practices across the full-period of management and the last three years. A third column asked if resources were provided by others. Although this Topic was discussed during pre-testing, it is now clear that many respondents thought they only needed to tick a circle for one column. As a result only data for the full-period of management is presented. Where a respondent ticked only for the last three years, they were assumed to have implemented across the full-period of management.

It is likely the data in Table 35 understates the real level of best-practice implementation. For example, it is possible to buy a property where all/most work for some best-practices has been completed.

No attempt has been made to provide separate data for croppers or graziers; or irrigators and dryland farmers. The best-practices were selected because they were expected to be relevant to most rural property owners in the region. The item asking about an irrigation tailwater reuse system is clearly an exception and the number of irrigators is indicated for that item in Table 35. A detailed description of differences across the four farmer identity cohorts has already been provided [Table 25].

14.2 KEY FINDINGS

The five items most frequently listed include some with an environmental focus and some more focussed on agriculture. Overall, there is little difference in the data for the 2019 and 2014 surveys. In most cases where there is a change, there is a lower proportion implementing those practices in the 2019 survey. Given that these data are for the full-period of management, and there is almost identical data for other survey topics (e.g. values and long-term plans), the likely explanation is that in five years there has been sufficient property turnover to affect results based on the full-period of management. There is one notable exception to the trend for slightly lower implementation of best-practices: *Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)* [Table 35].

The results of pairwise comparisons presented in earlier sections suggest the elements of the conceptual framework do influence implementation of best-practice NRM; and therefore, provide insights useful for NRM practitioners. Those results are consistent with widely accepted theory (i.e. VBN). However, the survey did not include items focussed on many of the factors that may influence decisions making. For example, market conditions. Pairwise comparisons and regression modelling can hint at causality, but other more sophisticated techniques will be needed if that type of question is important.

The key elements of a generalised model (refer to Figure A in the Executive Summary) might be:
Attached values; threats to attached values (i.e. issues of concern), farmer identity, beliefs about private property rights, personal norm related to maintaining productive soil, predisposition to accept risk, participation in Landcare, knowledge and confidence in best- practices, and engagement through property planning and field days/farm walks/demonstration.

The results of regression modelling are summarised below and provide additional insights about the specific mix of factors relevant to each best-practice. The extent of farmer occupational identity is common to many of the models. Contrasts also exist in the set of variables for best-practices focussed on production (e.g. applied lime) compared to environmental management (e.g. prepared a habitat assessment).

As always, causality is not as obvious as association. For example, increased confidence in lime is part of the regression model for applied lime. That is, increased confidence is associated with increased implementation of the practice. It is possible that building confidence is an important step in getting property owners to spend the substantial sums needed to purchase and then apply lime. It is also possible that the outcomes of applying lime lead, over time, to increased confidence in the practice. A similar issue arises where trust in the North Central CMA is part of models. It is not clear whether trust is the precursor to action or an outcome of dialogue, learning and action.

There may be relationships between some of the personal and farming attributes considered in the next section. However, there are fewer relationships than expected. For example, those who reported a *Net profit from agriculture in 2018/2019 financial year above $50,000* are no more likely to implement the 19 best-practice measures with the exception of *Established an irrigation tailwater reuse system*. Furthermore, there are no significant relationships between any of the 19 best-practice items and *Total of off-property income (before tax for*

14. IMPLEMENTATION OF BEST-PRACTICE NRM (CONT.)

you and your partner last financial year (2018/2019 above $50,000). These results are counterintuitive, especially considering the substantial costs involved in applying lime or establishing perennial pasture. On the other hand, it seems property owners evaluate the relevance of best-practices based on their assessment of how each practice helps them achieve their goals.

TABLE 35: IMPLEMENTATION OF BEST-PRACTICE NRM OVER FULL PERIOD OF MANAGEMENT, 2019 AND 2014 (N=663)

Best-practice NRM	%Yes 2019	% Yes 2014
Each year worked to control non-crop weeds	79%	92% combined Last year
Each year worked to control pest animals	67%	
Used minimum or no tillage techniques to establish crops or pastures	52%	54% Last 5 years
Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past	50%	56% Last 5 years
Planted trees and shrubs	66%	72%
Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)	46%	18% Last 5 years
Sown Lucerne	39%	N/A
Sown perennial pasture other than Lucerne	40%	N/A
Applied at least one application of lime to arable land	38%	46%
Fenced native bush/grasslands to manage stock access)	43%	44%
Used precision farming techniques for cropping	29%	34% Last year
Fenced waterways & wetlands to manage stock access	34%	29%
Used time controlled or rotational grazing	35%	46% Last year
Established off-stream watering points	29%	28%
Prepared a nutrient budget for all/most of the property	19%	26% Last 5 years
Deep ripped arable land	18%	N/A
Established an irrigation tailwater reuse system Irrigator n=147	14% All 61% irrigators	16%
Established permanent grassed waterways in drainage lines	14%	20%
Prepared a habitat assessment for native plants ###	11%	11% Last year

Only item where % of HF and NF implementing best-practice exceeds % FTF.

14.3 MODELLING BEST-PRACTICE IMPLEMENTATION

INTRODUCTION

This section provides a summary of results from logistic regression. Drawing on the results of the pairwise comparisons, Simon McDonald was provided with a short list of variables to include in the modelling for each best-practice.

The aim is to develop models representing the 'best combination of factors' that explain implementation of each practice. The output is typically a large set of possible models. Only one model is presented for each best-practice. Models presented have the best score for accurately predicting Yes or No responses for the relevant best-practice. The accepted standard is that the model correctly predicts 70% of responses.

No model is presented for *Established permanent grassed waterways in drainage lines*. There is not sufficient respondents implementing this practice (i.e. <20%).

