AGRICULTURE IN CENTRAL WEST NSW

RURAL LANDHOLDER SOCIAL BENCHMARKING REPORT 2022

HANABETH LUKE & WARREN LAKE

WITH

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The views expressed in this report are solely the authors', and do not necessarily reflect the views of Southern Cross University, the Soil Cooperative Research Centre or the people consulted during the research project.

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This Cooperative Research Centre for High Performance Soils (Soil CRC) research project involves a partnership between the Agricultural Innovation and the Central West Farming Systems, Southern Cross University (SCU) and Charles Sturt University (CSU). The Soil CRC is funded by the Australian Government's Cooperative Research Centre Program.

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Finally, we would like to thank all the landholders who took the time to complete the survey.

LIST OF ACRONYMS

SCU – Southern Cross University
CSU – Charles Sturt University
GIS – Geographic Information System
LGA – Local Government Area
NRM – Natural Resource Management
Soil CRC – Soil Cooperative Research Centre
CWLLS – Central West Local Land Services
LLS – Local Land Services
CWFS – Central West Farming Systems
FTF - Full-time Farmer
PTF - Part-time Farmer
HF - Hobby Farmer
NF - Non-farmer

LEGEND

= Significant difference by Farmer Type
*** = Significant difference by Rainfall Zone

EXECUTIVE SUMMARY

The project, *Surveying On-Farm Practices*, was initiated in 2019 to implement surveys in partnership with local farming organisations across multiple Australian states, to provide accurate information to support improved soil and land management. It will collate a dataset of national significance, showing both breadth and depth of information on factors involved in on-farm decision-making for Australian farmers. The project is led by Dr Hanabeth Luke of Southern Cross University (SCU) and funded by the funded by the Co-operative Research Centre for High-Performance Soils (Soil CRC).

The overall survey design builds on the work of Professor Allan Curtis[1]. The general approach is that questionnaires are physically mailed to landholdings over ten hectares (10 ha) in the selected region, to either a random selection or everyone, depending on the region's population. Questions are asked regarding farmers' actual and intended practices, challenges, and aspirations. Important background information is also collected on farm management styles and farmer values and items that focus on self-assessed knowledge of, and confidence in, current recommended (best) practices and perceptions of risk.

The general survey approach is customised through collaboration with regional partners to ensure regional relevance. Core questions relating to broad soil management principles and demographics remain consistent across regions to enable comparisons and the development of a nationally consistent dataset; however, our approach allows regional priorities to be explored in a number of customised questions.

The 2021 Central West NSW social benchmarking survey contributes to the national Soil CRC project. Project leader Dr Hanabeth Luke visited the Central West NSW region in 2021. A workshop with project partners Central West Farming Systems (CWFS) and Central West Local Land Services (CWLLS) identified key topics and questions to inform survey development. These included: farmer attitudes, how risk-averse farmers may be and what drives them to change and improve their soil health. Also, the perceived state of soil health and drivers of increased productivity, including carbon and biology; how soil testing takes place, what value-adding was taking place, how farmers were managing their stubble and what regional interest there may be in regenerative agriculture. A questionnaire was drafted and piloted with local partners and a small group of rural landholders.

The final questionnaire is in Appendix 2.

The questionnaire was mailed to rural property owners with holdings greater than 10 ha. Priority addresses were identified using spatially referenced landholder contact lists for the Central West region provided by the local governments of Bland, Blayney, Cabonne, Cowra, Forbes, Lachlan, and Parkes. Questionnaires were posted to 2,500 property owners, equating to 1872 possible respondents. A total of 575 surveys were completed, resulting in a 31% response rate.

Demographic and descriptive characteristics were collected to contextualise responses including general personal and property information (e.g. property size, absentee ownership), as well as asking respondents to identify as full-time, part-time, hobby farmers, or non-farmers. This background

[1] Curtis, A., & Luke, H. (2019). Social benchmarking for natural resource management: 2019 North Central Victoria. Southern Cross University, NSW, 2480.

information was used to check for sampling bias and to enable correlations to be sought between contextual variables and practice change.

The key findings reflect that the Central West region of New South Wales is primarily an agricultural landscape, dominated by full and part-time farmers, as well as hobby farmers:

- Full-time farmers: 55%
- Part-time-farmers: 19%
- Hobby farmers: 18%
- Non-farming landholders: 8%

The reported median landholding was 1,140 hectares across two properties, for full-time farmers, this decreased to 1016 hectares. The most common land uses reported are pastures (60%), sheep (59%), beef (52%) and cereal cropping (47%). Overall, 76% of respondents reside on their Central West property, rising to 83% for full-time farmers. The median length of family land ownership was reported as 55 years, with a mean of 80 years. Across all respondents, the median age was 61 years and 78% were male.

The results show that while there were a range of enterprises and land use mixes, the most common land use was sheep and beef (59% & 52%, respectively). Sixty percent used the land for pastures and 48% of all landholders were cropping.

Management of soil health was most often through maintaining groundcover, with other common responses including the use of crop rotation and avoiding overstocking. Overall, the data indicate a strong personal responsibility to maintain the productivity of soil and soil testing as an essential step, particularly amongst full-time farmers. A high percentage of full-time and part-time farmers believed that the benefits of stubble retention outweigh problems arising from the practice (76% and 70% respectfully).

While 83% of full-time farmers agreed that soil testing is an essential step in understanding soil condition, the frequency of testing varied greatly. For example, when landholders were asked how often soil testing was performed on their property, 47% indicated that they tested every 3 – 5 years; 14% at least annually; 17% once ever; with 22% having never completed any soil testing. Of the full-time farmer group, a slightly higher 57% tested every 3-5 years, with most concentrating on soil testing systematically in multiple paddocks.

When considering key challenges farmers face, the top three issues listed for farmers across the region were: water holding capacity of soils; declining soil health and/or soil productivity; and the absence of important services and infrastructure (e.g. health, schools, internet, phone coverage). Issues such as costs of inputs, land, and machinery were also seen as a big challenge to farmers. Labour prices and soil health were seen as important issues. Also common were financial challenges relating to mortgage repayments and debt, demonstrating a mix of personal and practical challenges for farmers. Just over half of farmers reported financial considerations as a barrier to taking risks and trying new approaches.

Management decisions were considered to have an important influence on profitability, with input costs, such as the restocking of sheep or cattle and re-cropping after drought being key considerations. Many farmers indicated a preference for keeping as many breeding sheep and cattle as possible during drought and either restocking based on a natural increase or purchasing more

stock post drought. The importance of maintaining a continual balancing act between destocking and restocking was evident from the responses.

Just 35% considered themselves to be an early adopter of new agricultural practices and technologies. Importantly, 87% of all landholders and 91% of full-time farmers reported being open to new ideas about farming & land management. However, 70% of landholders in the region stated they will not take risks if their intuition says no. Furthermore, they trust their intuition over other information when risk is involved (63%). Half of full-time farmers surveyed were interested in learning more about regenerative farming approaches.

When asked to nominate what they saw as their biggest challenge or opportunity in the next ten years, the strongest emergent theme was that of climate change. Many farmers were cognisant of the seasonal variability linked to climate change, focusing on a broad range of issues such as drought and water storage, with some highlighting the need to adapt to climate change and to take such actions as "drought-proofing the farm". The second most common challenge highlighted was that of aging, pending retirement, farm succession and health.

1. INTRODUCTION

A national project, *Surveying On-Farm Practices*, was initiated in 2019 to implement surveys in partnership with local farming organisations across multiple Australian states, to provide accurate information to support improved soil and land management. The project is collating a dataset of national significance, showing both breadth and depth of information on the factors involved in on-farm decision-making for Australian farmers. The project is led by Dr Hanabeth Luke of Southern Cross University (SCU) and funded by the funded by the Co-operative Research Centre for High-Performance Soils (Soil CRC). The research team includes social scientists from Southern Cross University and Charles Sturt University.

Data gathered will support the activities of local Soil CRC partners while contributing to the broader Soil CRC research portfolio. Leveraging the insights from in-depth landholder surveys, Soil CRC researchers will be able to explore farmer knowledge of soil health 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 have been developed in Victoria, South Australia, Western Australia and Tasmania.

The survey methodology draws on a widely accepted approach to social benchmarking for regional land and natural resource management developed by Professor Allan Curtis[2]. This survey-based methodology has previously 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 general survey approach is that questionnaires are physically mailed to landholdings in a region over ten hectares (10 ha) in size, to either a random selection or all landholders in low population areas that are linked to cadastral lists that enable spatial analysis and display of data. The surveys include questions on farmers' actual and intended practices, challenges, and aspirations. Important background information is also collected on-farm management styles and farmer values and items that focus on self-assessed knowledge of, and confidence in, best practices and perceptions of risk (see Curtis and Luke 2019).

Having spatially referenced data means that we can show social, economic and environmental trends spatially across the region. Our data can also be cross-referenced with other spatial data such as soil type and rainfall.

1.1 CONCEPTUAL FRAMEWORK

The conceptual underpinning of this study recognises that the drivers of human behaviour and decision-making are complex, multi-layered and interlinked. This requires careful consideration when seeking to support practice change in the context of rural land management. Drivers of practice change include governance frameworks, weather, property prices and demographic factors. This includes what farmers view as important, their knowledge of 'best-practice' and how

[2]Curtis, A., Byron, I., & MacKay, J. (2005). Integrating socio-economic and biophysical data to underpin collaborative watershed management. *Journal of the American Water Resources Association, 41*(3), 549-563.

they perceive their own role as landholders. In the absence of well-understood causal relationships between decision-making drivers, the potential success of practice change support is diminished.

While values, beliefs and personal norms (i.e., accepted behaviour and decision-making patterns) may mediate or moderate some of these other factors, it is difficult to change these deep-seated personal attributes in the short or medium term. Nevertheless, it is essential to understand the values and beliefs of landowners if they are to be effectively engaged. Values-Belief-Norm Theory (VBN) is a theoretical approach developed and applied to explain the relationship between values and behaviour, particularly regarding human-environment interactions and land management.

In short, landholder values and beliefs may be difficult to change but are extremely important to understand for effective engagement. The two main elements of this we explore in the survey are: 'assigned values' and 'held values', both of which are deemed important for guiding personal action[3]. 'Held', or 'intrinsic' values, are ideas or principles that people hold as important to them and may be abstract and conceptual,[4] whereas we describe 'assigned' or 'attached values' as those values landholders attach to their land and farm.

Value orientations are the position a person takes when a particular set of held values are more important to them than other held values[5]. It is important to note that individuals can simultaneously have more than one value orientation[6].

Practical strategies to encourage the adoption of current recommended practice (CRP) and new innovations can be improved by identifying a number of 'levers' to effect change[7]. If a landholder does not know of or understand an approach, technology or practice, it is unlikely that they will adopt it. If they are aware of the practice or innovation but have little confidence in its effectiveness, they are unlikely to adopt it. If they view it as too expensive or time-consuming to implement, they are also unlikely to take it up. Therefore, the survey must identify both knowledge of, and confidence in, relevant best-practice land and farm management[7].

It is also helpful to identify personal 'norms,' or the level of personal responsibility that landholders feel towards managing their soil, land and farm. Personal norms concerning risk-taking are essential predictors of adoption, where those with a higher risk tolerance are more likely to implement of practice change[7].

The next step is identifying the most effective 'extension' or information-sharing approaches, processes or platforms for engaging rural property owners in learning, dialogue and action. In

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[3]Lockwood, M. (1999). Humans Valuing Nature: Synthesising Insights from Philosophy, Psychology and Economics. *Environmental Values*, 8(3), 381-401.

[4] McIntyre, N., Moore, J., & Yuan, M. (2008). A place-based, values centred approach to managing recreation on Canadian crown lands. *Society & Natural Resources*, 21, 657-670.

[5] Axelrod, L. J. (1994). Balancing personal needs with environmental preservation: identifying the values that guide decisions in ecological dilemmas. *Journal of Social Issues, 50*(3), 85-104.

[6] Lockwood, M. (1999). Humans Valuing Nature: Synthesising Insights from Philosophy, Psychology and Economics. *Environmental Values*, 8(3), 381-401; Stern, P. C. (2000). Toward a coherent theory of environmentally significant behaviour. *Journal of Social Issues*, 56(3), 407-424.

[7] Curtis, A., & Luke, H. (2019). Social benchmarking for natural resource management: 2019 North Central Victoria. Southern Cross University, NSW, 2480.

identifying these approaches, it is also important to understand how landholders perceive and trust their local and regional organisations[8].

Landholder types/ categories present a useful way to see how different priorities influence landholder management practices. So this questionnaire asked how the respondent identified themselves as a full-time farmer, part-time farmer, hobby farmer or non-farmer. This typology was developed by Groth et al. (2014), has been published in peer-reviewed academic journals[9] , and has been applied in all phases of this Soil CRC project[10].

1.2 SURVEY DEVELOPMENT

Dr Hanabeth Luke visited the Central West NSW region in 2021 and gained the agreed participation of Central West Farming Systems (CWFS) and Central West Local Land Services (CWLLS) as project partners. A follow up workshop with CWFS and CWLLS staff identified key topics and questions to inform survey development. A list of priorities was developed and distilled into four main topics:

A) Profile of farming in Central West NSW
B) On-farm data management, especially in relation to soil testing
C) Changing farm management practices: risk and resilience
D) The future of farming in Central West NSW

The priorities relevant to the Central West (Figure 1a) were refined using a mind mapping process with members of the Central West Farming System group (Figure 1b).

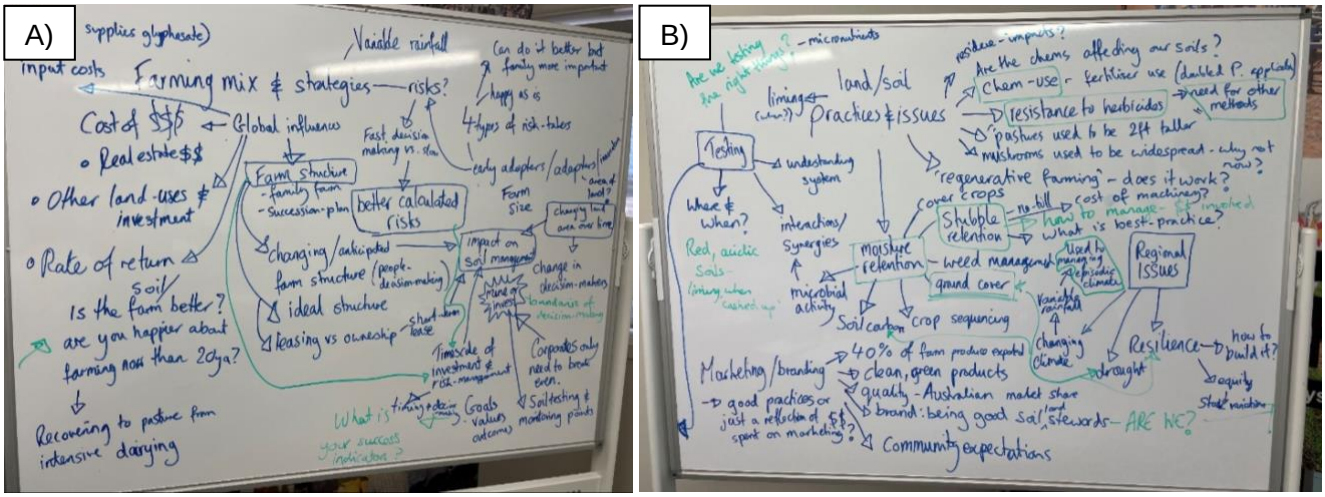

Figure 1a: Developing the survey priorities at the workshop with the CWFS and CWLLS Group.

Figure 1b: The mind-mapped priorities raised during the workshop with the CWFS Group.

[8] Luke, H. (2017). Social resistance to coal seam gas development in the Northern Rivers region of Eastern Australia: Proposing a diamond model of social license to operate. *Land Use Policy*, 69, 266–280.
[9] Groth, T. M., Curtis, A., Mendham, E., & Toman, E. (2014). Farmer identity in multifunctional landscapes: using a collective identity construct to explore the nature and impact of occupational identity. *Australian Geographer,* 45(1), 71-86; Groth, T., Curtis, A., Mendham, E. A., & Toman, E. (2016). The utility of a collective identity construct to explore the influence of farming identity on natural resource management. *Society and Natural* Resources 29(5) 508-602; Groth, T., and Curtis, A. (2017). Mapping farmer identity. Why? How? What it tells us? *Australian Geographer,* 48:3, 365-383.
[10] Curtis, A., & Luke, H. (2019). Social benchmarking for natural resource management: 2019 North Central Victoria. Southern Cross University, NSW.

Following the workshop, the project team built these topics into the existing core survey instrument, with sections on significant issues faced by landholders, their values, practices, experience and understanding of various topics, as well as confidence in a range of best practices in soil, farm and land management

Priority topics were chosen by consensus. These included: farmer attitudes, how risk-averse farmers may be and what drives them to change and improve their soil health. Also, the perceived state of soil health and drivers of increased productivity, including carbon and biology; the timeframe of decision-making; how soil testing takes place, what value-adding was taking place, how farmers were managing their stubble and what regional interest there may be in regenerative agriculture. A survey was drafted and sent to all workshop participants for comment and input. The next draft was piloted with local partners and a small group of rural landholders. The final questionnaire is presented in Appendix 2.

1.3 SURVEY ADMINISTRATION AND RESPONSE RATE

In advance of the survey, in June 2021, notices were mailed to 2500 randomly selected properties over ten hectares, which is about half of properties in the region. The addresses were identified using spatially referenced landholder contact lists for the Central West region provided by the local governments of Bland, Blayney, Cabonne, Cowra, Forbes, Lachlan, and Parkes. These notices included a link to an online survey posted on the Soil CRC website, and allowed some refinement of the mailing list. In July, 2284 comprehensive questionnaire booklets were mailed out to landholders in the seven partner local government areas. These were followed up with three reminder notes and a second survey.

Of the mailed questionnaires, 628 were 'return to sender' and opt-outs. Ninety-eight online surveys were completed, 62 of which were linked to the spatial property identifier. Online responses from LGAs outside the target region were removed from the sample. Thus, a 31% response rate was recorded from 575 surveys.

1.4 DATA ANALYSIS

We seek understanding of the data using three methods: descriptive statistics, tests for statistically significant relationships, and correlations between variables using linear regression modelling.

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 means analysis).

Further analyses include examining data for statistically significant differences between different groups (i.e. full-time farmer, part-time farmer, hobby farmer and non-farmer).

Kruskal Wallis Rank Sum tests were used to determine significant 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). The Likert responses 1-2 and 4-5 were combined for the purposes of the pairwise analysis.

Chi-squared Goodness of Fit test 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).

Pairwise comparisons tested for relationships (positive and negative) between variables expected to influence adoption (i.e., independent variables) of best-practice management (i.e., the dependent variables). Those practices consisted of current recommended practices that often relate to sustainable or regenerative agricultural practices and natural resource management. For all questions within the survey, respondents were given the choice "*Don't know/ Not applicable*" to allow for context-specific responses. Consequently, the proportion of selecting this option varied across the best-practice items.

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 R Studio software and Microsoft Excel.

Interpretation of the pairwise comparisons (e.g., to eliminate significant relationships that were irrelevant/nonsense) allowed the research team to identify a small number (approximately 25) of independent variables to include in the modelling for each best practice. The selected variables were then modelled with combinations of all variables, ranked by AIC, with any models flagged where there could be multicollinearity.

Logistic regression modelling was used to explore the extent a small number of independent variables contribute to the presence or absence of best-practice implementation. For logistic regression modelling we have only considered models with an accuracy of above 70%.

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 suggest that those efforts may lead to conceptually significant variables being excluded from models. For example, pairwise comparisons may reveal a meaningful relationship between the 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 techniques that can help to further tease out causality, but these are beyond the scope of this research project.

The sections that follow detail the results of the survey.

2 PROFILE OF FARMING IN CENTRAL WEST NEW SOUTH WALES

2.1 AN AGRICULTURAL LANDSCAPE

The Central West region of New South Wales is primarily an agricultural landscape, with 70% of all respondents earning an income from their property in 2018/2019. Only 57% of respondents reported earning more than $50,000 from these activities; this sits below the national average of 69% of agricultural enterprises with a turnover of $50,000 or above[11].

The reported median landholding was 1,140 hectares across two properties (mean of 1,300 hectares). The most common land uses were pastures (60%), sheep (59%), beef (52%) with 48% of landholders cropping.

Overall, 76% of respondents reside on their Central West property. The median length of land ownership by the respondent's family was reported as 60 years, with a mean average of 73 years. Across all respondents, the median age was 55 years and 78% of respondents were male. This is close to the national median farmer age of 54 years, which sat well above the national general workforce median age of 40 years and suggested slightly lower female participation in farm management than the national average of 32% females across the agricultural sector[12].

Survey participants were asked to self-identify into one of four landholder types, with results as follows:

- Full-time farmers: 55%
- Part-time-farmers: 19%
- Hobby farmers: 18%
- Non-farming land holders: 8%

Full-time farmers represented just over half of the respondents (55%), and 86% of these respondents were male, with an average age of 60 years. Full-time farmers had the largest holdings, with an average holding size of 1777 hectares. Their most likely land use was for sheep for wool or meat (74%); pasture (72%); cereal cropping (70%); and beef cattle (56%). Full-time farmers also had the highest residency rates (83%) and had the longest association with their land, with an average family ownership of 73 years. This group was most likely to have a family member working on the farm (68%), with 52% of this group working alongside a spouse/partner; 28% their children; 12% their parent; and 9% a sibling.

This cohort was least likely to have off-farm employment, sourcing 85% of income from agriculture in the region and spending more than 50 hours working on the farm. Full-time farmers were most likely to have additional land under their management (an average of 628 hectares). In terms of education, 71% had completed high school or vocational training and 37% held tertiary qualifications.

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[11] National Farmers Federation, (2017), *Food, Fibre & Forestry Facts — A Summary of Australia's Agriculture Sector*. NFF https://nff.org.au/wp-content/uploads/2020/01/171116-FINAL-Food-Fibre-Food-Facts.pdf

[12] Binks, B., Stenekes, N., Kruger, H., & Kancans, R. (2018), *Snapshot of Australia's Agricultural Workforce*, Australian Bureau of Agricultural and Resource Economics and Sciences.

Part-time farmers represented 19% of all respondents and of these respondents, 70% were male. The average age of part-time farmers was 60 years, and they held an average of 439 hectares, with 70% residing on the property. On average, their family had owned the land for 40 years. This group was the second most likely to have a family member working on the farm (58%), with 48% of this number a spouse/partner, 22% a child of the respondent, 5% a parent and 3% a sibling. Part-time farmers were most likely to use their land for farming beef (67%), pasture (50%), sheep for wool or meat (47%), areas of remnant vegetation (36%) and area set aside for living or recreation (33%). This was the most highly educated group in terms of education, with 86% having completed high school or vocational training and almost two thirds (63%) holding tertiary qualifications.

Hobby farmers made up 18% of all respondents, and of these, 65% were male. The average age of hobby farmers was 61 years, with 72% of hobby farmers living on their property, which had an average size of 89 hectares and had been owned by their family for 22 years. This group was the third most likely to have a family member working on the farm (11%). Of this, 28% were a spouse/partner, 7% were children of the respondent, 2% were a parent and 1% were siblings. This group used their land for pasture (49%), beef cattle (47%), sheep for wool or meat (40%), and areas set aside for living/recreation (33%). 71% of hobby farmers had completed secondary school or higher, with 47% holding tertiary qualifications.

Non-farmers were the least common landholder type, comprising 8% of respondents and holding an average property size of 291 hectares. This group had an average age of 64 years and the highest level of female respondents (46%). Non-farmers generally owned their property for 10+ years, receiving a median of 17% of income from regional agriculture and working around 10 hours per week on the property. Half of them were residents on the property. Their family ownership of the land spanned an average of 26 years and they were the group most likely to set aside an area for living and recreation (48%). Eighty-three percent of non-farmers had completed high school or higher and 64% held tertiary qualifications.

Figure 2 displays a map of landholder type by local government area:

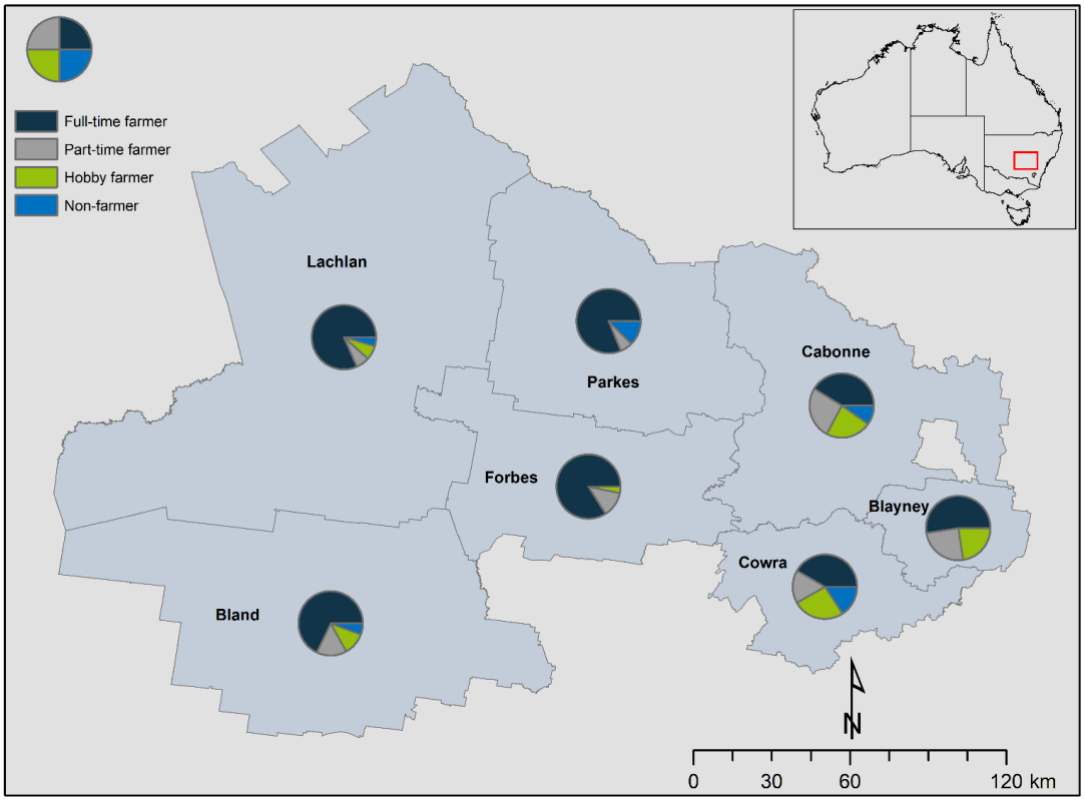

Figure 2: The distribution of landholder type in the Central West by local government area, 2021.

A breakdown of the survey responses relating to each reported land use can be found in Figure 3 below, with a further breakdown of land use and enterprise type in Table X2, Appendix 1.

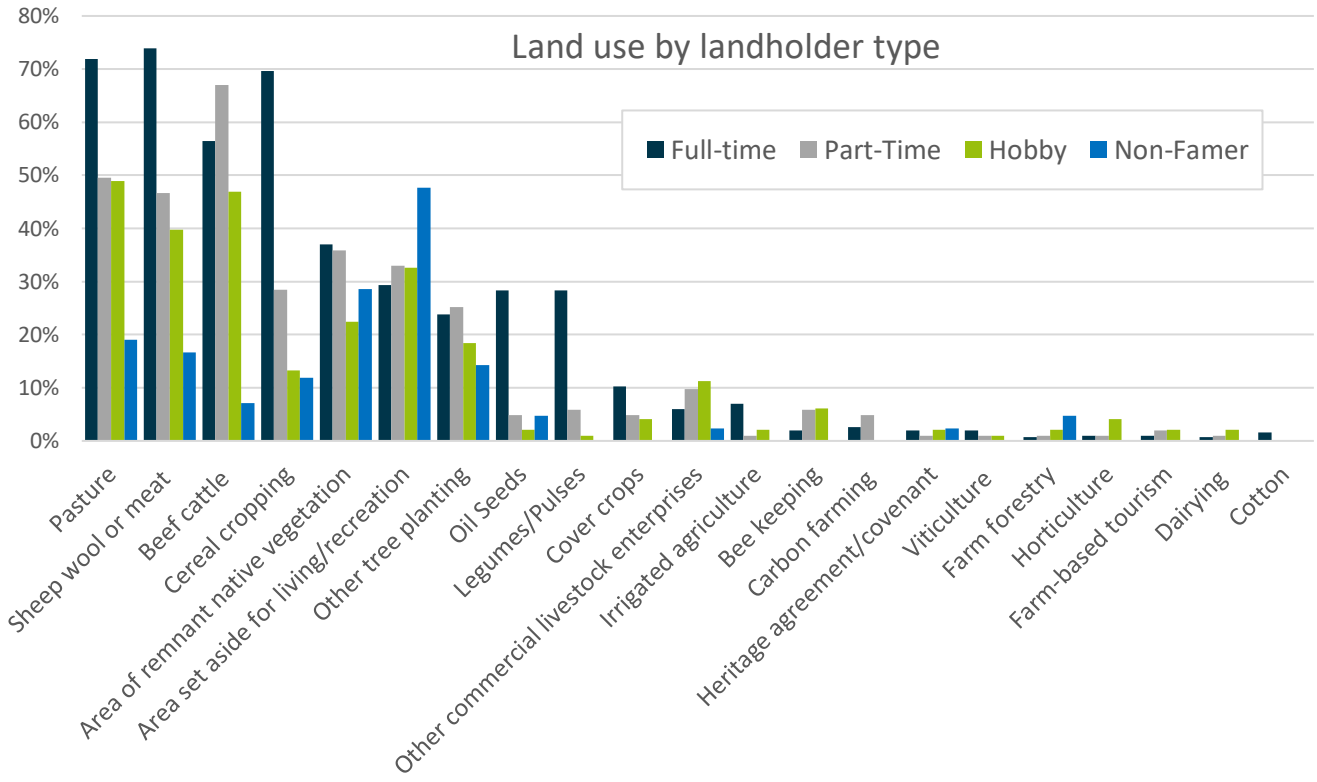

Figure 3. Breakdown of land use by landholder type. Percentage indicates the proportion of that landholder type undertaking that particular activity on their land.

2.2 FARM MANAGEMENT

Thirty-seven percent of landholders reported to have bought additional land in the region in the last twenty years, with 13% having subdivided or sold part of their property in that time. Across all landholder types, the average number of hours of on-property work was 60 hours per week, and 56% of respondents had another family member working on the farm, most of which (43%) were a spouse or partner. Off-property income was important for 24% of enterprises. Of this off-farm income, 57% was above $50,000 in the 2018/2019 financial year.

Key characteristics of the respondents overall and by landholder type are summarised in Table A with a further breakdown of key characteristics by local government area in Table X1 in the Appendix.

Table A: Key attributes summary table, Central West New South Wales Landholder Survey, 2021 (n= 575 to 509).

Key attributes (mean unless indicated)	**All**	**Full time**	**Part-time**	**Hobby Farmers**	**Non-Farmer**
Proportion of full-time farmer (FTF) survey responses	100%	55% (own 89% of land surveyed)	19% (own 8% of the land surveyed)	18% (own 1%)	8% (own 2%)
Age of respondent	61 years (median=61)	60 years (median=60)	61 years (median=60)	63 years (median=61)	63 years (median=64)
Percentage of Female respondents	21%	13%	30%	34%	46%
Mean total area owned (median in brackets)	1300 ha (1140 ha)	1777 ha (1016 ha)	440 ha (131 ha)	89 ha (40 ha)	291 ha (54 ha)
Bought additional land in region in past 20 yrs	37%	54%	26%	7%	17%
Subdivided or sold part of property past 20 yrs	13%	15%	12%	8%	10%
Property leased, share farmed or agisted by others	17%	23%	10%	6%	0%
Property leased, share farmed or agisted from others	88 ha	99 ha	26 ha	24 ha	166 ha
Resident on property	76%	84%	70%	72%	50%
Mean length of family ownership (median)	51 years (40)	66 years (60)	40 years (21)	22 years (17)	26 years (18)
Other family members working on the property	56%	68%	58%	34%	26%
Paid off-property work last 12 months	79 days	28 days	140 days	146 days	102 days
Hours work on-property per week	41 hours	56 hours	25 hours	17 hours	10 hours
Income from agriculture in relevant region 2018/19	70%	85%	74%	40%	15%

Key attributes (mean unless indicated)	All	Full time	Part-time	Hobby Farmers	Non-Farmer
Net profit from agriculture in relevant region in 2018/19	42%	56%	37%	12%	17%
Received off-property income 2019/2020	19% primary respondent	14% primary respondent	29% primary respondent	22% primary respondent	11% primary respondent
	16% spouse	21% spouse	15% spouse	5% spouse	3% spouse
	24% both	16% both	35% both	37% both	31% both
% survey respondents net income from off-property >$50k	57%	43%	73%	73%	63%
Completed short course related to property management, past 5 yrs	19%	22%	24%	14%	8%
Attended a field day in the last 12 months	38%	44%	46%	22%	15%
Property management or whole farm plan completed	39%	49%	43%	17%	10%
Proportion of land lost to production due to soil problems (mean)	14%	15%	17%	10%	8%
	Area: 66 ha	Area: 91 ha	Area: 24 ha	Area: 8 ha	Area: 2 ha
CWFS Group member	8% (5% was)	14% (6% was)	1% (5% was)	2% (2% was)	5% (2% was)

On-farm management was largely collaborative, with 75% of farmers including another person or people in their management decisions. Most often, this was a spouse/partner, other family members or a paid advisor such as an agronomist.

Of commercial farmers (full-time and part-time together), 76% reported having generated a profit over the last ten years. For a more detailed breakdown, see Table X3 in Appendix 1.

Those who had prepared comprehensive property plans generally had consistently high knowledge levels of most best-practices, particularly those relating to sustainable or regenerative agriculture. They also had a high level of confidence in applying those practices. They regularly test their soils, were competent with data management and view data as an essential basis for decision-making. They were also more likely to own more properties in the region.

2.3 LANDHOLDER VALUES

A key element of the conceptual basis for this social research is that farmer behaviour is derived from "core elements of personality and belief structures"[13], which can be seen through underlying values, beliefs and norms. Prior research has shown the usefulness of this Values-Belief-Norm (VBN)

[13] Curtis, A., & Luke, H. (2019). Social benchmarking for natural resource management: 2019 North Central Victoria. Southern Cross University, NSW, p28.

theory of understanding environmental behaviours, suggesting that individuals were more likely to act when something they value may be threatened[14].

This section of the report explores the values that landholders connect to their property ('attached values') as well as underlying values and principles held by the landholder ('held values'). Values described in this way help inform understanding of the complex priorities of landholders that may drive land management behaviours. Landholder beliefs and norms will be examined in following sections.

Table B: Attached values (n = 529 to 532), overall & by full-time farmer (FTF), part-time farmer (PTF), hobby farmer (HF), non-farmer (NF.) Grey shading indicates top three responses for each landholder type. ### = Significant difference by Landholder type. Colours refer to types of value where egoistic (orange shading), biospheric (green shading), altruistic (blue shading).

ATTACHED VALUES – Why your property is important to you	% INDICATING IMPORTANT/ VERY IMPORTANT				
	% OVERALL (Mean/5)	% FTF	% PTF	% HF	% NF
Ability to pass on a healthier environment for future generations ###	87% (4.4)	91%	85%	81%	75%
An attractive place/area to live	87% (4.3)	89%	83%	87%	86%
A great place to raise a family ###	83% (4.3)	91%	74%	72%	69%
The productive value of the soil on my property ###	81% (4.2)	92%	79%	61%	51%
My property is an important part of who I am ###	79% (4.2)	84%	75%	70%	69%
Sense of accomplishment from building/maintaining a viable business ###	77% (4.0)	90%	79%	50%	29%
Provide opportunities to learn new things	76% (4.0)	80%	78%	66%	56%
Provides a sense of belonging to a place	76% (4.1)	79%	71%	71%	78%
Sense of accomplishment from producing food and fibre for others ###	74% (3.9)	86%	70%	56%	22%
Native vegetation provides habitat for birds and animals ###	74% (4.1)	72%	71%	83%	83%
An asset that is an important part of family wealth ###	69% (4.0)	80%	63%	47%	49%
An important source of household income ###	67% (3.9)	91%	51%	28%	24%
Native plants and animals make the property an attractive place to live	65% (3.9)	63%	65%	67%	77%
An asset that will fund my retirement ###	62% (3.7)	69%	57%	52%	49%

[14] Ibid, p28.

ATTACHED VALUES – Why your property is important to you	% INDICATING IMPORTANT/ VERY IMPORTANT				
	% OVERALL (Mean/5)	% FTF	% PTF	% HF	% NF
Provides a sense of belonging to a community ###	62% (3.7)	69%	50%	57%	51%
A place or base for recreation ###	57% (3.6)	51%	55%	74%	81%

Our results show that different types of landholders attach different values to the land they own and manage, which is consistent with our findings in other areas[15] [16]. Table B shows the attached values in relation to the four landholder types. The values landholders attached to their property were measured across environmental or biospheric (green shading), social or altruistic (blue shading) and economic or egoistic (orange shading) values. These different groupings reflect the links between agriculture and the natural and social landscapes within which it occurs, particularly given the high levels of on-farm residency expressed earlier. These results highlight that farms provide a range of values for those who live, work and recreate on the land.

The top three values by landholder type are indicated with grey shading, but when looking across the whole sample, there is a fairly even spread among the top four ways in which landholders value the property. These are: the property representing the ability to pass on a healthier environment to future generations (87%), an attractive place/area to live, (87%); and a great place to raise a family (83%). We observed a range of attached values across themes of environmental and social values.

In addition to the values attached to the property presented above, the survey also considered the principles that guide a respondent's life, as represented by the underlying values held by respondents ('held values'). These are summarised in Table C.

The data in Table C shows a strong dominance of the principle 'looking after my family/ loved ones and their needs across all landholder types' (98%), representing a significant focus on the family unit. In comparison with the attached values shown above, there is a much stronger correlation amongst the landholder types across the top four principles guiding their lives, this time with a focus on more egoistic items (looking after family and creating a financially profitable business) and environmental values (preventing pollution and protecting natural resources; and respecting the earth and living in harmony with nature).

[15] Luke, H., Baker, C., Allan, C. & McDonald, S. (2020). Agriculture on the Eyre Peninsula: Rural Landholder Social Benchmarking Report 2020. Southern Cross University,NSW, 2480.
[16] Luke, H., Baker, C., Allan, C., McDonald, S., & Alexanderson, M. (2021). Agriculture in The Northern Wheatbelt: Rural Landholder Social Benchmarking Report 2021. Southern Cross University,NSW, 2480.

Table C: Principles that guide your life, overall & by landholder type, full-time farmer (FTF), part-time farmer (PTF), hobby farmer (HF), non-farmer (NF) 2021 (n= 542 to 549). ### = Significant difference by Landholder type. Colours refer to the types of value where egoistic (orange shading), biospheric (green shading) and altruistic (blue shading).

PRINCIPLES THAT GUIDE YOUR LIFE	% INDICATING IMPORTANT/ VERY IMPORTANT				
	% OVERALL (mean/5)	% FTF	% PTF	% HF	% NF
Looking after my family /loved-ones and their needs	98% (4.8)	98%	96%	93%	95%
Preventing pollution and protecting natural resources	86% (4.3)	86%	86%	89%	90%
Respecting the earth and living in harmony with nature	76% (4.1)	76%	77%	85%	90%
Creating wealth and striving for a financially profitable business	85% (3.9)	85%	63%	53%	41%
Caring for the weak/vulnerable and correcting social injustice	53% (3.6)	53%	57%	65%	59%
Fostering equal opportunities for all community members	47% (3.5)	47%	44%	52%	49%
Being influential and having an impact on people and events	37% (3.1)	37%	30%	33%	41%

3 FARMING PRACTICES

Due to the following sections of this report having a major focus on commercial farm management practices, information presented about 'farmers' refers to combined data from self-identified full and part-time farmers, unless clearly identified otherwise.

The actual practices that farmers incorporate in their management – historically, currently and those they intend to undertake – are themselves important outcomes of decision-making. Figure 4 shows changing farming practices implemented over time.