RESULTS

Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)

74% of No responses on this best-practice item correctly predicted by the items in the model below; 72% of Yes responses on this best-practice item correctly predicted; and 73% of all responses (i.e. No and Yes) correctly predicted

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (knowledge) *The production benefits of applying biological soil amendments and supplements (e.g. compost, manure, microbial innoculants)*
- (confidence in best-practice) *The cost of applying gypsum to address soil sodicity are justified by increased production*
- (predisposed to accept risk) *I usually view risks as a challenge to embrace*

Prepared a nutrient budget for all/most of the property

Correctly predicted 79% No, 55% Yes, 67% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (knowledge) *How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient runoff*
- (belief) *Biological activity is an important indicator of the productive capacity of soils*
- *I am an early adopter of new agricultural practices and technologies*

Deep ripped arable land
Correctly predicted 79% No, 100% Yes, 90% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *The productive value of the soil on my property*
- (knowledge) *How to establish introduced perennial pastures (e.g. Lucerne in this area*
- (confidence in best-practice) *The cost of deep-tillage and subsoil modification are justified by increased production*
- *I am an early adopter of new agricultural practices and technologies*

Fenced native bush/grasslands to manage stock access)
Correctly predicted 66% No, 67% Yes, 66% overall (so <70%)

- (knowledge) *Preparing a farm/property plan allocating land use according to land class*
- (knowledge) *The role of logs and river-side vegetation in supporting native fish*
- (confidence in best-practice) *Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking*
- *I am an early adopter of new agricultural practices and technologies*
- A local Landcare group member or participant

Fenced waterways & wetlands to manage stock access
Correctly predicted 67% No, 64% Yes, 63% overall (so <70%)

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Native vegetation makes the property an attractive place to live*
- (knowledge) *The role of logs and river-side vegetation in supporting native fish*
- (confidence in best-practice) *Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking*
- *I am an early adopter of new agricultural practices and technologies*

Prepared a habitat assessment for native plants
Correctly predicted 90% No, 50% Yes, 70% overall

- (knowledge) *The role of understorey plants in maintaining native birds*
- *I am an early adopter of new agricultural practices and technologies*
- (predisposition to accept risk) *I usually view risks as a challenge to embrace*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*
- A local Landcare group member or participant

14. IMPLEMENTATION OF BEST-PRACTICE NRM (CONT.)

Applied at least one application of lime to arable land
Correctly predicted 70% No, 65% Yes, 68% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from building/maintaining a viable business*
- (knowledge) *How to establish introduced perennial pastures (e.g. Lucerne in this area*
- (confidence in best-practice) T*he costs of applying lime to address soil acidity are justified by increased production*
- *I am an early adopter of new agricultural practices and technologies*

Sown Lucerne
Correctly predicted 71% No, 69% Yes, 70% overall

- (attached value) *An important source of household income*
- (attached value) *A great place to raise a family*
- (knowledge) *Strategies to maintain ground cover to minimise soil erosion in this area*
- (knowledge) *How to establish introduced perennial pastures (e.g. Lucerne in this area)*
- (confidence in best-practice) *The costs of establishing perennial pastures are justified by the returns*

Established off-stream watering points
Correctly predicted 68% No, 58% Yes, 62% overall (so below 70% threshold)

- Extent of farmer occupational identity (FTF compared to others)
- (knowledge) *The role of logs and river-side vegetation in supporting native fish*
- (confidence in best-practice) *Improvements in bank stability & vegetation condition justify the costs of watering stock off-stream*
- *I am an early adopter of new agricultural practices and technologies*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*

E*ach year worked to control pest animals*
Correctly predicted 100% No, 79% Yes, 90% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (attached value) *Native vegetation provides habitat for birds and animals*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*
- A local Landcare group member or participant

14. IMPLEMENTATION OF BEST-PRACTICE NRM (CONT.)

Planted trees and shrubs
Correctly predicted 38% No, 76% Yes, 57% overall (well below 70% threshold)

- (attached value) *Native vegetation provides habitat for birds and animals*
- (belief) *I am confident landholders in this region can adapt to expected changes in rainfall patterns*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*
- A local Landcare group member or participant
- *I am an early adopter of new agricultural practices and technologies*

Used precision farming techniques for cropping
Correctly predicted 74% No, 64% Yes, 69% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (knowledge) *How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off*
- (confidence in best-practice) T*he benefits of stubble retention outweigh problems arising from the practice*
- *I am an early adopter of new agricultural practices and technologies*

Sown perennial pasture other than Lucerne
Correctly predicted 65% No, 62% Yes, 64% overall (so below the 70% threshold)

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *An important source of household income*
- (attached value) *An attractive place to live*
- (knowledge) *How to establish introduced perennial pastures (e.g. Lucerne) in this area*

Established an irrigation tailwater reuse system
Correctly predicted 84% No, 33% Yes, 59% overall (well below the 70% threshold)

- Extent of farmer occupational identity (FTF compared to others)
- (knowledge) *Preparing a farm/property plan allocating land use according to land class*
- (confidence in best-practice) *The costs of establishing perennial pastures are justified by the returns*
- A local Landcare group member or participant
- *I am an early adopter of new agricultural practices and technologies*

14. IMPLEMENTATION OF BEST-PRACTICE NRM (CONT.)

Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past
Correctly predicted 68% No, 74% Yes, 71% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (knowledge) *How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off*
- (personal norm) *I feel a personal responsibility to maintain my soil's productive capacity*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*

Used minimum or no tillage techniques to establish crops or pastures
Correctly predicted 72% No, 77% Yes, 75% overall

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *An important source of household income*
- (knowledge) *How to establish introduced perennial pastures (e.g. Lucerne) in this area*
- (confidence in best-practice) *The benefits of stubble retention outweigh problems arising from the practice*
- *I am an early adopter of new agricultural practices and technologies*

Used time controlled or rotational grazing
Correctly predicted 60% No, 57% Yes, 58% overall (so below 70% threshold)