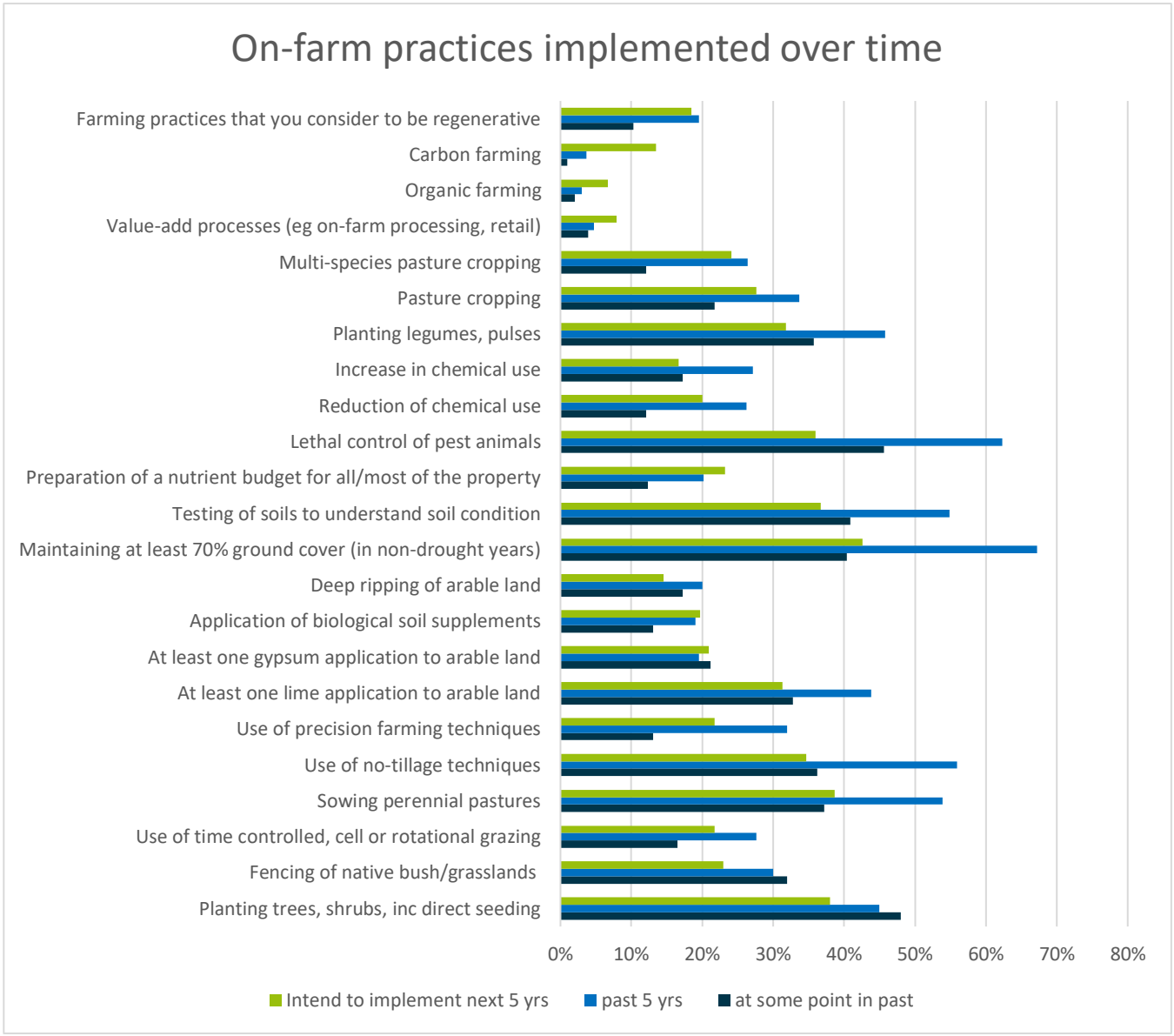

Figure 4: Farmer practices implemented over time 2021 (for full-time & part-time farmers combined: n = 406). A breakdown of management practices over time for both full and part-time farmers can be viewed in Table X4 in the Appendix.

Maintaining at least 70% groundcover stands out as the most common practice in the current period (2015 – present) for two thirds of farmers, followed by the lethal control of pest animals (62%), and the use of no-tillage techniques to establish crops or pastures (56%). Practices such as planting trees

and shrubs, fencing of native bush/grasslands to manage stock access, and applying gypsum to arable land show a decline. Apart from these three practices, all others indicate an increase in implementation over time.

When future intended practices were considered, many practices showed a decline, with some responses showing an intention to maintain a number of practices. The application of biological soil amendments and the preparation of a nutrient budget showed a slight intended increase, while others showed a greater rate of intended uptake, including on-farm value-adding (from current 5% to intended 8%); organic farming (from 3% to 7%); and carbon farming (from current 4% to intended 14%). There was generally a slightly higher rate of implementation across the board for full-time farmers.

Regarding stubble management, 29% of property holders used full retention, while 24% used incorporation. Only 15% used a cool burn method, while 7% used a hot burn method. For a further breakdown of approaches to stubble management by landholder type, refer to Table D.

In relation to regenerative agricultural practices, just 20% considered themselves to be undertaking practices that they consider to be regenerative. Despite this, a much higher proportion of farmers are implementing practices that are broadly considered to be within the toolkit of regenerative agriculture. For example, 67% of farmers are now cover cropping (in non-drought years), a practice that only 40% of farmers claimed to have been doing prior to five years ago. Even multi-species cover-cropping is a practice that over a quarter of farmers have implemented in the last five years.

More farmers appear to be reducing chemical use than they did in the past, however, a similar number have been increasing chemical use in the last five years. Farmers who reported to be reducing their dependence on chemicals were also likely to be doing organic farming or carbon farming. They were more likely to be concerned about climate change and consider a 100-year timeframe when making strategic decisions on the farm.

Conversely, those who reported to be increasing their chemical use were also more likely to own larger tracts of land and multiple properties in the region and spend a higher number of hours working on the farm each week. They were more likely to be cropping than other land uses, and plant legumes on a regular basis. These farmers were less likely to intend to sell their properties or put aside any part of their land for conservation purposes.

Table D. Stubble management by landholder type.

Question: If relevant, how do you usually manage your stubble?	**Full-time farmer**	**Hobby Farmer**	**Non-farmer**	**Part-time farmer**
Full retention	41%	14%	5%	21%
Incorporation	32%	14%	2%	18%
Cool burn	26%	1%	2%	9%
Hot burn	10%	3%	2%	3%
Other	7%	7%	10%	6%

3.1 CONFIDENCE IN THE IMPLEMENTATION OF BEST PRACTICE

An important element of decision-making in farm management practice are the beliefs that farmers hold toward those practices, otherwise understood as the level of confidence in the practice. Also very important are the personal norms that farmers relate to their farm, such as the personal responsibility they feel towards good soil stewardship. Table E presents a collection of norms and beliefs related to soil management for different types of landholders.

Table E: View statement agreement overall and by landholder type, 2021 (n= 509 to 535). Mean is out of 5. The most important three for each landholder type are shaded grey.

VIEWS & EXPERIENCE: STATEMENT	% AGREE/ STRONGLY AGREE				
	OVERALL MEAN	FTF	PTF	HF	NF
I feel a personal responsibility to maintain the productive capacity of my soil	90% (4.4)	93%	95%	86%	54%
Soil testing is an essential first step in understanding soil condition	82% (4.2)	83%	86%	80%	61%
Biological activity is an important indicator of the productive capacity of soils	81% (4.2)	83%	84%	80%	59%
Fencing to manage stock access is an essential element of protecting the health of waterways and native vegetation	79% (4.2)	75%	89%	82%	78%
The costs of establishing perennial pasture are justified by the returns	70% (4.1)	80%	70%	52%	31%
The benefits of stubble retention outweigh problems arising from the practice	66% (4.0)	76%	70%	41%	36%
The costs of applying lime to address soil acidity are justified by increased production	63% (3.9)	73%	60%	51%	29%
I am interested in learning more about alternative/holistic farming approaches	53% (3.5)	48%	65%	60%	42%
I'm confident that adopting regenerative/holistic farming practices is justified by the returns	35% (3.3)	29%	50%	44%	23%

Overall, our results indicate a strong sense of personal responsibility to maintain the productivity of soil, with soil testing regarded as an essential step, particularly among full-time farmers. Full-time farmers show the strongest support across most of the soil management items.

3.2 RISK AND OPENNESS TO CHANGE

Overall, there was a very high level of openness to change, with 90% of farmer respondents agreeing that they were open to new ideas about farming and land management, including 91% of full-time farmers (Table F). Just over half of farmers were interested in learning more about alternative/holistic farming approaches (52%), with a third being confident that adopting regenerative/holistic farming practices is justified by the returns (34%).

However, these responses were complicated by relatively low levels of agreement on other measures, such as 'financially, I can afford to take a few risks and experiment with new ideas' (51%), 'I am usually an early adopter of new agricultural practices and technologies' (35%), and 'I have sufficient time available to consider changing my practices' (46%). This suggests that while farmers may have an open mindset, there are financial and time constraints upon adoption. For a further breakdown of measures of trust and risk, refer to Table X6 in the Appendix.

Table F: Highest response questions on risk and openness to change, 2021 (n= 182 to 183). Mean and percent overall is for farmers out of 5 (with 5 being Very Important).

RISK AND OPENNESS TO CHANGE	Mean	% Imp/ Very imp	Highest concern by landholder type
I am open to new ideas about farming & land management	4.1	90%	Full-time farmers (91%)
I won't take a risk if my gut/intuition says no	3.7	70%	Part -time farmers (71%)
I trust my own intuition over other information when there is risk involved	3.6	63%	Full-time farmer (64%)
You can't be too careful when dealing with people	3.6	62%	Non-farmer (67%)

An important question to consider when looking into the willingness of farmers to change practices or take more risks is to consider whether landholders are happy with their farm as it is now. In this regard, landholders were asked if their farm is 'doing ok the way things are' but 'see no reason to change': 28% of farmers agreed while 50% of farmers disagreed to this question.

Farmers who indicated that they were unlikely to change their farming practices were more likely to be men and not have any formal qualifications. They preferred to avoid risks and were likely to not to act on something if their gut/intuition guided them not to. They were less likely to test their soils or implement the practices listed in the survey, preferring to see things working for others before trying anything new. They were very likely to believe that climate change did not pose a risk to the region and was not caused by humans, therefore had taken no actions to address it. A positive response to this (no) change question correlated strongly with a negative response to having implemented a range of conservation or regenerative agricultural practices in particular.

3.3 TIMING OF STRATEGIC DECISION MAKING

Seasonal timeframes were found to be the timeframe most relied on for influencing strategic decisions, with over half (56%) of all farmers making strategic decisions based on a seasonal timeframe. This was followed by year-to-year timeframes (43%), and "up to five years" timeframes (also 43%. Only 4% farmers indicating that they consider a timeframe of more than 100 years, while 16% considered timeframes of up to 20 years (Figure 5).

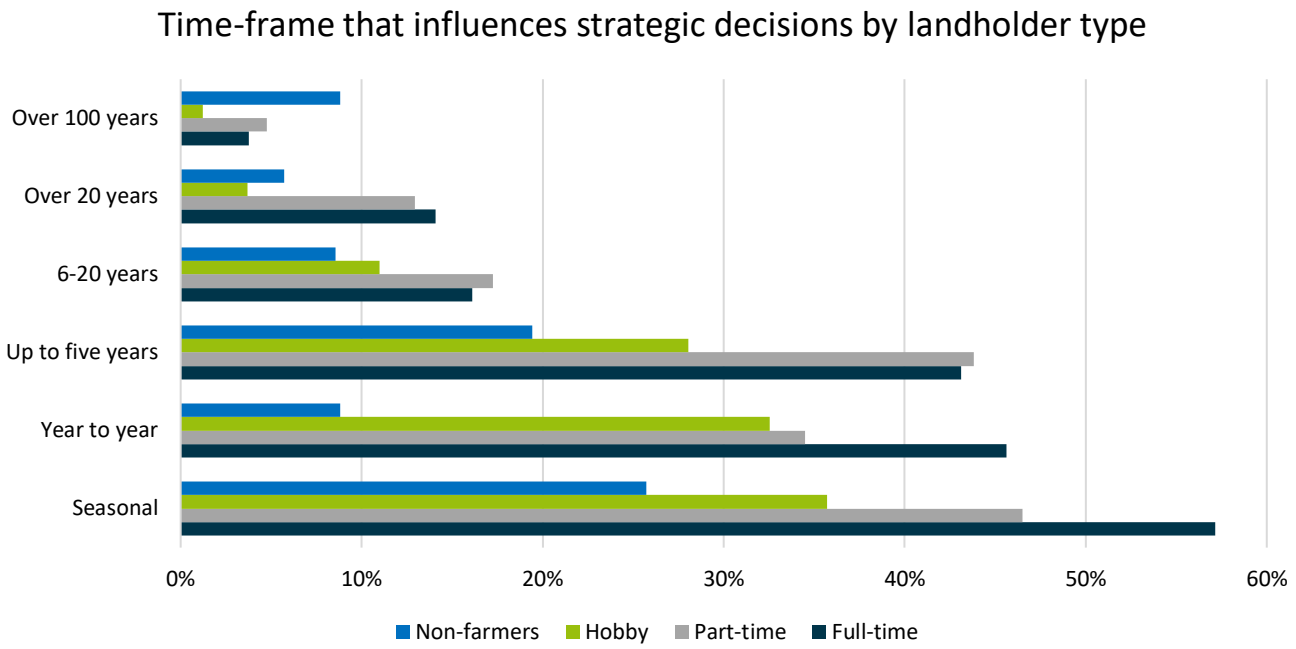

Figure 5. The timeframes relating to strategic, on-farm management decisions. 2021

Across the landholder groups, full time farmers consider strategic decisions primarily on a season to season basis, while the largest proportion of those considering more than 100 years ahead were non-farmers.

Well-developed engagement approaches aiming to support improved productivity, land management and soil stewardship can be informed by a better understanding of landholder beliefs experiences and attitudes, which have been explored in this section. The following section outlines self-reported knowledge-levels of a range of practices, and also, how farmers are currently accessing information, to inform future engagement.

4 ENGAGING FARMERS

4.1 KNOWLEDGE OF CURRENT RECOMMENDED PRACTICE

The knowledge surrounding a practice remains an extremely important element of its implementation. Respondents were asked to assess their level of knowledge of a number of farm management practices. Table G shows the proportion of self-reported knowledge for the listed topics. Respondents indicated a sound level of expertise in a number of topics, including 'strategies to maintain ground cover to minimize erosion in this area.' Other issues have low reported knowledge levels, with the lowest knowledge item being '*market mechanisms that support carbon farming.*' Notably, part-time farmers' self-reported knowledge tended to be lower than that of full-time-farmers across most topics, extending to non-farmers having the lowest self-reported knowledge for most items.

Table G: Self-assessed sound or very sound knowledge by landholder type, 2021 (n= 468 to 531). Mean is out of 5. Grey shading indicates knowledge level below 50%. ### = significant difference by Landholder type.

KNOWLEDGE TOPIC	Overall (mean)	Full-Time Farmer	Part-Time Farmer	Hobby Farmer	Non-Farmer
Strategies to maintain ground cover to minimise erosion in this area ###	74% (4.0)	87%	69%	55%	26%
Options and strategies to (re)establish perennial pastures (e.g. lucerne or native grasses) in this area ###	69% (3.9)	88%	61%	38%	17%
Preparing a farm/property plan allocating land use according to land/soil characteristics ###	60% (3.7)	75%	54%	37%	20%
How to identify the main constraints to soil productivity on your property ###	52% (3.5)	68%	49%	21%	11%
The processes leading to soil structure decline ###	49% (3.5)	64%	44%	25%	17%
How to (re)introduce more legumes/pulses into your enterprise mix ###	47% (3.3)	67%	32%	19%	11%
The role of remnant vegetation in supporting the natural ecosystem ###	45% (3.4)	51%	36%	36%	37%
The benefits of applying biological soil supplements (e.g. compost, manure, microbial inoculants) ###	44% (3.4)	48%	51%	34%	26%
How to build soil organic matter/soil carbon ###	41% (3.2)	48%	41%	29%	19%
How to use soil testing to prepare a nutrient budget that will increase soil productivity ###	36% (3.1)	47%	32%	15%	11%
Time controlled, holistic or cell grazing strategies ###	35% (3.1)	42%	32%	24%	6%

KNOWLEDGE TOPIC	Overall (mean)	Full-Time Farmer	Part-Time Farmer	Hobby Farmer	Non-Farmer
The role of on-farm biodiversity for supporting soil and landscape health ###	34% (3.1)	40%	35%	21%	11%
The role of soil carbon in maintaining soil health ###	34% (3.0)	42%	32%	19%	14%
How to support the persistence of native grasses in this area ###	30% (3.1)	38%	30%	11%	11%
Regenerative agriculture and holistic farm management ###	30% (3.0)	35%	34%	21%	3%
How to apply precision farming techniques ###	29% (2.9)	42%	18%	11%	9%
Emerging and/or cutting-edge agricultural technologies ###	26% (2.8)	36%	20%	11%	8%
The extent and type of biological activity in soils on your property ###	22% (2.8)	28%	22%	10%	6%
The Aboriginal group/s connected to the area where your property is located	15% (2.5)	15%	15%	12%	21%
How land in your district was used and managed before European settlement ###	14% (2.4)	15%	15%	8%	14%
Market mechanisms that support carbon farming ###	7% (2.2)	9%	3%	3%	3%

4.2 ACCESSING INFORMATION

The provision of information, support and education are important ways to increase knowledge and confidence in farm management practices. Understanding how landholders engage with processes of knowledge sharing and education, and with industry and land management groups, provides useful insights into how information can best be shared and landholders can be meaningfully engaged.

Respondents were asked what their top modes and sources of information were on topics related to the management of their property (Table H). For full- and part-time farmers combined, newspapers (51%), websites (46%), and field days (44%) were the most frequently nominated information sources. The top source of knowledge was other farmers (67%), followed by a farmer's own knowledge from their own experiences (66%), and friends/ neighbours/ relatives (50%).

Farmers were divided up into age groups by standardised generations[17]: Generation Y+ (born 1981-1996 and younger), Generation X (born 1965-1980) and Baby Boomer and older (born prior to 1965, referred to as Baby Boomer+). The age breakdown reveals that older farmers (56%) are more likely to refer to traditional information sources such as newspapers, radio, brochures and the BOM; whereas younger farmers were more likely to use social media such as youtube, podcasts, facebook and Instagram. The youngest group was twice as likely to draw on scientific journals directly (30% of

[17] Dimock, M. (2019). Defining generations: *Where Millennials end and Generation Z begins.* Pew Research Centre. Washington. https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

Gen Y vs 15% of older generations). The middle age group (Gen X) was the most likely to use websites. Only 8% of the older group, just 2% of the middle group and none in the youngest group draw on local councils for information on agriculture or land management. The youngest group of farmers was the least likely to draw on Landcare or environmental organisations for information. Younger farmers were far more likely to draw on commercial consultants for agricultural advice than the two older groups.

Table H: Information sources and modes of information for farmers, 2021 (n =406) in order of popularity.

MODE OF INFORMATION	% YES
Newspapers	51%
Websites	46%
Field days	44%
Emails	43%
Magazines	37%
Brochures/leaflets/newsletters	33%
Radio	30%
Television	28%
Books	23%
Academic journals/research papers	15%
Podcasts	15%
YouTube	11%
Facebook	10%
Twitter	7%
Whatsapp or Messenger groups	3%
Instagram	1%

SOURCE OF KNOWLEDGE	% YES
Other farmers	67%
My own knowledge from my own experiences ###	66%
Friends/neighbours/relatives	50%
Independent agricultural consultants, agronomists or stock agents	49%
Local Land Services	42%
Bureau of Meteorology	39%
Commercial agricultural consultants, agronomists or stock agents	33%
My intuition/gut feeling	30%
Department of Primary Industries (DPI)	28%
Rural R&D corporations (e.g. GRDC)	20%
Landcare	17%
Extension officers	12%
Central West Farming Systems	11%
Universities/CSIRO	8%
Other grower groups	8%
Commodity groups	8%
Local Council	5%
Environmental organisations (e.g. Greening Australia)	5%
Soil CRC	3%
RDA	2%

In terms of up-skilling, 41% of commercially farming property owners and their spouse's reported to have completed a short course or workshop relevant to property management in the past five years.

4.3 SOURCES OF SUPPORT

Respondents were asked to respond to a series of open questions relating to their sources of support and desired support for their agricultural and land management practices. Just over two thirds, at 70%, felt adequately supported to conduct farming and land management activities on their properties.

This qualitative data complemented the quantitative, showing that support from friends, family, neighbours and other farmers was of great importance. However, agronomists, farming system groups, Local Land Services and Landcare were also raised as important support organisations.

Under half of farmers (45%) agreed that farming system groups are the best way to drive and direct local research, development and extension. The same number of farmers (45%) reported to have attended field days/farm walks/demonstrations focused on soil health and productivity in the past 12 months (Table I). A very low 13% of farmers considered there to be adequate compensation or support for on-farm conservation activities.

Table I: Views and experiences for farmers (FT + PT) and by landholder type, 2021 (n= 531 to 513). The mean is out of 5, with 5 indicating 'strongly agree'.

VIEWS & EXPERIENCE: STATEMENT	% AGREE/ STRONGLY AGREE				
	Farmer (mean/5)	FTF	PTF	HF	NF
Farming system groups are the best way to drive and direct local research, development and extension	46% (3.5)	51%	30%	34%	29%
I feel adequately supported to conduct farming and land management activities on my property	70% (3.8)	73%	63%	55%	24%
I feel a personal responsibility to be part of a local grower group	43% (3.3)	42%	46%	44%	26%
There is adequate compensation or support for conservation activities on my farm	13% (2.7)	14%	11%	9%	6%

5 DATA MANAGEMENT AND USE

5.1 DATA MANAGEMENT

Business management at the farm level will directly impact land management decisions and has important consequences for profitability. Of farmers, 59% agreed that data should strongly inform decision-making around farm management, and 56% agreed that they already have good systems in place to manage farm data, yet over half (53%) report internet connectivity as a barrier to using on-farm data effectively.

When asked what testing/indicators farmers use to assess soil/land health, soil tests were the predominant answer, but many farmers also indicated the importance of other methods such as visual inspections of soils, plant health observations (including weeds), and yields (Figure 6).

While 84% of farmers agreed that soil testing is an essential step in understanding soil conditions, thus soil testing was perceived as an integral part of data gathering, only 55% of farmers reported having tested their soils at least once in the last five years (Table J).

When asked how about soil testing frequency on their property, 47% of commercial (full time and part time) farmers indicated that they tested every 3 – 5 years; 14% at least annually; 17% once, and 22% never. For a breakdown of the results for different landholder types, see Table K.

Table J. Frequency of soil testing performed, by landholder type.

Landholder type	**3-5 years**	**At least annually**	**Once**	**Never**
Full-time farmer	57%	19%	13%	11%
Part-time farmer	43%	10%	24%	24%
Hobby farmer	31%	9%	25%	35%
Non-farmer	12%	30%	15%	70%
Commercial farmers	**47%**	**14%**	**17%**	**22%**

Regarding where farmers concentrated their soil testing, 83% of landholders indicated that they test systematically across paddocks, while only 10% tested systemically in one paddock. Only 7% of property holders preferred one location for soil testing. For a breakdown of the results for different landholder types see Table L.

Table K. Preferred geographic approach to soil-testing by property holders.

Landholder type	Systematically across paddocks	Systematically in one paddock	One preferred location
Full-time farmer	86%	10%	4%
Part-time farmer	84%	6%	10%
Hobby farmer	31%	9%	35%
Non-farmer	12%	30%	70%
All commercial farmers	**85%**	**9%**	**5%**

Full-time farmers reported a higher level of knowledge on how to use data to inform land-management decisions than other landholder types. Figure 6 demonstrates the varying levels of understanding of how to use data to inform decision-making. This consistently lower knowledge across practices for part time farmers could present an important opportunity for agricultural support organisations to target this group of land managers, who also play an important role in the productivity of approximately 8% of the land.

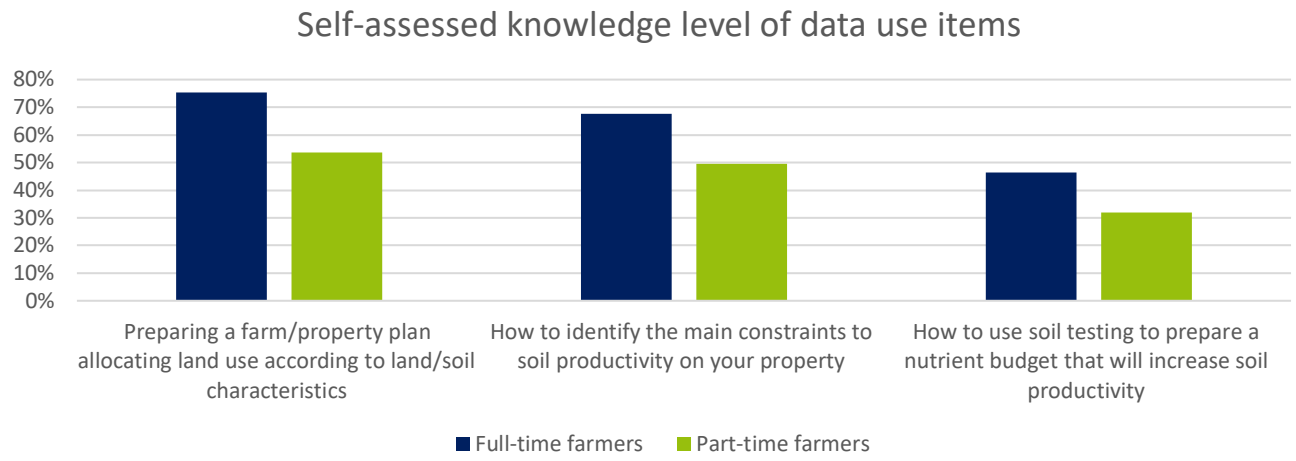

Figure 6: Self-assessed knowledge of data use by farmer type, 2021 (n = 526 to 528).

Our modelling indicated that those who prepared a property plan or whole-farm plan according to land or soil characteristics were more likely to self-identify as early adopters, have good systems in place to manage their farm data and feel a personal responsibility for the productive value of their soil. Universities and research institutions were a critical information source for this group, who were also more likely to be satisfied with the income from their farm (R^2 = 0.302).

Table L: Implementation of management practices compared with related knowledge & confidence in the practice for full-time and part-time farmers (data amalgamated), 2021. (n= 383 to 374). For a more detailed breakdown, see Table X3 in Appendix 1.

Management Practice	Imple-mented within 5 years	Confidence	Agree-ment	Knowledge	Sound or very sound
Testing of soils to understand soil condition	55%	Soil testing is an essential first step in understanding soil condition	84%	How to use soil testing to prepare a nutrient budget that will increase soil productivity	43%
Preparation of a nutrient budget for all/most of the property	23%	I feel confident working with numbers and managing my farm accounts	86%	How to identify the main constraints to soil productivity on your property	63%
Prepared/ preparing a property management or whole farm plan	48%	Decision making needs to be strongly influenced by data	59%	How to prepare a farm/property plan allocating land use according to land/soil characteristics	70%

Table M brings together some key elements of how farmers are using data. It shows that while there is a strong belief in the importance of soil testing, and a general confidence in working with numbers, soil testing was implemented by only 55% of farmers within the previous five years. What this indicates is that farmer capacity to use and apply this data has room for improvement, with just 23% of farmers reporting having prepared a nutrient budget, and under half of farmers having prepared a whole farm plan. Farmer belief in the importance of data for informing decision-making is also relatively low, at 59%.

6 AGRICULTURAL CHALLENGES

Respondents were asked to rate the importance of a set of issues at the district and property scale, identified by local groups at the survey development workshop. The percentages presented here are the proportion of respondents indicating an issue was important or very important. This section is divided up into the four landholder categories to show the difference in importance across issues by landholder type. Matters at this scale can mean a threat to the values expressed by the different groups in Section A, and therefore play a role in land management behaviours as a possible driver of action. Issues at the regional scale are presented in Figure 7, presented as the top five issues by landholder type.

6.1 REGIONAL ISSUES

The top four issues for commercial farmers in the region were: declining soil health/productivity (77%); water holding capacity of soils (77%); the absence of essential services and infrastructure (e.g. health, schools, internet, phone coverage) (74%) and changes in weather patterns (72%). For a complete list, see Table X5 in the Appendix.

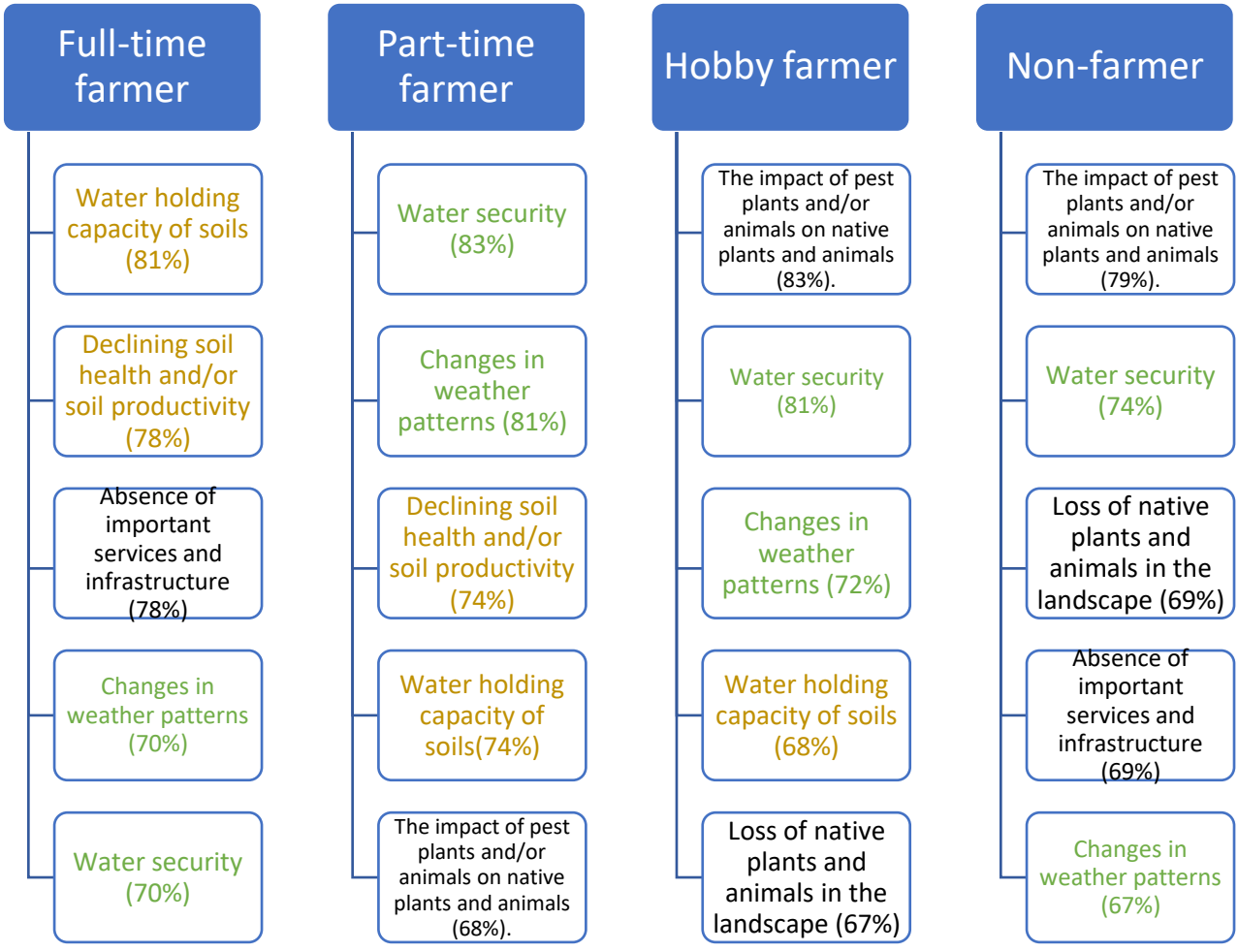

Figure 7: Top five most important regional issues by landholder type (n= 514 to 550), with issues related to climate change in the region highlighted by use of the colour green, soil issues in colour orange.

6.2 PROPERTY SCALE ISSUES

At the property scale (Figure 8), the number one issue across all groups was the impact of weeds or over-abundant native plant species on productivity. The declining nutrient status of soils also featured as a top-three issue across all groups. This is not surprising given the strong level of personal responsibility to maintain the productivity of soil and soil testing as an essential step indicated in Table E. For full-time farmers, these were the top two issues (75% and 64%, respectively). In particular, the water-holding capacity of soils (81%), and the declining health and/or soil productivity (78%).

Combining results for full- and part-time farmers, the top three property-level issues were the impact of weeds or over-abundant native plant species on productivity (74%), the declining nutrient status of soils (63%), and the effect of temperature extremes on farm productivity (62%). For a complete list of property-scale issues by landholder type, see Table X5 in the Appendix.

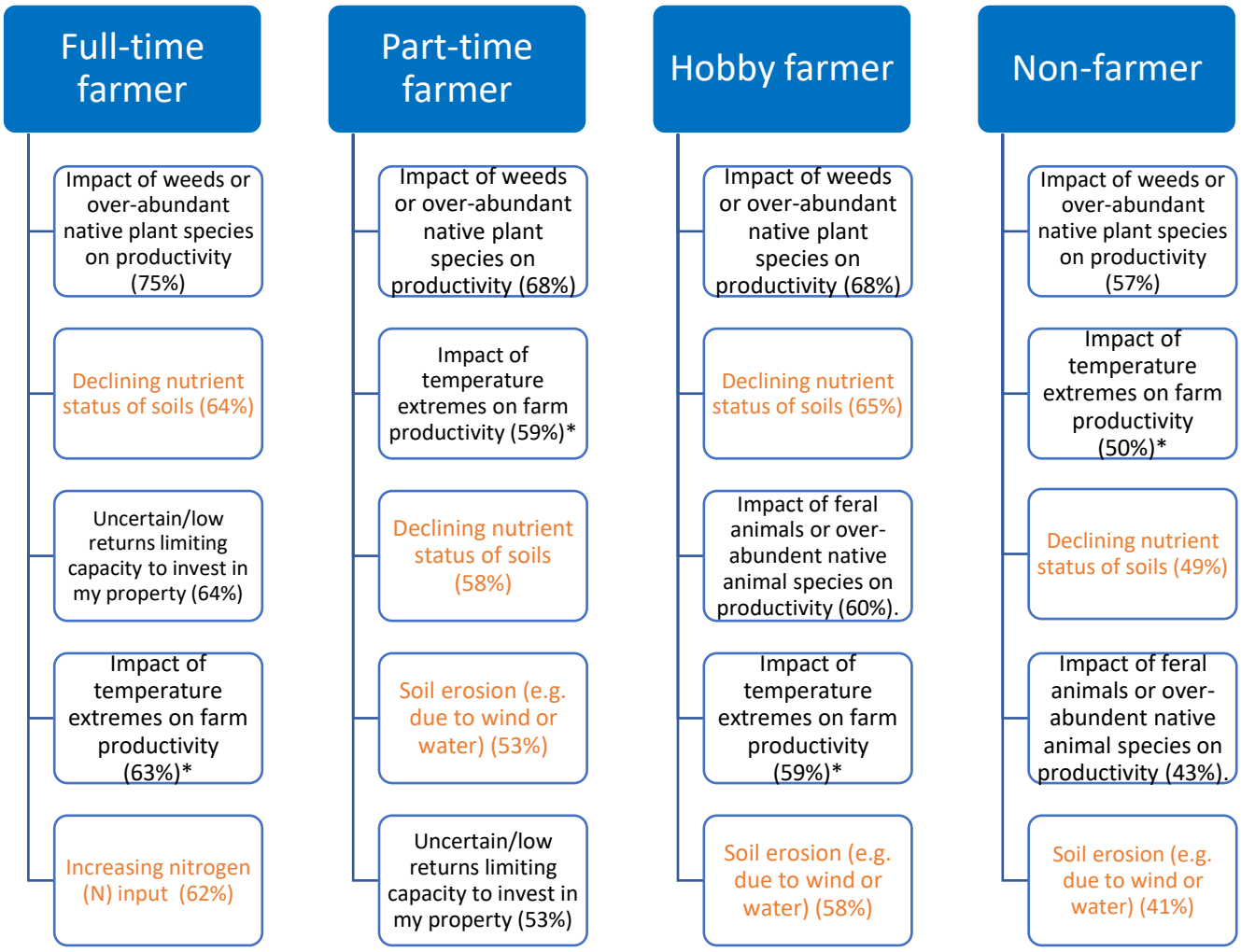

Figure 8: Top five property-level issues by landholder type, 2021 (n= 527 to 545). Orange colour indicates soil-related items common across landholder types.

In an open-ended question, landholders were asked to nominate what they saw as their biggest challenge or opportunity in the next ten years. In terms of challenges, the strongest emergent theme was that of climate change. Many farmers were cognisant of the seasonal variability linked to climate change, focusing on a broad range of issues such as drought and water storage, with some

highlighting the need to adapt to climate change and to take such actions as "drought-proofing the farm".

The second most common challenge highlighted was that of aging, pending retirement, and health. Issues such as costs of inputs, land, and machinery were also seen as a big challenge to farmers. Labour prices and soil health were seen as important issues. Also common were financial challenges relating to mortgage repayments and debt, demonstrating the mix of personal and practical challenges for farmers.

Figure 9: Nvivo™ word-cloud representation of responses to the open question: 'In the next 10 years, what would you see as likely being your biggest challenge and/or opportunity?', with each word emphasised in relation to times used in responses.

6.2.1 Chemical use

As mentioned at the property-scale (Figure 8), the number one issue across all groups was the impact of weeds on productivity. A strong statistical relationship (p value 2.94608E-66) was identified between farmers who were concerned about chemical residues in the soil being also concerned about the effects of chemicals (such as pesticides) on soil biota. Farmers experiencing soil-borne diseases were more likely to also have issues with chemical residue in soils.

6.3 RESPONDING TO THE CHALLENGES

Farmers were asked about their level of satisfaction with their farm's productivity, finding that 84% were satisfied in light of the seasonal conditions experienced. Over 78% of farmers indicated that they are coping well with the associated stresses and challenges of managing their farm. This did, however, drop notably to only 69% of farmers aged between 41-57 (Gen X).

Modelling showed that farmers who were coping better with the associated challenges of managing their farm were more likely to feel that their farm was in a better condition since they had taken on its management. They were also more likely to feel supported in their farming. While they were more likely to have the financial capacity to experiment with new ideas, they didn't see a reason to change much – indicating that interventions they had put in place appeared to be working (R^2 = 0.191).

Landholders were asked, in an open-text question, to nominate the most important influence on profitability in the last twelve months. The overwhelming response was the impacts of drought, but the most commonly nominated management decision was the stock management process of sheep or cattle, and re-cropping after drought. The importance of maintaining a continual balancing act

between destocking and restocking was evident from the responses. Many farmers indicated preference for keeping as many breeding sheep and cattle as possible during drought and either restocking based on a natural increase or by purchasing more stock post-drought. Other common activities mentioned were maintenance of fencing and weed control. Over a longer period of 10 years, keeping input costs down by managing cattle numbers, gaining access to water through bores, and ensuring adequate fodder reserves were common responses.

When asked what the most important influence on soil health is, the most common response was maintaining groundcover, consistent with their most commonly implemented listed practice. Other common responses included the use of crop rotation and avoiding overstocking. A word cloud created from the words raised in the open question can be found in Figure 10. Each word becomes larger the more frequently it was reported.

Figure 10. A word cloud of what farmers consider to be the most important influence on soil health, which shows words made bigger in proportion to the number of times mentioned by respondents.

In terms of opportunities arising over the coming decade, several were mentioned relating to reducing inputs, building soil capacity and improving the land to market value chain, particularly for niche products.

When asked if there was a particular technology/tool/innovation/knowledge that would support their farm management goals, there were a vast range of responses. Improved mobile and internet coverage was the most common theme raised, with such responses as "Connectivity- lack of coverage is the largest economic burden". Accurate long range weather forecasts were particularly high on the wish list. Next to this was knowledge – many farmers indicated that they were seeking improved knowledge on a broad range of farm and soil management practices, with carbon farming raised often.

A high number of responses related specifically to land health and regenerative agriculture, with responses such as "How to germinate native flora," "More information on Regenerative farming - field days", with examples given such as summer cover crop establishment, biological soil health, contour farming, holistic grazing and climate-change resilient species. One farmer mentioned politics, to: "get an environmentally competent government."

Technologies, such as drones and data gathering/management systems for a range of applications were mentioned, as were electric farm machinery and vehicles.

6.4 RELATIONSHIPS BETWEEN ISSUES AND PRACTICE

We assessed the relationship between soil health issues experienced on farmer properties and management interventions commonly employed using a Kruskal-Wallis Rank Sum Test (Table K).

Significant positive associations were identified between declining soil health and productivity with the several management interventions including maintaining at least 70% ground cover, soil testing, sowing perennial pastures, planting legume and pulses and carbon farming. Concerning interventions that assist soils' water holding capacity, we observed a positive relationship with management interventions such as rotational grazing, no-tillage crop or pasture establishment techniques, gypsum application and sowing perennial pastures. Indeed, gypsum application was a common management intervention being used across a range of significant issues including declining soil health (nutrient, carbon, pH, productivity), soil compaction, soil erosion, and changes in weather patterns.

Concerning soil management practices, the strongest pairwise comparison was the association between low levels of organic carbon and low levels of biological activity in soils on their property, showing that farmers view these as synonymous. Understanding the role of soil carbon in maintaining soil health strongly correlated with knowledge on how to build soil organic matter/soil carbon.

We interrogated negative relationships between soil challenges and management practices (Table K). While most negative relationships are salient, we observed a negative relationship between increasing nitrogen input and organic farming. Likewise, we observed a negative relationship between observing the effects of pesticides on soil biota and increasing chemical use. This may imply that where soil biota are observed to be negatively impacted by pesticides, the farmer is unlikely to increase chemical applications on their property.

Table M. Relationships between assessments of issues and best-practices implemented as mitigation interventions in the past five years.

Positive Relationships	
Important issue	**Management practice applied in the past five years**
Declining soil health and/or soil productivity (concern at regional scale)	• Planting of trees and shrubs (incl. direct seeding) • Sowing perennial pastures • Use of no-tillage techniques to establish crops or pastures • At least one lime application to arable land • At least one gypsum application to arable land • Deep ripping of arable land • Maintaining at least 70% ground cover (in non-drought years) • Testing of soils to understand soil condition • Planting legumes or pulses • Carbon farming
Water holding capacity of soils (concern at regional scale)	• Use of time-controlled, cell or rotational grazing • Sowing perennial pastures • Use of no-tillage techniques to establish crops or pastures • At least one gypsum application to arable land • Application of biological soil supplements (e.g. compost tea, effluent) • Farming practices considered to be regenerative practice/s

Low level of biological activity in soils (property scale issue)	• Use of no-tillage techniques to establish crops or pastures • Deep ripping of arable land • Maintaining at least 70% ground cover (in non-drought years) • Testing of soils to understand soil condition • Reduction of chemical use • Multi-species pasture cropping • Carbon farming • Farming practices that you consider to be regenerative practice/s. • Deep ripping of arable land
Low level of organic carbon in soils (property scale issue)	• Deep ripping of arable land • Reduction in chemical/fertiliser use • Use of minimum or no-tillage techniques • Carbon Farming
Risk to life and property from wildfires	• Testing of soils to understand soil condition
	Negative Relationships
Important issue	**Management practice applied in the past five years**
Increasing nitrogen (N) input	• Organic farming
Soil-borne diseases	• Application of biological soil supplements (e.g. compost tea, effluent) • Farming practices considered to be regenerative
Effects of pesticide use on soil biota	• Increase in chemical use

6.4.1 Sense of belonging

Having a sense of belonging to a place linked strongly with a number of items in the pairwise comparisons, including higher reported knowledge of good soil management practices and a higher level of appreciation for native plants and animals. Those with a strong sense of belonging were also more likely to consider their property to be an important part of family wealth. Those with a strong sense of belonging to a community were more likely to be confident that landholders can adapt to expected changes in weather patterns; more likely to be open to new ideas about farming; and have good systems in place to manage farm data.