- Extent of farmer occupational identity (FTF compared to others)
- (attached value) *Sense of accomplishment from producing food and fibre for others*
- (knowledge) *Preparing a farm/property plan allocating land use according to land class*
- (confidence in best-practice) *Intensive grazing for short periods is usually better for the health of native vegetation along waterways & wetlands than set stocking*
- *I am an early adopter of new agricultural practices and technologies*

Each year worked to control non-crop weeds
Correctly predicted 60% No, 57% Yes, 58% overall (below 70% threshold)

- (attached value) *Ability to pass on a healthier environment for future generations*
- (attached value) *A great place to raise a family*
- (knowledge) *The role of understorey plants in maintaining native birds*
- (trust in North Central CMA) *I can rely on the North Central CMA to provide useful advice about waterways & wetlands management*
- A local Landcare group member or participant

15. BACKGROUND PERSONAL AND FARMING ATTRIBUTES

15.1 INTRODUCTION AND SUMMARY

This section provides a regional profile for the property and personal attributes not covered elsewhere. Clearly the regional scale means that differences according to geography, but particularly the extent of farmer occupational identity, are "hidden" in regional summaries. Table 25 reveals the extent of differences across the four farmer identity cohorts; and the Local Government profiles provided below illustrate many of the key differences across the LGA.

In many ways, Table 36 provides a useful introductory table and is part of the Executive Summary. Comparisons with 2014 survey data reveal an overall pattern of stability across these items. To the extent there is change, respondents are a little older, properties a little smaller, there are more female respondents and there are fewer full-time farmers. Having said that, full-time farmers remain the largest farmer identity cohort and manage most of the land area in the region.

15. BACKGROUND PERSONAL AND FARMING ATTRIBUTES (CONT.)

TABLE 36: REGIONAL PROFILE BY KEY PROPERTY AND PERSONAL ATTRIBUTES, 2019 (N=663)

Key attributes (medians unless indicated)	For all Respondents 2019	For all respondents 2014
Property size (area owned)	228 ha	253 ha
Bought additional land in region past 20 years	45%	47%
Subdivided or sold part of property past 20 years	15%	15%
Property leased, share farmed or agisted by others (mean)	45 ha	80 ha
Property leased, share farmed or agisted from others (mean)	225 ha	200 ha
Irrigated in 2018/19 season	26%	30%
Of those irrigated: surface water/ground water (n=214; n=170)	77%/24%	NA
Age of respondent	62 years	59 years
Farmer by occupation (i.e. Full-time farmer)	49%	52%
Gender of respondent (n=608)	22% female	17%
Resident on property	73%	72%
Length of family ownership	46 years	NA
Other family members working full-time on property	30%	30%
Paid off-property work last 12 months (n=472) mean score	65 days	150 days
Hours work on-property per week (n=572)	32 hours	40 hours
Income from agriculture in North Central region 2018/19	69%	NA
% all survey respondents net profit from agriculture >$50K	24%	NA
Received net off-property income 2018/19	70% me 30% spouse	NA
% all survey respondents net income from off-property >50K	31%	NA
Landcare member/participant	30%	36%
Local commodity group participant	17%	15%
Soil health group participant	5.5%	8%
Completed short course related to property management past 5 years	19%	23%
Property management or whole-farm plan	28%	36%
Attended a field day/farm walk/demonstration on native plants & animals last 12 months	19%	19%
Attended a field day/farm walk on soil health last 12 months	32%	40%

16. LOCAL GOVERNMENT PROFILES

16.1 INTRODUCTION

This section provides profiles for 12 of the 14 LGA that are within the North Central CMA region. Profiles are not provided for Mitchell or Ballarat. Only a small part of the Mitchell and Ballarat LGA are within the North Central CMA region. In both cases, the small number of respondents from these LGA means any summaries would be unreliable.

The profiles provide some of the regional variation masked by the regional summary in Table 36. For some items included in the profiles there is a statistically significant difference across the LGA. Other topics/items have been included to provide regional NRM practitioners, especially those new to the region, with accessible summaries illustrating important sub-regional contexts. For example, in key values and issues.

LGA PROFILES

		Loddon	*Macedon Ranges*	*Gannawarra*	*Greater Bendigo*	*Hepburn*	*Mount Alexander*	*Northern Grampians*	*Buloke*	*Campaspe*	*Central Goldfields*	*Pyrenees*	*Swan Hill*
Number of respondents		111	38	56	91	54	64	52	32	60	33	33	18
Family members interested in taking on property		42%	37%	46%	31%	43%	31%	56%	37%	52%	23%	35%	28%
Level of knowledge of NRM	How to identify main constraints to soil productivity on property	50%	27%	68%	34%	24%	36%	70%	73%	63%	52%	48%	56%
	Role of understorey plants for birds	28%	38%	36%	36%	39%	52%	32%	20%	34%	34%	28%	33%
Prioritise private property rights (harvesting rainfall)		32%	51%	34%	47%	49%	50%	34%	29%	32%	45%	44%	39%
Confidence that best-practices are effective	Fencing to manage stock access to waterways & wetlands	70%	81%	66%	78%	64%	80%	62%	72%	78%	60%	69%	50%
	Benefits of stubble retention	65%	35%	71%	43%	36%	40%	74%	87%	71%	58%	52%	72%
	Watering stock off-stream improves bank stability & plants	57%	68%	61%	63%	55%	69%	44%	66%	66%	57%	63%	44%
Belief in climate change		53%	79%	46%	72%	75%	86%	51%	35%	42%	59%	67%	39%
Predisposition to trust		50%	37%	52%	45%	42%	40%	45%	42%	40%	66%	30%	28%
Predisposition to accept risk		45%	58%	63%	51%	48%	51%	43%	42%	45%	43%	38%	44%
Enterprise mix	Crop	74%	5%	57%	26%	28%	19%	87%	94%	73%	47%	58%	28%
	Dairy	4%	nil	14%	nil	2%	nil	nil	nil	23%	3%	nil	6%
	Beef	19%	37%	39%	19%	37%	27%	14%	16%	28%	18%	24%	22%
	Sheep	64%	37%	41%	53%	37%	39%	83%	72%	48%	67%	85%	39%
	Living/recreation space	29%	53%	41%	37%	46%	41%	25%	38%	18%	27%	39%	56%
Farmer identity	Full-time farmer	55%	16%	67%	16%	32%	21%	80%	94%	74%	50%	57%	71%
	Part-time farmer	18%	22%	24%	17%	28%	26%	12%	3%	17%	20%	17%	18%
	Hobby farmer	10%	27%	7%	25%	20%	18%	nil	nil	3%	13%	13%	12%
	Non-farmer	17%	35%	2%	42%	20%	36%	8%	3%	5%	17%	13%	nil