6.5 CLIMATE CHANGE

We draw out a section on accelerated climate change because of the notable presence of climate change as a key issue raised by landholders. In terms of the level of concern expressed by respondents, the survey included four regional issues related to climate change: 'Water security', 'Changes in weather patterns', 'Risk to life and property from wildfires', and 'Risk to life and property from flooding'. Results for these four items are shown in Table N

Table N: Issues affecting local region for farmers combined with issue by landholder type 2021 (n= 182 to 183). Mean is out of 5 (with 5 being Very Important).

ISSUE AFFECTING LOCAL REGION	Mean	% Importance for farmers	Highest concern by landholder type
Water security	4.1	73%	Part -time farmers (83%)
Changes in weather patterns	4.0	73%	Part -time farmers (81%)
Risk to life and property from wildfires	3.4	50%	Non-farmer (64%)
Risk to life and property from flooding	2.5	21%	Full-time farmer (23%)

As demonstrated in Figure 12, survey respondents were largely aware of the risks associated with climate change, with 55% agreeing and just 22% of respondents disagreeing that climate change poses a risk to the region, with 23% unsure. Of all respondents, 60% agreed that human activities are influencing changes in climate, with 61% agreeing that landholders should do all they can to reduce carbon emissions. More than half (53%) of all respondents agreed that if nothing is done, climate change will have dire consequences, with 49% of the view that fundamental changes were required to improve the resilience of the region.

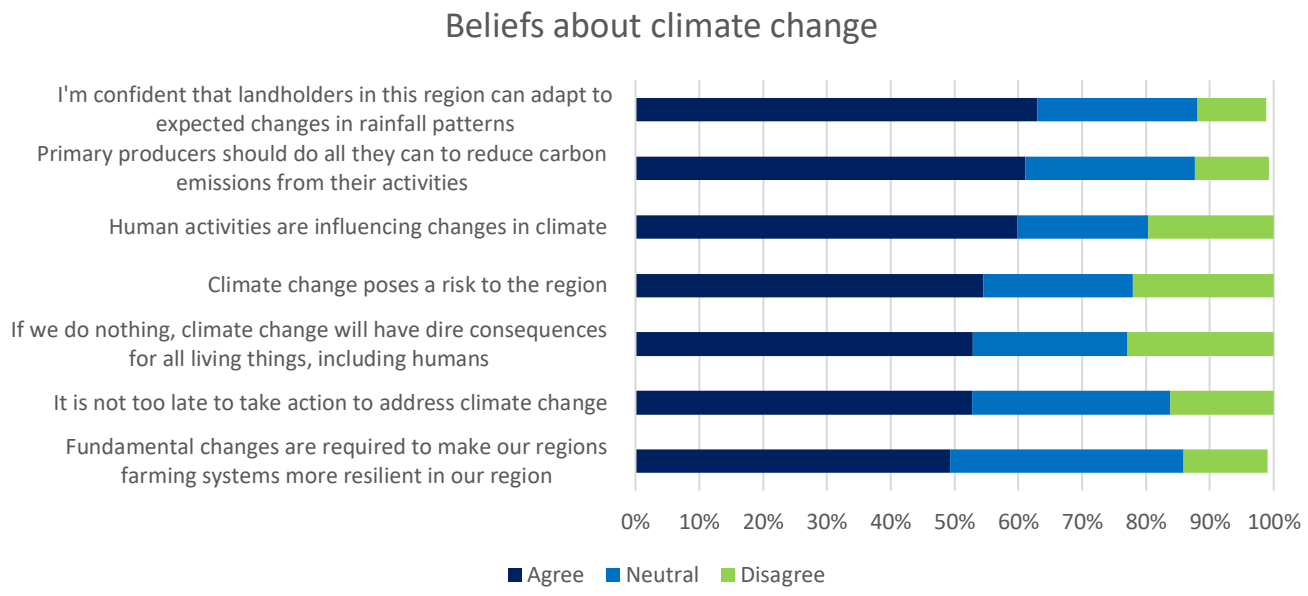

Figure 11: Landholder beliefs about climate change across all four landholder types, 2021 (n = 518 to 530).

A high level of confidence was apparent that landholders in the region can adapt to changes in weather patterns (63%). The data, shown by landholder type in Figure 13, illustrates that of the four landholder types, full time farmers were the most optimistic about the effects of climate change and our ability to adapt (69%), while the least likely to believe that climate disruption is due to human activities (just 53% of full-time farmers vs 72% of hobby farmers). Part-time farmers were most likely to be of the view that primary producers should be doing all they can to reduce emissions, compared to just 56% of full-time farmers.

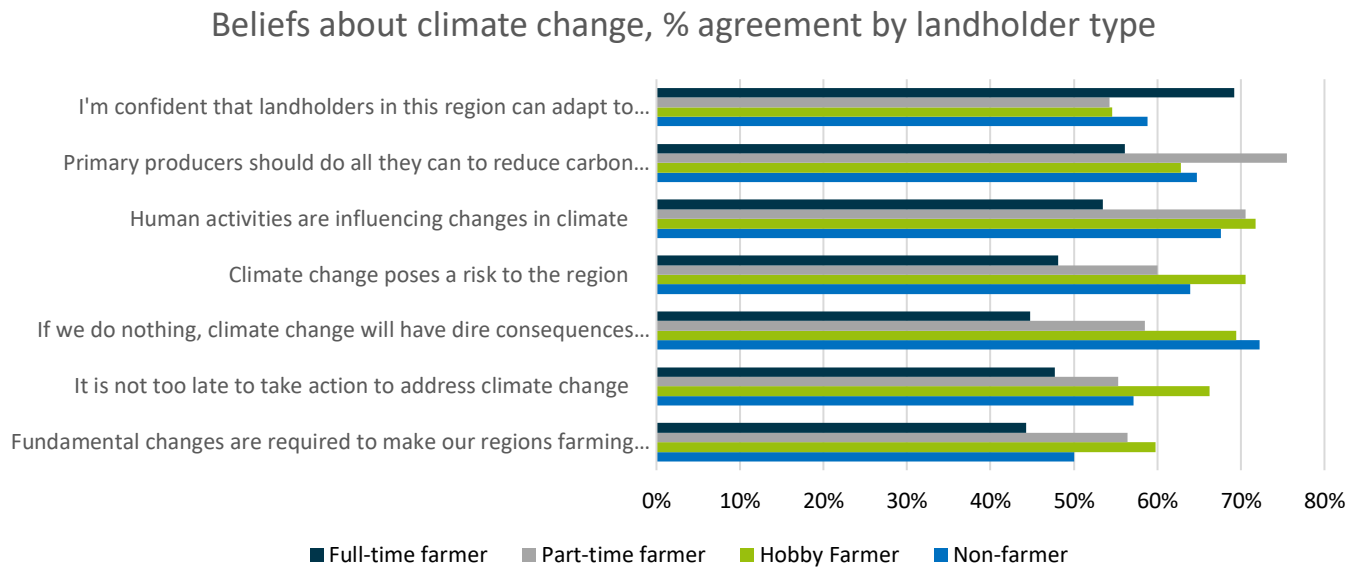

Figure 12: Beliefs about climate change by the four landholder types, 2021 (n = 518 to 530).

With water security and changes in weather patterns being top issues across landholder types, it is perhaps unsurprising given the decadal trend in both rainfall and temperature (see Figure 13) and associated impacts in the region. Figure 13 is based on historical Bureau of Meteorology data that demonstrates trends in decreasing annual rainfall and increasing mean annual temperatures since 1950. The prominence of fire risk as an issue for more than 50% for all landholder types echoes similar results to those in other survey work[18].

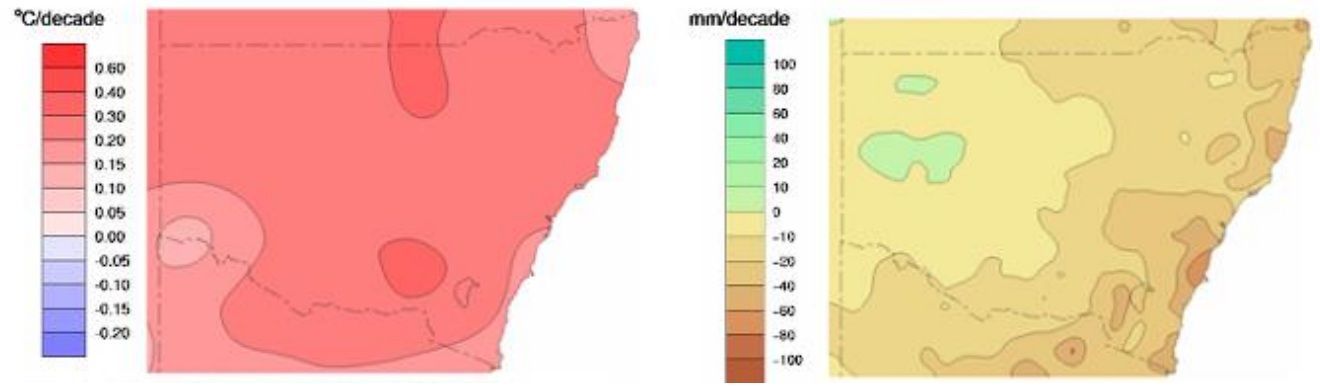

Figure 13: Trends in mean temperature and rainfall, 1950–2021 (source BoM). Climate change – Trends and extremes. Australian Bureau of Meteorology, Australia, accessed January 2022.

[18] Norman, B., Newman, P. & Steffen, W. 2021. Apocalypse now: Australian bushfires and the future of urban settlements. *npj Urban Sustainability* 1, 2.

The Central West predominately sits in the Murray Basin Natural Resource Management (NRM) cluster. Based on climate observations within this area, future projections include high or very high* confidence of the following: [19]

- substantial projected warming for the Murray Basin region
- substantial increases in the temperature reached on the hottest days, the frequency of hot days and the duration of warm spells.
- natural climate variability will remain the major driver of rainfall differences from the climate of 1986–2005 (annual-mean changes of -10 to +5 %, winter-mean changes of -15 to +10 %, and summer-mean changes of -15 to +15 %)".
- increased evapotranspiration rates and reduced soil moisture by late 21st century (there is medium confidence in the magnitude of these projections).
- intensity of heavy rainfall events will increase (which is, however, difficult to reliably project).
- harsher fire-weather climate in the future because of climate change. However, the magnitude of that change is hard to predict because of significant uncertainties in projected future rainfall and fire incidence.

6.5.1 Responding to climate change

Farmers with a stronger level of belief in climate change were more likely to have recently changed their farming operations to reduce carbon emissions while also reducing their dependence on chemicals. This view was, however extremely closely correlated with the view that it was not too late to take action to address this. These landholders were more likely to put their land aside for conservation purposes and be keen to participate in regenerative agriculture and/or carbon farming. They were also more likely to have a been increasing chemical use up to five years prior, but not in the last 5 years.

Table O: Practices related to climate change issues overall and by landholder type, 2021 (n= 575). ### = significant difference by landholder type.

CURRENT PRACTICE	% Yes TOTAL	% Yes FTF	% Yes PTF	% Yes HF	% Yes NF
In the past 12 months have you changed your operations to increase the soil carbon on your property (e.g. by revegetation, soil management) ###	29%	31%	37%	23%	7%
In the past 12 months have you changed your financial or on-property operations as a result of seasonal changes in weather patterns? ###	30%	39%	28%	18%	0%
In past 12 months have you changed your on-property operations as a result of considering opportunities to reduce carbon emissions (e.g. generating solar and/or wind power, increased power use efficiency, improved grazing practices, improved nitrogen use efficiency) ###	19%	20%	24%	16%	0%

[19] Timbal, B. et al. 2015, Murray Basin Cluster Report, Climate Change in Australia Projections for Australia's Natural Resource Management Regions: Cluster Reports, eds. Ekström, M. et al., CSIRO and Bureau of Meteorology, Australia. climatechangeinaustralia.gov.au

In the model, those with the view that climate change is due to humans also believed that if not addressed, it would have a dire impact on life on earth. Those with a stronger level of concern in climate change were more likely to have recently changed their farming operations to reduce carbon emissions and be reducing their dependence on chemicals. They were also more likely to have completed a higher level of education. This model has a high R^2 of 0.645, indicating a strong relationship between these factors. Those with a view that climate change is due to human activity were significantly more likely to be female and make strategic decisions considering a longer time period of over 20 years. Conversely, the 20% who did not believe climate change to be due to humans were more likely to be from the older age group.

*Table P: Long-term plans related to climate change for all landholder types, 2021 (n=490 to 500). ### = significant difference by landholder type*** = significant difference by Rainfall Zone*

LONG-TERM PLANS	% UNLIKELY	% LIKELY	% UNSURE
Buying property outside of my current area to mitigate increased seasonal variability ###	76%	11%	14%
Some part of my property will be set aside for conservation purposes ***	52%	27%	21%

This set of views and beliefs translated into reasonable levels of current action, and higher levels of intended action. In the last 12 months, less than half (39%) of full-time farmers had changed their financial or on-property operations as a result of seasonal changes to weather patterns, and 30% of all respondents. These rates were lower for both increasing soil carbon (31% of full-time farmers, 29% overall), and lower again for reducing carbon emissions (20% of full-time farmers, 19% overall).

For a further breakdown, see Table E. With regard to long-term plans, 27% of all respondents were likely to set part of their property aside for conservation purposes, and 10% were likely to buy property outside of their current area to mitigate against increased seasonal variability (Table P).

7 THE FUTURE OF FARMING

7.1 DIFFERENCES BY GENERATION

Age can be an important influence on farmer decision-making, both through the impact of changing life stages and associated priorities, as well as the level of experience of landholders. The respondent farmer data (for full-time and part-time farmers) was broken down into three age categories, as determined by established definitions of generations[20]: Generation Y+ (born 1981-1996 and younger), Generation X (born 1965-1980) and Baby Boomer and older (born prior to 1965, referred to as Baby Boomer+). Given the age demographics of the cohort, the Baby Boomer + group (aged 57 years and older group) was the largest group, so tests for significance were undertaken, where significance was set at $p<0.05$. From this analysis, some interesting differences emerged.

There was clear evidence of trends toward reduced intensity of farming amongst the younger group, with a slight trend towards reduced intensity amongst the older group. As a group, Generation Y managed 1262 hectares on average, while Generation X managed significantly more land, with an average of 1586 hectares compared to the oldest cohort average of 942 hectares.

Of the youngest group, 58% had bought additional land in the region in the last 20 years (compared to 37% of the Baby Boomers group). For the oldest group an average of 372 hectares of their land managed by others (compared with 1753 hectares of the younger group). Generation Y work an average of 50 hours per week on the farm, compared to 59 hours for generation X and 43 hours for Baby Boomers +.

The area in which the most differences emerged was in the levels of self-assessed knowledge between the groups, with the younger generation indicating a higher level of self-assessed knowledge across several knowledge topics, as shown in Figure 14.

[20] Dimock, M. (2019). Defining generations: *Where Millennials end and Generation Z begins.* Pew Research Centre. Washington. https://www.pewresearch.org/fact-tank/2019/01/17/where-millennials-end-and-generation-z-begins/

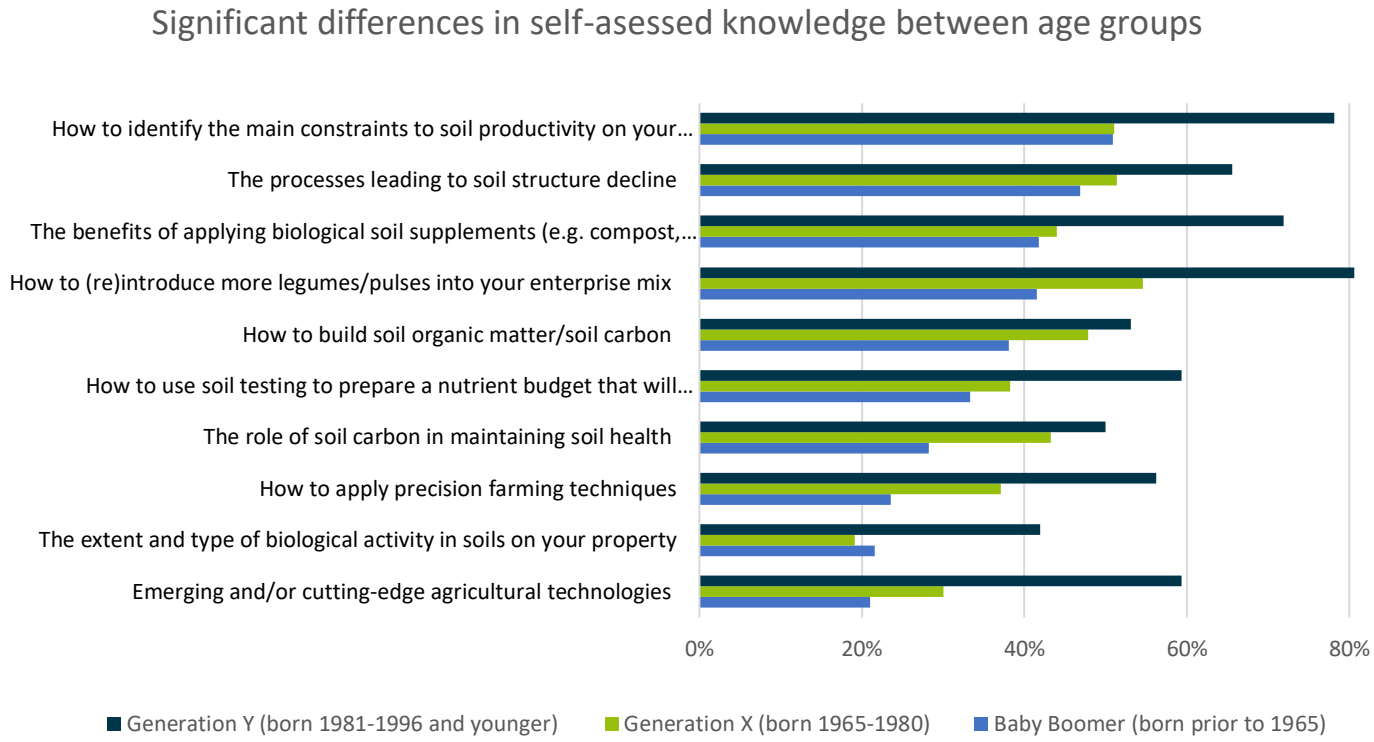

Figure 14: Items with levels of self-assessed knowledge that are significantly different between age groups, 2021. (data for commercial full- time and part-time farmers only).

This higher level of reported knowledge translated into a higher rate of actual practice over a number of items, both those that have been put in place and intended practice. In terms of past practice, there were 6 items for which there was a significant difference between the groups for practices implemented at some point prior to 2015. The first of these was the preparation of a nutrient budget for all/most of the property, for which 17% of Generation X had implemented this and only 8% of Baby Boomers. Similarly, maintaining at least 70% ground cover had been implemented by only 30% of Generation Y, compared with 44% of the Baby Boomer group. As shown in Figure 15, there were 13 items in which there was a significant difference in implementation over the past five years.

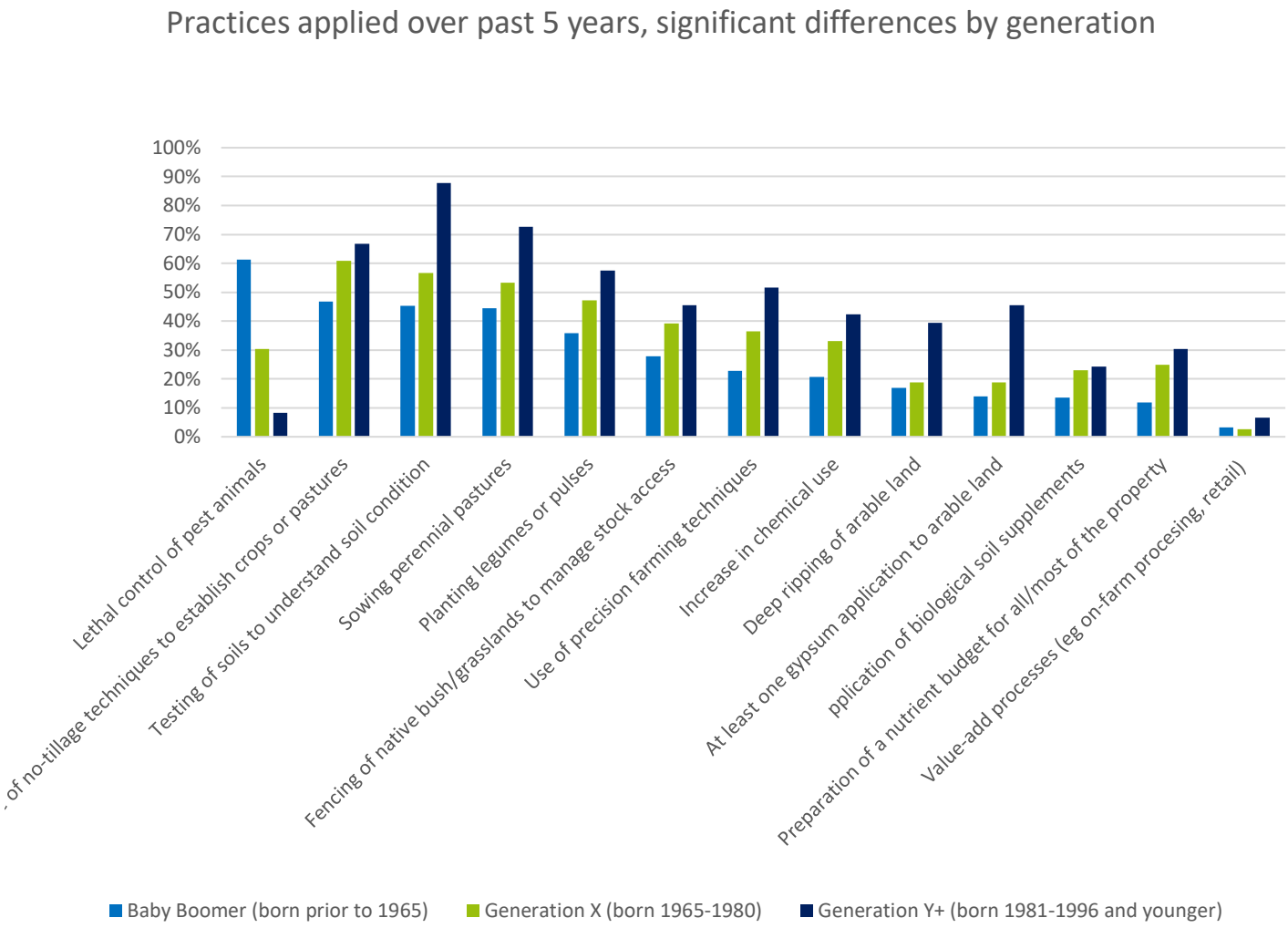

Figure 15: Management practices that show a significant difference between age groups, 2021. (Farmers and part-time farmers only).

As shown in Figure 16, this extended to 17 practices when considering intended implementation. All of these items correspond to self-assessed knowledge items that were rated with higher levels of confidence by the younger group. As can be seen, the only item more commonly applied by the older generations was the lethal control of pest animals.

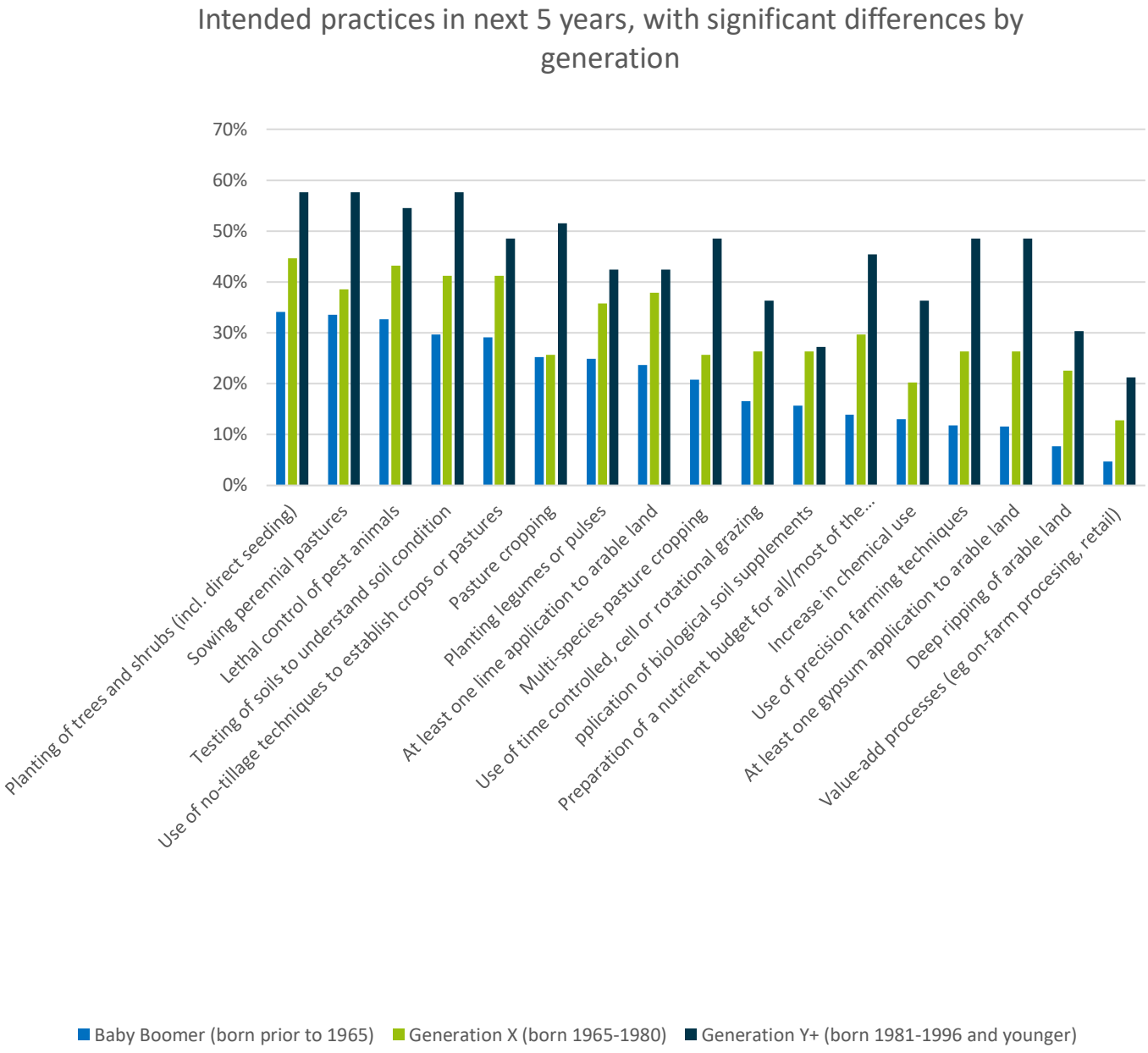

Figure 16: Intended management practices that show a significant difference by age group, 2021.

In terms of views and experiences, the six issues on which there were significant differences between the groups relate directly to these practices. The oldest group had stronger levels of agreement with the statements 'most years I am satisfied with the income from my farm's production' (79% compared to 72% of Generation X), and that 'biological activity is an important indicator of the productive capacity of soils' (90% compared to 79% for Generation X). Generation Y had stronger levels of agreement with the statement: 'soil testing is an essential first step in understanding soil condition' (88% compared to 81% of Baby Boomers), and that 'I am coping well with the associated stresses & challenges of managing my farm' (79% compared to 66% of generation X). Additionally, Generation Y also had stronger levels of agreement with the statements that 'there is adequate compensation or support for conservation activities on my farm (18%

compared to 6% for Generation X) and that 'I have good systems in place to manage my farm data' (64% compared to 42% of Generation X). Finally, Generation Y also had stronger levels of agreement that 'biological activity is an important indicator of the productive capacity of soils' (90% compared to 79% for Generation X).

7.2 LONG-TERM PLANS

With only 15% of farmers indicating that they intend to sell the property, ownership turnover of farmlands is intended to be low. A third of (33%) of farmers indicated that they intend to purchase additional land, which is in line with broader industry trends to larger holding sizes[21]. A fifth of farmers indicated they would lease additional land and intended to change the enterprise mix to diversify income (26%) or move toward intensive enterprises (16%).

Three quarters (75%) of farmers indicated that ownership of the property would stay within the family. However, only 41% of farmers had a family member interested in taking on the property in the future. For a breakdown of long terms plans by landholder type see Table X8 in Appendix 1.

When asked what the biggest challenge and/or opportunity might be over the next ten years, transition to retirement and related issues such as succession planning were a major issue raised. This was reinforced by the figures, with very low levels of succession planning in train, as shown in Figure 17. Full-time farmers are the most likely to have commenced succession planning.

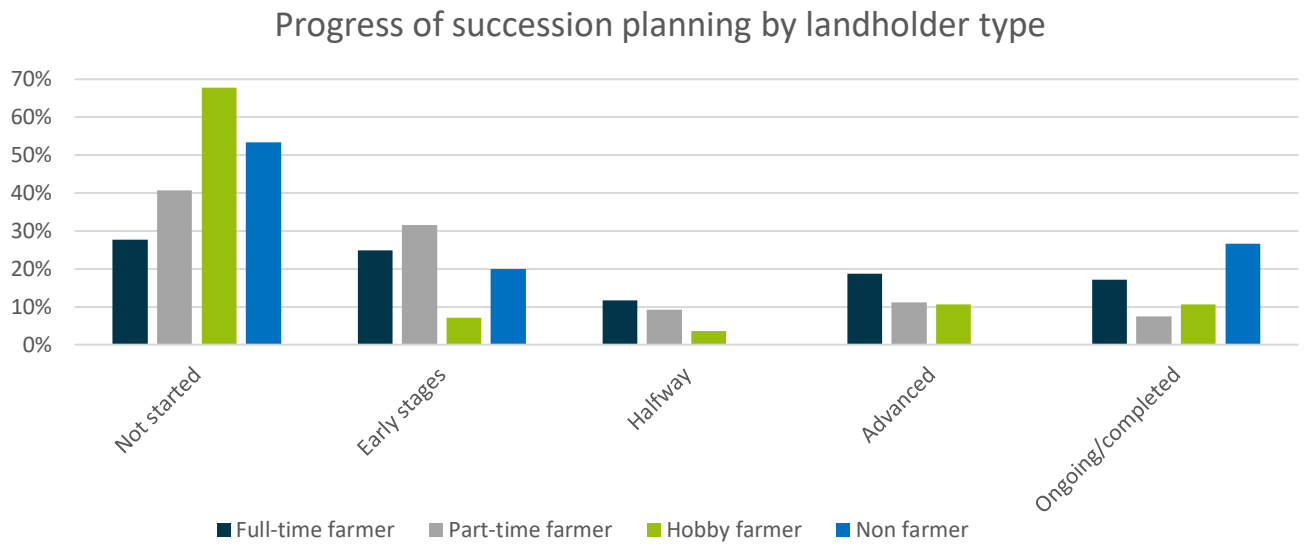

Figure 17: Progress of succession planning by landholder type, 2021 (n = 294).

[21] Jackson, T., Zammit, K., & Hatfield-Dodds, S. (2020), *Snapshot of Australian Agriculture 2020*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

8 CONCLUSION

This report has given a broad range of insights into the values, beliefs, norms and practices related to farming in the Central West region of New South Wales.

A high proportion of farmers are open to new ideas about farming and land management. It is, however, evident that while landholders are open to new approaches, their ability to take on the risk involved could be tempered by unconscious considerations. Their approach to taking on new ideas and risk is also influenced by financial considerations, with just under half of farmers reporting that they can afford to take a few risks and experiment with new ideas.

This may explain why, despite a high proportion being open to new ideas, there are a relatively low number of self-identified early adopters in the sample. Further, nearly a third of landholders indicate that their farm is doing fine the way things are and see no reason to change, which correlates negatively with best practice implementation. A broad range of information is used by farmers, with older farmers more likely to access traditional information sources, with younger farmers more likely to access online and social media sources. Most farmers in the region trust their intuition and other farmers over other information.

In relation to soil-related practices, groundcover was the most implemented practice across the region, perceived as the most important influence on soil health and productivity. Overall, the data indicate a strong personal responsibility to maintain the productivity of soils, with young farmers most likely to consider soil testing is an essential first step for understanding soil condition. While soil testing was broadly perceived as an integral part of data gathering for soil productivity and health, little more than half of farmers are testing their soils, with the frequency of testing varying greatly. While soil tests were considered key indicators for farmers, they also use visual inspections of soils, plant health observations (including weeds), and yields.

When asked to select key challenges on a regional scale, the top three issues for farmers in the region were the water holding capacity of soils, declining soil health and/or soil productivity, and the absence of important services and infrastructure. The importance of the continual balancing act between destocking and restocking in relation to seasonal and annual variability was evident in the responses. Nearly two thirds of respondents agreed that human activities influence our changing climate, and that landholders in the region should do all they can to reduce carbon emissions. More than half of all respondents agree that climate change will have dire consequences if nothing is done, and that fundamental changes are required to make the region's farming systems resilient. Farmers with a more substantial belief in climate change were more likely to have recently changed their farming operations to reduce carbon emissions while also reducing their dependence on chemicals.

When asked an open question on what they saw as their greatest challenge in the next ten years, the strongest emergent theme was that of climate change. Many farmers were cognisant of the seasonal variability linked with it, focusing on a broad range of issues such as drought and water storage. The second most common challenge highlighted was that of aging, pending retirement, and health issues. Input costs, including labour, land and machinery were listed as important issues for farmers. Also common were financial challenges relating to mortgage repayments and debt, demonstrating a considerable mix of personal and practical challenges for farmers. However, when

considering generational differences, the oldest generation were most likely to be satisfied with their farm's income.

In terms of how farmers could be better supported into the future, there are opportunities for groups such as Central West Farming Systems to connect with farmers across a greater region, and particularly younger farmers. Connecting with younger farmers may involve increased engagement with social media and online means, although young farmers were also keen to attend field days. While it may be more difficult for rural agricultural organisations to improve mobile communications services, the results suggest that their lobbying on this front would be supported by farmers. Second to this, farmers are seeking information and knowledge. Accurate and long-range weather forecasting and an increased role for drones and data systems on the farm were raised as useful by some farmers, however, reliable internet was cited as a significant barrier to the use of these innovations.

Future goals for improving farm resilience were raised, including reducing inputs, building soil capacity, and improving the land to the market value chain, particularly for more niche products. While just 20% of farmers considered themselves to be undertaking practices that they consider to be regenerative, a much higher proportion of farmers are implementing practices that are broadly considered to be within the toolkit of regenerative agriculture. Half of farmers were interested in learning more about regenerative farming approaches, with many highlighting the need to adapt to climate change and to take such actions as “drought-proofing the farm”. The most frequently mentioned desire for knowledge was about sustainable and regenerative farming and soil management.

APPENDIX 1 – DATA TABLES

Table X1: Key attributes by LGA

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Property size (area owned)	1216ha	203ha	135ha	126ha	1000ha	2525ha	1400ha	84ha
Property principal place of residence	71%	78%	83%	68%	90%	75%	77%	50%
Bought additional land in region in past 20 years	51%	32%	27%	31%	65%	51%	47%	17%
Subdivided or sold part of property past 20 years	15%	12%	11%	11%	16%	14%	24%	0%
Property leased, share farmed or agisted from others (mean)	182ha (n=25)	8ha (n=50)	47ha (n=103)	23ha (n=60)	221ha (n=14)	249ha (n=56)	0ha (n = 10	0ha (n=3)
Age of respondent	61 years	64 years	63 years	63 years	58 years	59 years	58 years	58 years
Gender of respondent (n=142)	15% female	26% female	22% female	23% female	14% female	19% female	19% female	100% female
Length of family ownership	56 years mean (median 50 yrs)	57 years mean (median 46 yrs)	44 years mean (median 27 yrs)	45 years mean (median 29 yrs)	54 years mean (median 40 yrs)	59 years mean (median 58 yrs)	202 years mean (median 65 yrs)	45 years mean (median 13 yrs)
Other family members working on property	59%	55%	55%	47%	55%	69%	65%	0%
Paid off-property work last 12 months mean score	13% Yes both 17% Yes me 15% Yes partner	25% Yes both 24% Yes me 13% Yes partner	36% Yes both 16% Yes me 15% Yes partner	27% Yes both 21% Yes me 18% Yes partner	20% Yes both 17% Yes me 23% Yes partner	16% Yes both 15% Yes me 21% Yes partner	13% Yes both 20% Yes me 13% Yes partner	33% Yes both 67% Yes me 0% Yes partner

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Hours work on-property per week	50 hours	40 hours	30 hours	30 hours	50 hours	50 hours	60 hours	25 hours
Income from agriculture in Central West region 2019/20	74%	77%	69%	54%	87%	78%	69%	67%
If yes, % all survey respondents net profit from agriculture >$50k	68% (n=53)	70% (n=67)	75% (n=133)	74% (n= 94)	43% (n=28)	63% (n=76)	67% (n=12)	NA
Received net off-property income 2018/19	17% me 15% spouse 13% both	24% me 13% spouse 25% both	16% me 14% spouse 36% both	21% me 18% spouse 20% both	17% me 23% spouse 20% both	15% me 21% spouse 16% both	20% me 13% spouse 13% both	67% me 0% spouse 33% both
% all survey respondents net income from off-property >$50k	50%	44%	27%	54%	43%	57%	71%	0%
CWFS member	7% (7% was)	2% (1% was)	3% (2% was)	1% (2% was)	26% (13% was)	26% (10% was)	12% (24% was)	0% (0% was)
Completed short course related to property management past 5 years	16% me 5% partner 7% both	22% me 5% partner 4% both	21% me 6% partner 10% both	20% me 1% partner 6% both	19% me 10% partner 13% both	13% me 7% partner 18% both	20% me 0% partner 13% both	67% me 0% partner 0% both
Property management or whole farm plan	36%	42%	40%	34%	40%	40%	50%	33%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Attended a field day/farm walk/ demonstration on soil health last 12 months	36%	43%	40%	30%	48%	32%	53%	67%
Proportion of land lost to production due to soil problems	12% Median 18ha, mean 115ha	12% Median 1ha, mean 37ha	12% Median 10ha, mean 43ha	13% Median 5ha, mean 30ha	10% Median 200ha, mean 297ha	21% Median 10ha, mean 101ha	13% Median 7ha, mean 7ha	33% Median 40ha, mean 40ha
Family members interested in taking on property	49%	32%	34%	27%	26%	49%	54%	0%
How to identify main constraints to soil productivity on property	61%	42%	53%	46%	47%	60%	73%	0%
How to build soil organic matter/soil carbon	42%	38%	41%	38%	59%	39%	60%	33%
The processes leading to soil structure decline in this area	50%	49%	47%	43%	60%	54%	67%	0%
How to use soil testing to prepare a nutrient budget that will increase soil productivity	38%	37%	36%	30%	43%	34%	60%	50%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
The production benefits of applying biological soil supplements (e.g. compost, manure, microbial inoculants)	36%	50%	49%	40%	38%	39%	47%	67%
The extent and type of biological activity in soils on your property	24%	21%	24%	18%	21%	23%	27%	0%
Regenerative agriculture and holistic farm management	23%	37%	38%	22%	28%	27%	27%	0%
Soil testing is an essential first step in understanding soil condition	81%	84%	88%	72%	90%	74%	94%	100%
Biological activity is an important indicator of the productive capacity of soils	84%	83%	81%	80%	89%	72%	81%	67%
The costs of applying lime to address soil acidity are justified by increased production	70%	62%	70%	56%	79%	44%	0%	33%
Belief in climate change (Climate change poses a risk to the region)	40%	60%	67%	58%	58%	34%	38%	67%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Predisposition to accept risk (I am usually an early adopter of new agricultural practices and technologies)	41%	38%	34%	29%	37%	32%	60%	67%
Predisposition to resist risk (My farm is doing ok the way things are, I see no reason to change)	34%	33%	24%	36%	32%	36%	31%	0%
Enterprise mix - top 3	Cereal cropping (80%), Sheep for wool or meat (74%), Pasture (67%)	Beef cattle (70%), Sheep for wool or meat (56%), Pasture (52%)	Beef cattle (60%), Pasture (56%), Sheep for wool or meat (43%)	Pasture (55%), Sheep for wool or meat (50%), Beef cattle (46%),	Cereal cropping (77%), Pasture (68%), Sheep for wool or meat (68%)	Sheep for wool or meat (86%), Cereal Cropping (78%). Pasture (69%)	Cereal cropping (88%), Sheep for wool or meat (76%), Pasture (65%)	Area of remnant vegetation (83%), Pasture (67%), Beef cattle (50%).
Farmer identity: Full-time	68%	53%	41%	41%	84%	82%	81%	33%
Farmer identity: Part-time	15%	25%	26%	17%	13%	7%	6%	50%
Farmer identity: Hobby	11%	22%	23%	26%	3%	7%	0%	17%
Farmer identity: Non	6%	0%	10%	16%	0%	4%	13%	0%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Used minimum or no tillage in the past 5 years	57%	45%	47%	39%	71%	46%	53%	33%
Tested soils for nutrient status I n the past 5 years	79%	60%	59%	52%	74%	57%	73%	33%
Top 3 Attached Values	A great place to raise a family (84%), Ability to pass on a healthier environment for future generations (82%), Sense of accomplishment from building/maintaining a viable business (82%)	An attractive place/area to live (95%%), Ability to pass on a healthier environment for future generations (93%), Its native vegetation provides habitat for birds and animals (84%)	An attractive place/area to live (90%), A great place to raise a family (85%), Ability to pass on a healthier environment for future generations (83%)	Ability to pass on a healthier environment for future generations (90%), An attractive place/area to live (86%), My property is an important part of who I am (81%)	Sense of accomplishment from building/maintaining a viable business (93%), The productive value of the soil on my property (83%), An attractive place/area to live (83%)	A great place to raise a family (94%), Ability to pass on a healthier environment for future generations 92%), An important source of household income (92%)	Ability to pass on a healthier environment for future generations (93%), Sense of accomplishment from building/maintaining a viable business (93%), Provides a sense of belonging to a place (87%)	Note low n value. Sense of accomplishment from building/maintaining a viable business (100%), Provide opportunities to learn new things (100%), The productive value of the soil on my property (100%)