		Loddon	Macedon Ranges	Gannawarra	Greater Bendigo	Hepburn	Mount Alexander	Northern Grampians	Buloke	Campaspe	Central Goldfields	Pyrenees	Swan Hill
Have implemented best-practice over the full-period of management	Fenced waterways & wetlands	29%	53%	38%	25%	37%	31%	52%	34%	32%	30%	42%	22%
	Tested soils for nutrient status	47%	34%	63%	26%	43%	39%	75%	75%	72%	39%	64%	56%
	Used minimum or no tillage	60%	29%	55%	32%	33%	38%	73%	88%	75%	49%	64%	44%
	Fenced native bush/grasslands	49%	55%	38%	31%	44%	45%	52%	63%	45%	36%	52%	39%
Median property size		460 ha	26 ha	290 ha	40 ha	50 ha	51 ha	1000 ha	1525 ha	400 ha	400 ha	403 ha	50 ha
Median time property in family		50 years	20 years	60 years	26 years	30 years	35 years	100 years	100 years	60 years	70 years	63 years	40 years
Property principal place of residence		76%	67%	83%	61%	71%	71%	73%	67%	86%	58%	70%	94%
Landcare participant		29%	32%	31%	14%	28%	44%	48%	40%	18%	21%	44%	11%
Have property management plan		25%	30%	32%	16%	30%	28%	31%	28%	18%	32%	26%	50%
Male respondent		80%	71%	83%	73%	59%	57%	90%	94%	93%	79%	87%	83%
Any income from agriculture		76%	31%	84%	39%	65%	48%	92%	93%	92%	74%	77%	83%
% all respondents with net profit from agriculture >$50k		40%	12%	44%	14%	25%	11%	64%	70%	21%	21%	55%	47%
% all respondents with net off-property income > $50k		25%	45%	27%	38%	35%	41%	23%	16%	22%	30%	27%	39%
Days paid off-property work		51 days	116 days	44 days	106 days	96 days	86 days	51 days	1 day	45 days	30 days	42 days	76 days

		Loddon	Macedon Ranges	Gannawarra	Greater Bendigo	Hepburn	Mount Alexander	Northern Grampians	Buloke	Campaspe	Central Goldfields	Pyrenees	Swan Hill
Top 4 attached values	1	Pass on healthier environment 88%	Attractive place to live 92%	Pass on healthier environment 96%	Attractive place to live 92%	Attractive place to live 85%	Attractive place to live 90%	Sense of accomplish-ment building business 96%	Sense of accomplish-ment building business 97%	Sense of accomplish-ment building business 95%	Opportunity to learn new things 86%	An important source of household income 85%	Sense of accomplish-ment building business 100%
	2	Productive soil 87%	Ability to pass on 86%	Sense of accomplish-ment building business 93%	Pass on healthier environment 88%	Pass on healthier environment 83%	A great place to raise a family 90%	An important source of household income 92%	An important source of household income 97%	Productive soil 93%	Productive soil 86%	Productive soil 84%	Attractive place to live 94%
	3	Sense of accomplish-ment building business 87%	Place to raise family 81%	Sense of accom-plishment producing food 91%	Native vegetation for an attractive place to live 77%	Opportunity to learn new things 80%	Pass on healthier environment 85%	Pass on healthier environment 90%	Productive soil 97%	Pass on healthier environment 90%	Sense of accomplish-ment building business 85%	Sense of accomplish-ment building business 82%	A great place to raise a family 88%
	4	Sense of accom-plishment producing food 85%	Escape pressures of life 79%	Productive soil 91%	A great place to raise a family 75%	A great place to raise a family 77%	Sense of accomplish-ment building business 81%	Sense of accom-plishment producing food 89%	Attractive place to live 94%	Sense of accom-plishment producing food 88%	Attractive place to live 84%	Pass on healthier environment 81%	An asset that is an important part of family wealth 88%
Top 4 issues	1	Soil erosion 83%	Risk to life and property from wildfires 76%	Movement of irrigation water away from this region 94%	Changes in seasonal weather patterns 83%	Risk to life and property from wildfires 83%	Soil erosion 84%	Crop weed resistance to herbicide 90%	Crop weed resistance to herbicide 97%	Movement of irrigation water away from this region 91%	Soil erosion 80%	Soil erosion 93%	Movement of irrigation water away from this region 100%
	2	Movement of irrigation water away from this region 81%	Crop weed resistance to herbicide 73%	Absence or poor quality of important services and infrastructure 79%	Quality of water in farm dams during drought 79%	Low biological activity in soils 77%	Declining nutrient status of soils 79%	Soil erosion 88%	The impact of pest plants and animals on native plants and animals 90%	Low biological activity in soils 77%	Risk to life and property from wildfires 76%	Low biological activity in soils 92%	Modernisa-tion of the irrigation system as part of water reform 77%
	3	Quality of water in farm dams during drought 77%	Changes in seasonal weather patterns 70%	Modernisa-tion of the irrigation system as part of water reform 79%	Risk to life and property from wildfires 77%	Low organic carbon in soils 76%	Quality of water in farm dams during drought 79%	Absence or poor quality of important services and infrastructure 83%	Changes in seasonal weather patterns 83%	Crop weed resistance to herbicide 74%	Low biological activity in soils 73%	Quality of water in farm dams during drought 90%	Crop weed resistance to herbicide 71%
	4	Crop weed resistance to herbicide 75%	Quality of water in farm dams during drought 70%	Uncertain/ low returns limiting capacity to invest in my property 77%	Soil erosion 75%	The impact of pest plants and animals on native plants and animals 75%	Risk to life and property from wildfires 78%	Public support for agricultural activities/ practices 80%	Low organic carbon in soils 82%	Changes in seasonal weather patterns 73%	Declining nutrient status of soils 70%	Low organic carbon in soils 87%	Quality of water in farm dams during drought 67%