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Top 3 Regional Issues	Absence of important services and infrastructure (e.g. health, schools, internet, phone coverage) (78%), Herbicide resistance (72%), Water security (71%)	Declining soil health and/or soil productivity (79%), Changes in weather patterns (75%), Water security (73%)	Water security (80%), Water holding capacity of soils (78%), Changes in weather patterns (75%)	The impact of pest plants and/or animals on native plants and animals (77%), Water security (75%), Changes in weather patterns (71%)	Water holding capacity of soils (87%), Water security (81%), Declining soil health and/or soil productivity (80%)	Absence of important services and infrastructure (e.g. health, schools, internet, phone coverage) (93%), The impact of pest plants and/or animals on native plants and animals (79%), Water holding capacity of soils (77%)	Water holding capacity of soils (100%), Declining soil health and/or soil productivity (93%), Changes in weather patterns (88%)	Note low n value. Declining soil health and/or soil productivity (100%), The impact of pest plants and/or animals on native plants and animals (100%), Herbicide resistance (100%)

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Property size (area owned)	1216ha	203ha	135ha	126ha	1000ha	2525ha	1400ha	84ha
Property principal place of residence	71%	78%	83%	68%	90%	75%	77%	50%
Bought additional land in region in past 20 years	51%	32%	27%	31%	65%	51%	47%	17%
Subdivided or sold part of property past 20 years	15%	12%	11%	11%	16%	14%	24%	0%
Property leased, share farmed or agisted from others (mean)	182ha (n=25)	8ha (n=50)	47ha (n=103)	23ha (n=60)	221ha (n=14)	249ha (n=56)	0ha (n = 10	0ha (n=3)
Age of respondent	61 years	64 years	63 years	63 years	58 years	59 years	58 years	58 years
Gender of respondent (n=142)	15% female	26% female	22% female	23% female	14% female	19% female	19% female	100% female
Length of family ownership	56 years mean (median 50 yrs)	57 years mean (median 46 yrs)	44 years mean (median 27 yrs)	45 years mean (median 29 yrs)	54 years mean (median 40 yrs)	59 years mean (median 58 yrs)	202 years mean (median 65 yrs)	45 years mean (median 13 yrs)
Other family members working on property	59%	55%	55%	47%	55%	69%	65%	0%
Paid off-property work last 12 months mean score	13% Yes both 17% Yes me 15% Yes partner	25% Yes both 24% Yes me 13% Yes partner	36% Yes both 16% Yes me 15% Yes partner	27% Yes both 21% Yes me 18% Yes partner	20% Yes both 17% Yes me 23% Yes partner	16% Yes both 15% Yes me 21% Yes partner	13% Yes both 20% Yes me 13% Yes partner	33% Yes both 67% Yes me 0% Yes partner

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Hours work on-property per week	50 hours	40 hours	30 hours	30 hours	50 hours	50 hours	60 hours	25 hours
Income from agriculture in Central West region 2019/20	74%	77%	69%	54%	87%	78%	69%	67%
If yes, % all survey respondents net profit from agriculture >$50k	68% (n=53)	70% (n=67)	75% (n=133)	74% (n= 94)	43% (n=28)	63% (n=76)	67% (n=12)	NA
Received net off-property income 2018/19	17% me 15% spouse 13% both	24% me 13% spouse 25% both	16% me 14% spouse 36% both	21% me 18% spouse 20% both	17% me 23% spouse 20% both	15% me 21% spouse 16% both	20% me 13% spouse 13% both	67% me 0% spouse 33% both
% all survey respondents net income from off-property >$50k	50%	44%	27%	54%	43%	57%	71%	0%
CWFS member	7% (7% was)	2% (1% was)	3% (2% was)	1% (2% was)	26% (13% was)	26% (10% was)	12% (24% was)	0% (0% was)
Completed short course related to property management past 5 years	16% me 5% partner 7% both	22% me 5% partner 4% both	21% me 6% partner 10% both	20% me 1% partner 6% both	19% me 10% partner 13% both	13% me 7% partner 18% both	20% me 0% partner 13% both	67% me 0% partner 0% both
Property management or whole farm plan	36%	42%	40%	34%	40%	40%	50%	33%
Attended a field day/farm walk/ demonstration on soil health last 12 months	36%	43%	40%	30%	48%	32%	53%	67%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Proportion of land lost to production due to soil problems	12% Median 18ha, mean115ha	12% Median 1ha, mean 37ha	12% Median 10ha, mean 43ha	13% Median 5ha, mean 30ha	10% Median 200ha, mean 297ha	21% Median 10ha, mean 101ha	13% Median 7ha, mean 7ha	33% Median 40ha, mean 40ha
Family members interested in taking on property	49%	32%	34%	27%	26%	49%	54%	0%
How to identify main constraints to soil productivity on property	61%	42%	53%	46%	47%	60%	73%	0%
How to build soil organic matter/soil carbon	42%	38%	41%	38%	59%	39%	60%	33%
The processes leading to soil structure decline in this area	50%	49%	47%	43%	60%	54%	67%	0%
How to use soil testing to prepare a nutrient budget that will increase soil productivity	38%	37%	36%	30%	43%	34%	60%	50%
The production benefits of applying biological soil supplements (e.g. compost, manure, microbial inoculants)	36%	50%	49%	40%	38%	39%	47%	67%
The extent and type of biological activity in soils on your property	24%	21%	24%	18%	21%	23%	27%	0%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Regenerative agriculture and holistic farm management	23%	37%	38%	22%	28%	27%	27%	0%
Soil testing is an essential first step in understanding soil condition	81%	84%	88%	72%	90%	74%	94%	100%
Biological activity is an important indicator of the productive capacity of soils	84%	83%	81%	80%	89%	72%	81%	67%
The costs of applying lime to address soil acidity are justified by increased production	70%	62%	70%	56%	79%	44%	0%	33%
Belief in climate change (Climate change poses a risk to the region)	40%	60%	67%	58%	58%	34%	38%	67%
Predisposition to accept risk (I am usually an early adopter of new agricultural practices and technologies)	41%	38%	34%	29%	37%	32%	60%	67%
Predisposition to resist risk (My farm is doing Ok the way things are, see no reason to change)	34%	33%	24%	36%	32%	36%	31%	0%

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
Enterprise mix - top 3	Cereal cropping (80%), Sheep for wool or meat (74%), Pasture (67%)	Beef cattle (70%), Sheep for wool or meat (56%), Pasture (52%)	Beef cattle (60%), Pasture (56%), Sheep for wool or meat (43%)	Pasture (55%), Sheep for wool or meat (50%), Beef cattle (46%),	Cereal cropping (77%), Pasture (68%), Sheep for wool or meat (68%)	Sheep for wool or meat (86%), Cereal Cropping (78%). Pasture (69%)	Cereal cropping (88%), Sheep for wool or meat (76%), Pasture (65%)	Area of remnant vegetation (83%), Pasture (67%), Beef cattle (50%).
Farmer identity: F-T	68%	53%	41%	41%	84%	82%	81%	33%
Farmer identity: P-T	15%	25%	26%	17%	13%	7%	6%	50%
Farmer identity: Hobby	11%	22%	23%	26%	3%	7%	0%	17%
Farmer identity: Non-F	6%	0%	10%	16%	0%	4%	13%	0%
Used minimum or no tillage in the past 5 yrs	57%	45%	47%	39%	71%	46%	53%	33%
Tested soils for nutrient status in the past 5 yrs	79%	60%	59%	52%	74%	57%	73%	33%
Top 3 Attached Values	A great place to raise a family (84%), Ability to pass on a healthier environment for future generations (82%), Sense of accomplishment from	An attractive place/area to live (95%%), Ability to pass on a healthier environment for future generations (93%), Its native vegetation provides	An attractive place/area to live (90%), A great place to raise a family (85%), Ability to pass on a healthier environment for future generations (83%)	Ability to pass on a healthier environment for future generations (90%), An attractive place/area to live (86%), My property is an important	Sense of accomplishment from building/maintaining a viable business (93%), The productive value of the soil on my property (83%), An	A great place to raise a family (94%), Ability to pass on a healthier environment for future generations 92%), An important source of	Ability to pass on a healthier environment for future generations (93%), Sense of accomplishment from building/maintaining a viable	Note low n value. Sense of accomplishment from building/maintaining a viable business (100%), Provide opportunities to learn new

Key attributes (medians unless indicated)	Bland n = 61 (11% of respondents)	Blayney n = 82 (14% of respondents)	Cabonne n = 173 (30% of respondents)	Cowra n = 111 (19% of respondents)	Forbes n = 31 (6% of respondents)	Lachlan n = 93 (16% of respondents)	Parks n = 17 (3% of respondents)	Other n = 6 (1% of respondents)
	building/maintaining a viable business (82%)	habitat for birds and animals (84%)		part of who I am (81%)	attractive place/area to live (83%)	household income (92%)	business (93%), Provides a sense of belonging to a place (87%)	things (100%), The productive value of the soil on my property (100%)
Top 3 Regional Issues	Absence of important services and infrastructure (e.g. health, schools, internet, phone coverage) (78%), Herbicide resistance (72%), Water security (71%)	Declining soil health and/or soil productivity (79%), Changes in weather patterns (75%), Water security (73%)	Water security (80%), Water holding capacity of soils (78%), Changes in weather patterns (75%)	The impact of pest plants and/or animals on native plants and animals (77%), Water security (75%), Changes in weather patterns (71%)	Water holding capacity of soils (87%), Water security (81%), Declining soil health and/or soil productivity (80%)	Absence of important services and infrastructure (93%), The impact of pest plants and/or animals on native plants and animals (79%), Water holding capacity of soils (77%)	Water holding capacity of soils (100%), Declining soil health and/or soil productivity (93%), Changes in weather patterns (88%)	Note low n value. Declining soil health and/or soil productivity (100%), The impact of pest plants and/or animals on native plants and animals (100%), Herbicide resistance (100%)

TABLE X2: LAND USE AND ENTERPRISE MIX, 2021 (n=575)

LAND USE/ ENTERPRISE TYPE	% Yes 2021	Difference by rainfall zone	Difference by landholder type (highest response group)
Cereal	48%	***	### (FTF 70%)
Pasture	60%	Nil	### (FTF 72%)
Cotton	1%	Nil	Nil (FTF 2%)
Legumes	17%	***	### (FTF 28%)
Sheep for wool or meat	59%	***	### (FTF 74%)
Area of remnant native vegetation (e.g. trees, grasslands, wetlands)	33%	Nil	### (FTF 37%)
Oil seeds	17%	***	### (FTF 28%)
Other tree planting (e.g. shelter, habitat, erosion or recharge control, carbon)	23%	Nil	Nil (PTF 25%)
Beef cattle	52%	***	### (PTF 67%)
Area set aside for living/recreation (e.g. gardens, pets, water bodies, vehicles)	31%	Nil	Nil (NF 48%)
Farm forestry	1%	Nil	Nil (NF 5%)
Cover crops	17%	Nil	### (FTF 10%)
Other commercial livestock enterprises (e.g. goats, pigs, deer, horse studs, poultry, alpaca, dogs)	7%	Nil	Nil (HF 11%)
Heritage agreement/ covenant	2%	Nil	Nil (HF 2%)
Horticulture	1%	Nil	Nil (HF 4%)
Irrigated agriculture	4%	Nil	### (FTF 7%)
Farm-based tourism (e.g. farm stays, B&B)	1%	Nil	Nil (HF 2%)
Viticulture	2%	Nil	Nil (FTF 2%)
Dairying	1%	Nil	Nil (FTF 1%)

TABLE X3: VIEW STATEMENT AGREEMENT DATA USE AND MANAGEMENT BY LANDHOLDER TYPE, 2021 (n = 509 to 535)

VIEW STATEMENT	% AGREE/ STRONGLY AGREE				
	OVERALL	FTF	PTF	HF	NF
I feel a personal responsibility to maintain the productive capacity of my soil	90%	93%	95%	86%	54%
I am confident that my land is in a better condition than when I took on the management of this farm	84%	87%	87%	80%	56%
Soil testing is an essential first step in understanding soil condition	82%	83%	86%	80%	61%
Biological activity is an important indicator of the productive capacity of soils	80%	83%	84%	80%	59%
I feel confident working with numbers and managing my farm accounts	79%	86%	86%	69%	39%
Fencing to manage stock access is an essential element of protecting the health of waterways and native vegetation	79%	75%	89%	82%	78%
Most Yrs I am satisfied with the income from my farm's production	77%	84%	84%	66%	22%
I am coping well with the associated stresses & challenges of managing my farm	73%	78%	79%	69%	23%
The costs of establishing perennial pasture are justified by the returns	70%	80%	70%	52%	31%
I usually include another person or people in my on-farm management decisions	69%	75%	74%	59%	35%
The benefits of stubble retention outweigh problems arising from the practice	66%	76%	70%	41%	36%
I feel adequately supported to conduct farming and land management activities on my property	64%	72%	63%	55%	24%
The costs of applying lime to address soil acidity are justified by increased production	63%	73%	60%	51%	29%
I'm confident that landholders in this region can adapt to expected changes in rainfall patterns	63%	69%	54%	55%	59%
Primary producers should do all they can to reduce carbon emissions from their activities	61%	56%	76%	63%	65%
Decision making needs to be strongly influenced by data	56%	59%	61%	52%	40%
I am interested in learning more about alternative/holistic farming approaches	53%	48%	65%	60%	42%
Fundamental changes are required to make our regions farming systems more resilient in our region	49%	44%	56%	60%	50%

I have good systems in place to manage my farm data	48%	60%	43%	34%	14%
Internet or mobile phone connectivity is a barrier to my using on-farm data more effectively	47%	58%	38%	25%	36%
Farming system groups are the best way to drive and direct local research, development and extension	43%	51%	30%	34%	29%
I feel a personal responsibility to be part of a local grower group	42%	42%	46%	44%	26%
Im confident that adopting regenerative/holistic farming practices is justified by the returns	35%	29%	50%	44%	23%
There is adequate compensation or support for conservation activities on my farm	12%	14%	11%	9%	6%

TABLE X4: MANAGEMENT PRACTICES OVER TIME, 2021 (n= 575)

MANAGEMENT PRACTICE	At some point (prior to 2015)		Past 5 years (2015-2020)		Intend to implement in next 5 years	
	FT	PT	FT	PT	FT	PT
Maintaining at least 70% ground cover (in non-drought years)	40%	42%	66%	70%	38%	44%
Lethal control of pest animals	49%	37%	64%	58%	37%	33%
Use of no-tillage techniques to establish crops or pastures	40%	24%	58%	49%	38%	26%
Testing of soils to understand soil condition	44%	32%	58%	47%	32%	33%
Planting of trees and shrubs (incl. direct seeding)	51%	40%	40%	60%	38%	38%
Sowing perennial pastures	41%	25%	57%	45%	41%	31%
Planting legumes or pulses	41%	21%	50%	33%	32%	30%
At least one lime application to arable land	35%	26%	46%	39%	34%	20%
Pasture cropping	23%	17%	36%	28%	29%	22%
Fencing of native bush/grasslands to manage stock access	33%	30%	28%	36%	23%	23%
Reduction of chemical use	11%	17%	26%	28%	17%	27%
Use of precision farming techniques	17%	3%	37%	17%	26%	10%
Use of time controlled, cell or rotational grazing	16%	19%	25%	36%	20%	27%
Increase in chemical use	20%	10%	30%	17%	17%	15%
Multi-species pasture cropping	14%	8%	28%	20%	25%	22%
Deep ripping of arable land	19%	11%	24%	8%	17%	7%
Farming practices that you consider to be regenerative practice/s.	10%	11%	18%	23%	15%	28%
At least one gypsum application to arable land	24%	14%	21%	16%	25%	10%
Application of biological soil supplements (e.g. compost tea, effluent)	13%	13%	16%	28%	18%	24%

Preparation of a nutrient budget for all/most of the property	14%	8%	21%	18%	25%	18%
Value-add processes (e.g. on-farm processing, retail)	4%	4%	4%	6%	8%	7%
Organic farming	2%	1%	3%	4%	6%	9%
Carbon farming	1%	1%	3%	5%	14%	14%

TABLE X5: MOST IMPORTANT ISSUES 2021, (n = 514 to 550).

REGIONAL ISSUES	% AGREE/ STRONGLY AGREE				
	OVERALL	FTF	PTF	HF	NF
Water holding capacity of soils ###	76%	81%	74%	68%	59%
Water security	75%	70%	83%	81%	74%
Declining soil health and/or soil productivity	74%	78%	74%	67%	58%
Changes in weather patterns	72%	70%	81%	72%	67%
The impact of pest plants and/or animals on native plants and animals ***	72%	68%	68%	83%	79%
Absence of important services and infrastructure (e.g. health, schools, internet, phone coverage) ###	71%	78%	64%	56%	69%
Public support/opposition for agricultural practices (e.g. GMs, animal welfare, pesticide use) ###	60%	67%	52%	49%	51%
Herbicide resistance ### ***	59%	66%	52%	51%	39%
Loss of native plants and animals in the landscape ###	55%	48%	59%	67%	69%
Long-term negative impacts of property purchased by absentees or corporate farms	53%	57%	54%	49%	33%
Risk to life and property from wildfires	53%	49%	53%	59%	64%
Non-agricultural land use (e.g. residential, wind farms, mining) encroaching on farming land ***	46%	48%	49%	38%	42%
Risk to life and property from flooding ***	21%	23%	13%	20%	26%
ON-FARM ISSUES	OVERALL	FTF	PTF	HF	NF
The impact of weeds or over-abundant native plant species on productivity.	74%	75%	68%	68%	57%
Declining nutrient status of soils ###	63%	64%	58%	65%	49%
Impact of temperature extremes on farm productivity (i.e. frost, heat damage)	62%	63%	59%	59%	50%
Uncertain/low returns limiting capacity to invest in my property ###	62%	64%	53%	39%	19%

Soil erosion (e.g. due to wind or water)	60%	62%	53%	58%	41%
The impact of feral animals or over-abundant native animal species on productivity ###	58%	60%	52%	60%	43%
Low level of organic carbon in soils ###	58%	62%	46%	52%	39%
Increasing nitrogen (N) input ### ***	57%	62%	41%	50%	33%
Low level of biological activity in soils ###	56%	60%	46%	55%	41%
Soil (re)compaction	45%	47%	39%	51%	31%
Effects of pesticide use on soil biota	44%	45%	41%	39%	34%
Soil-borne diseases ***	38%	40%	32%	41%	33%
Soil sodicity undermining productive capacity of soils ### ***	37%	40%	27%	34%	26%
Chemical residue in soils ***	37%	40%	29%	38%	34%
The activities of neighbouring landholder (e.g. such as overspray, building dams)	37%	35%	42%	35%	32%
Salinity undermining productive capacity of soils	34%	36%	29%	37%	23%
Soil acidity (lower pH) undermining productive capacity of soils ### ***	34%	60%	49%	47%	26%

TABLE X6: VIEWS ABOUT RISK AND TRUST BY LANDHOLDER TYPE, 2021 (n= 518 to 530). Mean is out of 5, shading indicates top 3

VIEW STATEMENT	% AGREE/STRONGLY AGREE				
	OVERALL % (mean/ 5)	FTF	PTF	HF	NF
I am open to new ideas about farming & land management	87% (4.1)	91%	86%	84%	60%
I won't take a risk if my gut/intuition says no	70% (3.7)	70%	71%	66%	71%
You can't be too careful when dealing with people	62% (3.6)	62%	61%	61%	67%
Human activities are influencing changes in climate	60% (3.6)	53%	71%	72%	68%
I trust my own intuition over other information when there is risk involved	63% (3.6)	64%	60%	60%	56%
It is not too late to take action to address climate change	53% (3.5)	48%	55%	66%	57%
If we do nothing, climate change will have dire consequences for all living things, including humans	53% (3.5)	45%	59%	69%	72%
Climate change poses a risk to the region	55% (3.4)	48%	60%	71%	64%
I prefer to see evidence of local success before trying a new practice	57% (3.4)	57%	54%	63%	36%
I usually view risks as a challenge to embrace	49% (3.3)	54%	39%	35%	59%
I prefer to avoid risks	48% (3.3)	47%	42%	55%	44%
People are almost always interested only in their own welfare	40% (3.2)	36%	42%	48%	50%
I have sufficient time available to consider changing my practices	45% (3.2)	47%	43%	42%	48%
Financially, I can afford to take a few risks and experiment with new ideas	47% (3.1)	53%	45%	38%	42%
I am usually an early adopter of new agricultural practices and technologies	35% (3.1)	42%	26%	24%	25%
My farm is doing ok the way things are, I see no reason to change	31% (2.9)	27%	31%	37%	34%

TABLE X7: VIEWS AND BELIEFS REGARDING CLIMATE CHANGE, 2021 (n= 519 to 530)

VIEW	Mean /5.0	% Disagree	% Neutral /Don't know	% Agree	% N/A	Landholder type with highest rate of agreem't
I'm confident that landholders in this region can adapt to expected changes in weather patterns ### ***	3.7	11%	25%	63%	1%	PT
Primary producers should do all they can to reduce carbon emissions from their activities ### ***	3.6	11%	27%	61%	1%	PT
Fundamental changes are required to make our region's farming systems sustainable ### ***	3.5	13%	37%	49%	1%	HF
BELIEF						
Climate change poses a risk to the region ### ***	3.4	22%	23%	55%	0%	HF
It is not too late to take action to address climate change ###	3.5	16%	31%	53%	0%	NF
Human activities are influencing changes in climate ### ***	3.6	20%	20%	60%	0%	HF
If we do nothing, climate change will have dire consequences for all living things, including humans ### ***	3.5	23%	24%	53%	0%	NF

Table X8: LONG TERM PLANS BY LANDHOLDER TYPE, 2021 (n = 490 to 508)

LONG TERM PLANS	% OVERALL	% FTF	% PTF	% HF	% NF
Ownership of the property will stay within the family ***	72%	76%	72%	63%	66%
Some part of my property will be set aside for conservation purposes ***	27%	22%	36%	32%	35%
Additional land will be purchased ###	26%	34%	27%	8%	3%
The enterprise mix will be changed to diversify income sources ###	24%	24%	31%	19%	19%
I will move off the property around/soon after reaching retirement age	20%	20%	18%	17%	23%
A family member will seek additional off-property work to support the farm	18%	13%	28%	23%	21%
The property will be sold	17%	14%	17%	22%	25%
Additional land will be leased or share farmed ###	16%	23%	10%	6%	0%
The enterprise mix will be changed to more intensive enterprises ###	13%	18%	9%	6%	6%
The enterprise mix will be changed to less intensive enterprises ###	13%	14%	13%	10%	0%
All or most of the property will be leased or share farmed	10%	10%	9%	10%	13%
Buying property outside of my current area to mitigate increased seasonal variability ###	10%	12%	16%	5%	3%
The property will be subdivided and a large part of the property sold	5%	6%	4%	3%	9%

APPENDIX 2 – SURVEY

SOiL CRC
Performance through collaboration

SURVEY NO.