17. OTHER COMMENTS

17.1 INTRODUCTION AND SUMMARY

Respondents were invited to provide comments on any topic. About half-a-page was allocated for this purpose.

One hundred and eighty-eight respondents provided comments. In almost all cases, their comments were very brief (i.e. a sentence or single paragraph); and typically focussed on one topic.

Thirty-one comments referred to the survey. Most expressed concern about the relevance of the survey to their context (e.g. non-farmer managing living space; retired farmer no longer actively managing their property). There were some concerns that items were biased (i.e. attempting to gather information to support a particular position). Some comments were positive and respondents were looking forward to reading the results. Others were disappointed that important work they had undertaken was not captured by the survey.

Twenty-eight comments explained the work that respondents had completed on their property.

Another set of comments (29 in total) were typically brief and difficult to classify (so called non-specific).

Many respondents referred to specific issues (14 different topics). The most common issue was water trading and the Murray-Darling Basin Plan (17 comments). In all cases, respondents were critical of the impact of water reform and with water trading, opposed the separation of land and water titles on principle. Climate change was the second most frequently listed issue (13 comments). All but four of these respondents indicated they did not believe in human-induced changes in climate. Amongst the other issues, environmental watering (6 comments), kangaroo grazing pressure (6 comments), economic viability (4 comments), pest plants on public land (4 comments), waterway management (3 comments), and chemical pollution of waterways (3 comments with a focus on water released by Coliban Water) were those identified by more than one respondent.

Eight comments focussed on the North Central CMA and these included complaints that the CMA didn't respond to feedback; needed to take more action on some issues; or that specific actions had negative outcomes (e.g. applying environmental water).

Ten comments referred to future plans, including topics of interest (e.g. soil carbon), succession planning and other long-term plans (e.g. sale of the property; building a house on vacant land). A small number of comments were really requests for assistance. For example, advice about the management of native vegetation; soil health or Landcare group to join).

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SOIL CRC
Performance through collaboration

SURVEY NO.

SUPPORTING LANDHOLDERS IN THE NORTH CENTRAL VICTORIA REGION

RURAL LANDHOLDER SURVEY 2019




NORTH CENTRAL Catchment Management Authority
Connecting Rivers, Landscapes, People

Southern Cross University

Charles Sturt University

SUPPORTING LANDHOLDERS IN THE NORTH CENTRAL VICTORIA REGION

This survey is a vital part of efforts to understand the important social and economic factors shaping landholder decision making. Information you provide will guide implementation of the North Central Catchment Management Authority's (CMA) 2020-2026 Regional Catchment Strategy that supports landholders working to establish viable futures in the North Central CMA region.

Information provided will also inform the research activities of the Australian Government and industry funded Soil Cooperative Research Centre (Soil CRC), of which North Central CMA is a partner.

Surveys have been sent to a random selection of landholders covering small and large properties. There is no other way to obtain this property level information. This survey follows up a similar survey in 2014 and will provide insights into trends over time.

We are seeking the views of the persons primarily responsible for managing the property. If you are not involved in the management of the property please forward the survey to the property manager or return the survey in the return envelope. We ask that you only provide information for property/s within the North Central CMA region.

It should take you about 25 minutes to complete the survey. There are no right or wrong answers and there is no need to think at great length about your responses. If you have any questions about the survey, please phone Dr Hanabeth Luke on 1800 317 503 or by email at Hanabeth.Luke@scu.edu.au

You are assured of complete confidentiality. Your name will never be placed on the survey or used in any of the reports. No group outside the research team will have access to the survey data. Information is published at the regional scale and individual data are never published.

Thank you for your assistance,

Professor Allan Curtis

Dr. Hanabeth Luke

1. WHY YOUR PROPERTY IS IMPORTANT TO YOU

The next set of statements seeks information about the **reasons your property is important to you.** *Examine each statement in the table and place the number for your response in each space provided for* ***'Your View'.***

RESPONSE OPTIONS:

NOT IMPORTANT	MINIMAL IMPORTANCE	SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT	NOT APPLICABLE
1	2	3	4	5	6

WHY YOUR PROPERTY IS IMPORTANT TO YOU	YOUR VIEW
Sense of accomplishment from producing food and fibre for others	
Ability to pass on a healthier environment for future generations	
Sense of accomplishment from building/maintaining a viable business	
Opportunity to learn new things	
A place or base for recreation	
Working on the property is a welcome break from my normal occupation	
An asset that will fund my retirement	
A great place to raise a family	
A place where I can escape the pressures of life	
Native vegetation provides habitat for birds and animals	
An important source of household income	
An attractive place/area to live	
Provides a sense of belonging to a community	
The productive value of the soil on my property	
Native vegetation makes the property an attractive place to live	
An asset that is an important part of family wealth	

2. LONG-TERM PLANS FOR YOUR PROPERTY

Please indicate the possibility that your **long-term plans** for your property in the **next 10 years** will involve each of the choices in the table below. *Examine the response options underneath this paragraph. For each choice in the table, place the number of your response option in the '**Your view**' column.*

RESPONSE OPTIONS:

HIGHLY UNLIKELY	UNLIKELY	UNSURE	LIKELY	HIGHLY LIKELY	NOT APPLICABLE
1	2	3	4	5	6

LIKELIHOOD YOUR LONG-TERM PLANS WILL INVOLVE	YOUR VIEW
Ownership of the property will stay within the family	
The property will be sold	
The property will be subdivided and a large part of the property sold	
I will move off the property around/soon after reaching age 65 years	
All or most of the property will be leased or share farmed	
Additional land will be purchased	
Additional land will be leased or share farmed	
The enterprise mix will be changed to diversify income sources	
The enterprise mix will be changed to more intensive enterprises	
The enterprise mix will be changed to less intensive enterprises	
Me or my spouse will seek additional off-property work	
Some part of property will be placed under a conservation covenant	

Do you have **family members interested in taking on your property in the future**? *Please tick your answer.*

○ Yes ○ No ○ Unsure/too early to know

If Yes, has your family agreed to a **succession plan**? *Please circle your answer.*

Not started Early stages Halfway Well advanced Completed/Ongoing

3. YOUR ASSESSMENT OF ISSUES

This set of statements seeks your opinion about the importance of a **range issues that may be affecting your property and your local district**. *Examine each statement in the table, then place the number of your response option in each space provided for '**Your view**'.*

RESPONSE OPTIONS:

NOT IMPORTANT	MINIMAL IMPORTANCE	SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT	NOT APPLICABLE/ DON'T KNOW
1	2	3	4	5	6

IMPORTANCE OF ISSUES AFFECTING YOUR LOCAL DISTRICT	YOUR VIEW
Absence or poor quality of important services and infrastructure (e.g. health, schools, internet)	
The impact of pest plants and animals on native plants and animals	
Uncertain/low returns limiting capacity to invest in my property	
Less water being made available to support recreation on rivers and lakes	
Movement of irrigation water away from this region	
Dryland salinity undermining long-term productive capacity	
Irrigation salinity undermining long-term productive capacity	
Loss of native plants and animals in the landscape	
Nutrient run-off from rural properties affecting water quality	
Stock damage to native vegetation along waterways and in wetlands	
Risk to life and property from wildfires	
The effect of ground water extraction on stream flows during drought	
Non-agricultural land use (e.g. residential, solar, mining) encroaching on farming land	
Changes in weather patterns	
Dams on rural properties reducing run-off to natural waterways	
Modernisation of the irrigation system as part of water reform	
Crop weed resistance to herbicide	
Long-term negative impacts of property purchased by absentees	
Quality of water in farm dams during drought	
Public support for agricultural activities/practices, e.g. pesticide use, bare paddocks, mulesing	

IMPORTANCE OF SOIL RELATED ISSUES ON YOUR PROPERTY	YOUR VIEW
Soil erosion (e.g. by wind or water)	
Low permeability of sub soil	
Declining nutrient status of soils	
Soil acidity (lower pH) undermining productive capacity of soils	
Soil sodicity	
Low organic carbon in soils	
Low biological activity in soils	

4. THE PRINCIPLES THAT GUIDE YOUR LIFE

The next set of statements seeks information about the **principles that guide your life**. *Examine each statement in the table and place the number for your response in each space provided for **'Your View'**.*

RESPONSE OPTIONS:

NOT IMPORTANT	MINIMAL IMPORTANCE	SOME IMPORTANCE	IMPORTANT	VERY IMPORTANT	NOT APPLICABLE
1	2	3	4	5	6

THE PRINCIPLES THAT GUIDE YOUR LIFE	YOUR VIEW
Looking after my family and their needs	
Working for the welfare of others	
Protecting the environment and preserving nature	
Being influential and having an impact on other people and events	
Fostering equal opportunities for all community members	
Preventing pollution and protecting natural resources	
Having power and being able to lead others	
Respecting the earth and living in harmony with other species	
Caring for the weak and correcting social injustice	
Creating wealth and striving for a financially profitable business	

5. YOUR KNOWLEDGE OF DIFFERENT TOPICS

In this section we would like you to provide **an assessment of your knowledge** for a number of different topics. *Examine the response options. For each choice in the table, place the number of your response in the **'Your view'** column.*

RESPONSE OPTIONS:

NO KNOWLEDGE	VERY LITTLE KNOWLEDGE	SOME KNOWLEDGE	SOUND KNOWLEDGE (sufficient to act)	VERY SOUND KNOWLEDGE (can give a detailed explanation)	NOT APPLICABLE
1	2	3	4	5	6

YOUR KNOWLEDGE OF DIFFERENT TOPICS	YOUR VIEW
Preparing a farm/property plan allocating land use according to land class	
Which Aboriginal group is connected to the area where your property is located	
The role of understorey plants in maintaining native birds	
The role of logs & river-side vegetation in supporting native fish	
The extent and type of biological activity in soils on your property	
Strategies to maintain ground cover to minimise erosion in this area	
How to establish introduced perennial pastures (e.g. lucerne) in this area	
How to identify the main constraints to soil productivity on your property	
The production benefits of applying biological soil amendments and supplements (e.g. compost, manure, microbial inoculants)	
The processes leading to soil structure decline in this area	
The role of soil carbon in maintaining soil health	
The extent of native vegetation cover in the North Central region before European settlement	
How land in your district was used and managed before European settlement	
How to use soil testing to prepare a nutrient budget that will increase soil productivity without the risk of high levels of nutrient run-off	
The effect of fertiliser application on the persistence of native grasses in this area	

6. YOUR VIEWS

We would like to know **how closely the statements presented below reflect your views**. *Examine each statement in the table, then place the number for your response in the space provided for '**Your view**'.*

RESPONSE OPTIONS:

STRONGLY DISAGREE	DISAGREE	UNSURE	AGREE	STRONGLY AGREE	NOT APPLICABLE/ DON'T KNOW
1	2	3	4	5	6

STATEMENTS	YOUR VIEW
The increased allocation of water for the environment under the Murray-Darling Basin Plan will improve the health of waterways & wetlands	
Aboriginal people should be able to negotiate access with landholders to visit cultural sites	
The public should be able to access crown land managed by private landholders (e.g. unused roads)	
If landholders are informed in advance, it would be acceptable to cause minor floods for environmental purposes	
Landholders should be able to harvest rainfall on their property, even if that action impacts on others	
Primary producers should do all they can to reduce carbon emissions from their activities	
The cost of deep-tillage and subsoil modification are justified by increased production	
The benefits of stubble retention outweigh problems arising from the practice	
The costs of applying lime to address soil acidity are justified by increased production	
The costs of applying gypsum to address soil sodicity are justified by increased production	
The costs of establishing perennial pasture are justified by the returns	
The cost of willow removal is justified by improvements in the condition of river banks & river health	
Soil testing is an essential first step in understanding soil condition	
Intensive grazing for short periods is usually better for the health of native vegetation along waterways and wetlands than set stocking	
Fencing to manage stock access is necessary to protect the health of waterways & wetlands	
Improvements in bank stability & vegetation condition justify the costs of watering stock off-stream	
I feel a personal responsibility to be part of a soil health group	
I feel a personal responsibility to maintain my soil's productive capacity	
Biological activity is an important indicator of the productive capacity of soils	
I'm confident landholders in this region can adapt to expected changes in rainfall patterns	

7. PREFERRED SOURCES OF INFORMATION

In the past 12 months what have been your sources of i**nformation about topics related to the management of your property in the North Central Catchment?** *Please place a tick besides any relevant sources of information in the table below.*

SOURCE OF INFORMATION		SOURCE OF INFORMATION	
Television	○	Facebook	○
Books	○	YouTube	○
Academic Journals	○	Twitter	○
Magazines	○	Instagram	○
North Central CMA	○	Internet	○
Victorian Farmers Federation	○	Landcare group/network	○
Bureau of Meteorology	○	Local Council	○
Water Authorities (e.g GMW, Coliban Water)	○	Mailed brochures/leaflets/community newsletters	○
Government agencies/departments	○	Rural R&D corporations (e.g. MLA, GRDC)	○
Soil Cooperative Research Centre (CRC)	○	Extension officers	○
Newspapers	○	Environmental organisations	○
Field days	○	Commodity groups	○
Radio	○	Friends/neighbours/relatives	○
Podcasts/Webinars	○	Agricultural consultants, agronomists and stock agents	○
Banks	○	Other – please specify	

For your selection/s above, please indicate the title/name of your preferred top source (e.g. radio station, paper or website)? _____

8. YOUR VIEWS ABOUT RISK, TRUST AND CLIMATE

In this section we would like to explore your **views about the taking risks, trusting others, climate change and the North Central CMA**. *For each statement in the table, place the number of your response in the '**Your view**' column.*

RESPONSE OPTIONS:

STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE	NOT APPLICABLE/ DON'T KNOW
1	2	3	4	5	6

STATEMENTS	YOUR VIEW
You can't be too careful when dealing with people	
People are almost always interested only in their own welfare	
One has to be alert or someone is likely to take advantage of you	
I am an early adopter of new agricultural practices and technologies	
I prefer to avoid risks	
I really dislike not knowing what is going to happen	
I usually view risks as a challenge to embrace	
Human activities are influencing changes in climate	
It is not too late to take action to address climate change	
If we do nothing, climate change will have dire consequences for all living things, including humans	

Are you aware of the existence of the North Central CMA? ○ Yes ○ No

If Yes, please answer the next items. **If no**, please move to the next section.

STATEMENTS	YOUR VIEW
The North Central CMA keeps landholders' interests in mind when making decisions about waterways and wetlands management	
Sound principles guide North Central CMA decisions about waterways & wetlands management	
The North Central CMA is very knowledgeable about waterways & wetlands management	
I can rely on the North Central CMA to provide useful advice about waterways & wetlands management	
I can rely on the North Central CMA to provide appropriate financial assistance for waterways & wetlands management	

9. ENTERPRISE/ LAND USE MIX

This topic is seeking i**nformation about your current land use/enterprise mix**. *Please place a tick besides any correct response in the '**Situation Now**' column*. Please answer with the land you own and manage within the NC CMA region in mind.

ENTERPRISES / LAND USE ON YOUR PROPERTY IN 2019	SITUATION NOW	ENTERPRISES / LAND USE ON YOUR PROPERTY IN 2019	SITUATION NOW
Cropping	○	Irrigated agriculture	○
Pasture	○	Area of remnant native vegetation (e.g. trees, grasslands, wetlands)	○
Dairying	○	Farm forestry	○
Beef cattle	○	Other tree planting (e.g. shelter, habitat, erosion or recharge control, carbon)	○
Sheep for wool or meat	○	Farm-based tourism (e.g. farm stays, B&B)	○
Other commercial livestock enterprises (e.g. goats, pigs, deer, horse studs, poultry, alpaca, dogs)	○	Conservation covenant attached to property title (e.g. Trust For Nature)	○
Viticulture	○	Area set aside for living/recreation (e.g. gardens, pets, water bodies, vehicles)	○
Vegetation offsets	○	Carbon farming	○
Horticulture	○	Hay production for sale	○

10. OCCUPATIONAL IDENTITY

Please **circle** the descriptor/term that best describes your **occupational identity:**

Full-time farmer Part-time farmer Hobby farmer Non-farmer

11. MANAGEMENT PRACTICES ON YOUR PROPERTY

This section asks about **practices undertaken** on your main or 'home' property in the North Central region during the full period of your management; and the past 3 years.

Some actions may not be relevant to your situation. Please ignore those topics.
If you have owned your property for less than 12 months, please leave this topic and go to the next page.

We also want to know **if the activities listed have been supported by resources from outside groups** (e.g. North Central CMA, DEWLP, Greening Australia, Trust for Nature, Landcare). *Please place a tick where that is the correct response in the three columns*.

PRACTICES IMPLEMENTED ON YOUR MAIN OR "HOME" PROPERTY IN THE NORTH CENTRAL REGION	AT SOME TIME DURING PERIOD OF MANAGEMENT	PAST 3 YEARS (2017-2019)	RESOURCES PROVIDED BY OTHERS
Planted trees and shrubs (incl. direct seeding)	○	○	○
Fenced native bush/grasslands to manage stock access	○	○	○
Fenced waterways & wetlands to manage stock access	○	○	○
Established permanent grassed waterways in drainage lines	○	○	○
Established off-stream watering points	○	○	○
Established an irrigation tailwater reuse system	○	○	○
Used time controlled or rotational grazing	○	○	○
Sown lucerne	○	○	○
Sown perennial pastures other than lucerne	○	○	○
Used minimum or no tillage techniques to establish crops or pastures	○	○	○
Used precision farming techniques for cropping	○	○	○
Applied at least one lime application to arable land	○	○	○
Deep ripped arable land	○	○	○
Applied soil ameliorants other than fertiliser and lime (e.g. gypsum, organic manure)	○	○	○
Tested soils for nutrient status in paddocks where have applied fertiliser/soil conditioners in the past	○	○	○
Prepared a nutrient budget for all/most of the property	○	○	○
Prepared a habitat assessment for native plants	○	○	○
Each year have worked to control pest animals	○	○	○
Each year have worked to control non-crop weeds	○	○	○

12. BACKGROUND INFORMATION

BACKGROUND INFORMATION	PLEASE TICK OR FILL IN YOUR RESPONSE
What is the total area of rural land you own within the NC CMA region? (excluding land you manage but do not own)	_____ total Ha owned
Is this property your principal place of residence?	○ Yes ○ No
What area of additional land do you manage (lease/sharefarm/agist from others) within the NC CMA region (additional to the figure you provided above)?	_____ additional Ha managed
What is the longest period of time you or your family have owned or managed all/some part of your property?	_____ yrs
What area of your property is leased, share farmed or agisted by others?	_____ Ha
How many rural properties do you own? (including those within and outside of the NC CMA)?	_____ No. of properties
How many of these properties are within the NC CMA region?	_____ No. of properties

13. YOUR PROPERTY

This topic seeks **information about you and your main or 'home' property**.

BACKGROUND INFORMATION	PLEASE TICK OR FILL IN YOUR RESPONSE
Did you attend field days/farm walks/demonstrations focused on **soil health in the past 12 months**	○ Yes ○ No
Has this enterprise bought additional land to increase a landholding in this region in the past 20 years?	○ Yes ○ No
Have you subdivided or sold part of your existing property in this region in the past 20 years?	○ Yes ○ No
Are other **family members** working **full time** on your property?	_____
Are you **male** or **female**?	○ M ○ F
What is your **age?**	_____ yrs
What is your main **occupation**? (e.g. farmer, teacher, accountant, investor, retiree)	_____
In the past 5 years have you **completed a short course** relevant to property management? (e.g. financial planning, integrated pest management)	○ Yes ○ No
Estimate the **average** number of **hours per week** that you **worked on farming/property** related activities **over the past 12 months.**	_____ hr/wk
Estimate the number of **days** that you were involved in **paid off-property** work in the **past 12 months**	_____

Did you attend field days/farm walks/demonstrations focused on **native plants & animals in the past 12 months**	◯ Yes ◯ No
Are you a member or involved with a local Landcare group?	◯ Yes ◯ No
Are you a member or involved with a local commodity group? (e.g. Better Beef, Best Wool, Birchip Cropping Group)	◯ Yes ◯ No
Are you a member or involved with a local soil health group?	◯ Yes ◯ No
In the past 12 months have you changed your financial or on-property operations as a result of considering climate change?	◯ Yes ◯ No
In the past 12 months have you changed your on-property operations as a result of considering opportunities to capture carbon (e.g. by revegetation, soil management)?	◯ Yes ◯ No
In the past 12 months have you changed your on-property operations as a result of considering opportunities to reduce carbon emissions (e.g. solar, wind, gravity systems)?	◯ Yes ◯ No
Have you prepared/are you preparing a property management or whole farm plan that involves a map or other documents that address the existing property situation and include future management and development plans?	◯ Yes ◯ No
Did you irrigate in the 2018/19 season?	◯ Yes ◯ No
If yes: Was surface water used	◯ Yes ◯ No
Was ground water was used	◯ Yes ◯ No
Did you earn income from agriculture on your property in the North Central region during 2018/19 financial year?	◯ Yes ◯ No
If yes, did your property return a net profit from agriculture (income exceeded all paid expenses before tax) in 2018/19?	◯ Yes ◯ No
If yes, was the net profit from agriculture in 2018/19 above $50,000?	◯ Yes ◯ No

Did you or your spouse receive a net off-property income (after expenses and before tax) **last financial year** (2018/2019)?

◯ Yes, me ◯ Yes, my spouse ◯ No

If yes, was the **total off-property income** (before tax) for you and your partner last financial year (2018/2019) above $50,000? ◯ Yes ◯ No

OTHER COMMENTS AND **THANK YOU FOR YOUR TIME**

Do you have any other comments about any of the topics covered in the survey, or other aspects of land and water management in the North Central CMA region? Please use the space provided to write your comments or attach additional sheets. Your comments will be recorded by the research team.

We appreciate the time you have spent answering the questions. **Please return the completed survey in the envelope provided that is addressed to Professor Curtis.**

If you need assistance with the survey, or wish to make specific comments about it, please 1800 317 503 to contact Dr Hanabeth Luke.

Prepared by North Central CMA