SUPPORTING LANDHOLDERS IN CENTRAL WEST NSW

RURAL LANDHOLDER SURVEY 2021

Southern Cross University
CWFS
SOiL CRC
NSW Local Land Services
Charles Sturt University

SUPPORTING LANDHOLDERS IN CENTRAL WEST NSW

This comprehensive survey is a vital part of efforts to understand the important social and economic factors shaping landholder decision making in Central West New South Wales. Information you provide will guide decision-making and strategic planning by Central West Farming Systems and Central West Local Land Services, organisations working to support landholders to have viable futures in your region. Information will also be used to inform the activities of the Australian Soil Cooperative Research Centre (Soil CRC).

Surveys are being sent to landholders with properties in the Central West region of NSW, identified via ratepayer lists. Each survey has a serial number that links to the property, enabling us to spatially reference our survey results with soil and weather data. **No property or person will ever be identifiable in our reporting.** Our plans are to follow up this survey in about five years, to provide insights into trends over time.

We recognise that you may not be involved in decision making for this property. We are seeking the views of the person/s 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 postage-paid return envelope. We ask that you only provide information for your property/s within the Central West region.

This voluntary survey should take approximately 25-45 minutes to complete. 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 contact 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 is never published.

Thank you for your assistance,

Dr. Hanabeth Luke
Senior Lecturer & Soil CRC Project Leader
Faculty of Science & Engineering,
Southern Cross University

1. OCCUPATIONAL IDENTITY

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

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

Please circle the rainfall zone most relevant to your main/home property:

LOW (Under 350mm) MEDIUM (350-500mm) HIGH (Over 500mm)

2. ENTERPRISE / LAND USE MIX

This topic is seeking **information 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 in the Central West region in mind.

ENTERPRISES / LAND USE ON YOUR PROPERTY IN 2021	SITUATION NOW	ENTERPRISES / LAND USE ON YOUR PROPERTY IN 2021	SITUATION NOW
Cereal	○	Horticulture	○
Legumes/Pulses	○	Irrigated agriculture	○
Oil Seeds	○	Area of remnant native vegetation (e.g. trees, grasslands, wetlands)	○
Pasture	○	Farm forestry	○
Dairying	○	Other tree planting (e.g. shelter, habitat, erosion or recharge control)	○
Beef cattle	○	Farm-based tourism (e.g. farm stays, B&B)	○
Sheep	○	Heritage agreement/covenant	○
Bee keeping	○	Area set aside for living/recreation (e.g. gardens, pets, vehicles)	○
Other commercial livestock enterprises (e.g. goats, pigs, deer, horse studs, poultry, alpaca, dogs)	○	Carbon Farming	○
Viticulture	○	Cover crops	○
Cotton	○	Other (please specify):	○

3. YOUR ASSESSMENT OF ISSUES

This set of statements seeks your opinion about the importance of a **range of 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
1	2	3	4	5	6

IMPORTANCE OF ISSUES AFFECTING YOUR LOCAL DISTRICT	YOUR VIEW
Absence of important services and sufficient infrastructure (e.g. phone, schools, internet, roads & transport) **For example:**	
Risk to life and property from wildfires	
Water holding capacity of soils	
Long-term negative impacts of property purchased by absentees or corporate farms	
The impact of pest plants and/or animals on native plants and animals	
Loss of native plants and animals in the landscape	
Risk to life and property from flooding	
Water security	
Changes in weather patterns	
Public support/opposition for agricultural practices (e.g. GMs, animal welfare, pesticide use)	
Herbicide resistance	
Non-agricultural land use (e.g. residential, solar farms, mining) encroaching on farming land **Please specify:**	
Declining soil health and/or soil productivity	

IMPORTANCE OF ISSUES ON YOUR PROPERTY	YOUR VIEW
Uncertain/low returns limiting capacity to invest in my property	
Impact of temperature extremes on farm productivity (e.g. frost, heat damage)	
The impact of weeds on productivity **Please indicate the most important:**	
The impact of feral animals or over-abundant native animal species on productivity **Please indicate the most important:**	
The activities of neighbouring landholders (eg. such as overspray, building dams) **Please provide an example:**	

THE IMPORTANCE OF SOIL-RELATED ISSUES ON YOUR PROPERTY	YOUR VIEW
Soil erosion (e.g. due to wind or water)	
Declining nutrient status of soils	
Salinity undermining productive capacity of soils	
Soil acidity (lower pH) undermining productive capacity of soils	
Soil sodicity undermining productive capacity of soils	
Low level of organic carbon in soils	
Low level of biological activity in soils	
Soil-borne diseases	
Chemical residue in soils	
Effects of pesticide use on soil biota	
Soil (re)compaction	
Increasing nitrogen (N) input	

4. THE PRINCIPLES THAT GUIDE YOUR LIFE

The next set of statements seeks information about the **principles that guide your life.** *Please number each.*

RESPONSE OPTIONS:

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

THE PRINCIPLES THAT GUIDE YOUR LIFE	YOUR VIEW
Looking after my family/loved-ones and their needs	
Preventing pollution and protecting natural resources	
Being influential and having an impact on people and events	
Fostering equal opportunities for all community members	
Respecting the earth and living in harmony with nature	
Caring for the weak/vulnerable and correcting social injustice	
Creating wealth and striving for a financially profitable business	

5. 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
1	2	3	4	5

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	
Provides opportunities to learn new things	
A place or base for recreation	
An asset that will fund my retirement	
A great place to raise a family	
Its 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	
Provides a sense of belonging to a place	
My property is an important part of who I am	
The productive value of the soil on my property	
Native plants and animals make the property an attractive place to live	
An asset that is an important part of family wealth	

6. 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/soil characteristics	
The Aboriginal group/s who are connected to the area where your property is located	
The role of remnant vegetation in supporting the natural ecosystem	
Strategies to maintain ground cover to minimise erosion in this area	
Options and strategies to (re)establish perennial pastures (e.g. Lucerne/native grasses) in this area	
How to identify the main constraints to soil productivity on your property	
The benefits of applying biological soil supplements (e.g. compost, manure, microbial inoculants)	
The processes leading to soil structure decline	
Market mechanisms that support carbon farming	
The role of soil carbon in maintaining soil health	
How to build soil organic matter/soil carbon	
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	
Regenerative agriculture and/or holistic farm management	
How to support the persistence of native grasses in this area	
Emerging and/or cutting-edge agricultural technologies	
How to (re)introduce more legumes/pulses into your enterprise mix	
Time controlled, holistic or cell grazing strategies	
The role of on-farm biodiversity for supporting soil and landscape health	
How to apply precision-farming techniques	
The extent and type of biological activity in soils on your property	

7. YOUR VIEWS & EXPERIENCE

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

STATEMENTS	YOUR VIEW
The benefits of stubble retention outweigh problems arising from the practice	
If relevant, how do you usually manage your stubble? ◯ cool burning ◯ hot burning ◯ full retention ◯ incorporation ◯ other	
The costs of applying lime to balance soil acidity is justified by increased production	
The costs of establishing perennial pasture are justified by the returns	
Soil testing is an essential step in understanding soil condition	
Biological activity is an important indicator of the productive capacity of soils	
Fencing to manage stock access is an essential element of protecting waterways and native vegetation	
I feel a personal responsibility to be part of a local farming systems group	
I feel a personal responsibility to maintain the productive capacity of my soil	
There is adequate compensation or support provided for improving soil carbon on my farm	
I usually include another person or people in my on-farm management decisions	
If yes, please indicate who (i.e. agronomist, partner):	
I have good systems in place to manage my farm data	
Decision-making needs to be strongly influenced by data	
Internet or mobile phone connectivity is a barrier to my using on-farm data more effectively	
I feel confident working with numbers and managing my farm accounts	
Most years I'm satisfied with my farm's productivity given the seasonal conditions experienced	
I am coping well with the associated stresses and challenges of managing my farm	
Farming systems groups are the best way to drive and direct local research, development and extension	
I am interested in learning more about regenerative/holistic farming approaches	
I'm confident that adopting regenerative/holistic farming practices is justified by the returns	

STATEMENTS	YOUR VIEW
I'm confident that landholders in this region can adapt to expected changes in rainfall patterns	
Primary producers should do all they can to reduce carbon emissions from their activities	
Fundamental changes are required to make farming systems in our region more resilient	
I'm confident that my land is in a better condition than when I took on the management of this farm	
I feel adequately supported to conduct farming and land management activities on my property	

OPEN QUESTIONS

What is your main source of support for your agricultural and/or land management activities (e.g grower groups, friends)?

What is the most important influence on your soil health?

What testing/indicators do you use to assess soil/land health?

Approximately, how often are your soils tested?

◯ At least annually ◯ Every 3-5 years ◯ Once ◯ Never

Where do you soil test?

◯ One preferred location ◯ Systematically in one paddock ◯ Systematically in many paddocks

To a depth of (tick one only): ◯ 0-10cm ◯ 0-15cm ◯ 0- 30cm ◯ Deeper than 30cm

If you don't soil-test, why not?

Are you a member of Central West Farming Systems (CWFS)? ◯ No ◯ Yes ◯ I was previously

Please use the following response options to respond to the statements below:

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

STATEMENTS (indicate the extent to which you agree with the following)	CWFS	LOCAL LAND SERVICES
Provides valuable information about soil, agronomy, farm management and/or natural resource management		
Can be relied on to keep landholders' interests in mind when making decisions about research priorities		
Should play an advocacy role/lobby on behalf of my community's needs in regards to research, development & extension (R,D & E)		

What would you most like to see from your local farming systems group?

If you used to be, but are no longer a member, could you please explain why?

8. PREFERRED SOURCES OF INFORMATION

In the past 12 months, what have been your **top** sources of **information about topics related to the management of your property in the Central West region?** *Please place a tick besides your key sources in the table below.*

MODE OF INFORMATION		ORGANISATION/PERSONS	
Television	○	Other farmers	○
Books	○	Central West Farming Systems Group	○
Magazines	○	Local Land Services	○
Newspapers	○	Landcare	○
Emails	○	RDA	○
Radio	○	Local Council	○
Field days	○	Department of Primary Industries (DPI)	○
Websites	○	Soil CRC	○
Instagram	○	Rural R&D corporations (e.g. GRDC)	○
Twitter	○	Environmental organisations (e.g. Greening Australia)	○
Brochures/leaflets/newsletters	○	Commodity groups	○
YouTube	○	Friends/neighbours/relatives	○
Podcasts	○	Universities/CSIRO	○
Academic journals/research papers	○	Bureau of Meteorology	○
Facebook	○	**Independent** agricultural consultants, agronomists or stock agents	○
Whatsapp or Messenger groups	○	**Commercial** agricultural consultants, agronomists or stock agents	○
My intuition/gut feeling	○	Other grower groups	○
Extension officers	○	My own knowledge from my own experiences	○

For your selection/s above, please indicate the title of your preferred top source (e.g. name of newspaper or website)

_____

9. YOUR VIEWS ABOUT RISK, TRUST AND CLIMATE

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

RESPONSE OPTIONS:

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

STATEMENTS	YOUR VIEW
You can't be too careful when dealing with people	
I am usually an early adopter of new agricultural practices and technologies	
People are almost always interested only in their own welfare	
I trust my own intuition over other information when there is risk involved	
My farm is doing ok the way the things are, I see no reason to change	
I prefer to see evidence of local success before trying a new practice	
I prefer to avoid risks	
I am open to new ideas about farming and land management	
I usually view risks as a challenge to embrace	
I won't take a risk if my gut/intuition says no	
Financially, I can afford to take a few risks and experiment with new ideas	
I have sufficient time available to consider changing my practices	
Climate change poses a risk to the region	
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	

10. MANAGEMENT PRACTICES ON YOUR PROPERTY

This section asks about **practices undertaken** on your main or 'home' property in the Central West region during the full period of your management; and the past 5 years. *Tick all relevant.*
Some actions may not be relevant to your situation: Please ignore those topics.

PRACTICES IMPLEMENTED ON YOUR MAIN OR "HOME" PROPERTY IN THE CENTRAL WEST REGION	AT SOME POINT PRIOR TO 2015	PAST 5 YEARS (2015-present)	INTEND TO IMPLEMENT IN NEXT 5 YEARS
Planting of trees and shrubs (incl. direct seeding)	○	○	○
Fencing of native bush/grasslands to manage stock access	○	○	○
Use of time-controlled, cell, or holistic grazing	○	○	○
Sowing perennial pastures	○	○	○
Use of minimum or no-tillage techniques	○	○	○
Use of precision farming techniques for cropping	○	○	○
At least one lime application to arable land	○	○	○
At least one gypsum application to arable land	○	○	○
Application of biological soil supplements (eg. compost-tea, effluent)	○	○	○
Deep ripping of arable land	○	○	○
Maintaining at least 70% groundcover (in non-drought years)	○	○	○
Testing of soils to understand soil condition	○	○	○
Preparation of a nutrient budget for all/most of the property	○	○	○
Lethal control of pest animals	○	○	○
Reduction of chemical/fertiliser use	○	○	○
Increase in chemical/fertiliser use	○	○	○
Plant legumes/pulses	○	○	○
Pasture cropping	○	○	○
Multi-species pasture cropping	○	○	○
Value-add processes (eg on-farm processing, retail)	○	○	○
Organic farming	○	○	○
Carbon farming	○	○	○
Farming practices you consider to be regenerative **Example/s:**	○	○	○

11. YOUR PROPERTY AND YOU

BACKGROUND INFORMATION	PLEASE TICK OR FILL IN YOUR RESPONSE
What is the total area of land you own in the Central West region? (excluding land you manage but do not own)	_____ total Ha owned
Is this Central West property your principal place of residence?	◯ No ◯ Yes
What area of additional land do you manage (lease/sharefarm/agist from others) in the Central West region (additional to the figure you provided above)?	_____ additional Ha managed
How long have you or your family owned or managed all/some part of your property?	_____ years
How many rural properties do you own **within** the Central West region?	_____ No. of properties
What area of your property is leased, share farmed or agisted by others?	_____Ha

INFORMATION ABOUT YOU AND YOUR MAIN OR 'HOME' PROPERTY	PLEASE TICK OR FILL IN YOUR RESPONSE
Has this enterprise bought additional land in this region in the past 20 years?	◯ No ◯ Yes
Have you subdivided or sold part of your property in this region over the past 20 years?	◯ No ◯ Yes
Estimate the number of **hours per week** that you **worked on farming/property** related activities **(average over the past 12 months)**.	_____ hrs/week
What is your **age**?	_____ years
What is your gender? ◯ Male ◯ Female ◯ Non-binary	
Do you identify as Aboriginal and/or Torres Strait Islander?	◯ No ◯ Yes
What is your main occupation (e.g., farmer, teacher, investor, retiree)? _____	
What is the highest level of formal education you have completed? ◯ Trained in life but no formal quals ◯ Year 10 ◯ Year 12 ◯ Vocational Certificate ◯ Tertiary/Uni	
Are other **family members** working on your property **on a daily or weekly basis?** **If yes, please indicate who they are and their approximate age:** ◯ Partner ___ ◯ Child/ren ___ ◯ Parent/s ___ ◯ Sibling/s ___ ◯ Other/s ___	◯ No ◯ Yes
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?	◯ No ◯ Yes
Is any proportion of your land presently lost to production due to soil problems? If yes, how many hectares have been lost due to soil _____Ha **Please specify the issue:**	◯ No ◯ Yes

11. YOUR PROPERTY AND YOU (CONT)

INFORMATION ABOUT YOU AND YOUR MAIN OR 'HOME' PROPERTY	PLEASE TICK OR FILL IN YOUR RESPONSE
In the past 12 months have you changed your financial or on-property operations as a result of seasonal changes in weather patterns?	◯ No ◯ Yes
In the past 12 months have you changed your operations to increase the soil carbon on your property (e.g. by revegetation, soil management)	◯ No ◯ Yes
In the past 12 months have you changed your on-property operations as a result of considering opportunities to reduce carbon emissions ((e.g. generating wind power, improved grazing practices)	◯ No ◯ Yes
Did you earn income from agriculture on your Central West NSW property during 2019/2020 financial year?	◯ No ◯ Yes
Did your Central West NSW property return a net profit during the 2019/2020 financial year? (i.e. income exceeded all expenses before tax)	◯ No ◯ Yes
If yes, was your net 2019/2020 agricultural income above $50,000?	◯ No ◯ Yes
Did you or your spouse/partner receive a net off-property income (after expenses and before tax) in the financial year (2019/2020)?	◯ No ◯ Yes, me ◯ Yes, my partner
If yes, was the total off-property income for you and/or your spouse above $50,000?	◯ No ◯ Yes
In the 2019/2020 financial year, what percentage of you (and your spouse's) income was earned off farm? (eg. from shares, rental income, employment, other business)	____%
Estimate the number of **days** you were involved in paid off-property work in the **past 12 months**	____days per year
Has your Central West NSW property returned a net profit over the last 10 years? (i.e. income exceeded all expenses before tax, on balance, over the 10 year period)	◯ No ◯ Yes
In the past 5 years have you or your partner completed a short course/workshop relevant to property management? (e.g. financial planning, integrated pest management)	◯ No ◯ Yes, me ◯ Yes, my partner
In the last 12 months, did you attend field days, farm walks and demonstrations focused on soil health and productivity?	◯ No ◯ Yes

On average, what time-frame influences your strategic decisions on the farm? (tick all that apply)

◯ Opportunistic ◯ Seasonal ◯ Year to year ◯ Up to 5 years ◯ 6-20years ◯ Over 20 years ◯ Over 100 yrs

In the last **12 months**, what **management decision** was the most important influence on your **profitability**?

Over the last **10 years**, what **management decision** was the most important influence on your **profitability**?

In the **next 10 years**, what would you see as likely being your **biggest challenge and/or opportunity**?

Is there a **particular technology/tool/innovation/knowledge** that would support your farm management goals?

12. 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
1	2	3	4	5

LONG TERM PLAN OPTIONS	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 retirement age	
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	
A family member will seek additional off-property work to support the farm	
Some part of my property will be set aside for conservation purposes	
Buying property outside of my current area to mitigate increased seasonal variability	

Is this a corporate-owned farm? Please tick your answer. ◯ No ◯ Yes

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

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 Central West 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 postage-paid envelope provided.**

If you need assistance with the survey, wish to make specific comments about it, or receive a copy of results, please contact Dr Hanabeth Luke via **1800 317 503**.

If you would like to be contacted as a part of further research, please write your email address or other contact here: