THE UNIVERSITY OF SYDNEY

NSW GOVERNMENT Department of Primary Industries

Land ownership change in rural NSW

Riverina Transect Report

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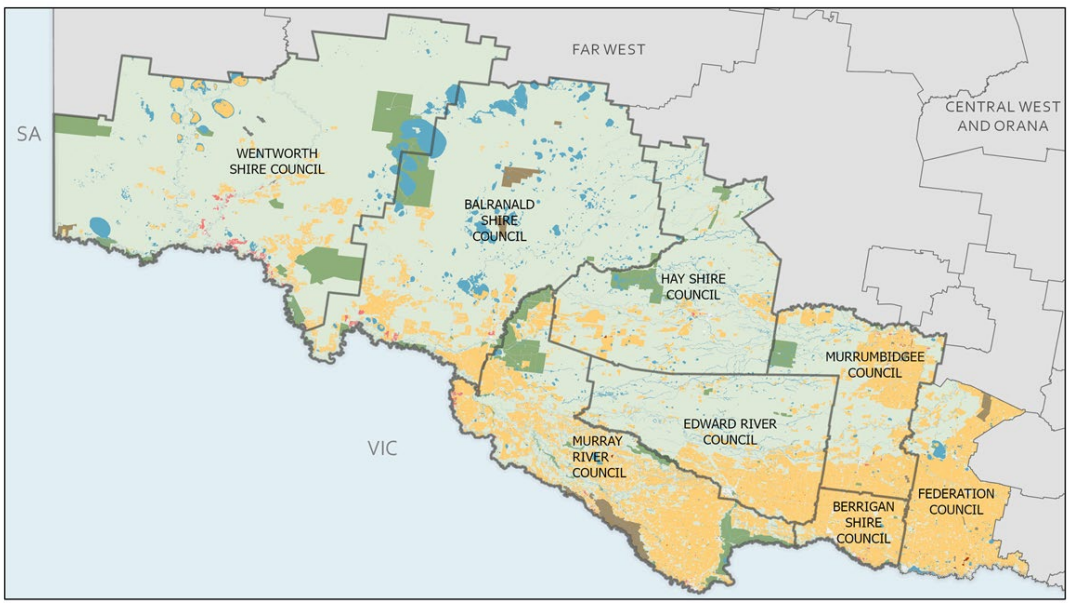

Land Ownership Change in Rural NSW: Riverina transect Report

August, 2022

This report has been commissioned as an output from the Australian Research Council's Linkage Project "The impacts of land ownership change on rural social and economic change" (LP170101125)

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Acknowledgements and overview

The Riverina transect report is an output from the Australian Research Council Linkage Project 'The impacts of land ownership change on rural social and economic change' (LP170101125) undertaken by the University of Sydney in partnership with the NSW Department of Primary Industries. Research reported here has the approval of the University of Sydney Human Research Ethics Committee (Protocols 2018/020 and 2019/749).

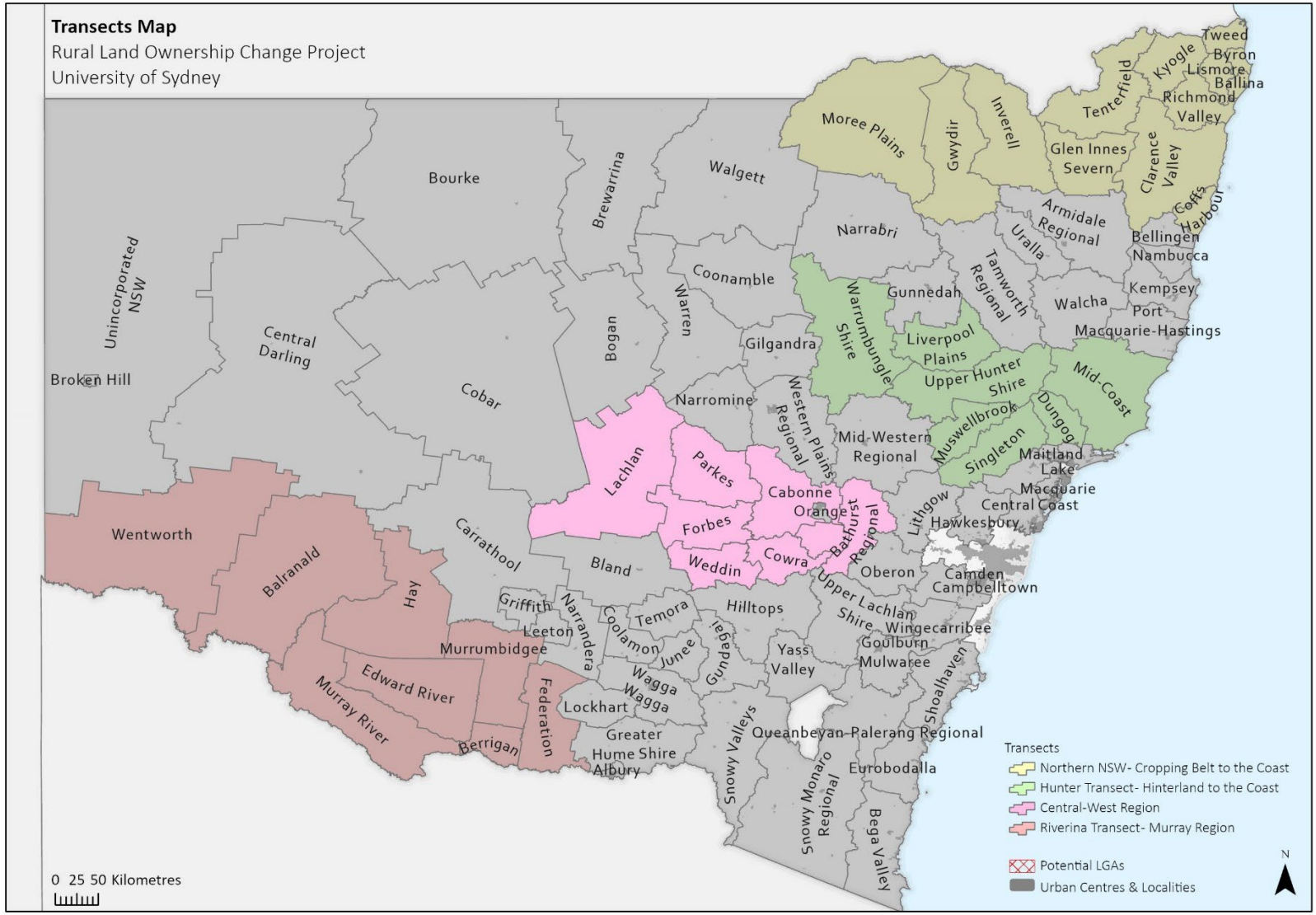
This report is one of four transect reports covering different regions of NSW. The aim of the broader project is to identify and explain key trends in the spatial and temporal patterns of changes in the ownership of land in rural NSW. The core component for achieving this objective is the construction of a unique, research-ready, spatially informed database that records and maps every land transaction in rural NSW over the 16-year period from January 2004 to January 2020. Details of the methodology for generating this dataset are provided in Appendix A of this report.

Preparation of this report has had oversight from the project's Steering Committee in the NSW Department of Primary Industries. We wish to thank members of the Steering Committee, and specifically the project liaisons, Tamara Prentice, Mary Kovac and Lilian Parker. We also thank and acknowledge Dr Robyn Hean in the NSW Department of Primary Industries, who was our liaison officer in the initiation stages of the project. For more information, please consult the webpage for this research project: **https://rural-land-science.sydney.edu.au/**.

Acknowledgement of Traditional Custodians of Country

We would like to acknowledge all Aboriginal and Torres Strait Islander Traditional Custodians of Country and recognise their continuing connection to land, sea, culture, and community. We pay our respect to Elders, past and present. In particular, we acknowledge and pay respect to all the Traditional Custodians of Country in NSW upon which this research is conducted. As we share our own knowledge, teaching, learning, and research practices within the context of this research project, we also pay our respect to the knowledge embedded forever within the Aboriginal Custodianship of Country.

Figure 1 - Transects in this project



Summary of findings

Key messages from this study

1. ***Key message 1***. Irrigation status is a major source of difference in land ownership patterns across the Riverina. Irrigated land has a legacy of being tightly held by family-focused farm enterprises. Many of these owners are seeking to increase their holdings when opportunities arise, typically through neighbour purchases. Non-irrigated land is more open to large-scale transactions, although there is no unequivocal evidence of an increasing trends towards corporate ownership.

2. ***Key message 2***. The rate at which rural land changes hands in the Riverina is slightly slower than for other parts of the state. This is despite major shifts in the mix of agricultural production in the region, and the disruptive effects of water reforms. This would seem to point to relatively lower demand for rural land in the Riverina, when compared to other parts of rural NSW. The region's population outside of major towns is declining and ageing.

3. ***Key message 3***. Yearly trends in land ownership change are subject to considerable volatility due to the effects of large single transactions. In the more remote, dryland areas of the region, environmental offsets and conservation-related acquisitions have had a notable effect in driving changes to land ownership.

4. ***Key message 4***. Planning instruments, notably Minimum Lot Size restrictions and zoning categories, have not been major impediments to patterns of rural land use and land ownership change, however in some areas, such as town boundaries and some irrigation areas, land uses have been contested.

Summary of transect-wide insights

Insight 1. The Riverina transect's rate of substantive rural land ownership change was 4.1%, which is below the state-wide rate of change of 4.3%. Significant volatility is present, with annual peaks well above state-wide median observable in 2014 and 2017. However, these peaks are linked to major individual land transactions, which include a range of large-scale environmental government purchases of rural land and agri-corporate restructurings. In several years of the study the rate of change dipped well below state-wide median, with only 2-3% of land changing hands. Outside of peaks and troughs, year-to-year churn in the Riverina is constituted by a slow but steady stream of transactions linked to farm consolidation and succession planning.

Insight 2. Rural land in the Riverina is generally tightly held. There has been a reduction in the number of mid and small-scale agricultural holdings over recent years, which have been replaced larger-scale farming operations. The expansion of large-scale farming enterprises through consolidation of land was cited consistently as the primary trend in agricultural land ownership change across the transect, and it is therefore likely that this type of transaction comprises a significant proportion of observed change.

Insight 3. Annual rates of change in agricultural and non-agricultural land in the Riverina transect display no clear connection to one another, implying that the drivers of change in both are quite different.

Insight 4. All LGAs in the Riverina transect had median churn rates below the state average. However, year-on-year volatility varied greatly between LGAs showing that some are more tightly held than others. Federation LGA had the lowest median churn rate at 3.29%, whilst Balranald had the highest at 4.35%. Consistent feedback from participants was that a more meaningful picture of year-on-year change in the Riverina could be obtained through an analysis of irrigated vs non-irrigated areas within LGAs. For this reason, it is important to note that whilst broadscale observations can be made through averaging land churn rates at the LGA scale, this intra-LGA variation is obscured.

Insight 5. The Riverina transect can be conceived in terms of the following geographical zones:

1. Federation and Berrigan LGAs are located in the southeast of the transect, and are dominated by cropping (both irrigated and dryland). These two areas have very low volatility, with small peaks in the rate of change not exceeding 9%, and additionally have the highest land values in the transect associated with the dominance of irrigated land.
2. Edward River, Murray River and Murrumbidgee LGAs are located centrally in the transect, and comprise a greater mix of irrigation areas and dryland grazing areas. Associated with the grazing areas, transfers of large pastoral holdings characterise a significant amount of the volatility of rates of change in these LGAs, alongside large-scale conservation transfers. The volatility of Murrumbidgee is far higher than the other three, however this is the result of one major corporate restructuring which has dragged up a major peak.
3. Hay LGA has experienced significant volatility following 2012, fuelled in part by large conservation related transfers. A dominance of dryland farming has meant that major land transactions are also frequently associated with pastoral transfers, with a mix of corporate and individual ownership.
4. Balranald LGA one of the largest and westernmost LGAs in the Riverina transect. Balranald experienced sustained reductions in rates of change following 2008, however then experienced a major increase in rate in 2014 associated with titanium mining purchases related to compulsory biodiversity offsets.
5. Wentworth is the westernmost LGA in the transect, and experienced a major decline in churn rate following 2005. A small peak occurred in 2018, however the rate then dipped back well below the NSW median indicating sustained reductions in land transactions throughout the study period.

Insights into land aggregation, family farms and corporatisation

Insight 6. The concentration of land ownership increased during the study period in five of the eight LGAs, signalling a shift to increased sizes of agricultural operations. In general, LGAs in the southeast of the transect tended to have increasing concentration, whilst LGAs in the northwest tended to have decreasing concentration. Balranald and to some extent Murray River LGAs are clear outliers to this pattern.

Insight 7. There is no overall trend towards increased corporate ownership of land in the Riverina transect during the study period. Four LGAs increased the number of corporate owners in the top 15 landowners in the study period, while four LGAs moved in the opposite direction. Further research is necessary to establish whether this insight holds for trends on irrigated and non-irrigated lands respectively.

Insight 8. In 2020 the median price per hectare in the Riverina transect ($4,263/ha) was less than that of NSW ($5,855). The low median price is due to the large areas of dryland farming and grazing, which are worth significantly less than irrigated regions in the south and east of the transect. In general, rising land prices in the Riverina are in line with trends across NSW, and have been influenced by the consolidation of large holdings and the related constant demand for productive agricultural land.

Insights into demographic drivers of land ownership change

Insight 9. The total population of the Riverina transect has increased from 2006-21, however three LGAs experienced population decline: Hay, Balranald and Murrumbidgee.

Insight 10. Population growth in the Riverina transect has occurred in towns, but not in rural parts of each Council area. All LGAs have experienced a decline in the rural component of their population except Edward River, but this outlier is explained through population growth just outside the urban area of Deniliquin. This indicates a minimal role of rural residential demand as a driver of land ownership change.

Insight 11. The Riverina transect has a relatively old, and ageing, population.

Agricultural land-uses and restructuring insights

Insight 12. *A tale of two types of agriculture*. Land uses are tied to water availability, creating a divide between irrigated and non-irrigated areas. Dryland grazing of beef and sheep is concentrated in the northern and western parts of the transect, and is the largest land use by area. Irrigated and non-irrigated cropping also occur widely across the transect and citrus and other horticulture, viticulture and table grapes, dairy and intensive animal production also comprise important Riverina agricultural industries. Almonds have been expanding in the region where soil conditions allow, and the almond industry generates significant income.

Insight 13. Farm sizes across the transect are increasing, with large operations purchasing more land to increase economies of scale and enable succession planning. These farms are investing significantly in technologies and efficiencies to reduce input costs, which is also associated with increasing farm enterprise diversification. Water availability and management has influenced key agricultural changes in the region including driving a transition away from rice, whilst enabling the entry of high value permanent plantations including almonds.

Insight 14. In the Riverina transect, agriculture is the largest single employer. Agriculture as a proportion of total employment has been slowly increasing since 2011, reversing the decline experienced between 2006 to 2011.

Insight 15. Drought has not had a cyclical effect on the rate at which rural land changes hands. Owners tend to find other ways to cope with the stresses generated by drought and selling land remains a last resort. Strategies to avoid selling land in the Riverina included water trading, intensifying production and increasing efficiencies to reduce input costs, switching between different commodities and moving from irrigating pastures to buying feed (dairy industry). In addition to ‘weather’ droughts, water management rules were cited as causing ‘allocation’ droughts, which further influence farming and land acquisition decisions.

Land-use planning insights

Insight 16. RU1 primary production zoning dominates the Riverina transect, highlighting the significance of the agriculture in the region. However, RU1 zone boundaries are a source of controversy, with criticism of the 'one-size-fits-all' logic of RU1 at a time when parts of the transect are being affected by rural land use diversification including rural residential, solar energy uses, and rural manufacturing.

Insight 17. With the notable exception of Balranald, Minimum Lot Size (MLS) rules loosely follow an east-west gradient, with smaller MLSs in the irrigation areas of the south east and larger MLSs in the north-west. However, there is also significant intra and inter-LGA variability unrelated to biophysical land characteristics. Stakeholders expressed a range of opinions on the suitability of MLSs in relation to planning pressures in their region. Overall, consolidation (merging parcels) played a larger role than sub-division (breaking up existing parcels) across the transect, leading to a net reduction in the number of rural parcels between 2004-20.

Insight 18. Rural subdivision is permissible across a substantial area of the Riverina transect, most notably in Balranald and the southern half of Edward River LGAs. However, demand for subdividable properties is weak in these areas, so this potential remans minimally realised.

Insight 19. Concern around land use conflict is growing in LGAs which are experiencing development pressure. Demand for lifestyle blocks/hobby farms is reportedly on the rise in some transect LGAs. Land use conflicts are arising where new entrants are unprepared for the impacts on neighbouring properties (for example noises, odours etc.) generated by large agricultural enterprises, and in turn are not aware of biosecurity practices (such as weed and feral animal control) which may impact farming.

1. Introduction

This report presents research findings on the dynamics of rural land ownership change in the NSW Riverina transect. It is one of four transect reports into regions of NSW. Transects provide a basis for comparative assessment of the different drivers of rural land ownership change across the state.

The Riverina transect is defined as the Local Government Areas (LGAs) of Federation, Berrigan, Murray River, Murrumbidgee, Edward River, Hay, Balranald and Wentworth. Ownership histories are considered for 82,363 km^2 of rural land in the eight LGAS and the total transect area.

Table 1 - Transect Overview: area and number of parcels in our sample by LGA, 2004-20

LGA	Sample Area (km^2)	Percentage of region area	No. of Land Parcels[1]
Federation	4,578	5.56%	6,467
Berrigan	1,710	2.08%	2,016
Murray River	9,200	11.17%	7,725
Murrumbidgee	5,114	6.21%	4,211
Edward River	7,007	8.51%	7,441
Hay	9,737	11.82%	4,251
Balranald	20,901	25.38%	2,099
Wentworth	24,116	29.28%	3,305
Transect Total	**82,363**	**100.00%**	**37,515**

Note: LGAs are presented in order from east to west.

Similar to other transects explored as part of this research project, the Riverina transect is dominated by agricultural land uses. Approximately 95.95% of land in the Riverina is used for agriculture, while just 4.05% is used for non-agricultural purposes including for example mining, residential and tourism uses.

Table 2 - Proportion of agricultural and non-agricultural land in the Riverina transect

Sample	Percentage of total
Agricultural	95.95%
Non-agricultural	4.05%
Total	100.00%

1.1 Measuring substantive change

Substantive land ownership change in the Riverina transect was analysed for the 16-year period between 01/01/2004 and 01/01/2020. This was done by measuring the annual proportion at which rural land changes hands (this is referred to as the substantive 'churn rate') but excluding instances in which the previous owner and new owner in a land-title registration are more than 70% similar. A fuzzy logic methodology was used for this purpose. Details of our data and methodology are provided in **Appendix A**.

Since our methodology relies on land title registrations, a transaction is defined as an instance in which the name of the owner on title changes in a given year. However, a name change on title does not always represents a transaction. For example, an 'on-paper' name change occurs when a spelling error is corrected, when one of several owners is removed or added to the land title, or when a company updates its name (for example to add or remove Ltd.). This is why applying a substantive change threshold (<70% similarity) is beneficial. This approach allows us to exclude 'on-paper' land-registration name changes, not associated with

[1] This is the number of parcels in the LGA's sample on 1 January 2020.

conventional land sales/transfers, and allows us to present an accurate representation of substantive churn rates in the transect or LGA. The threshold of 70% was chosen as it was found that it is the point in which most on-paper name changes cease to be name corrections and amendments, and start being conventional transactions. As such, the formula for the substantive churn rate is as follows:

> Substantive churn rate = (Land area in the sample that changed hands in a particular year excluding on-paper names changes with over a 70% similarity) / (Total sample area) x 100

This methodology also allowed us to identify the largest landowners in each LGA of the region and the change in area of land owned by the largest landowners at the start and end of the 16-year period. Because of privacy provisions we cannot name individual landowners, however, we can use this information to establish whether an acquirer of land is a new entrant to the LGA, or an aggregator (a landowner already in the LGA increasing the size of their holding).

Year-on-year rates of land ownership change reflect the combined effect of multitude forces exerting influence over how and when land parcels transfer from one owner to another. These forces include the state of the agricultural economy, demand for rural land for amenity and lifestyle reasons, the effects of drought, changes to planning regimes, and actions by government such as the acquisition or protection of land for conservation purposes. Because these forces operate at different strengths and are responsive to different time periods, nuanced consideration of data from several angles assists the identification of relevant insights.

Examining trends in these data over time and space generates insights into rural land ownership that have not been possible to present in any previous analysis. Large-scale land titles data has been a mostly untapped resource for researchers and policymakers. Their development has been driven mainly by desires to facilitate the extraction of point-in-time single records for 'over-the-counter' enquiries about land titles, rather than for the extraction of state-wide records over a multi-year period.

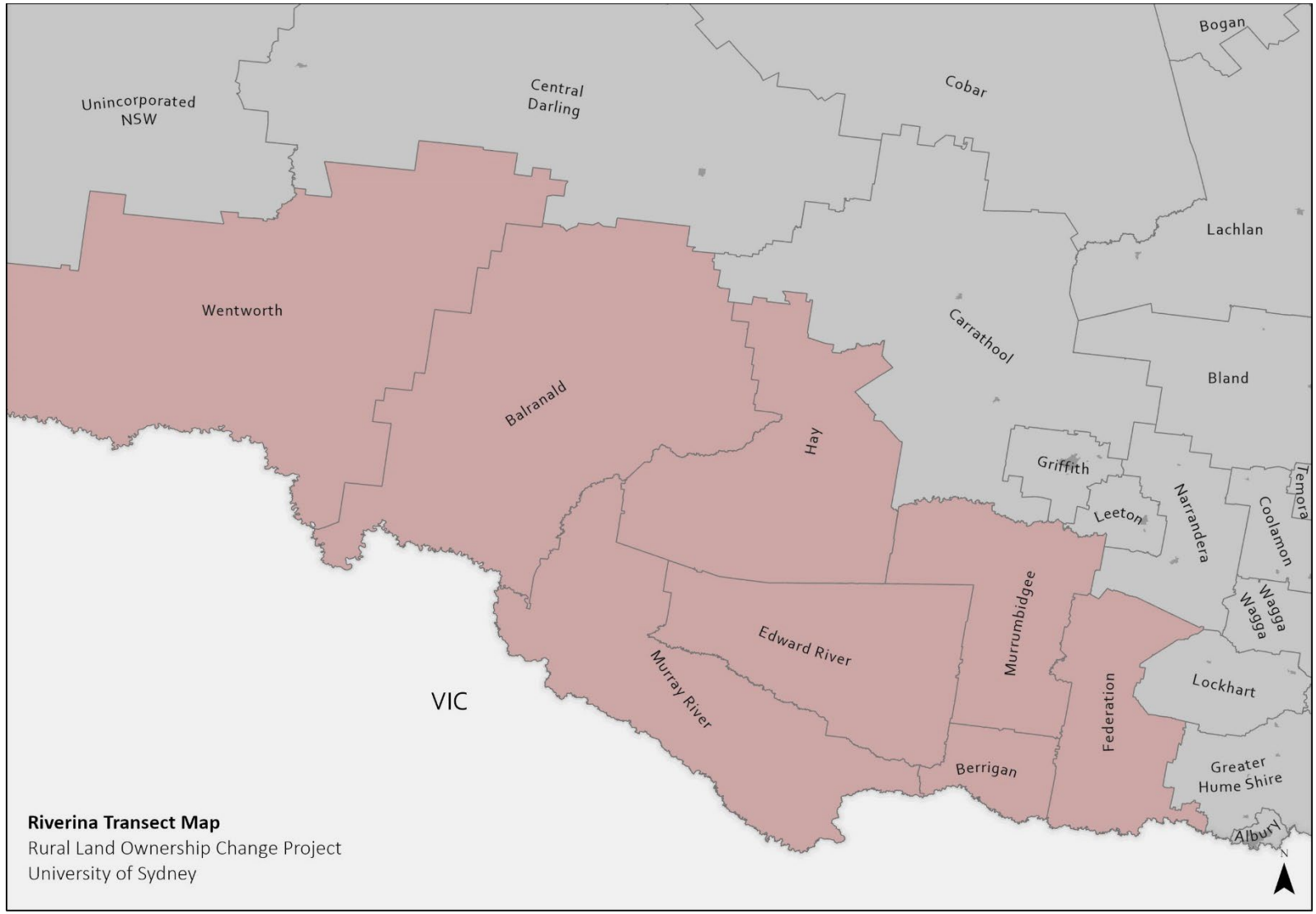
Applying these data to longitudinal regional analysis is a major innovation of this project. Once data was generated, we presented these to regional stakeholders in a series of in-depth interviews and focus groups with stakeholders in (insert LGAs) during March 2022. Feedback from these meetings is incorporated into this report.

1.2 Report sections

The next section of the report introduces key findings on rural land ownership in the transect. Then, three sections address how the use of our land titles database sheds light on four pressing issues at the forefront of agricultural policy in the Riverina transect:

- What demographic trends, including population growth driven by amenity and lifestyle migration, impact on patterns of rural land ownership (Section 3),
- How agricultural restructuring translates into greater consolidation or fragmentation of rural land, including a discussion of how drought cycles influence rates of substantive rural land ownership change (Section 4),
- How planning instruments shape patterns of rural land ownership (Section 5)

Figure 2 - The Riverina transect



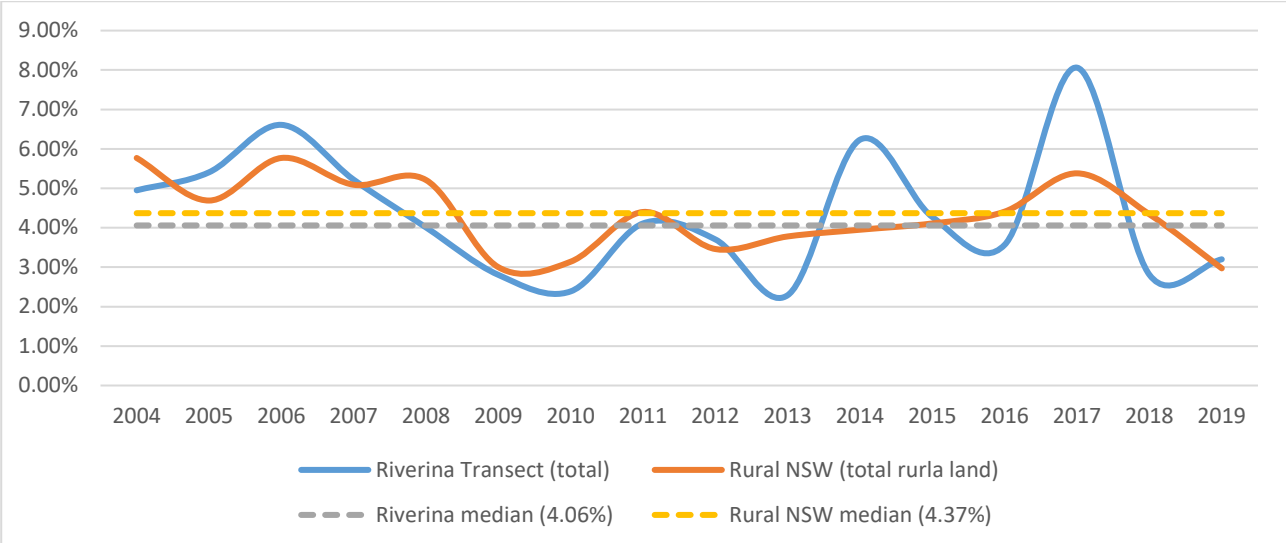
2. Rural land ownership trends in the Riverina transect

The Riverina transect encompasses a diverse area of NSW. Land uses change significantly moving from the north-west to south-east: sheep and cattle grazing of native vegetation dominate in the north-west, large areas of irrigated and dryland cropping border the Murray River in the south and cereal cropping in the east. Pockets of horticulture are also scattered along rivers and irrigation areas. Water availability is a key issue shaping transect-wide geographies, with major rivers modified for irrigation including the Murray in the south and the Darling, Murrumbidgee and Lachlan in the centre of the transect. Large wetland conservation areas, titanium mining, horticulture, dairy and increasing renewable energy enterprises are also present. Reflecting these varied land-uses and the east-west transition, the transect extends across two planning regions; the Far West (Balranald and Wentworth Shires) and the Riverina Murray (Federation, Hay, Murrumbidgee, Berrigan, Murray River and Edwards River Shires).

2.1 The transect in context

Insight 1. The Riverina transect's rate of substantive rural land ownership change was 4.1%, which is below the state-wide rate of change of 4.3%. Significant volatility is present, with annual peaks well above state-wide median observable in 2014 and 2017. However, these peaks are linked to major individual land transactions, which include a range of large-scale environmental government purchases of rural land and agri-corporate restructurings. In several years of the study the rate of change dipped well below state-wide median, with only 2-3% of land changing hands. Outside of peaks and troughs, year-to-year churn in the Riverina is constituted by a slow but steady stream of transactions linked to farm consolidation and succession planning.

Figure 3 - Rate of substantive rural land ownership change, transect and NSW[2]



[2] This is measured as a percentage of total area. In this and all subsequent analysis presented in this report, the rate of land ownership change is calculated as 'substantive change.' This means that transactions in which former and subsequent owners have a similarity score of over 70% are not counted as being a change of ownership. For more information, see Appendix A.

As shown in

Figure 3, the Riverina transect's median rate of change is 4.06%, which is slightly below the median rate of change of 4.37% for rural NSW. Land in the Riverina may be considered tightly held in comparison to other transects considered in this project, with 'opportunistic' property acquisition occurring for succession planning and to allow already large farming enterprises to further expand.

Insight 2. Rural land in the Riverina is generally tightly held. There has been a reduction in the number of mid and small-scale agricultural holdings over recent years, which have been replaced larger-scale farming operations. The expansion of large-scale farming enterprises through consolidation of land was cited consistently as the primary trend in agricultural land ownership change across the transect, and it is therefore likely that this type of transaction comprises a significant proportion of observed change.

From Figure 3, there is no meaningful trend which can be observed in the rate of land change over time. Rather, single and multiple large scale transactions where large areas of land change hands have created peaks and troughs which can be observed in the data. Due to data privacy commitments, it is not possible to outline the exact details of these transactions. However, the following is a list of some of the key large-and-medium scale agricultural transactions across the transect which have affected the volatility:

- 2006 – In Murray River LGA a private company sold major holdings to the NSW Government, and a large transaction occurred where land was transferred from a pastoral company to an individual with existing large holdings.
- 2007 – Large individual to individual and corporate to individual transfers, plus a significant purchase by a mineral company occurred in Balranald LGA.
- 2014 – In Hay LGA a complex set of transactions extending across a significant area occurred involving a water administration corporation, several companies and individuals. These transactions extended across to Murray River LGA, where a water administration corporation also made several purchases from individuals.
- 2017 – A number of large-scale transactions occurred. In Hay LGA, a large investment firm made a purchase from high profile pastoral company. In Balranald LGA, there was a significant family succession transfer, where a surname was shared by parties. And finally in Murrumbidgee LGA, a very large internal corporate transaction involving the restructuring of a subsidiary company occurred.

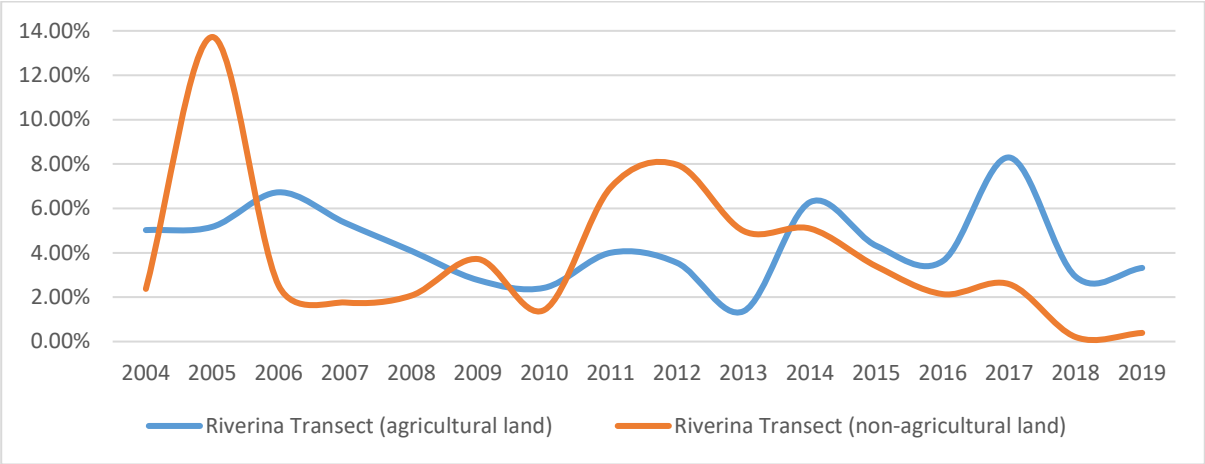
Insight 3. Annual rates of change in agricultural and non-agricultural land in the Riverina transect display no clear connection to one another, implying that the drivers of change in both are quite different.

Figure 4 depicts significant year on year differences in the rates of change of agricultural and non-agricultural ownership change. The Riverina Transect experienced a large dip in the rate of land ownership change in 2013, which was experienced more sharply in agricultural land than in non-agricultural land (see Figure 4). Volatility is present in both the rate of agricultural and non-agricultural ownership change, and there are also significant year on year differences between them. This implies that separate processes are impacting land ownership change across the two land types.

The final year of the transect, 2019, was the year before COVID-19 took over as a major disruptor. Comments from participants about changes witnessed in the subsequent years spark a series of questions about rates of rural land ownership change in 2020, 2021, and beyond. Following 2019, the COVID-19 pandemic was met with the drought breaking across NSW in 2020 and large rainfall events in 2021 and 2022. Further, interest rates which were at record lows have begun to rise, whilst commodity prices already at record highs continue to climb. The mix of these major drivers would have had significant effects on the

rates of rural landownership change in the Riverina transect. As highlighted in other reports in this series, future research is necessary to explore these trends in more detail.

Figure 4 - Rate of agricultural and non-agricultural land ownership change in the Riverina



2.2 Rates of ownership change by LGA

Insight 4. All LGAs in the Riverina transect had median churn rates below the state average. However, year-on-year volatility varied greatly between LGAs showing that some are more tightly held than others. Federation LGA had the lowest median churn rate at 3.29%, whilst Balranald had the highest at 4.35%. Consistent feedback from participants was that a more meaningful picture of year-on-year change in the Riverina could be obtained through an analysis of irrigated vs non-irrigated areas within LGAs. For this reason, it is important to note that whilst broadscale observations can be made through averaging land churn rates at the LGA scale, this intra-LGA variation is obscured.

Annual rates of substantive rural land ownership change reflect the combined effect of multitude forces exerting influence over how and when land parcels transfer from one owner to another. These forces include the state of the agricultural economy, demand for rural land for amenity and lifestyle reasons, the effects of drought, changes to planning regimes, and actions by government such as the acquisition or protection of land for conservation purposes. Because these forces operate at different strengths and are responsive to different time periods, there needs to be a nuanced consideration of data from several angles to assist the identification of relevant insights.

To compare LGAs within the transect, year-on-year rates of rural land ownership were viewed for each LGA through the following angles:

- the rate of change in relation to the transect average,
- year-on-year variability,
- whether volatility increased over time during the study period.

Taken together, and following conversations with participants, these three ways of looking at the data on land ownership change provide a geographical framework for understanding the transect region in terms of five sub-areas.

Table 3 - Median Rate of Change Summary by LGA compared to All NSW (total sample)[3]

LGA	Median rate of change	Difference from NSW median	Highest annual rate of change	Lowest annual rate of change	Difference between highest and lowest rate of change	Standard deviation
Federation	3.29%	-1.08%	5.85%	1.68%	4.17%	1.19%
Berrigan	4.20%	-0.17%	8.85%	1.79%	7.07%	1.78%
Murray River	4.01%	-0.36%	11.88%	2.76%	9.11%	2.32%
Murrumbidgee	3.41%	-0.96%	19.65%	1.00%	18.65%	4.15%
Edward River	3.77%	-0.60%	6.72%	1.41%	5.30%	1.83%
Hay	3.97%	-0.40%	13.04%	1.33%	11.71%	3.17%
Balranald	4.35%	-0.02%	9.65%	0.66%	8.99%	2.49%
Wentworth	3.85%	-0.52%	8.58%	1.41%	7.17%	1.97%
All NSW (sample)	4.37%	-	5.77%	2.97%	2.80%	0.93%

As shown in Table 3, median annual rates of substantive rural land ownership change among **all eight** of the eight transect LGAs were lower than those the state as a whole.

Reading this table in conjunction with data in **Appendix B** and insights from our key stakeholder meetings allows a fivefold classification of sub-areas across the transect to be proposed. LGAs in Table 3 are ordered broadly from east-west (acknowledging that the shape of the transect and LGA's does not lend itself neatly to this classification), consistent with other tables and figures in this report. The LGAs are colour-coded according to the four regions identified in this report to assist with the analysis of processes and trends affecting land ownership change patterns. An analysis of each of the five regions is presented below.

Insight 5. The Riverina transect can be conceived in terms of the following geographical zones:

1. Federation and Berrigan LGAs are located in the southeast of the transect, and are dominated by cropping (both irrigated and dryland). These two areas have very low volatility, with small peaks in the rate of change not exceeding 9%, and additionally have the highest land values in the transect associated with the dominance of irrigated land.
2. Edward River, Murray River and Murrumbidgee LGAs are located centrally in the transect, and comprise a greater mix of irrigation areas and dryland grazing areas. Associated with the grazing areas, transfers of large pastoral holdings characterise a significant amount of the volatility of rates of change in these LGAs, alongside large-scale conservation transfers. The volatility of Murrumbidgee is far higher than the other three, however this is the result of one major corporate restructuring which has dragged up a major peak.
3. Hay LGA has experienced significant volatility following 2012, fuelled in part by large conservation related transfers. A dominance of dryland farming has meant that major land transactions are also frequently associated with pastoral transfers, with a mix of corporate and individual ownership.
4. Balranald LGA one of the largest and westernmost LGAs in the Riverina transect. Balranald experienced sustained reductions in rates of change following 2008, however then experienced a major increase in rate in 2014 associated with titanium mining purchases related to compulsory biodiversity offsets.
5. Wentworth is the westernmost LGA in the transect, and experienced a major decline in churn rate following 2005. A small peak occurred in 2018, however the rate then dipped back well below the NSW median indicating sustained reductions in land transactions throughout the study period.

[3] Ordered from east to west. In this and all subsequent analysis, the rate of land ownership change is calculated as the area of land with a change in owner from one year to the next, divided by the total area of land covered in our study. For more information, see Appendix A.

Federation

Federation LGA is the most tightly held region in the transect and has very low volatility. Agricultural land here is dominated by irrigation, with traditional crops such as canola and wheat the primary commodities grown. Large farming properties are owned by a small number of local families who have gradually expanded their holdings, and there has been limited corporate entry. Succession planning and farm consolidation are two key drivers of land ownership change here, and according to stakeholders, farms in the region can be classified into two different types – those that have large assets and have succession plans happening, and those where children aren't returning leading to retirement sales. Intensive agriculture including the Rivalea piggery in Corowa also forms a basis for significant agricultural employment in the Federation region. The value of land in Federation is high, in part due to the proximity of the LGA to eastern seaboard markets.

Berrigan

Land in Berrigan is also very tightly held, and similar to Federation is dominated by irrigated cropping of traditional commodities including wheat, corn, rice and canola. In 2004, two separate major transactions occurred wherein Victorian registered pastoral companies purchased properties from an individual and an investment fund. In 2015 there was a spike in the rate of land ownership change due a large individual-to-individual transaction in the west of the LGA and multiple smaller purchases by Victorian registered agricultural companies. There are many multi-generation farmers who own land in this region, with one participant commenting 'There are sixth generation farmers here – they don't move on and are very proud of the area'. The main drivers of farms sales were described to be farm consolidation and succession planning, again similar to Federation LGA.

Already a highly productive region, according to stakeholders a move towards farm intensification driven by rising input costs, has led to increases in the efficiency of farm production – there are overall fewer farms, but they operate at a higher scale of operations.

Murrumbidgee

Murrumbidgee LGA has a diverse geography due to its different settlement and farming histories based on the institutional infrastructures around water. In irrigated parts of the LGA, smaller holdings predominate. In non-irrigation parts there is a different dynamic of larger holdings and some agri-corporate investment. In these areas, focus group informants said that increases in land values were pricing out smaller operations, and according to stakeholders this has meant that corporates are best placed to purchase land.

In Murrumbidgee LGA, a major corporate restructuring in 2017 has created a significant peak in the rate of land ownership change where approximately 20% of the LGA changed hands. This is not a change of ownership in the sense that the land was bought or sold, but rather an outcome of a corporate restructure. Outside of this transaction, Murrumbidgee LGA is one of the most tightly held in the transect.

Murray River

Murray River LGA contains a mix of irrigated and dryland farming, which influences the sizes of properties and property transfers. Participants described the southeast of the LGA as being more intensive and the north-west as more extensive, which is linked with the presence and availability of water. Local ownership of grazing and dryland properties remains the norm here, with some corporate entry linked to properties where water is more readily available. Participants also noted that a major driver of land ownership change in Murray River LGA is that the population is aging, leading to a number of secession transfers and farmer exit.

Differences in average property sizes between the southeast and northwest have meant that larger individual transactions affecting the rate of land ownership change have generally occurred in the north-west of the transect – this was the case in 2006, where a big peak can be observed, linked to a major purchase by the

NSW Government. Similarly in 2014, another large area of land directly adjacent to the 2006 transfer changed hands, leading to another substantial spike in the rate of change.

Edward River

Edward River is comprised of larger holdings away from irrigation areas and smaller holdings in the irrigation regions. Edward River has a comparatively low rate of change, and very low volatility with few significant peaks present. Smaller peaks are created by large scale transactions primarily in the north of the LGA and away from the irrigation regions. These have included company to company transactions, and concurrent major transactions by individuals with the same last name.

Hay

During the study period, Hay LGA was generally very tightly held, with increased volatility present following 2013. Land ownership comprised of a mix of corporate and local families running large operations, with stakeholders noting that these major players are 'constantly circling' one another waiting for opportunities to purchase neighbouring land to arise. Major peaks in rate of land ownership change in the Hay region can be linked to conservation related transfers, when significant areas of land changed hands through multiple transactions linked to the establishment of a conservation area in the region. Additional major purchases have been made by pastoral companies, contributing to the volatility.

Balranald

Balranald LGA has experienced elevated land prices in part due to the presence of titanium mines and the biodiversity offsets they are legally required to purchase. Major land purchases associated with these titanium mines are largely responsible for the peaks observed in the rate of land ownership change in 2007 and 2015, and for the high median rate relative to the rest of the transect. Large pastoral transactions, individual to individual sales and family succession planning transactions where buyers and sellers share the same last name make up the remainder of the large-scale transactions affecting the rate of change.

Wentworth

The rate of change in Wentworth is relatively low compared with other LGAs in the transect. Some peaks are created from time to time by individual transactions, including a major purchase in 2005 by a corporate from individual owners. Wentworth also has lower average land prices than most of the transect, which is consistent with the significant land area used for lower value commodities such as dryland grazing. Different drivers are affecting land ownership change in the irrigation (or 'settlement') and dryland regions, and according to stakeholders, trends are different again within individual irrigation regions.

Themes for future research: Consistent feedback from participants was that a more meaningful picture of year-on-year change in the Riverina could be obtained through an analysis of irrigated vs non-irrigated areas within LGAs and that through averaging land churn rates at the LGA scale, important differences between these areas of land are obscured. It has not been possible to address this within this report, and further research is needed in this area (see **Appendix C**)[4].

[4] At multiple points within this report we have highlighted gaps in our own research and advocated for particular future research directions. **Appendix C** collates these.

Figure 4 - Rate of substantive rural land ownership change in Federation LGA

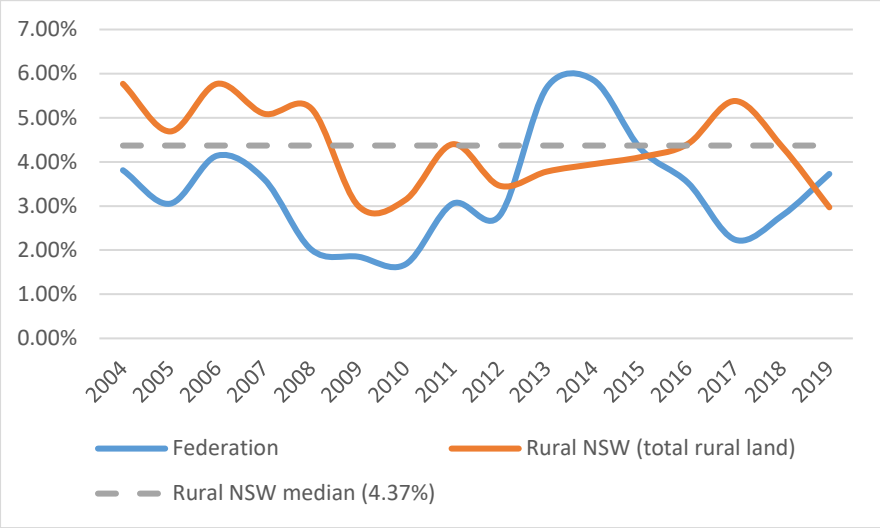


Figure 5 - Rate of substantive rural land ownership change in Berrigan LGA

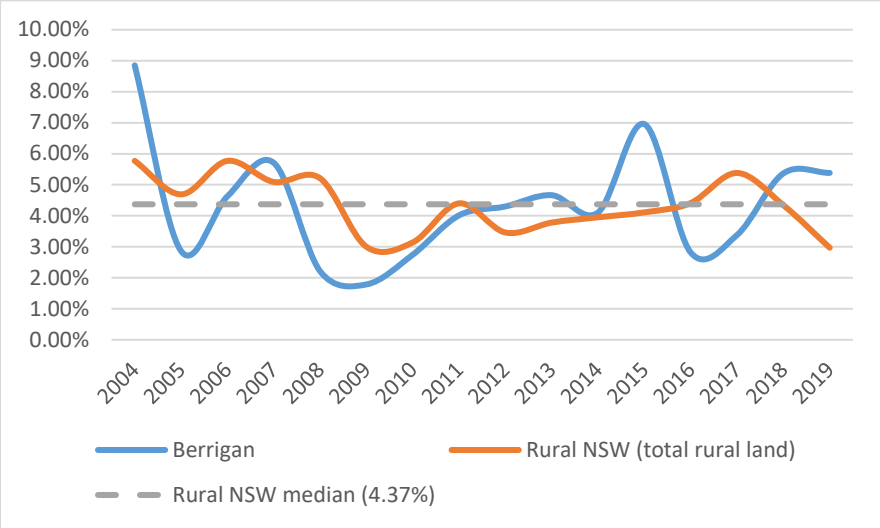


Figure 6 - Rate of substantive rural land ownership change in Murrumbidgee LGA

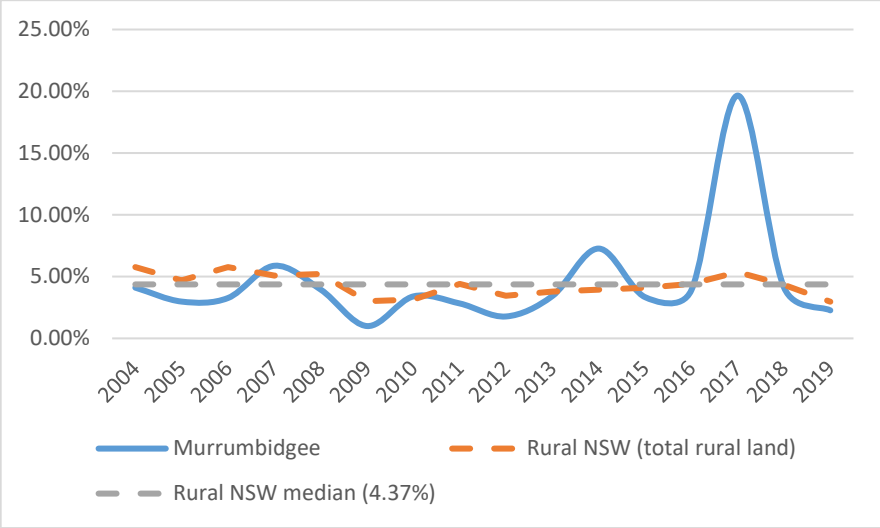


Figure 7 - Rate of substantive rural land ownership change in Murray River LGA

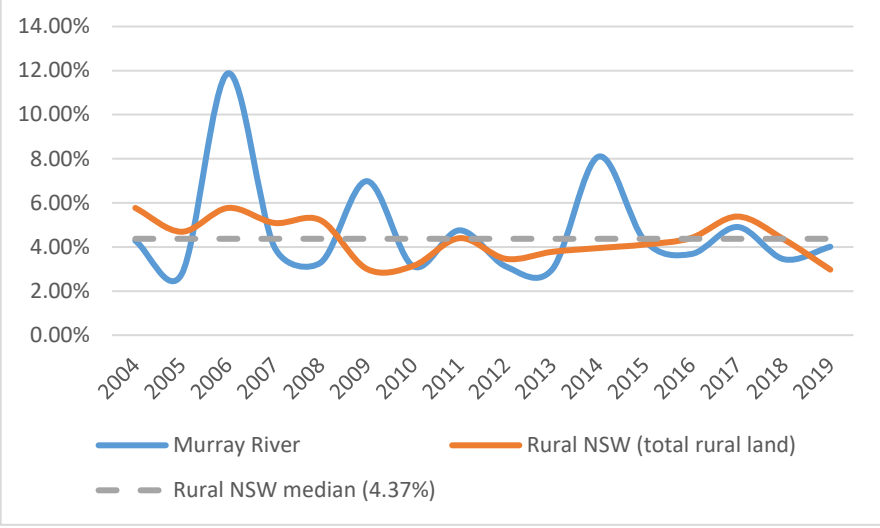


Figure 8 - Rate of substantive rural land ownership change in Edward River LGA

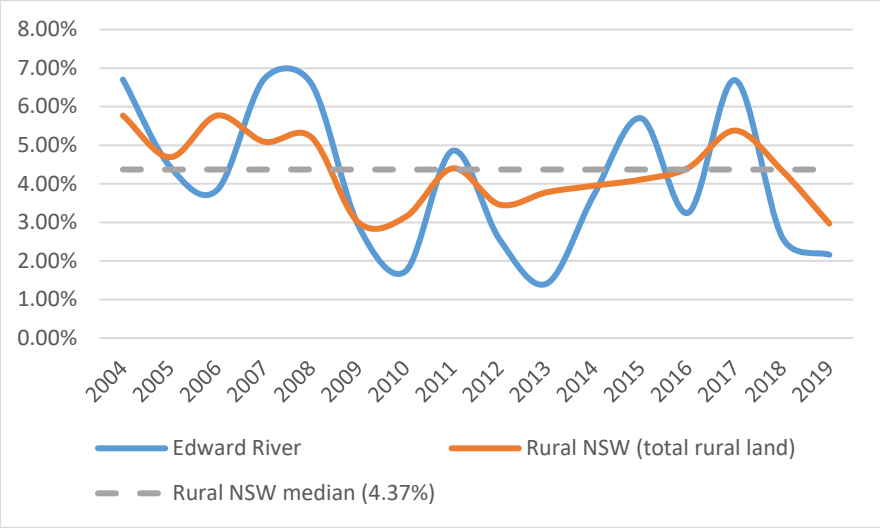


Figure 9 - Rate of substantive rural land ownership change in Hay LGA

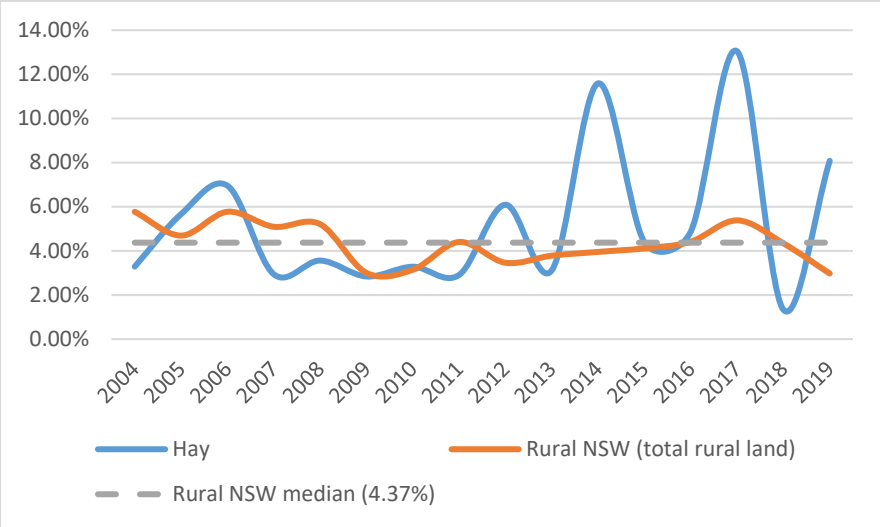


Figure 10 - Rate of substantive rural land ownership change in Balranald LGA

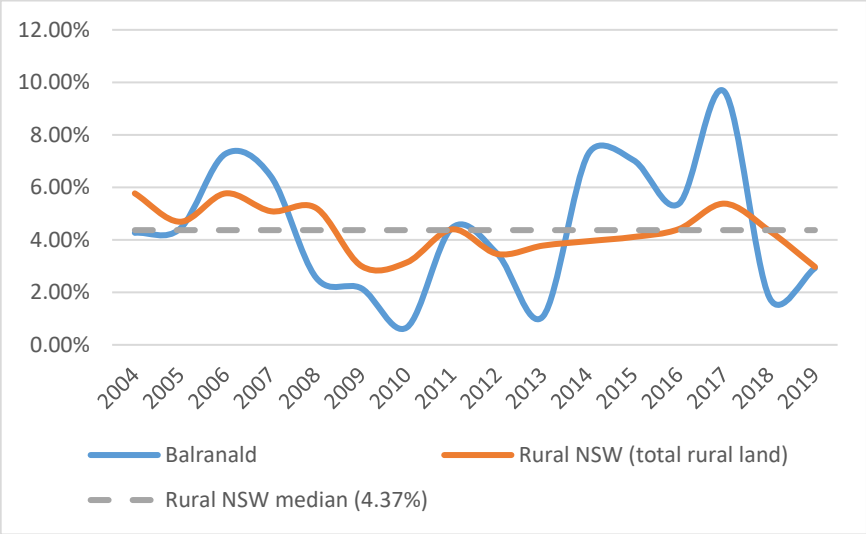
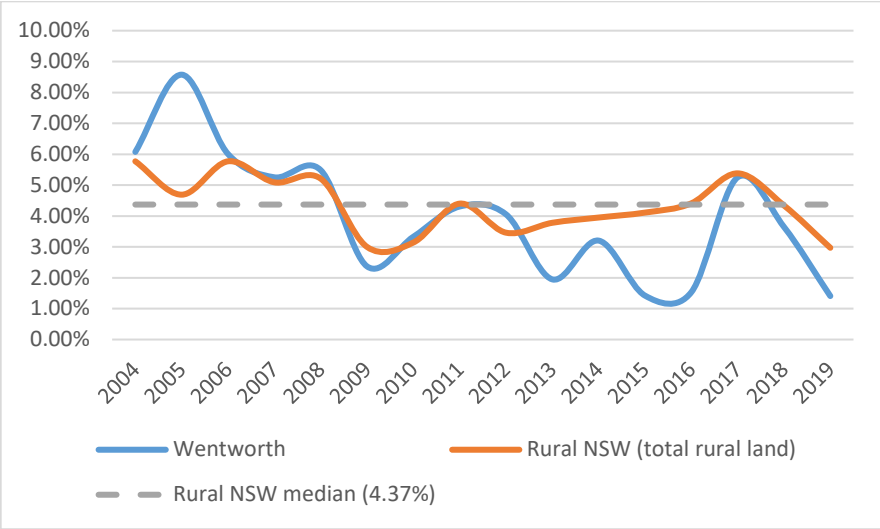


Figure 11 – Rate of substantive rural land ownership change in Wentworth LGA



2.3 Trends in land concentration and aggregation

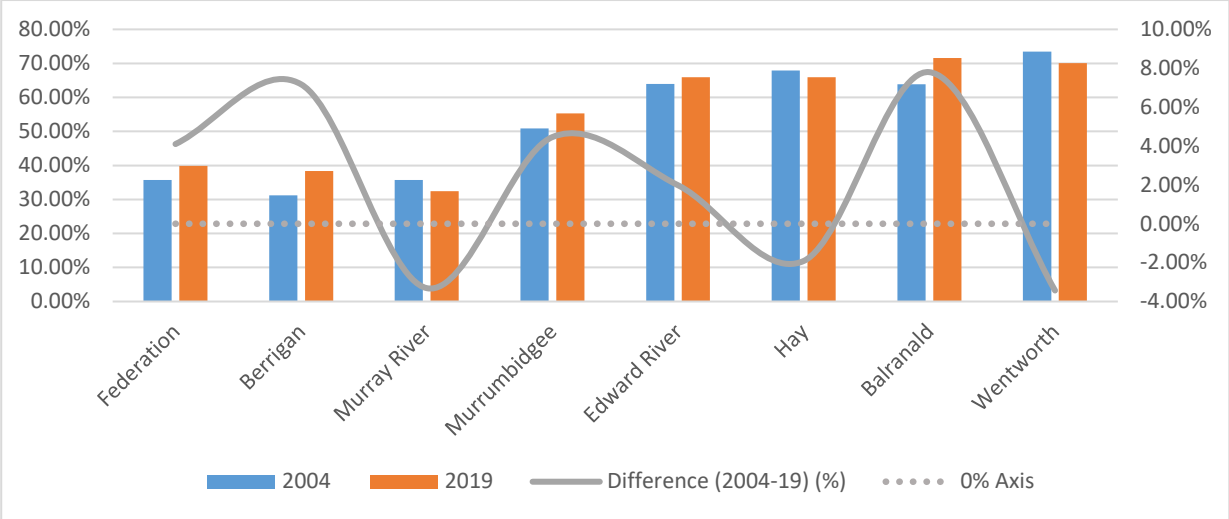
Insight 6. The concentration of land ownership increased during the study period in five of the eight LGAs, signalling a shift to increased sizes of agricultural operations. In general, LGAs in the southeast of the transect tended to have increasing concentration, whilst LGAs in the northwest tended to have decreasing concentration. Balranald and to some extent Murray River LGAs are clear outliers to this pattern.

Concentration of land ownership in the Riverina transect is significantly higher than the other transect reports of this series, and increased overall during the study period. Table 4 shows that the median area of land owned by the 50 largest landowners in each LGA in 2019 was 60.64%, in contrast with 33.75% in the Hunter transect and 23% in the Central West. Table 4 additionally shows that for five of the eight LGAs, the amount of land owned by the top 50 landholders in each LGA increased. In general, LGAs in the southeast of the transect tended to have increasing concentration, whilst LGAs in the northwest tended to have decreasing concentration. Balranald and to some extent Murray River LGAs are outliers to this pattern, with Balranald increasing in concentration by 7.8% during the study period and Murray River decreasing in concentration by 3.31%. High levels of concentration of ownership correlate with reports from stakeholders around the reduction in moderate sized holdings and the increase in larger holdings within the study period.

Table 4 - Ownership trends for top 50 landowners by LGA

LGA	% of study area occupied by top 50 landowners		Difference between 2004 and 2019 (%)	Number of corporate landowners in top 50		Difference
	2004	2019		2004	2019	
Federation	35.72%	39.82%	4.10%	17	16	-1
Berrigan	31.23%	38.41%	7.17%	24	20	-4
Murray River	35.75%	32.43%	-3.31%	22	23	1
Murrumbidgee	50.89%	55.35%	4.46%	28	28	0
Edward River	63.96%	65.94%	1.98%	21	20	-1
Hay	67.89%	65.98%	-1.91%	24	17	-7
Balranald	63.83%	71.63%	7.80%	11	14	3
Wentworth	73.48%	70.04%	-3.43%	6	8	2
Median	57.36%	60.64%	3.04%	22	19	-1

Figure 12 - Percentage occupied by top 50 landowners (2004-19) (East to West)



Insight 7. There is no overall trend that towards increased corporate ownership of land in the Riverina transect during the study period. Four LGAs increased the number of corporate owners in the top 15 landowners by area in the study period, while four LGAs moved in the opposite direction. It is important to note that the focus on area may obscure differences between trends occurring on irrigated and non-irrigated lands.

High land concentration is accompanied by reasonably high rates of corporate ownership in the Riverina transect, however there is no clear trend which can be observed in rates of corporatisation across the transect. As shown in Table 5, the area of each LGA owned by corporates who fall within the top 15 landowners by area has increased in 4 of the 8 LGAs and decreased in the remaining 4. Moreover, there is a large range of inter-LGA variability between the extents to which corporatisation has increased or decreased. At either end of this range are Murray River LGA, where corporate ownership decreased by 31% and Balranald where corporate ownership increased by 15%.

In interpreting our data, it is important to note that data represents the average of area changing hands. This focus on area has the effect of inflating the effect of transfer of non-irrigated land, which tend to be larger in size, vis-à-vis irrigated land (which has a higher price per hectare). According to stakeholders in Murrumbidgee and Wentworth, corporate land ownership differs both *between* irrigated and non-irrigated areas and *within* different types of irrigated areas. In Murrumbidgee LGA, large corporates are best placed to buy high value irrigated land outside of irrigation districts, which are generally larger holdings suited to hosting the expansion of almonds, walnuts and cotton. These corporates have historically not been so interested in buying land in irrigation districts because of smaller parcel sizes, and parcel shapes structured around irrigation infrastructure. This has created hurdles for economies of scale in the irrigation districts. In Wentworth, a similar story was told wherein irrigation properties no longer viable were becoming 'stranded assets', with corporates generally unwilling to purchase in these areas due to a combination of aging infrastructure, small parcel sizes, nutrient poor soil and historical leasehold arrangements.

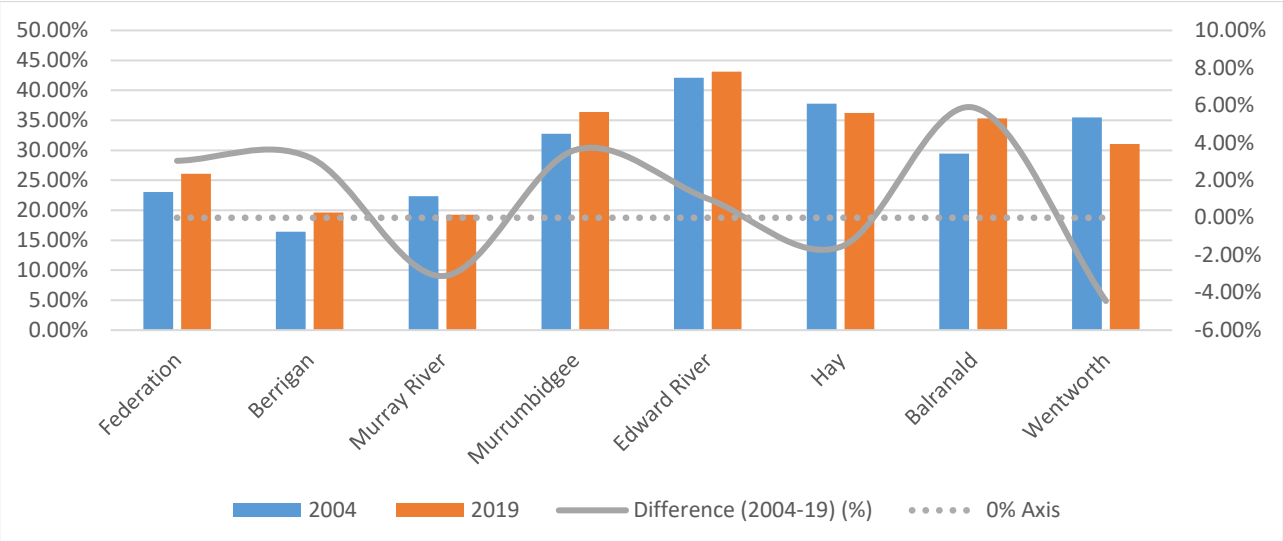
Again, similarly to the findings of other reports within this series, it is important to note that many family farms are becoming family corporates, with land registered under company names and operated according to a variety of business models. This allows many of these businesses to take loans at better rates and manage their tax obligations more flexibly. In contrast to narratives which point towards the entry of corporates into regional Australia, stakeholders emphasised that in many LGAs the expansion and incorporation of local

multi-generational farming families was an equal if not more prevalent trend. There are thus many types of operations with different business management styles falling under the 'corporate' label.

Table 5 - Ownership trends for top 15 landowners by LGA

LGA	% Of study area occupied by top 15 landowners		Difference	Number of corporate landowners in group of top 15 landowners		Difference	% Of study area occupied by top 15 landowners that is corporate owned		Difference
	2004	2019		2004	2019		2004	2019	
Federation	23.02%	26.06%	3.04%	6	10	4	61%	71%	10%
Berrigan	16.41%	19.63%	3.22%	10	7	-3	68%	43%	-25%
Murray River	22.34%	19.23%	-3.11%	9	8	-1	81%	50%	-31%
Murrumbidgee	32.78%	36.40%	3.62%	11	10	-1	87%	84%	-3%
Edward River	42.09%	43.10%	1.02%	8	8	0	70%	67%	-3%
Hay	37.77%	36.22%	-1.55%	9	9	0	68%	71%	3%
Balranald	29.46%	35.34%	5.89%	5	6	1	35%	50%	15%
Wentworth	35.50%	31.06%	-4.44%	1	3	2	11%	20%	9%
Median	31.12%	33.20%	2.03%	9	8	0	68.%	58.50%	0.00%

Figure 13 - Percentage occupied by top 15 landowners (2004-19) (East to West)



Insight 8. In 2020 the median price per hectare in the Riverina transect ($4,263/ha) was less than that of NSW ($5,855). The low median price is due to the large areas of dryland farming and grazing, which are worth significantly less than irrigated regions in the south and east of the transect. In general, rising land prices in the Riverina are in line with trends across NSW, and have been influenced by the consolidation of large holdings and the related constant demand for productive agricultural land.

In 2020, the median price per hectare in the Riverina transect was $4,263 which is less than that of NSW at $5,855/ha. The low median price is due to the large areas of dryland farming and grazing, which are worth significantly less than irrigated regions in the south and east of the transect. Wentworth and Hay have the lowest median $/ha, whilst Balranald did not experience sufficient transactions to calculate a reliable median $/ha.

Anecdotally, all Hay participants agreed that the 2020 median $/ha shown in Table 6 was not an accurate representation of actual land value in their region. Participants suggested that this may be both due to a low number of transactions occurring and significant differences between the median values of irrigated and no-irrigated areas. Further research is needed to determine the cause of this discrepancy.

Table 6 - Farmland Sales by Municipality (adapted from Rural Bank, 2021)

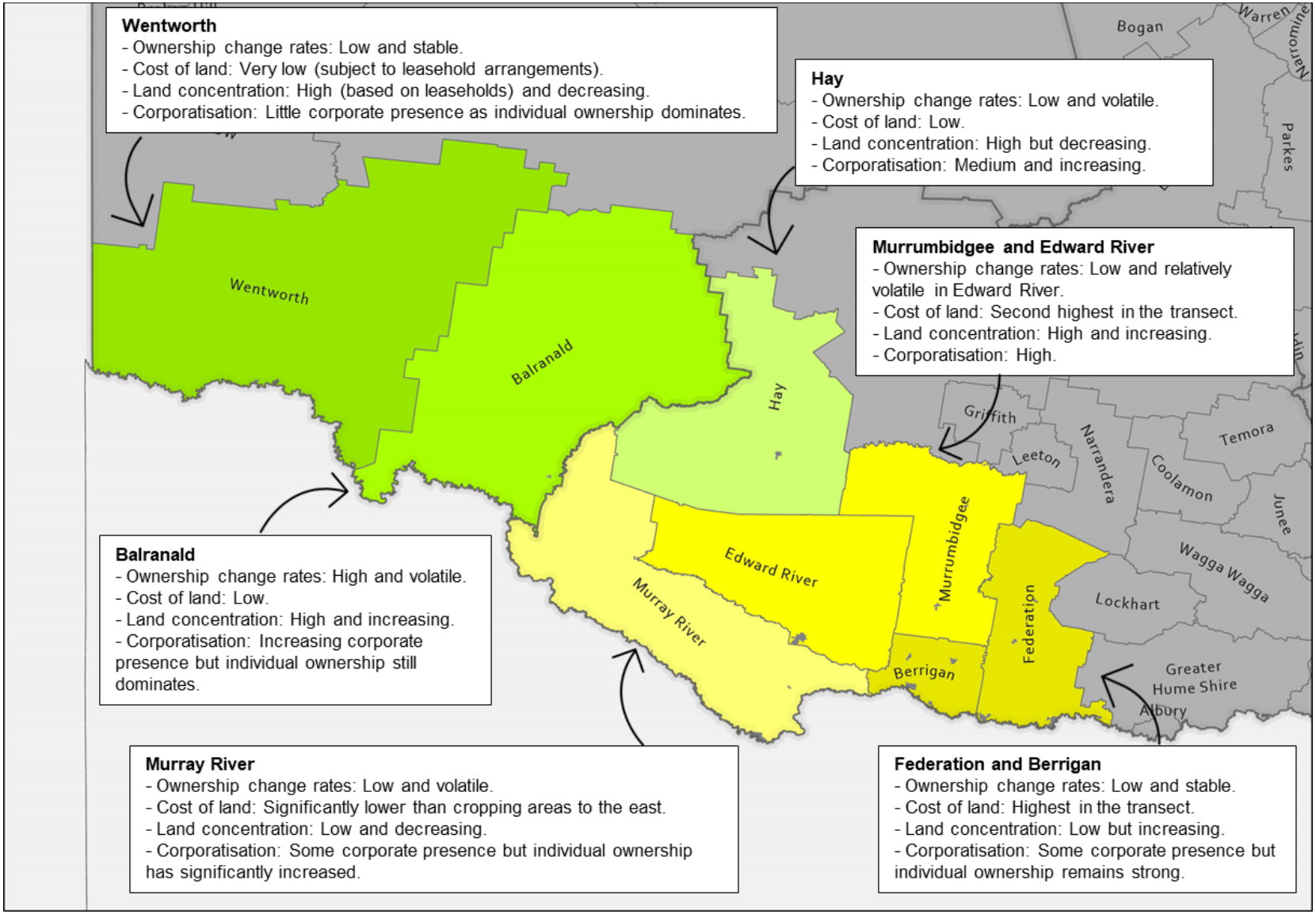
LGA	2020 Median $/ha	5yr CAGR	LGA	2020 Median $/ha	5yr CAGR
Federation	$5,560	13.0%	**Edward River**	$4,379	11.9%
Berrigan	$4,942	10.0%	**Hay**	$357	-6.6%
Murray River	$2,376	4.9%	**Balranald**	No data	37.1%
Murrumbidgee	$4,263	14.1%	**Wentworth**	$560	23.5%
			NSW	$5,855	12.2%

CAGR: Compound Annual Growth Rate

The high and increasing value of land in the Riverina region, similar to the Hunter transect, is also linked to the consolidation of larger holdings. According to stakeholders in Murrumbidgee and Hay LGAs, increasing land values have meant that large corporates looking to expand are best placed to purchase properties which come up for sale. For a large company, an observation from one informant in Murrumbidgee was that the appreciation of the price of land on their balance sheets was the major contribution to shareholder value, with the cash profits from farming playing second fiddle. One participant from Hay commented that in their region the price of land is beyond what you can make a profit from, meaning that buying land to farm is not financially viable for small operations. The acquisition of land parcels for these purposes can bid up prices thus raising the barriers for entry for new non-corporate entrants.

Themes for future research: The 2020-2022 period has been one of great change in the way land changes ownership in NSW. The COVID-19 pandemic, combined with the end of the most intense period of drought in recent years, record low interest rates, record high commodity prices and an intense La Niña, have significantly affected some of the trends of previous years. For example, in 2022 the volume of agricultural land changing hands in NSW reached a 14 year high and land values have significantly increased Australia-wide (Rural Bank, 2022). As such, it is important to consider annual churn rates beyond the period explored in this report. Future research should dive into these themes in more detail. As more data is collected through the land-titles registration method presented in this report and other outcomes of our project, we hope that more light will be shed on these important trends affecting the ownership and management of land in rural NSW.

Figure 14 - Summary of findings, rate of change and land concentration in the Riverina



3. Demographic trends as drivers of rural land ownership change in the transect

Insight 9. The total population of the Riverina transect has increased from 2006-21, however three LGAs experienced population decline: Hay, Balranald and Murrumbidgee.

There is a clear east-west demographic pattern in the Riverina transect. The region's eastern LGAs typically display higher population size, density, and growth, while LGAs in the west of the transect are less densely populated and are more prone to exhibiting population decline. This demographic east-west gradient also applies to the prevalence of residents in rural vs urban areas of the LGA. Such trends align with the findings of other transect reports in this series (see, e.g., Central West and Hunter reports).

Table 7 - Demographic overview (data based on ABS 2022)

LGA	Total population (2021)	Population change (2006-21)	Population density (persons/km^2) (incl UCLs)	Percentage of residents living in rural areas of LGA (non-UCL) (2016)
Federation	12,735	4.08%	2.24	16.74%
Berrigan	8,810	10.22%	4.26	19.33%
Murray River	12,571	16.62%	1.06	32.15%
Murrumbidgee	3,871	-6.63%	0.56	37.42%
Edward River	9,158	0.55%	1.03	22.73%
Hay	2,945	-12.84%	0.26	21.19%
Balranald	2,276	-6.80%	0.10	26.94%
Wentworth	7,142	5.37%	0.27	42.95%
Total	59,508	4.64%	0.63	26.34%

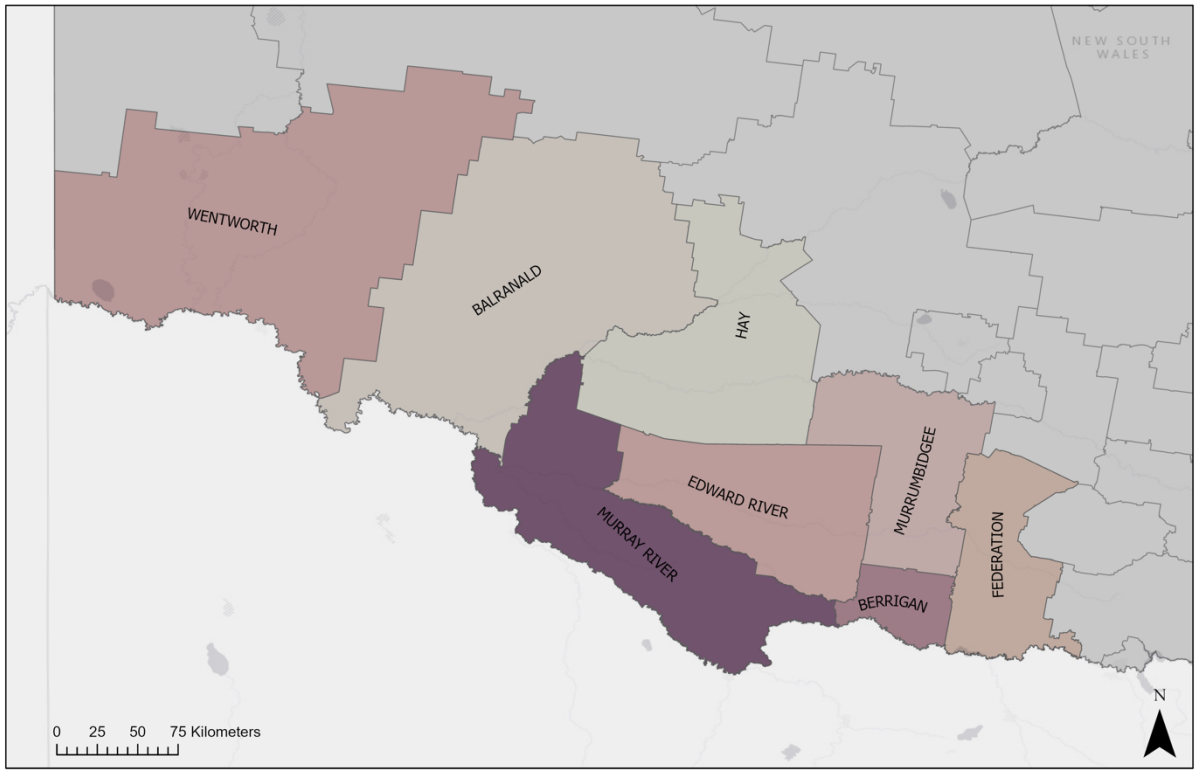
The transect LGAs all had relatively modest population sizes, ranging from Balranald (2,276) to Federation (12,735) (Table 7). Population density was low, with four of the eight LGAs having less than one person per square kilometre. The four LGAs in the east of the transect and closer to the Murray (Federation, Berrigan, Edward River and Murray River Councils) had larger populations and population densities than those to the west and north. Balranald stands out as having the lowest population and population density of all the transect LGAs. At the extreme west of the transect, there is relatively higher population density in the portion of Wentworth Shire adjacent to the Murray River because of irrigated agriculture and spill over effects from the population centre of Mildura across the river in Victoria.

The rate of population growth varies considerably among LGAs in the transect. Overall, the Riverina transect experienced 4.64% growth in population size during the study period. There is some suggestion of an east-west gradient, with the eastern LGAs (particularly Berrigan and Murray River) experiencing moderate to high levels of population growth. This seems to reflect population growth adjacent to the major rivers of the region, with LGAs with less access to river flows, higher amenity landscapes and irrigation opportunities experiencing lower and/or negative population change, seen most clearly in Balranald and Hay Shires (Figure 15). Murray River Shire's population increased the most, growing by

16.62% between 2006 and 2021. The shape of Murray River Shire extends east-west along the Murray River. Its growth can be attributed to the LGA's urban areas of the Shire, also located close to the Murray, as rural parts of Murray River Shire experienced population decline between 2006 and 2016 (Table 8).

In the west of the transect, Wentworth exhibited relatively high rates of population growth, again likely attributable to riverine locations and proximity to regional centre Mildura. Hay experienced the greatest overall decline of -12.84%, with both urban and rural parts of the LGA experiencing population decline. All LGAs' rural populations decreased between 2006 and 2021. The rural populations of all LGAs in the Riverina transect decreased between 2006 and 2016, with the exception of Edward River. Edward River had a growth rate of 20%, considerably higher than all other LGAs. The reasons for Edward River Council being an outlier with strong rural population growth appears to stem from rural residential expansion to the north of the ABS' definition of Deniliquin's urban centre. This story of rural decline and urban growth is further explored and complicated in Section 5.4 of this report.

Figure 15 - Population growth by LGA in the transect, 2011-16



Northern Transect Population Growth 2011-2016
Australian Bureau of Statistics 2011-2016

Insight 10. Population growth in the Riverina transect has occurred in towns, but not in rural parts of each Council area. All LGAs have experienced a decline in the rural component of their population except Edward River, but this outlier is explained through population growth just outside the urban area of Deniliquin. This indicates a minimal role of rural residential demand as a driver of land ownership change.

Table 8 - Changes in rural population by LGA

LGA	Total population in rural areas of the LGA (non-UCL) (2016)	Population change in rural areas of the LGA (non-UCL) (2006-16)
Federation	2,055	-10.65%
Berrigan	1,636	-5.32%
Murray River	3,756	-23.74%
Murrumbidgee	1,436	-15.03%
Edward River	2,011	20.06%
Hay	624	-16.24%
Balranald	617	-19.56%
Wentworth	2,920	-14.92%
Total	15,046	-12.89%

Throughout the study period, the average annual population change rates for LGAs in the Riverina transect were relatively stable. Overall, the transect experienced a slight acceleration in population growth. A few instances of volatility are noted below:

- Murray River experienced population growth between 2011 and 2021 that was significantly higher than other LGAs in the transect. The rate of population growth jumped significantly between 2006-11 and 2011-16. This growth rate has continued to increase.
- Although Hay had the greatest population decline between 2006 and 2011, the rate of population decline considerably slowed between 2011 and 2016, and is now stable.
- All LGAs except Edward River experienced rural population decline between 2006-11. Instead, Edward River had a relatively high year-on-year growth rate of 6.52%. After 2011, however, Edward River has joined other LGAs experiencing rural population decline.

Insight 11. The Riverina transect has a relatively old, and ageing, population.

The age profile of the Riverina transect population is older than the national average. At the 2016 Census, the median age of the transect was 46 years old, compared to a national median age of 38 (ABS 2016a). Hay and Balranald tend to have a younger population, which would seem to be explained by the role of working age people in these LGAs. These are less attractive places for retiree inflows into these areas, and indeed, may be affected by potential outflows of population as individuals retire. The ageing of the Riverina transect's population is aggravated by the out-migration of younger people, especially to Melbourne. As shown in Figure 17, more than 12% of the 20-24 years old population in the Riverina in 2011 were living in Melbourne by 2016. Melbourne is a much stronger magnet for migration flows than Sydney for younger people in the region. This is also true for in-migrants to the region, as shown in Figure 19. Interestingly, the Riverina transect was an important place of destination for Melbournians aged in retirement (60-70) years.

Table 9 - Change in population size 2006-2021

LGA	Population in 2006	Population in 2011	Population in 2016	Population 2021	Av. annual change 2006-11	Av. annual change 2011-16	Av. annual change 2016-21
Federation[5]	**12,236**	**12,159**	**12,279**	**12,735**	**-0.13%**	**0.20%**	**0.74%**
• *UCLs*	9,936	10,207	10,224	---	0.55	0.03	---
• *Rest of LGA*	2,300	1,952	2,055	---	-3.03	1.06	---
Berrigan	**7,993**	**8,067**	**8,462**	**8,810**	**0.19%**	**0.98%**	**0.82%**
• *UCLs*	6,265	6,488	6,826	---	0.71	1.04	---
• *Rest of LGA*	1,728	1,579	1,636	---	-1.72	0.72	---
Murray River[6]	**10,779**	**10,919**	**11,682**	**12,571**	**0.26%**	**1.40%**	**1.52%**
• *UCLs*	5,854	6,843	7,926	---	3.38	3.17	---
• *Rest of LGA*	4,925	4,076	3,756	---	-3.45	-1.57	---
Murrumbidgee[7]	**4,146**	**3,756**	**3,838**	**3,871**	**-1.88%**	**0.44%**	**0.17%**
• *UCLs*	2,456	2,420	2,402	---	-0.29	-0.15	---
• *Rest of LGA*	1,690	1,336	1,436	---	-4.19	1.50	---
Edward River[8]	**9,108**	**8,660**	**8,847**	**9,158**	**-0.98%**	**0.43%**	**0.70%**
• *UCLs*	7,433	6,439	6,836	---	-2.67	1.23	---
• *Rest of LGA*	1,675	2,221	2,011	---	6.52	-1.89	---
Hay	**3,379**	**2,958**	**2,945**	**2,945**	**-2.49%**	**-0.09%**	**0.00%**
• *UCLs*	2,634	2,298	2,321	---	-2.55	0.20	---
• *Rest of LGA*	745	660	624	---	-2.28	-1.09	---
Balranald	**2,442**	**2,282**	**2,290**	**2,276**	**-1.31%**	**0.07%**	**-0.12%**
• *UCLs*	1,675	1,598	1,673	---	-0.92	0.94	---
• *Rest of LGA*	767	684	617	---	-2.16	-1.96	---
Wentworth	**6,778**	**6,610**	**6,798**	**7,142**	**-0.50%**	**0.57%**	**1.01%**
• *UCLs*	3,346	3,810	3,878	---	2.77	0.36	---
• *Rest of LGA*	3,432	2,800	2,920	---	-3.68	0.86	---
TOTAL	**56,868**	**55,405**	**57,131**	**59,508**	**-0.51%**	**0.62%**	**0.83%**

Note: 2006, 2011 and 2016 data was sourced from ABS Population Census Data. Data for 2021 from ABS (2022). Urban Centres & Localities data derived from 2006, 2011 and 2016 censuses.

[5] Federation formed in 2016 from Corowa Shire and Urana LGAs

[6] Murray River formed in 2016 from Murray and Wakool LGAs

[7] Murrumbidgee formed in 2016 from Murrumbidgee and Jerilderie LGAs

[8] Edward River formed in 2016 from Deniliquin and Conargo LGAs

Table 10 - 10-year age group growth pattern (2011-16) (%)

	Federation	Berrigan	Murray River	Murrumbidgee	Edward River	Hay	Balranald	Wentworth	Transect
0-9 years	-6.22	8.70	14.19	-3.95	-6.15	-16.24	-2.08	-1.24	-0.21
10-19 years	-7.85	-13.06	-7.51	5.77	-12.78	-8.33	5.49	-11.71	-8.43
20-29 years	10.16	21.61	9.53	13.40	28.79	6.96	22.60	4.93	14.17
30-39 years	-9.92	0.26	5.39	0.00	-9.85	10.47	-12.87	-8.16	-4.01
40-49 years	-11.11	1.66	-2.44	-8.10	-2.60	-25.93	-13.25	-1.89	-6.17
50-59 years	3.22	-8.40	-0.36	8.69	-2.75	15.56	-7.32	1.88	0.40
60-69 years	12.25	15.07	11.78	7.08	21.35	11.92	29.88	20.64	14.93
70-79 years	10.72	17.71	28.03	-4.56	7.25	5.13	-13.86	23.06	14.22
80-89 years	10.72	11.74	13.63	-12.93	10.56	46.08	-1.20	12.14	11.18
90-99 years	32.32	10.31	56.94	46.67	60.66	-50.00	-10.00	37.84	31.81
100+ years	[NaN]	[NaN]	66.67	[NaN]	66.67	[NaN]	[NaN]	[NaN]	166.67

Table 11 - Migration into rural parts of the transect

Total population							Persons over 50					
SA2	Usual residence 2016 (persons)	Same SA2 five years earlier (persons)	Not in same SA2 five years earlier (persons)	Not in the same SA2 in 2011 (proportion, %)	Moved from Sydney (2011 - 2016) (persons)	Moved from Sydney (2011 -2016) (proportion, %)	Usual residence 2016 (persons)	Same SA2 five years earlier (persons)	Not in same SA2 five years earlier (persons)	Not in the same SA2 in 2011 (proportion, %)	Moved from Sydney (2011 - 2016) (persons)	Moved from Sydney (2011 -2016) (proportion, %)
Corowa Region	6,742	4,375	2,367	35.11	44	1.86	3,311	2,412	899	27.15	19	2.11
Tocumwal - Finley - Jerilderie	9,728	6,400	3,328	34.21	108	3.25	4,763	3,591	1,172	24.61	26	2.22
Deniliquin Region	6,751	4,425	2,326	34.45	20	0.86	3,304	2,543	761	23.03	8	1.05
Hay	2,970	2,001	969	32.63	30	3.10	1,358	1,057	301	22.16	9	2.99
Wentworth-Balranald Region	3,611	2,300	1,311	36.31	20	1.53	1,496	1,099	397	26.54	5	1.26
TOTAL	29,801	19,501	10,300	34.56	220	2.14	14,233	10,702	3,531	24.81	67	1.90

Note: To draw closer comparisons with our land titles data, the statistics in these tables have been tailored to focus on rural parts of the transect. They use SA2 regions at the 2016 Census (rather than LGAs) allowing the major population centres of the transect (Corowa Town, Deniliquin Town) to be excluded. For convenience, we call this population the 'rural Riverina transect'.

- *Corowa Region = Federation minus what overlaps with Narrandera SA2 and excluding Corowa (township)*
- *Tocumwal - Finley - Jerilderie = Berrigan LGA and Murrumbidgee LGA (minus what overlaps with Griffith Region SA2)*
- *Deniliquin Region = Murray River LGA (minus Moama SA2 and Wentworth-Balranald Region SA2) and Edward River LGA, excluding Deniliquin (township)*
- *Hay = Hay LGA plus small parts of Carrathool*
- *Wentworth-Balranald Region = Balranald and Wentworth LGAs (plus part of Murray River LGA) excluding Wentworth - Buronga SA2*

Figure 16 - Proportion of population who moved to select SUAs (2011-16)

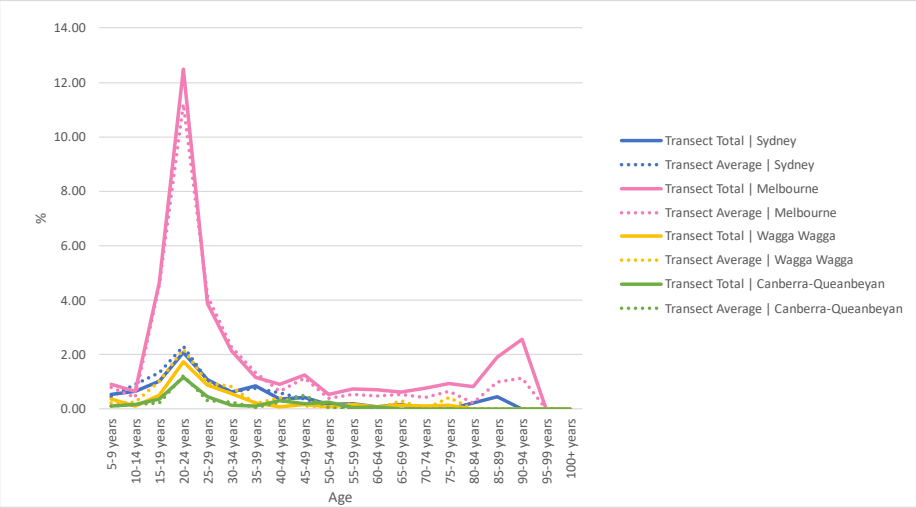


Figure 17 - Proportion of population moving from rural SA2s to SUAs (2011-16)

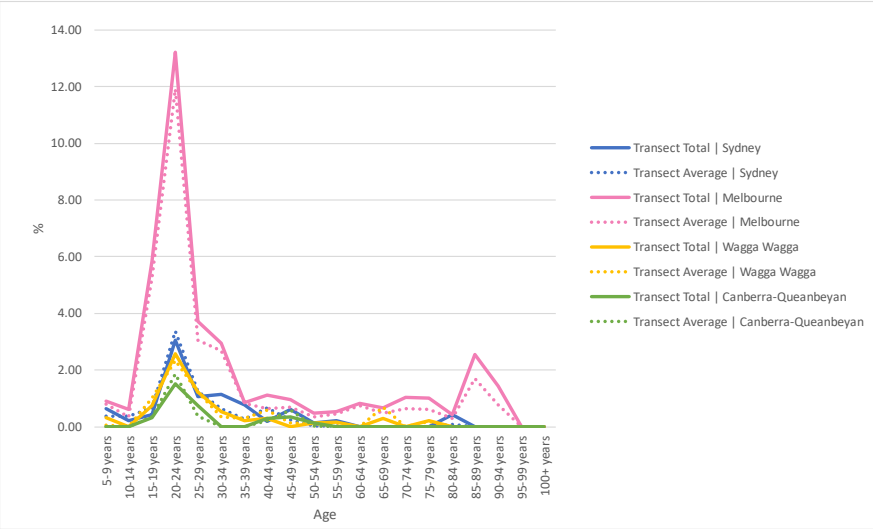


Figure 18 - Proportion of population moving from select SUAs to transect (2011-16)

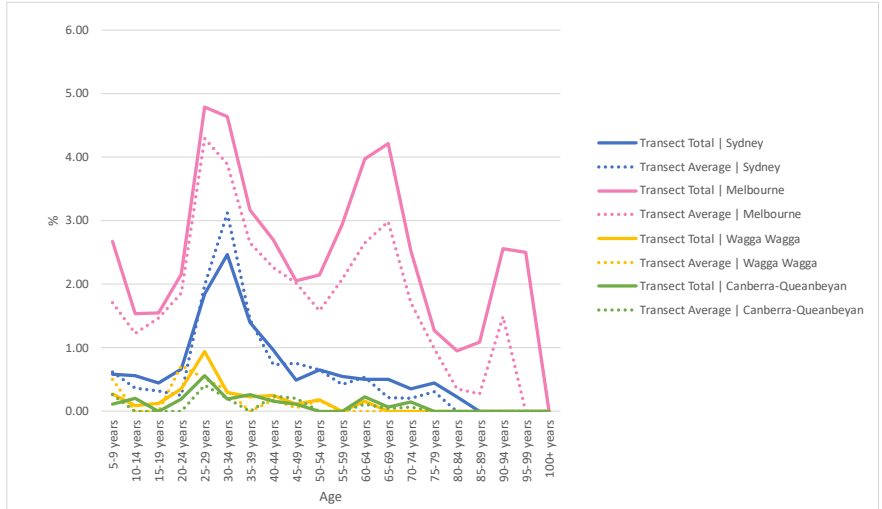
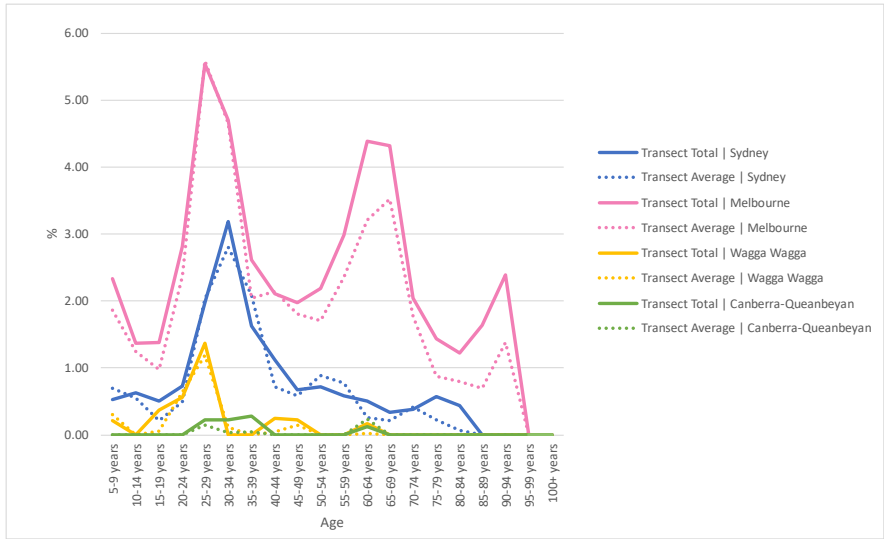


Figure 19 - Proportion of population moving to rural SA2s from SUAs (2011-16)



4. Agricultural restructuring, water and rural land ownership change in the Riverina transect

4.1 Agricultural land-use profile of the transect

Insight 12. *A tale of two types of agriculture*. Land uses are tied to water availability, creating a divide between irrigated and non-irrigated areas. Dryland grazing of beef and sheep is concentrated in the northern and western parts of the transect, and is the largest land use by area. Irrigated and non-irrigated cropping also occur widely across the transect and citrus and other horticulture, viticulture and table grapes, dairy and intensive animal production also comprise important Riverina agricultural industries. Almonds have been expanding in the region where soil conditions allow, and the almond industry generates significant income.

The Riverina transect includes some of the most fertile agricultural land in Australia, and for this reason the Riverina is known as the 'food bowl of Australia'. Dryland sheep and cattle grazing remain the primary land use in the transect, covering 70.8% percent of the total land area and concentrated in the northern and western areas. In the southeast portions of the transect, rich soils and reliable access to water have supported the development of diverse agricultural industries. Cropping of pulses, cereals and cotton generates significant income in these areas and form the second largest land use by area. Dairy with associated irrigated cropping (maize and sorghum) and more intensive livestock production including poultry and pork are also present in the south and east of the transect. Almonds and other nut crops are well advanced in their entry into these areas.

The irrigation regions around the Murray, Murrumbidgee, Edward and Lachlan Rivers host a variety of horticultural industries including citrus, wine grapes, table grapes and vegetables. The rivers of these regions fall within the Murray Darling Basin, and the transect forms part of the southern connected basin. Water availability here is a key determinant of what is grown – for example, reduced water availability during the millennium drought led to a significant decrease in rice crops. Tradeable water entitlements allow growers to participate in water markets, and in dry years growers can sell water rather than grow a crop. Myriad other factors including climate change, land and commodity prices and developments in farming technologies are further contributing to changing land-use within the transect.

4.2 Agricultural change in the Riverina transect and patterns of land ownership

Insight 13. Farm sizes across the transect are increasing, with large operations purchasing more land to increase economies of scale and enable succession planning. These farms are investing significantly in technologies and efficiencies to reduce input costs, which is also associated with increasing farm enterprise diversification. Water availability and management has influenced key agricultural changes in the region including driving a transition away from rice, whilst enabling the entry of high value permanent plantations including almonds.

An important development in the agricultural land market is a trend towards the decoupling of agricultural land market conditions and agricultural commodity prices. As shown in Figure 21, sourced from the Rural

Bank 36 (2021: 27), NSW has seen a historically 'strong correlation between commodity price and farmland values in NSW.' Since around 2015, however, this correlation has been diverging. Median agricultural commodity prices have continued to grow, but rural property prices have escalated much more rapidly.

According to the Reserve Bank of Australia data (RBA, 2022), the index of commodity prices (rural component; SDR) grew by 1.5% between January 2015 and January 2020[9]. Meanwhile, data from the Rural Bank shows that the median $ / ha of the Riverina transect LGAs grew on average 11.9% in the same period[10]. In comparison to other reports in this series, this is higher than the Hunter transect but lower than the Central West. These data highlight the increasingly divergent trends between commodity price index increases and land price increases, which are not just evident in the Riverina transect but in other transects across NSW. These trends point to the wider phenomenon of assetisation – whereby capital is being attracted to real assets (such as property) rather than equities and financial instruments. In the Riverina, higher rural land prices have encouraged the entry of some large agri-corporate investors who have the financial wherewithal to invest in agriculture notwithstanding higher property prices, evidenced in some large pastoral and cropping companies, and also, tree crop plantations (mainly almonds). However, whilst focus group informants reported that new, large investors had entered the Riverina transect during the study, the expansion and increasing sophistication of existing farms was understood to be a more significant trend. Large farms are getting larger through neighbours buying neighbours, to both increase economies of scale and to enable succession planning.[11] These types of transactions are occurring through both 'across the fence' sales (private transactions between willing neighbours) and public sales. Participants across the transect described both corporate investors and family farms as 'constantly circling one another', waiting for rare opportunities to snap up land.

High land prices in many of the transect LGAs act as a barrier for potential new entrants without significant financial backing, with implications for next generation farmers, increasing the dominance of the larger enterprises. A further ramification of high land prices is to encourage existing farmers to institute changes to their operations without the need to acquire more land. For example, this could occur where a dairy farm has decided to stop growing irrigated pastures and instead begun to grow high yield crops such as maize or sorghum. Some land use changes were also reported as occurring in response to changing climatic conditions, such as for example a more drought tolerant breed of sheep being farmed or the reported slow creep of cotton moving further south – these would similarly not show up in this analysis.

[9] Index for Jan 2015 = 99.8. Index for Jan 2020 = 101.4. Index based on 2019/20=100.

[10] Average calculated from the 5yr Compound Annual Growth Rate in median %/ha for all the LGAs in the Riverina transect, as published by the Rural Bank (2020).

[11] Identifying the extent of these trends through land titles data alone is difficult because not all land held in the name of corporations is large-scale (many are family companies) and in some other cases, corporate-run businesses operate on land registered in the names of individuals (sometimes a director of the company, sometimes another party, which the company leases from). Further, large, incorporated family farms may operate in a similar way to large corporate investors, who typically employ professional on-farm management and generate commercial advantages through economies of scale. Nevertheless, a corporate name on title does give an indication that the property is linked to an agricultural business, an investor or financial institution, which tells us a lot about the use of land.

Figure 20 - Riverina transect Land-use Map

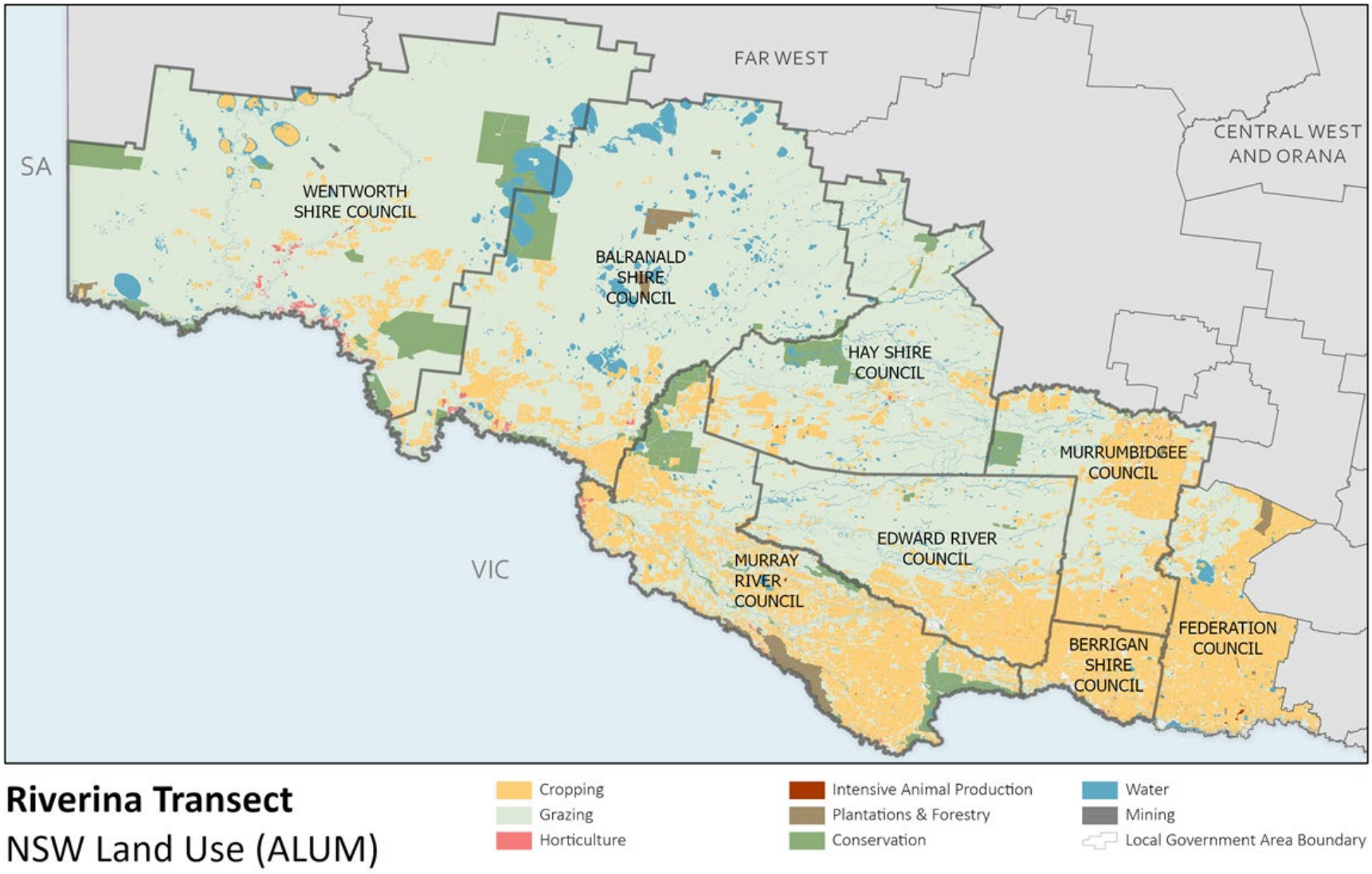


Figure 21 - NSW Commodity Price Comparison (Rural Bank, 2021)[12]

Table 12 - Proportion of agricultural land-uses in the Riverina transect[13]

Agricultural Land-use	Total Area (ha)	Proportion of the transect	Total Irrigated Area (ha)	Proportion of ALUM category irrigated	Details
Cropping	1,702,286	20.67%	767,047	45.06%	Includes irrigated cropping, including cereals, cotton, and pulses. Includes land under rotation, which at other times may be pasture.
Grazing	5,829,928	70.78%	42,075	0.72%	Includes grazing on native and modified pastures.
Horticulture	19,856	0.24%	15,726	79.20%	Includes perennial and seasonal horticulture (both irrigated and non-irrigated).
Intensive animal production	2,793	0.03%	n/a	n/a	Includes feedlots for cattle or sheep, dairy sheds and yards, poultry farms, pig farms, horse studs, saleyards, and some forms of aquaculture.
Other uses	681,404	8.27%	n/a	n/a	Includes other residential, industrial, conservation and transition uses, not considered to be strictly related to agriculture.
Total	8,236,268	100.00%	824849	10.92%	

The increasing sophistication and complexity of farming operations was also reported as increasing the ability of primary producers to respond to changing commodity markets and climatic conditions through 'pivoting' to different land uses. As farms get more extensive, they are able to incorporate increased diversity and become mixed, multiple enterprise operations – this could include both grazing and cropping, biodiversity offsets or renewable energy generation, for example. Reports of the growth of large, multi-enterprise farms were a feature across the transect. We include these notes as a caveat to indicate where parts of the story of land-use change are complex, and unable to be fully captured within the scope of this report.

[12] Graph published by the Rural Bank (2021).

[13] Calculated based on the NSW Land use 2017 v1.2 dataset, publicly available for download on the NSW Government SEED website, **https://datasets.seed.nsw.gov.au/dataset/nsw-landuse-2017**

Water policy and availability, influenced by both drought and management decisions, plays a vital role in how farmers respond to current contexts in the rural land market. Water determines the different commodities able to be grown, and water availability is influenced by both seasonal conditions and management rules. In the Murray Darling Basin, water rights have been separated from land rights, and both permanent and temporary water entitlements are able to be traded on water markets. Managing water is complex for growers, requiring in depth understanding of the highly technical water market which operates within the Murray Darling Basin – this is briefly discussed here, and is revisited in Section 4.4 of this report.

The value of irrigated land is generally higher than non-irrigated land, leading to large variations in the price of land within LGAs which contain both irrigated and non-irrigated lands. High land prices were noted as a significant barrier to new entrants into Riverina. However, trends in irrigated land value are not uniform - in Wentworth LGA for example, different irrigation areas are experiencing different trends. Participants reported that Curlwaa Irrigation area directly east of Wentworth Township was experiencing significant decline, with largely hobby farms and non-operational irrigation fields remaining. This was attributed to a combination of old irrigation infrastructure needing to be upgraded making properties less attractive to potential investors, historical 30 year leases on properties and poor quality 'black' soil. In contrast, slightly further east up the Murray River the irrigation district of Coomealla was thriving, with a significant uptick in land transactions experienced here in the final year of the study period. These differences show that more research is needed to determine place-specific trends.

In general, traditional crops such as wheat, corn and canola remain key high value crops grown in irrigation districts of the Riverina. For example, in Berrigan LGA, wheat, rice, corn and canola were described as being the 'bread-and-butter' agricultural commodities. Here, trends towards enterprise diversification and farm expansion were reported as being more significant than changes to the types of commodities being grown. Similarly in the neighbouring LGA of Federation, canola and wheat are the primary crops grown and have generated significant returns in recent years.

One exception to the steady continuation of traditional irrigated crops in the Riverina transect is rice. There has been a transition away from rice towards crops such as maize and cotton, which was described by focus group participants as being a major character change for the region – prior to the millennium drought, the irrigation regions of the south-eastern Riverina were known as 'rice country', where most farms grew rice and ran a small amount of sheep on the side. The low water allocations and high water prices of the millennium drought meant that growing rice was no longer viable. Whilst rice is still grown in parts of the south and east of the transect, most participants believed that rice was unlikely to ever return to pre-millennium drought levels in the region.

Two further industries are worth commenting on specifically in greater detail in the recent contexts of water policy changes and higher land prices: dairy and almonds. We now address these.

Dairy

The dairy industry has undergone significant changes in recent years. Dairy in the Riverina transect primarily occurs in the Edward River and Murray River LGAs, and to a lesser extent in Federation and Berrigan LGAs along the Murray River. A shift towards dairy farm intensification has been accompanied by a reduction in reliance on irrigated pastures and a move towards growing higher yield crops for fodder such as maize. According to an industry stakeholder, these changes have partially occurred in response to changes in the water market, which has greatly increased in complexity during the study period. It was reported that when water markets were first introduced, many dairy farmers sold their permanent water rights to pay off drought debt, believing that they would be able to buy them back on the temporary water market. Notably, similar reports were made by participants in relation to the transect in general, and this is explored more in section 4.4. These changes meant that dairy farmers who were used to operating a low cost and low input system

had to transition to a different way of operating or leave dairy entirely. Now, farmers have a much higher comfort level with managing water as a risk management strategy. For example, in dry times dairy farmers are able to buy in feed and sell remaining water rights to permanent plantings.

In line with trends across all LGAs, there has been significant land consolidation by large dairy enterprises in the Riverina, likely contributing to higher land prices. Also consistent with the rest of the transect, it was reported that these large operations were not new corporates but rather existing farms which had expanded and intensified. These farms often manage diverse income streams, with leasing and increased cropping forming important revenue. Participants noted that because the most significant changes occurring in the dairy industry were related to on-farm structure, land ownership change was only one small part of a larger and more complex story.

Almonds

Growth in the almond industry represents a significant agricultural land use change in the Riverina transect. In the period 2003-2021, almond plantations increased from 25ha to 7,300ha in the NSW Lower Murray Darling[14] with the bulk of this growth occurring from 2015 onwards (SunRISE, 2022). The Riverina transect falls partially within two of the most productive almond growing regions in Australia – the 'Riverina' region in the east which contains Murrumbidgee LGA, and the 'Sunraysia' region in the southwest which broadly includes parts of Murray River, Balranald and Wentworth LGAs. In the east, participants in Murrumbidgee LGA described the 'steady march' of almonds moving in from Hillston in the north and west from Narrandera along the Murrumbidgee.

The intensified growth in almond plantations in the Riverina since 2016 has been attributed to a perceived reduction in development controls in NSW vs Victoria, access to multiple types of water entitlements and water delivery constraints in the lower Murray regions (MRIC, 2021). Focus group participants to this study indicated that the majority of almond properties in this region are owned by corporate investors – for example, a large investment fund sold a prominent almond orchard with associated water entitlements for $98 million in 2020 to a major foreign investment group. This is at odds with the overall lack of corporate entry into other parts of agriculture in the Riverina transect, described in Section 2.3 of this report, and shows the distinctiveness of almonds as an area of new agricultural investment.

In some areas, councils are preparing for further almond industry expansion. Participants from Murray River LGA highlighted that in the Tooleybuc region, on the banks of the Murray River and within the broad 'Sunraysia' area, old grazing properties on suitable soil types are being transformed to horticultural uses, with participants describing a 'land grab' related to almond (and other nut) trees. However, areas where almonds can be grown are limited due to their need for loamy, well-drained soil types to thrive. According to participants, Balranald and Federation had not experienced the same growth in almonds as other LGAs because of a lack of this type of soil.

Themes for future research:

Land ownership change is only one part of a highly complex story. Land use changes without an accompanying change of ownership were identified as occurring in response to changing climatic conditions, including switching to drought tolerant breeds of sheep and cotton beginning to be grown further south than is traditional. Land use changes were also identified as linked to the increasing sophistication and diversification of farms including into mixed enterprises, renewable energy generation, biodiversity offsets and intensification. Further research is required to determine the extent to which these trends are occurring and to highlight the implications of these changes for agricultural futures in the Riverina region. This section also highlighted that there are significant intra-LGA variability between land ownership trends occurring on irrigated land, noting that in Wentworth one of the primary irrigation areas is declining whilst another is thriving. Further research is required to determine place-specific trends.

[14] Data from the higher reaches of the Murray River catchments is not yet available at the time of writing this report.

4.3 Transitions in agricultural employment

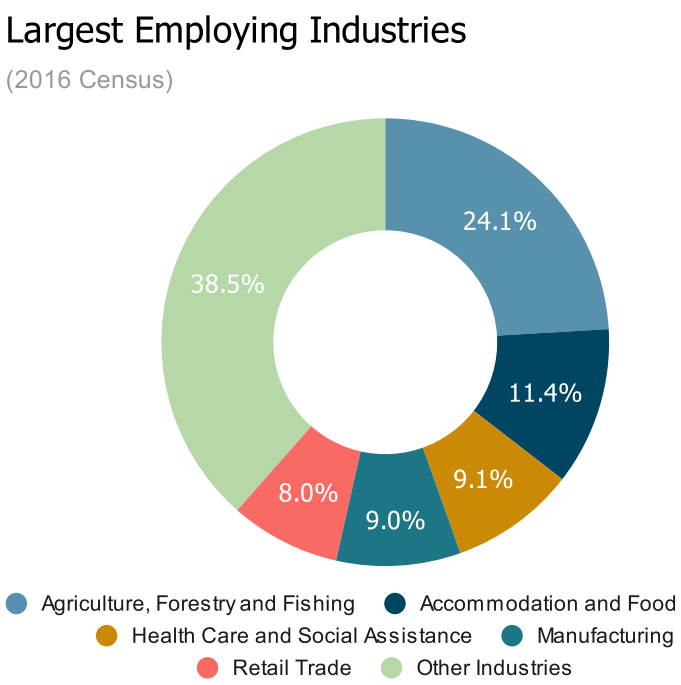
Insight 14. In the Riverina transect, agriculture is the largest single employer. As a proportion of total employment, it has been slowly increasing since 2011, reversing the decline experienced between 2006-11.

Agriculture has consistently been the largest employing industry in the Riverina transect across the study period. As of 2016, Agriculture comprised almost a quarter (24.1%) of the region's total workforce. Despite a decline in the number of workers between 2006-11 (26.33%), the total agricultural workforce increased by 15.12% between 2011-16. Only two industries trumped Agriculture's percentage growth for 2011-16. Those were Construction at 35.48% (the seventh largest employing industry) and Administrative and Support Services at 33.15% (outside top 10).

Across the study period, Agriculture was also the largest employing industry in each LGA, with two exceptions. In 2011, the largest employing industry in Federation was Manufacturing. In 2016, the largest employing industry in Edward River was Health Care and Social Assistance. Given the ageing population of Edward River LGA, it is unsurprising that Health Care and Social Assistance has consistently become a larger workforce since 2006.

Agriculture remains the backbone of employment in the Riverina, and several trends in Agricultural employment were described by participants. On-farm labor was reported by one participant in Hay as more likely to be contractual rather than a traditional style of farm manager who lives on the property. This participant also identified that an increasing reliance on technology in farming was reducing the need for people to be physically employed, giving remote monitoring of reservoir water levels as an example of a job which is more efficiently performed by software. Hay experienced a net decrease in people employed in Agriculture during the study period, which may be related to this.

Figure 22 - Largest employing industries across the Riverina transect [15]



[15] Modified from source: ABS 2016b

Table 13 - Top 10 largest employing industries across the Riverina transect (2006-16)

Top 10	2006	2011	2016
1	Agriculture, Forestry and Fishing	Agriculture, Forestry and Fishing	Agriculture, Forestry and Fishing
2	Accommodation and Food Services	Accommodation and Food Services	Accommodation and Food Services
3	Manufacturing	Manufacturing	Health Care and Social Assistance
4	Retail Trade	Retail Trade	Manufacturing
5	Health Care and Social Assistance	Health Care and Social Assistance	Retail Trade
6	Education and Training	Education and Training	Education and Training
7	Transport, Postal and Warehousing	Public Administration and Safety	Construction
8	Public Administration and Safety	Transport, Postal and Warehousing	Transport, Postal and Warehousing
9	Construction	Construction	Public Administration and Safety
10	Wholesale Trade	Other Services	Other Services

The Status in Employment (SIEMP) data from the Census was used to identify the percentage change in the number of people employed in different agricultural industries along the transect between 2006 and 2016. The following categories of employment were used for this purpose (with definitions from the ABS (2011b, 2016b):

- **Owner managers of incorporated enterprises** - a person who works in his/her own incorporated enterprises, that is, a business entity which is registered as a separate legal entity to its members or owners (also known as a limited liability company).
- **Owner managers of unincorporated enterprises** - a person who operates his/her own unincorporated economic enterprise, that is, a business entity in which the owner and the business are legally inseparable, so that the owner is liable for any business debts that are incurred. It includes those engaged independently in a profession or trade.
- **Contributing family workers** - a person who works without pay, in an economic enterprise operated by a relative.
- **Employee not owning business** - employees who do not own businesses (excluding owner managers of incorporated enterprises and contributing family workers).

As evident in Table 14, most agricultural industries experienced an overall increase in the number of people employed between 2011-16. This increase was experienced most significantly by Forestry Support Services, Agriculture, Forestry and Fishing (nfd), Agriculture (nfd), and Other Crop Growing, which increased by 433.33%, 213.64%, 230.60% and 211.43 % respectively. The overall increase is a reversal of the decline in the number of people employed experienced by most agricultural industries in the 2006-11 period.

Agricultural industries with a decrease in employment

The following industries experienced an overall decrease in the number of people employed between 2011-16:

- Mushroom and Vegetable Growing
- Sheep, Beef Cattle and Grain Farming
- Poultry Farming

The reduction in employment in both 'Mushroom and Vegetable Growing' and 'Sheep, Beef, Cattle and Grain Farming' was largely associated with a significant reduction in family workers. 'Sheep, Beef, Cattle and Grain Farming' also experienced a sustained reduction in owner/managers of unincorporated enterprises between

2006-2016. This is in contrast to a slight (15.23%) increase in owner/managers of incorporated enterprises experienced between 2011-2016 in the same industry, indicating a small trend towards corporatisation.

Agricultural industries with less than 50% employees not owning a business

The below industries have considerably less demand for agricultural wage-labour than others in the transect, as indicated in the data for 'employee not owning business' category:

- Agriculture, nfd
- Sheep, Beef Cattle and Grain Farming
- Aquaculture

Of the three industries listed above, 'Aquaculture' had only six workers in 2016, all of whom were contributing family workers. There were no workers in 'Aquaculture' prior to 2016. As shown in Table 14, 'Sheep, Beef Cattle and Grain Farming' has a relatively even split of employees, owners of incorporated enterprises, owners of unincorporated enterprises, and contributing family workers. In contrast, the majority of 'Agriculture, nfd' workforce belongs to the 'employee not owning business' category (40.38%), although there are considerable proportions of owners of unincorporated enterprises and contributing family workers. This implies that 'Agriculture, nfd' contains a considerable proportion of family-run farming operations.

All other agricultural industries have at least 50% of their workforce as employees, rather than owners or contributing family workers. This finding indicates that there is a high incidence of agricultural wage-labour throughout the transect. The 'Nursery and Floriculture Production', 'Mushroom and Vegetable Growing', 'Fruit and Tree Nut Growing', 'Dairy Cattle Farming', and 'Other Livestock Farming' industries also experienced a decrease in the number of owner managers and/or family workers between 2011-16. The decline of owner managers and family workers in these employee-dominated industries suggests some level of corporatisation or consolidation of smaller businesses is occurring throughout the transect.

Table 14 - SIEMP proportions in agricultural industries (INDP3) for Riverina transect (2016)

Proportion (%) of workers in Riverina Agriculture INDP3 by SIEMP categories				
Agriculture INDP3	**Employee not owning business (%)**	**Owner managers of incorporated enterprises (%)**	**Owner managers of unincorporated enterprises (%)**	**Contributing family workers (%)**
Agriculture, Forestry and Fishing, nfd	53.62	15.94	23.19	7.25
Agriculture, nfd	40.38	13.81	23.25	23.43
Nursery and Floriculture Production	70.18	12.28	5.26	0.00
Mushroom and Vegetable Growing	53.70	24.07	17.59	8.33
Fruit and Tree Nut Growing	59.97	11.22	14.57	13.40
Sheep, Beef Cattle and Grain Farming	29.18	19.45	29.13	22.71
Other Crop Growing	50.46	12.84	22.94	8.26
Dairy Cattle Farming	61.08	9.09	15.91	14.77
Poultry Farming	89.58	6.25	0.00	8.33
Other Livestock Farming	90.86	1.94	2.77	1.11
Aquaculture	0.00	0.00	0.00	100.00
Forestry and Logging	63.33	23.33	13.33	0.00
Forestry Support Services	62.50	0.00	0.00	0.00
Agriculture and Fishing Support Services	66.25	12.50	12.19	7.50

Table 15 - Percentage change in the transect's agricultural industries (2006-16)

Percentage Change (%) in status of agricultural employment categories in Riverina Agriculture INDP3										
Agriculture INDP3	**Employee not owning business (%)**		**Owner managers of incorporated enterprises (%)**		**Owner managers of unincorporated enterprises (%)**		**Contributing family workers (%)**		**Total (%)**	
	2006-11	**2011-16**	**2006-11**	**2011-16**	**2006-11**	**2011-16**	**2006-11**	**2011-16**	**2006-11**	**2011-16**
Agriculture, Forestry and Fishing, nfd	112.50%	117.65%	-100.00%	NaN	200.00%	77.78%	-100.00%	NaN	29.41%	213.64%
Agriculture, nfd	-29.55%	272.58%	121.43%	154.84%	107.14%	129.31%	86.67%	378.57%	15.33%	230.64%
Nursery and Floriculture Production	14.81%	29.03%	33.33%	-12.50%	12.50%	-66.67%	33.33%	-100.00%	27.50%	11.76%
Mushroom and Vegetable Growing	-32.50%	7.41%	-32.26%	23.81%	-54.55%	26.67%	14.29%	-62.50%	-28.93%	-4.42%
Fruit and Tree Nut Growing	-24.27%	26.06%	-38.54%	13.56%	-48.21%	0.00%	-17.31%	-37.98%	-29.80%	6.04%
Sheep, Beef Cattle and Grain Farming	-31.20%	13.12%	-34.88%	15.23%	-25.81%	-23.94%	-9.70%	-23.08%	-25.22%	-9.53%
Other Crop Growing	-12.00%	150.00%	-14.29%	133.33%	-76.92%	733.33%	-54.55%	80.00%	-32.69%	211.43%
Dairy Cattle Farming	-19.08%	53.57%	-29.31%	-21.95%	-52.67%	-21.13%	12.73%	-16.13%	-28.80%	12.10%
Poultry Farming	22.64%	-33.85%	NaN	NaN	NaN	NaN	NaN	33.33%	38.89%	-36.00%
Other Livestock Farming	-52.17%	41.99%	NaN	133.33%	80.00%	-44.44%	50.00%	-55.56%	-48.81%	39.38%
Forestry and Logging	-23.53%	46.15%	NaN	NaN	-25.00%	33.33%	NaN	NaN	-8.33%	36.36%
Fishing, Hunting and Trapping, nfd	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	-100.00%
Hunting and Trapping	-100.00%	NaN	NaN	NaN	0.00%	-100.00%	NaN	NaN	-55.56%	-100.00%
Agriculture, Forestry and Fishing Support Services, nfd	-100.00%	NaN	NaN	NaN	NaN	NaN	NaN	NaN	-100.00%	NaN
Forestry Support Services	-50.00%	233.33%	NaN	NaN	NaN	NaN	NaN	NaN	-50.00%	433.33%
Agriculture and Fishing Support Services	-40.63%	123.16%	-35.56%	37.93%	15.63%	5.41%	80.00%	166.67%	-30.83%	92.77%

4.4 Drought in the Riverina transect

Insight 15. Drought has not had a cyclical effect on the rate at which rural land changes hands. Owners tend to find other ways to cope with the stresses generated by drought and selling land remains a last resort. Strategies to avoid selling land in the Riverina included water trading, intensifying production and increasing efficiencies to reduce input costs, switching between different commodities and moving from irrigating pastures to buying feed (dairy industry). In addition to 'weather' droughts, water management rules were cited as causing 'allocation' droughts, which further influence farming and land acquisition decisions.

Analysis by the research team of the correlation between landownership change and drought patterns shows that at the state-wide level, droughts have little if no effect on regional patterns of land ownership change in the short-term. Over the long term (10+ years), however, the longer the time in drought, the less land seems to change hands.

In the irrigated areas of the Riverina, drought interacts with the water management structures which also regulate water availability in the Murray Darling Basin. While drought causes water scarcity, management rules may lead to differing water availabilities in different areas. For this reason, one participant from Murray River distinguished between anthropogenic 'allocation' droughts and 'weather' droughts. According to this participant, allocation drought rather than weather drought is a problem in areas of high irrigation reliability, where (for example) 10% less rain in one place means 20% less runoff down the river. Management approaches to water allocations complicate efforts to understand the impact of drought on land ownership transition in irrigated areas of the Riverina transect.

One participant working in both the Murray River and Edward River LGAs had observed that farmers were struggling with managing the complexity of water market participation (including managing yearly allocation changes and broader market instruments), and that farmers who were unable to 'keep up' were forced to leave. This points to the requirements of technological adroitness and professional expertise that are now part-and-parcel of contemporary agriculture. Several other participants from these areas and Wentworth LGA echoed this, and described the exit of some farmers from the regions as linked to the initial establishment of the water market. It was reported that farmers initially sold their permanent water rights to assist with paying off drought debt, believing that it would be possible to buy back water on the temporary market as needed. However, when water prices increased, farmers were unable to afford these purchases. It should be noted here that as reported by Wheeler & Cheeseman (2013), irrigators at this time employed a variety of responses to government water buyback programs which included selling some water and staying in farming, selling all water and leaving farming, and selling all water and staying in farming. Wheeler (2014) also found that many irrigators who sold water and remained in farming sold unused or surplus water, and then used the money to both reinvest on farm and assist in paying off debt. Whilst this study demonstrated that irrigators were not generally negatively impacted long term by these sales, it did note that they were potentially more vulnerable to the impacts of future water scarcity.

Participants also described multiple ways in which farmers sought to cope with drought without having to resort to selling the property. Increasing efficiencies and reducing costs of inputs were cited as a key drought resilience strategy, with participants explaining that the most significant change in recent years has been innovation in technology and efficiencies to reduce input costs, with cost of water being the biggest input. The introduction of feedlots and the switching from irrigating pasture to buying feed on dairy farms were given as examples of this. Water trading was also mentioned as a drought response, where water scarcity redistributes the consumptive pool and industries such as dairy and rice are less able to compete on water markets (Sefton et al., 2020). Commentary from Berrigan participant noted that the design of the water market to allow water to be directed towards more high value uses has 'decimated' fibre livestock and dairy which are lower value industries but which are also essential. These findings are in keeping with previous

work investigating the kinds of drought strategies adopted in irrigated agriculture in the MDB (Kirby et al., 2014).

Exposure to drought raises longer term questions about adaptation to climate change. This is a key factor influencing drought and affecting productive agriculture in the Riverina region, cited as affecting farm size, varieties of crops being grown, water availability and farming strategies. For example, in Balranald a participant commented that 30,000 ha is a standard farm size in Balranald and that this is partially driven by the impact of climate change – larger farms are required to make a profit. Another participant from Hay noted that climate change and the likelihood of increased extreme droughts such as that experienced in 2018-19 meant that farmers were becoming more interested in strategies to build drought resilience into landscapes through changing farming practices.

Around the Murray River and Edward River LGAs, cotton has begun to be grown due to 'climate creep' (the slow change in seasonal conditions related to climate change), and also to the development of new varieties of cotton able to tolerate less sunlight and cooler temperatures. Although it is not possible to separately identify the impact of climate change as a driver of rural land ownership change, it is nevertheless a factor and further study should be directed towards better understanding this relationship.

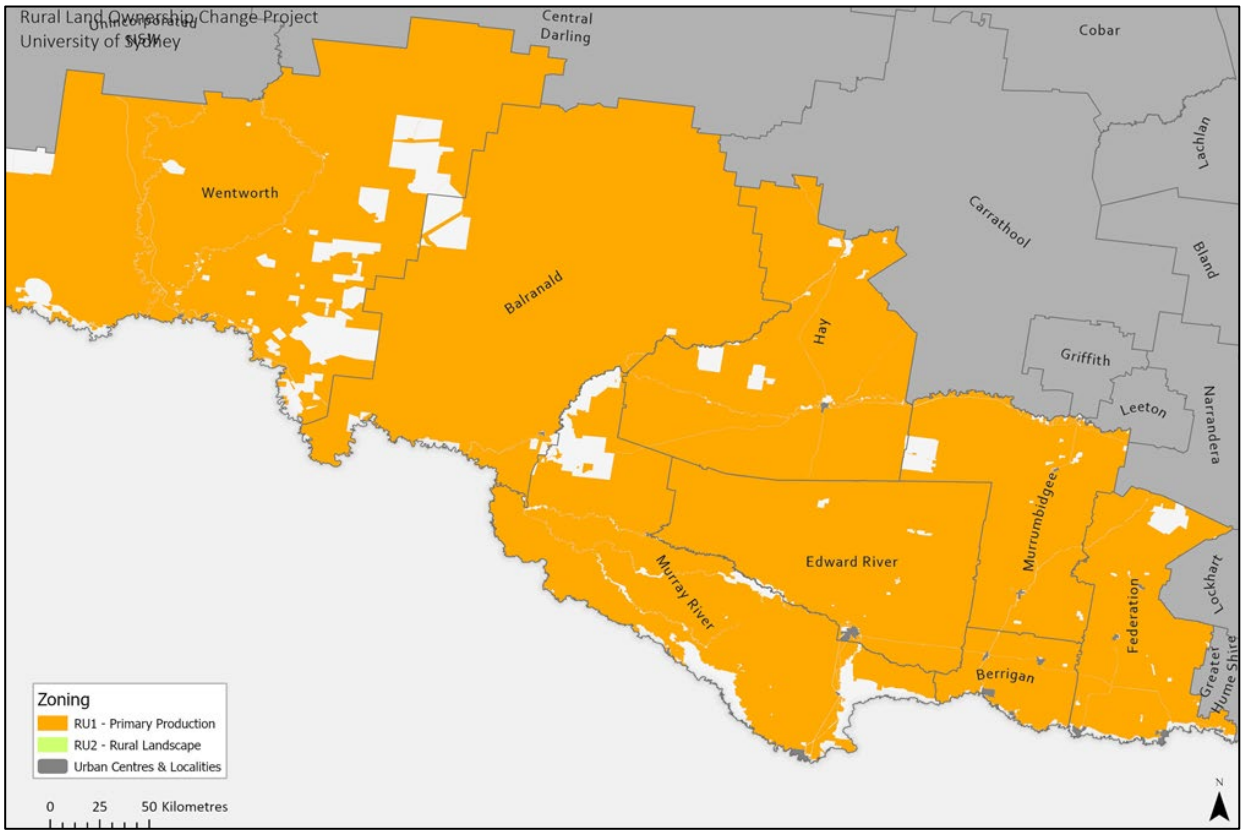
5. Land-use planning trends affecting land ownership patterns

5.1 Zoning and land-use permissibility

Insight 16. RU1 primary production zoning dominates the Riverina transect, highlighting the significance of the agriculture in the region. However, RU1 zone boundaries are a source of controversy, with criticism of the 'one-size-fits-all' logic of RU1 at a time when parts of the transect are being affected by rural land use diversification including rural residential, solar energy uses, and rural manufacturing.

The vast majority of the Riverina transect is designated RU1 Primary Production Zone (Figure 23), wherein under the standard instrument extensive agriculture is permitted without consent. Notably, open cut mining and extractive industries are also permissible with consent. The dominance of RU1 is consistent with most land use in the transect, but its perimeters can cause dispute. In many regional towns across the transect a lack of transitional zoning between urban areas and RU1 has limited town expansion, creating challenges in managing development for local councils and pressures to develop RU1 zoned land for housing. Reflecting the environmental significance of riparian areas within the Murray Darling Basin, extensive national park zoned wetland systems are present at several points throughout the transect adjacent to agricultural land and are represented in white in Figure 23.

Figure 23 - Planning zones in the Riverina transect



The NSW standard LEP includes a list of standard objectives for all RU1 Primary Production zones:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To encourage diversity in primary industry enterprises and systems appropriate for the area.
- To minimise the fragmentation and alienation of resource lands.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

However, councils can and often do add additional objectives to reflect the local character of the zone, as outlined in Table 16.[16] In the central south of the transect, existing LEP specific objectives in the adjacent LGAs of Murray River and Edward River seek to enable the development of non-agricultural land uses compatible with the character of RU1 zoned areas. These two LGAs also aim to support the development of processing and servicing industries related to agricultural production. Edward River and Berrigan LGAs aim to promote land uses and accommodation for tourism associated with primary production. In the west, Wentworth LGA aims to enable the development of intensive agricultural plant activities, and to protect existing dryland and irrigation-based agricultural land uses. Federation, Murrumbidgee, Murray River and Hay LGA's do not specify any additional RU1 objectives.

The diversity of objectives across LGAs demonstrates that council priorities vary along the transect. Tourism-related uses and visitor accommodation are more prominent in the eastern and southern LGAs, closer to the Murray River, while the protection of extensive agriculture, the minimisation of conflict between agriculture and environmental protection, and the housing of workers is key in LGAs to the west and north of the transect.

Table 16 - List of LEP specific objectives for RU1 Primary production zone

Local Environmental Plan (LEP)	LEP specific objectives for the RU1 zone (additional to those in prescribed by the standard instrument LEP)
Federation: *Corowa Local Environmental Plan 2012*	• None
Urana Local Environmental Plan 2011	• None
Berrigan: *Berrigan Local Environmental Plan 2013*	• To permit development that enhances the agricultural and horticultural production potential of land in the locality. • To permit low-key tourist and visitor accommodation that is compatible with the scenic amenity, and promotes the character, of the area. • To enable function centres to be developed in conjunction with agricultural uses
Murray River: *Murray Local Environmental Plan 2011*	• None
Wakool Local Environmental Plan 2013	• To promote the use of agricultural land for efficient and effective agricultural production without the encroachment of urban land uses. • To allow the development of processing, service and value-adding industries related to agriculture and primary industry production. • To allow the development of complementary non-agricultural land uses that are compatible with the character of the zone

[16] Note that following LGA amalgamations in Federation, Murray, Murrumbidgee and Edward River, at the time of writing many of these Local Environmental Plans are in the process of being revised and consolidated.

Murrumbidgee: *Murrumbidgee Local Environmental Plan 2013*	• None
Jerilderie Local Environmental Plan 2011	• None
Edward River: *Conargo Local Environmental Plan 2013*	• To allow for the development of processing and service industries relating to primary production. • To encourage tourist and visitor accommodation that does not have an adverse impact on agricultural activities. • To allow for the development of non-agricultural land uses that are compatible with the character of the zone. • To permit small-scale rural tourism uses associated with primary production and environmental conservation that have minimal impact on primary production and the scenic amenity of the area. • To provide opportunities for employment-generating development that adds value to local agricultural production and integrates with tourism
Deniliquin Local Environmental Plan 2013	• To allow the development of non-agricultural land uses that are compatible with the character of the zone.
Deniliquin Local Environmental Plan 1997	• NA
Hay: *Hay Local Environmental Plan 2011*	• None
Balranald: *Balranald Local Environmental Plan 2010*	• To encourage development that is in accordance with sound management and land capability practices, and that takes into account the environmental sensitivity and biodiversity of the locality. • To support rural communities. • To ensure the provision of accommodation for itinerant workers.
Wentworth: *Wentworth Local Environmental Plan 2011*	• To ensure the protection of both mixed dryland and irrigation agricultural land uses that together form the distinctive rural character of Wentworth. • To ensure land is available for intensive plant agricultural activities. • To encourage diversity and promote employment opportunities related to primary industry enterprises, including those that require smaller holdings or are more intensive in nature.

The differences between councils led one participant to comment that there is a perception that RU1 zoning is 'everything to everyone'. Although the zone is used consistently across the transect, permissibility varies greatly and the pressures for land use changes in certain areas have meant that the intent of RU1 (primary production zone) is sometimes challenged. This same participant described instances where land zoned as RU1 was no longer being used for primary production and had instead become residential, causing increasing land use conflict issues (discussed further in Section 5.3 of this report).

Several councils also expressed a desire to change current zoning in line with changing planning priorities for particular areas. For example, Hay and Berrigan councils expressed a desire to change zoning around major towns to RU4 (primary production small lots) to allow town expansion, and to promote rural residential and hobby style farms. In Wentworth, a number of factors including poor 'black soil' quality, small parcel size and existing infrastructure have led to historical irrigation areas no longer being used for

primary production. These areas are still zoned RU1, however participants believed that this zoning was outdated and that this area should instead be made available to rural amenity migrants. Balancing growth objectives with protection of agricultural land was therefore an important issue for many LGA's across the transect, and forms a key part of the discussion in this section.

5.2 Minimum lot sizes

Insight 17. With the notable exception of Balranald, Minimum Lot Size (MLS) rules loosely follow an east-west gradient, with smaller MLSs in the irrigation areas of the southeast and larger MLSs in the north-west. However, there is also significant intra and inter-LGA variability unrelated to biophysical land characteristics. Stakeholders expressed a range of opinions on the suitability of MLSs in relation to planning pressures in their region. Overall, consolidation (merging parcels) played a larger role than sub-division (breaking up existing parcels) across the transect, leading to a net reduction in the number of rural parcels between 2004-20.

Minimum Lot Sizes vary considerably across the Riverina transect. Some are the result of historic minimum lot size rules that were translated into the standard instrument LEP, with no changes. Others have been adjusted in consideration of farm size requirements, biophysical land characteristics and thresholds perceived to prevent fragmentation of agricultural land. As experienced in other transects within this project, across LGA's differing opinions were held on the 'right size' MLS, and were related to the particular planning priorities of participants and planning pressures in communities. Stakeholder opinions also varied significantly on the effectiveness of MLS in protecting rural land in their regions whilst allowing town growth. Issues which were raised included the impact of historical MLSs unsuited to modern farming methods and sizes, the inherent difficulty of changing existing MLSs, and pressures to reduce MLSs to allow development.

In theory, the "optimal" MLS is one which is consistent with managing land use pressures so that land uses remain consistent with zoning. In the case of RU1-zoned land, MLSs are ideally at a level which discourages agricultural landscapes from losing their integrity from rural residential expansion. How to manage this aspiration was a point of debate and contention in all the LGAs visited in the transect. Participants in Berrigan believed that their MLS of 120ha was ideal because it allowed a diversity of irrigated land uses and farm expansion whilst being big enough to deter interest in conversion of the land-use to non-agricultural uses such as rural residential. The success of MLS in protecting rural land in Berrigan has meant that although the region is experiencing significant demand for housing and growth pressure on towns adjacent to the Murray River, growth is able to be managed through more deliberate planning decisions. Directly adjacent to the east of Berrigan, participants in Federation Shire reported different experiences. Federation LGA includes MLSs of 100ha in the north, and 250ha in the south, again the result of historical council amalgamations. Participants here stated that the large MLSs around villages were too restrictive of town development, and some suggested the introduction of a 'transitional zone' for smaller lifestyle farms around the outskirts of town. Housing demand and development pressure will be further discussed in the following section.

Across the transect, participants were generally satisfied with the function of MLSs on rural land not directly adjacent to towns. Participants in Hay indicated that there was no desire to make changes to MLSs in the drafting of a new LEP which was underway at the time of fieldwork. In Edward River, a split between an MLS of 40ha in the southern half of the LGA and 200ha in the northern part of the LGA was considered to be appropriate for the local agricultural profile. The split here is the result of the historical amalgamation of the former Conargo and Deniliquin Shires.

Overall, MLS rules have provided a barrier to rural subdivision in the transect, but as would be expected, there is diversity of opinion on whether the restrictions have best met social and economic objectives. As shown in Table 17, at the start of the study period the area covered by the eight transect LGAs contained

37,827 unique land parcels (noting the exclusions described in **Appendix A**). At the endpoint of the study, in January 2020, this area was covered by 37,515 unique parcels, indicating a small net consolidation in the number of parcels of 0.83%. This indicates that any increases in the number of parcels caused by subdivisions were outweighed by the merging of parcels by landowners. As with other transects explored, it also shows that the overwhelming number of ownership changes occurred within the confines of pre-existing parcel boundaries.

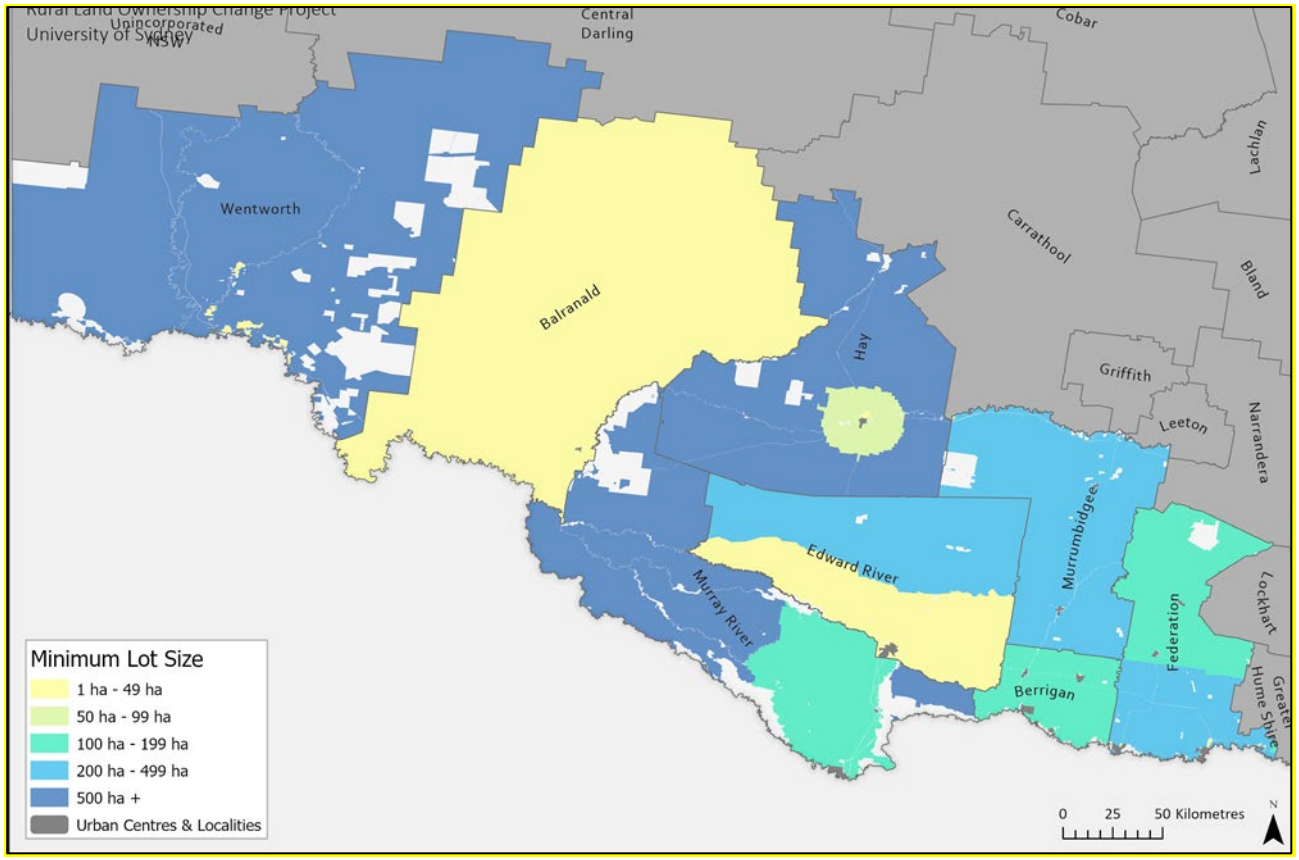
Table 17 - Number of parcels in the transect, 2004-20

LGA	Number of parcels (Jan 2004)	Number of parcels (Jan 2020)	Percentage change (2004-2020)
Federation	6,571	6,467	-1.61%
Berrigan	1,974	2,016	2.08%
Murray River	7,942	7,725	-2.81%
Murrumbidgee	4,334	4,211	-2.92%
Edward River	7,512	7,441	-0.95%
Hay	4,325	4,251	-1.74%
Balranald	2,063	2,099	1.72%
Wentworth	3,106	3,305	6.02%
Riverina Transect (total)	37,827	37,515	-0.83%

In contrast to the report on the Hunter transect produced by this project, which found that similar MLSs blanket land areas with very different agricultural prospects (as measured through soil quality, pasture availability etc.), in the Riverina transect there are sometimes significant differences between MLSs which cover similar land types. For example, as shown in Figure 24, there are multiple areas within the transect where a minimum 40ha MLS is positioned directly adjacent to MLS of 500ha or more. This is most starkly evident in the difference between Balranald (40ha) and Wentworth (10,000ha), which participants noted was the legacy of historical planning instruments rather than reflecting current planning decisions. These two areas are mostly dryland grazing, which participants reported as requiring land parcels around 30,000ha to remain viable.

The discrepancies between MLS for areas of similar land use, described above, disrupt a more logical south-east to north-west transition, wherein irrigation dominated areas in the south-east generally have a smaller MLS than those in the north-west of the transect. The transition is not unexpected, as irrigated cropping and horticulture require smaller parcels of land than the dryland grazing which comprises the majority of non-irrigated areas in the north-west of the transect. Larger variations in MLS are also present within LGA's where land use is mixed. For example, in Wentworth, participants described the region as divided into the 'settlement' areas, which are historical irrigation areas next to the Darling and Murray Rivers, and the broader dryland grazing areas which comprise most of the LGA. The historical settlement areas are subject to MLSs of 10ha, which participants noted were based on historical understandings of viable irrigation farm size. The vast majority of RU1 zoning in the LGA is 10,000ha which participants believed was too large, preferring a smaller 1000ha.

Figure 24 - Minimum Lot Sizes in the Riverina transect



A consistent theme across LGAs was that changing agricultural practices across both irrigated and non-irrigated farms have led to increasing farm sizes which better capitalise on economies of scale. One participant commented that because of this increase, MLSs were sometimes based around outdated understandings of what the minimum viable size for a productive farm should be. Along these lines, Berrigan participants argued that the skills and knowledge of individual growers are also an important factor in determining farm viability, which are not considered in planning processes. This demonstrates the complexity of pressures and drivers beyond MLS in shaping rural land fragmentation, or lack thereof. As a further example of this, participants in Balranald noted that the MLS of 40ha did not lead to excessive subdivision because although 40ha is far smaller than the average dryland grazing farm size of the region, the LGA was experiencing no significant population growth pressure.

Stakeholders also expressed concerns that once in place, MLSs are hard to change. In an attempt to create consistency across the LGA, Murray River Council sought an independent assessment of ideal MLS size which was recommended to be 500ha. As seen in Figure X, current MLSs are 500ha in the north west of the LGA and 120ha in the south east, meaning that a significant size adjustment would be required in the south east of the LGA reducing the ability for land to be subdivided and dwellings constructed. The magnitude of the required change was determined to be politically unviable and hence was not explored further. Reconciling the significant differences in MLS across the transect is thus a challenging prospect and unlikely to occur in the near future.

5.3 Dwelling entitlements and subdivision

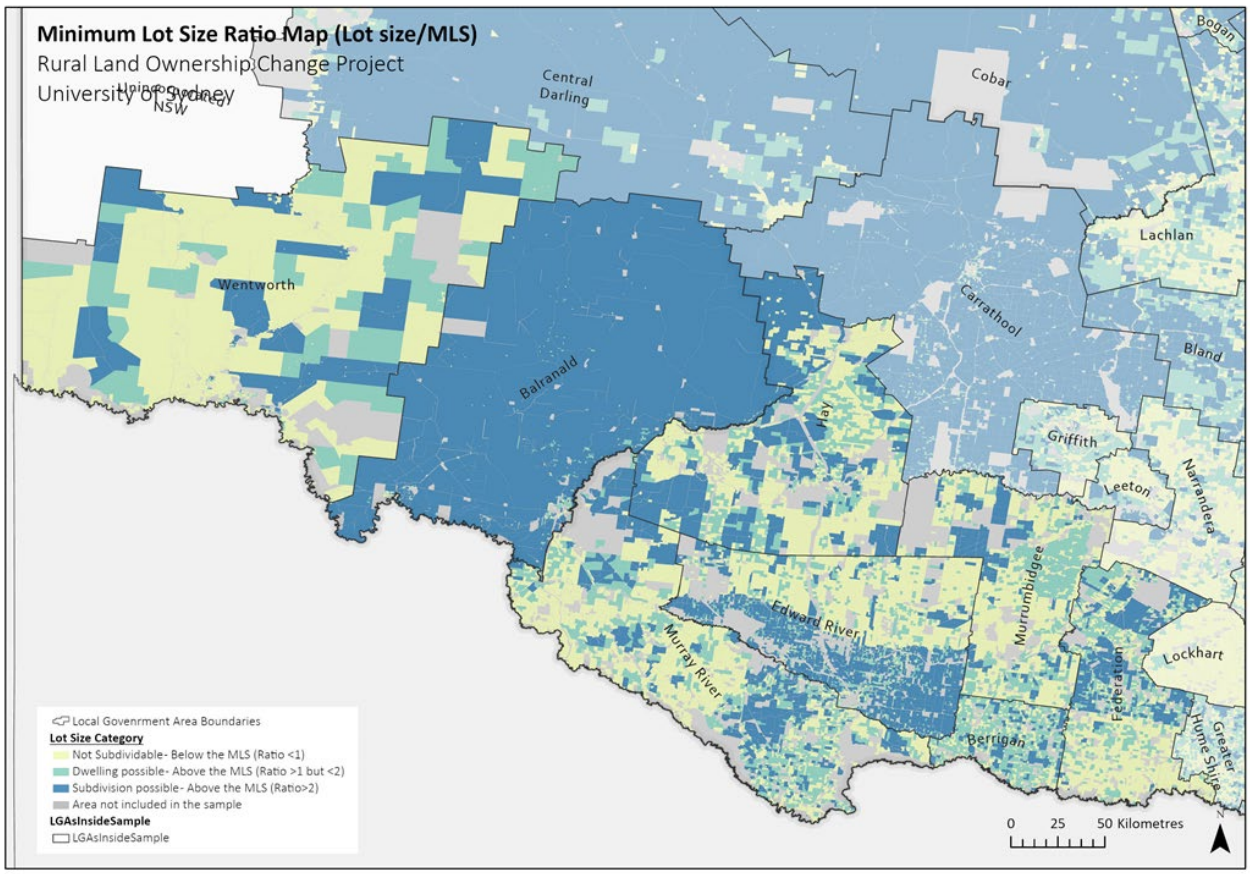
Insight 18. Rural subdivision is permissible across a substantial area of the Riverina transect, most notably in Balranald and the southern half of Edward River LGAs. However, demand for subdividable properties is weak in these areas, so this potential remans minimally realised.

The capacity for future subdivision and potential house construction (subject to dwelling entitlements) in an LGA is equivalent to the number of parcels that are at least double the MLS. As shown in Table 18, parcel sizes vary significantly across the transect, with LGAs in the north-west having larger average sizes than LGAs in the south-east. However, this does not necessarily reflect subdivision or dwelling potential, as other matters are necessary to establish this. A ratio of minimum lot size rules to lot sizes can be established to determine patterns of lot size across the transect, as shown in Figure 25. This figure shows that Balranald and the southern half of Edward River Shire have the highest subdivision potential based on MLS rules. This is because of the small MLS and relatively large parcel sizes in these parts of the transect. However, according to stakeholders, these two areas are not experiencing high levels of development pressure, so this high subdivision permissibility is not manifested in the fragmentation of rural land. In Balranald, most parcels in the LGA can be subdivided on-paper but the pressures to do so for purposes other than primary production are very low. Balranald is dominated by dryland grazing, and participants explained that to remain economically viable farm size must be around 30,000ha. Current low housing demand and the need to maintain large farm sizes has meant that subdivision is not considered to be economically worthwhile by focus group participants.

Table 18 - Summary of parcel sizes, Riverina transect

LGA	Average parcel size (Jan 2020)	Largest parcel (Jan 2020)	Difference in the No. of parcels 2004-20
Federation	82 ha	52,766 ha	-104
Berrigan	90 ha	12,186 ha	42
Murray River	130 ha	42,999 ha	-217
Murrumbidgee	125 ha	232,263 ha	-123
Edward River	100 ha	30,838 ha	-71
Hay	236 ha	110,653 ha	-74
Balranald	1,090 ha	437,976 ha	36
Wentworth	828 ha	489,748 ha	199
Riverina Transect (total)	235 ha	489,748 ha	-312

Figure 25 - Potential for rural subdivision in Riverina transect



The Flexible Minimum Lot Size Clause in the Standard Instrument

Notable differences were present in the way that councils were implementing LEP clauses permitting the subdivision of land below the MLS. Section 4.2 is a mandatory clause in the Standard Instrument which allows subdivision below MLS if for agriculture, and provided that no new dwellings will be constructed on the subdivided land. Whilst this is designed to provide flexibility for councils and applicants, the research team heard that the clause is being implemented differently across councils in the region. In some LGAs it is being used more often, creating issues for council in the monitoring of covenants that prevent the construction of a dwelling following subdivision under this clause. In other areas, councils are using it and reported no issues with its application. In other areas again, councils reported that they try to advise applicants to use other methods, such as boundary adjustments, as they are concerned that it may be used for problematic subdivision. Discretionary application of clause 4.2 is thus a potential cause of differences between the protection and fragmentation of rural land occurring across the Riverina transect.

5.4 Land use conflicts

Insight 19. Concern around land use conflict is growing in LGAs which are experiencing development pressure. Demand for lifestyle blocks/hobby farms is reportedly on the rise in some transect LGAs. Land use conflicts are arising where new entrants are unprepared for the impacts on neighbouring properties (for example noises, odours etc.) generated by large agricultural enterprises, and in turn are not aware of biosecurity practices (such as weed and feral animal control) which may impact farming.

A key issue for councils is managing demand for residential and rural residential growth whilst maintaining the right to farm and avoiding land use conflict situations. Many rural towns in the Riverina transect reported that they are under pressure to provide housing development opportunities and rural-residential land nearby. This complicates the picture presented in Section 3, wherein ABS data showed that in general populations in the transect LGAs are declining in rural areas and increasing in urban areas. Steadily increasing rural-amenity migration, which anecdotally has been further fuelled by the Covid-19 pandemic in the years following the study period, is driving both increasing house prices in rural towns and demand for small lifestyle or 'hobby farm' blocks. Zoning, infrastructure, community services and the potential for land-use conflicts provide barriers to this. Simultaneously, some small towns in the transect area are experiencing rural decline.

Managing growth was a primary focus for most LGAs, again with the notable exceptions of Balranald and Edward River which were not experiencing significant growth pressure and which were open to subdivision because of smaller MLSs. Multiple council participants from LGAs along the Murray River expressed a desire for increased housing and more 'hobby farms' or rural residential areas adjacent to established towns. In Berrigan LGA for example, multiple towns are surrounded by RU1 (primary production) zoning which borders village (R5) zones directly. Here, council participants described a need for a rural residential 'transitional' zone between these zones, arguing that there is currently a 'missing middle'. Participants suggested that these could be RU4 (primary production small lots), and noted that careful planning was required to understand how these areas could support growth and how land uses may interact. These stakeholders highlighted that town growth was not necessarily incompatible with agriculture, and that for some industries small town growth was actually required. They also voiced frustration with the current State Significant Agricultural Land mapping process being undertaken by DPI, noting that the productive potential of agricultural land was more dependent upon the knowledge and skills of individual landowners than biophysical characteristics.

The connectivity of areas is influencing the trends in growth and changes in agricultural industries. Those LGAs with high connectivity to regional centres (i.e. Mildura, Shepparton) and to major cities (in particular Melbourne) reported experiencing more amenity migration pressure. North-south connectivity was generally considered to be more important for participants than east-west, and this was amplified in border towns on the Murray River. For example, a participant from the Murray River LGA described the rise of people wishing to reside on a lifestyle block or hobby farm several days of the week, and commute to Melbourne several other days a week for work.

Several participants described the growth of hobby farms in the Edward River and Murray River LGAs as increasingly causing issues of land use conflict. These farms, which are generally too small to run a viable farming enterprise, were described as often being owned by people who do not have experience with farming. Problems can arise where new residents lack an understanding of the ways in which plants and animals may interact across property boundaries – for example, one participant described a situation where lifestyle farm neighbours did not control domestic pet dogs on their property, which meant that the adjacent

farm could not run sheep. A lack of weed and feral animal control on lifestyle blocks was also described as causing problems for neighbouring primary production land, alongside complaints about odours and intensive farming. Participants stated that these kinds of conflict were an ongoing issue in the transect area.

Differing perspectives were canvassed on the pressures of migration to high-amenity areas along the Murray and other significant rivers in the transect including the Darling, Edward and Murrumbidgee. Some councils reported that riverfront development was not an issue due to successful planning controls (including the *Murray Regional Environmental Plan no. 2* along the Murray River, now incorporated with the State Environmental Planning Policy (Biodiversity and Conservation) 2021), flood vulnerability and the difficulty of connecting to residential infrastructure. However, one participant commented that increasing demand for lifestyle riverfront blocks was causing land use conflicts along the Murray River. In particular, this participant described the land-use conflict which emerged between lifestyle properties and growers around the operation, maintenance and upgrading of irrigation pumps by growers along the river. In Wentworth too, stakeholders described a significant rise in interest in the purchase of small-scale lifestyle blocks along the Darling and Murray Rivers. These were no longer being used for irrigated agriculture, and offered significant amenity value for rural lifestylers moving from urban centres. Further research into the particular development pressures on rural riparian land is needed to unpack the place-specific aspects of these trends.

South West Renewable Energy Zone

The South West Renewal Energy Zone was a key issue raised by many stakeholders in the context of potential rural land conflict. The NSW Government is in the process of planning five Renewable Energy Zones (REZs) to help facilitate a transition towards renewable energy. The South West REZ will extend through the majority of transect LGAs, from Murrumbidgee LGA in the east across to Wentworth LGA in the west. TransGrid (electricity transmission operator in NSW) will construct an energy transmission line known as an 'interconnecter' through the middle of the REZ, which will support the development of regional renewable energy generation through enhancing the energy transmission capacity of infrastructure. In response to concerns that energy developments would be undertaken on valuable agricultural land, the boundaries of the REZ were adjusted to avoid encroachment on irrigated areas. However, ongoing potential exists for land use conflict between the protection of productive agricultural land and the spatial requirements of renewable energy generation.

Reports from councils on the impact of these zones locally were mixed. In Hay, one participant reported that farmers stood to make up to $250,000 per wind turbine located on their property and believed that renewable energy represented an important form of non-agricultural income diversification for landholders. The majority of the Hay LGA falls within the south west REZ, and this council had received a significant number of development proposals firstly in solar developments and then wind. Other participants in Hay noted that transmission capacity limit of the new interconnector was already reached with current proposals, and strongly believed that this would limit future development. Though the relationship between renewable energy development and land prices is not established, these developments represent an important land-use change underway which is attracting significant interest. Because the development of wind and solar farms may involve leasing arrangements alongside land purchases, the production of renewable energy further represents a land use change which is not always accompanied by land ownership change.

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Appendix A: Methodology

The findings in this report are based on spatial analysis and a series of interviews and focus groups undertaken in the region by the research team.

The spatial database

Spatial analysis was undertaken by creating a spatial database that contains land parcel ownership information on an annual basis each year from 2004 to 2020. Land titles and cadastral data was provided to the research team through an agreement with NSW Land Registry Services (LRS). We augmented these data with linked datasets on land-use sourced from the NSW Department of Planning, Industry and Environment (DPIE) and drought data provided by the Department of Primary Industries (DPI). The spatial database covers 91% of rural NSW (639, 975 km^2). Full details of the state-wide scope of the spatial database are available in Pritchard et al. (2021). Each parcel of land in the study area includes the following information for each year of the study period:

- **Land parcel details:** including area (sqm), Cadastre ID (CADID), LGA and region where it is located
- **Ownership information:** including owner category, names of owners
- **Seller information:** including seller category and names of sellers (for parcels changing hands in the relevant year
- **Subdivision and amalgamation data:** whether the parcel was subdivided or combined with other parcels in the calendar year
- **Land use information:** the total area of the different land uses that apply to the parcel of land and the proportion of the lot that is dedicated to agriculture, developed by the overlay of Australian Land Use & Management (ALUM) onto our land parcel spatial dataset.
- **Other information:** whether the lot changed hands in the calendar year and the proportion of similarity between the owners and the seller.

The database excludes Urban Centres and Localities (UCLs), Metropolitan LGAs, national parks and parcels under 200sqm. This is because residential and industrial land in urban centres and rural towns follow different ownership change patterns and respond to different pressures. The same can be said of environmental protection areas. In rural areas parcels of land under 200sqm are too small to be viable farming land, and are likely to be road easements, drainage land or land dedicate to other infrastructure or services. These exclusions ensure that 'data noise' created by these specific land-uses was excluded from the analysis.

Furthermore, land titling has inherent legal and administrative complexities, including business registration rules, co-ownership of land between private owners and public agencies, land covenants and name changes. Consequently, the creation of a research-ready database required the development of sophisticated methodologies to facilitate the extraction, cleaning and interpretation of the data. Hence, this project's research-ready database is an innovative source of evidence on the NSW landownership change patterns over the past two decades.

Identifying substantive change

Since the data used for this report relies on land-titles registration names, there are inevitable formatting inconsistencies in the data associated with name changes which are not a result of a transaction. These are not as simple to identify and clean due to the scale of the dataset, and the possibility remains for certain administrative inconsistencies being picked up as 'ownership changes.'

For example, the correction of a spelling error for the same parcel of land across datasets could be classified as an 'event' because it involves a change in the owners' record name (e.g. a land parcel held by 'Jonathon Smith' one year and 'Johnathon Smith' the next may refer either to a spelling correction for the same person, or an actual transfer of ownership between two people with remarkably similar names).

The same issue occurs when the owner has the same name but a different surname across multiple years, which may represent a name change (for example due to a marriage) or it may represent a sale between two different people who share a given name. Some of these may be naming and spelling corrections, however the possibility remains that these are legitimate transactions between individuals with similar names or transactions between family members. In other situations, a parcel of land may be owned by (say) five individual owners, and one of these is removed from the title and an additional owner added. Classifying examples like these as transactions requires making a judgment of the extent under which a name is similar enough to be classified as being the same owner. The research team sought to clean the data as far as possible, but the possibility remains for certain data anomalies being picked up as transactions.

The method used by the research team to minimise the false identification of these formatting inconsistences as changes in ownership was based on identifying the extent of similarities between the seller and owner fields in the database. The *Fuzzy Lookup* ad-in for Microsoft Excel was used to determine the similarity between 'strings of text' in the owner and seller fields of the database. This tool provides a similarity score based on the percentage of the text string which matches. The following thresholds were defined based on the percentage similarity between the owner and seller fields for each parcel of land on each year:

- **0-20% similarity:** this level of similarity is considered a definite ownership change with little or null possibility for typographical or formatting errors to be present.
- **20-70% similarity:** this level of similarity is considered to be an ownership change; however, it includes instances in which there are partial ownership changes, including:
    - One or multiple owners being replaced in a multi-owner arrangement
    - Potential family transactions, where the owner and seller share a surname
    - Name changes (for example due to marriage)
    - Typographical and formatting errors are also possible, including different spellings for the same surname or given name, and different use of acronyms and special characters.
- **70-100% similarity:** when the similarity is above 70% it is considered not to be a legitimate ownership change, but a typographical or formatting issue associated with the same owner.

For the purposes of the analysis presented in this report, only substantial changes (where similarity between owner and seller is below 70%) are considered to be a 'change of ownership' as they indicate a significant change to the name on the land title.

<u>In-depth interviews and focus groups</u>

Once data was prepared, a series of interviews and focus groups were scheduled with stakeholders in the region to elicit local perspectives on patterns of rural land ownership change. Stakeholders included local and state government staff, real estate agents, landholders and primary producers. Adding this research component to our analysis of the spatial database allowed a nuanced and locally grounded understanding of the factors shaping patterns of ownership change in the Hunter transect.

In-depth interviews and focus groups were undertaken in March 2022. Each focus group session was 1.5 hours long and was attended by 4-10 stakeholders. Stakeholders included business and farm representatives, council and state government officers and real estate agents. Each session included a presentation by the research team on the quantitative findings followed by an in-depth discussion about issues and factors surrounding patterns of ownership change. The discussion was guided by questions prepared by the research team and submitted to the participants in advance. Indicative focus group questions are included in **Appendix D**. In some cases, stakeholders were not available to participate in focus groups, and so individual, in-depth interviews were arranged.

Appendix B: LGA data

1. Federation

Figure 26 Federation Land Use Map

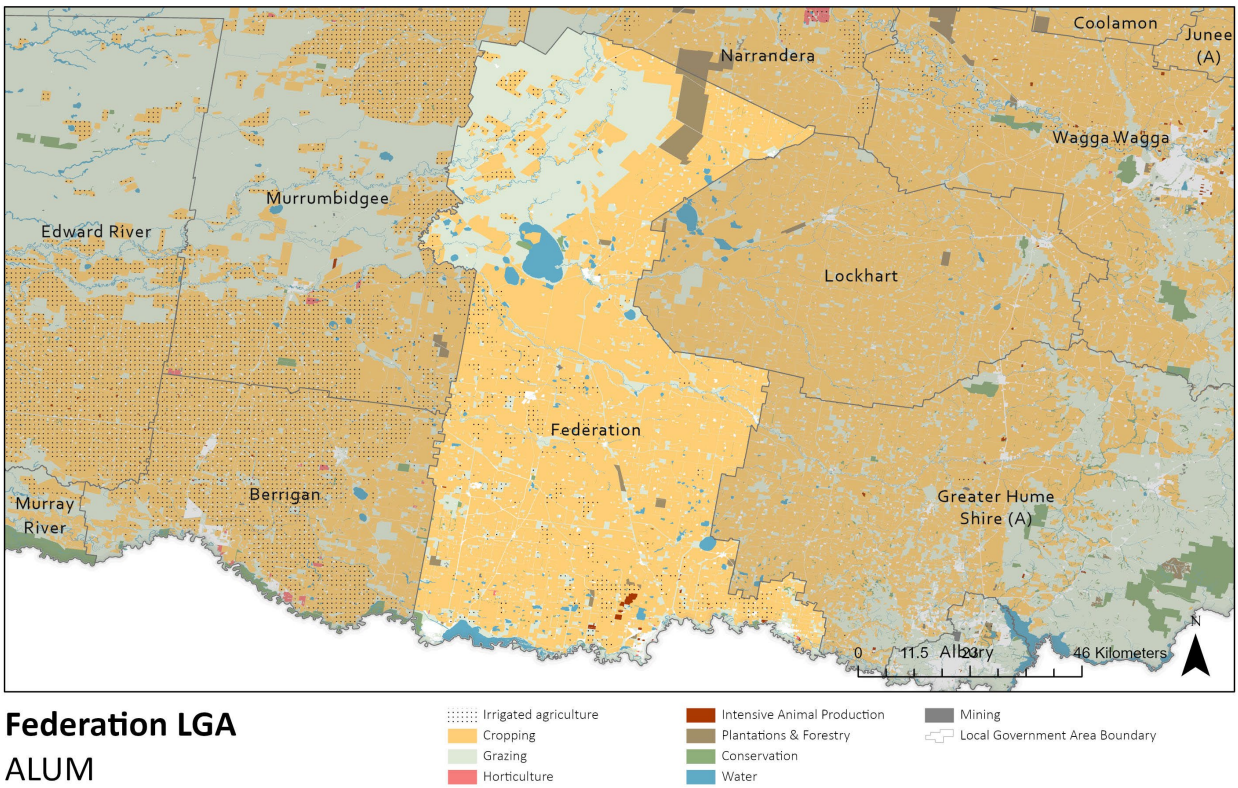

Table 19 Federation Land Use Overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	22.8%	2.0%
Cropping	76.2%	9.3%
Horticulture	~0.0%	-

Figure 27 Largest 50 landholders in Federation

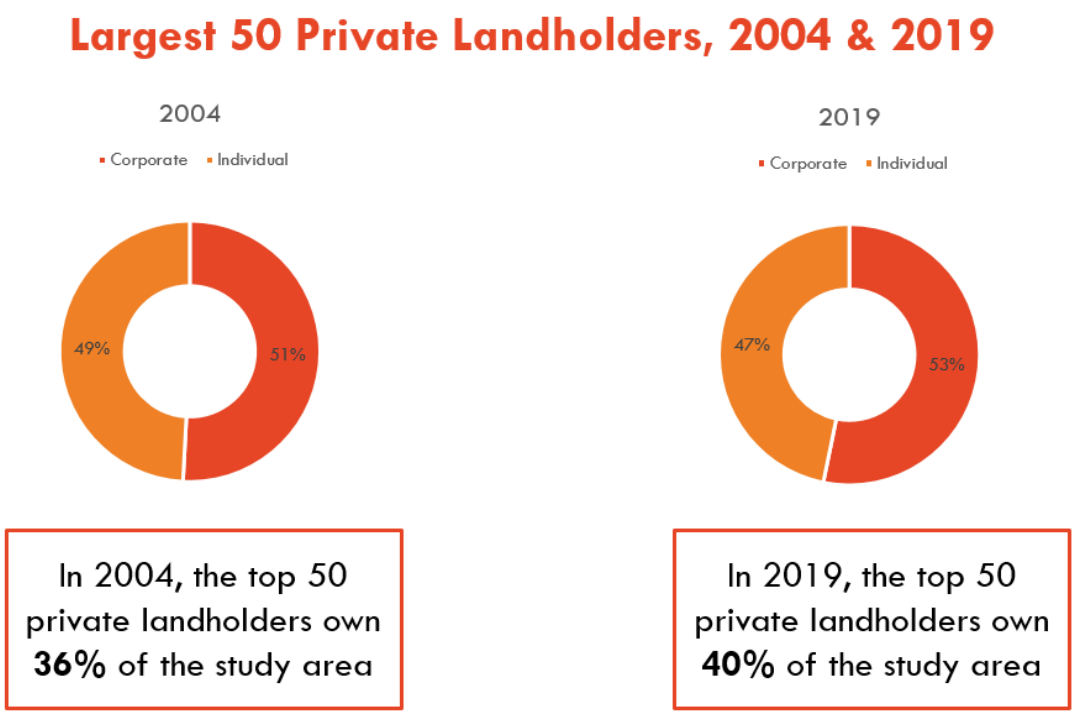

Table 20 Profile of top 15 largest private landholders in Federation

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	17,961	Company	#2	17,459	3%
2	16,637	Company	#1	19,685	-18%
3	15,767	Company	-	-	NEW
4	13,161	Individual	#4	10,554	20%
5	8,475	Company	#3	12,022	-42%
6	8,361	Company	#5	8,355	0%
7	8,343	Individual	#6	7,102	15%
8	6,834	Individual	#36	1,464	79%
9	4,368	Company	#19	2,077	52%
10	3,365	Individual	#8	3,365	0%
11	2,844	Company	#18	2,079	27%
12	2,742	Company	-	-	NEW
13	2,587	Company	-	-	Family transaction
14	2,545	Individual	-	-	Family transaction
15	2,508	Company	-	-	NEW

2. Berrigan

Figure 28 Berrigan land use map

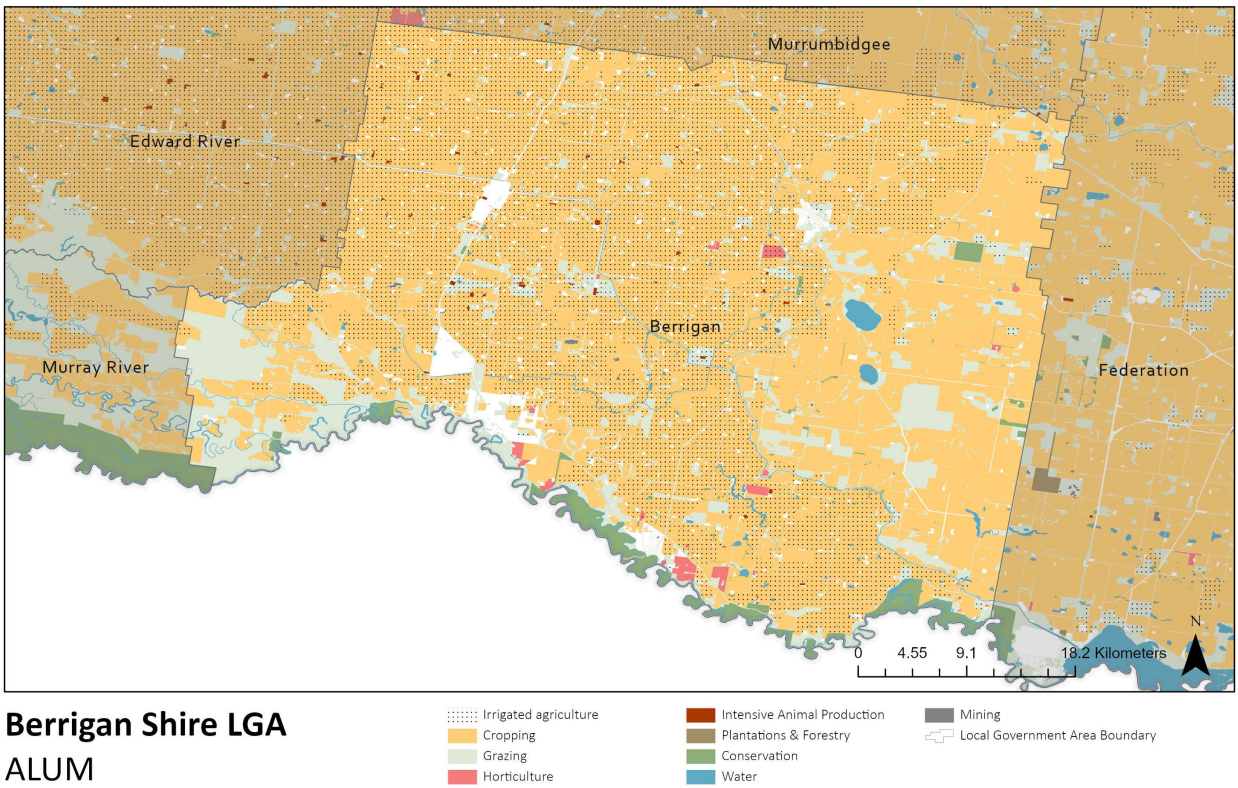

Table 21 Berrigan land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	8.7%	8.4%
Cropping	90.0%	64.5%
Horticulture	0.5%	95.3%

Figure 29 Largest 50 landholders in Berrigan

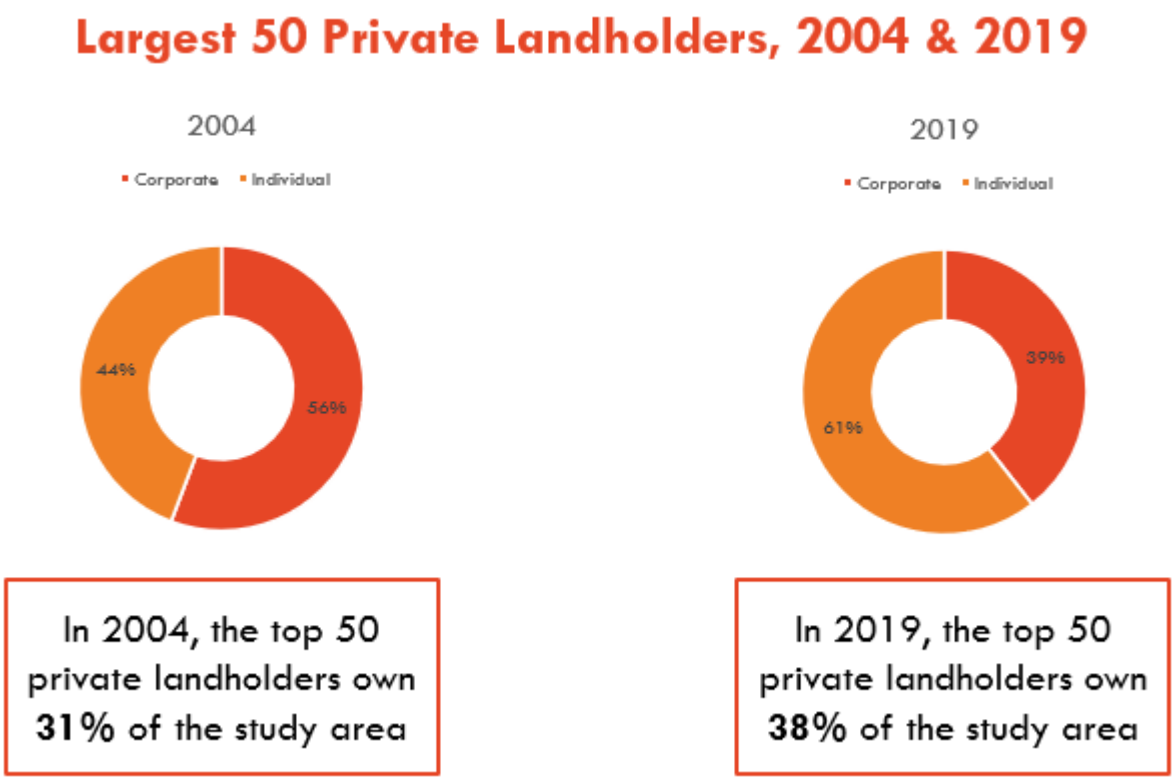

Table 22 Profile of top 15 largest private landholders in Berrigan

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	3,470	Individual	#22	880	75%
2	3,309	Company	#162	310	91%
3	3,068	Individual	#6	2,021	34%
4	3,053	Individual	-	-	NEW
5	2,986	Individual	-	-	NEW
6	2,652	Company	#3	2,634	1%
7	1,862	Company	#18	923	50%
8	1,817	Company	#7	1,816	0%
9	1,798	Individual	-	-	NEW
10	1,690	Individual	#53	576	66%
11	1,670	Company	#8	1,661	1%
12	1,559	Company	-	-	NEW
13	1,467	Individual	-	-	NEW
14	1,412	Company	#11	1,357	4%
15	1,367	Individual	#97	430	69%

3. Murray River

Figure 30 Murray River land use map

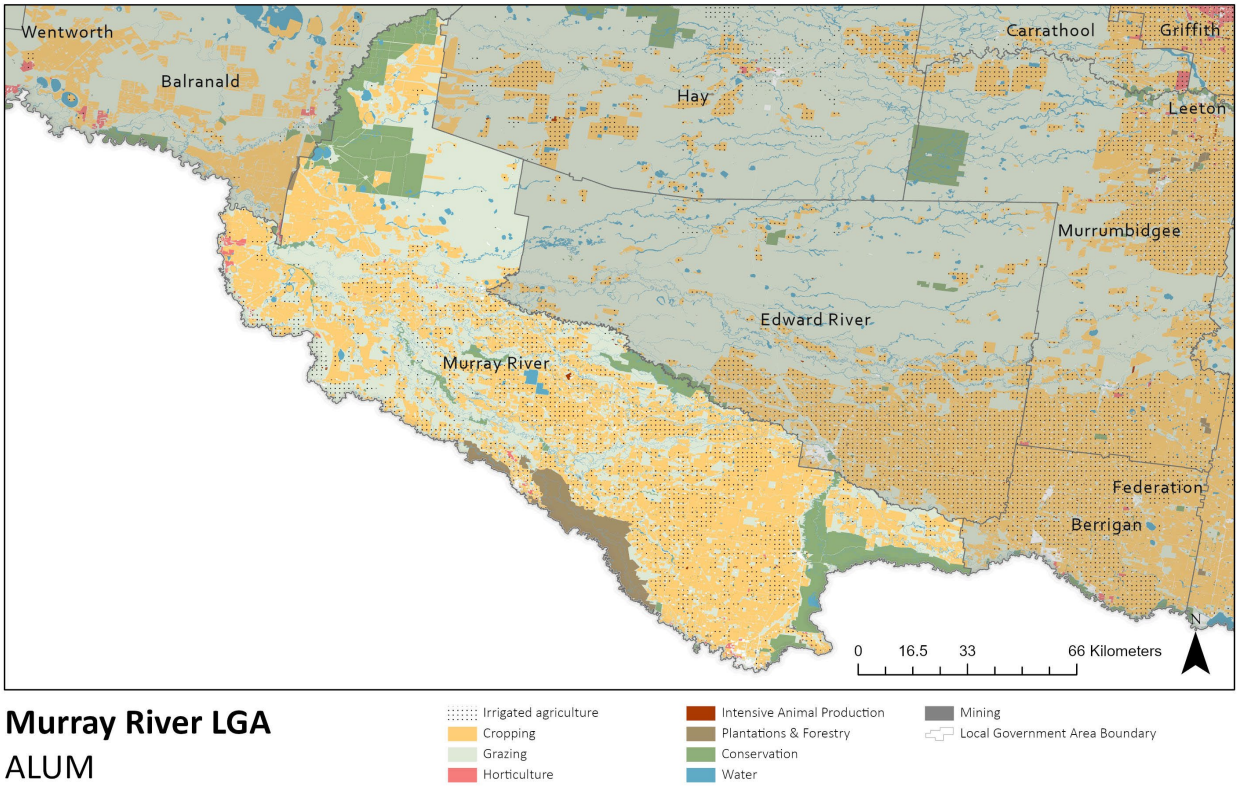

Table 23 Murray River land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	39.2%	6.5%
Cropping	58.1%	37.3%
Horticulture	0.3%	74.5%

Figure 31 Largest 50 landholders in Murray River

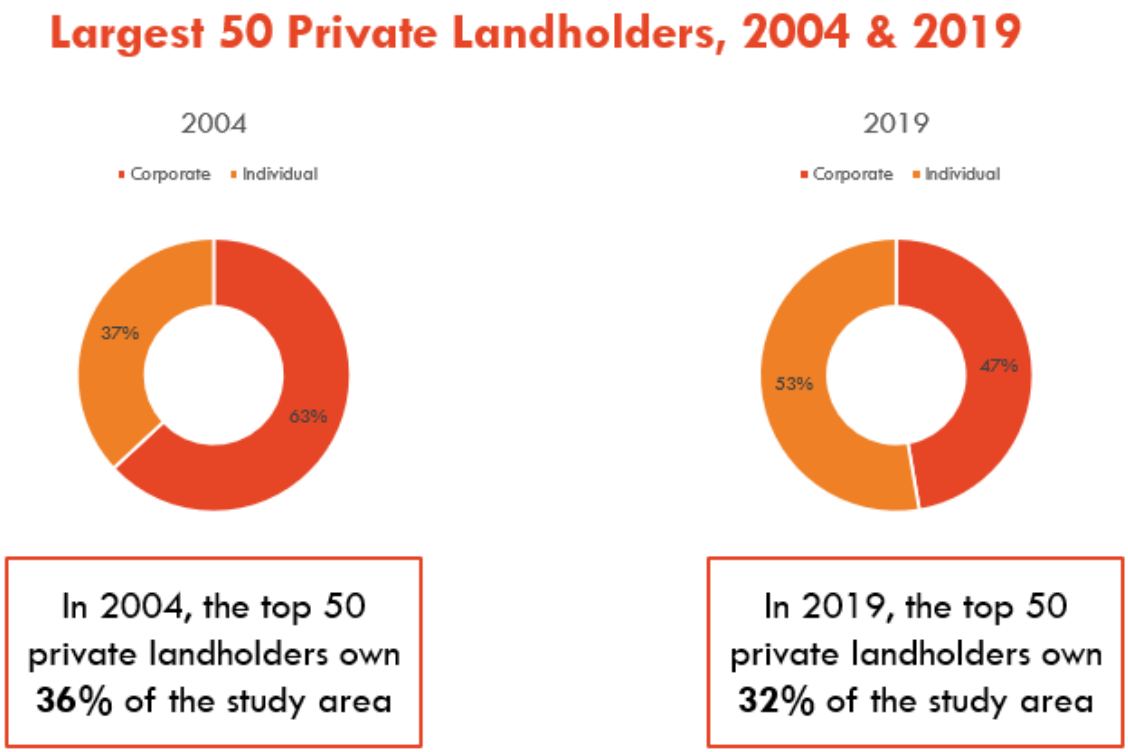

Table 24 Profile of top 15 largest private landholders in Murray River

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	38,412	Individual	#14	4,698	88%
2	18,377	Company	#3	17,304	6%
3	14,862	Company	#4	14,862	0%
4	14,611	Individual	#55	2,457	83%
5	13,912	Company	#5	13,910	0%
6	10,062	Company	-	-	NEW
7	8,427	Company	#9	8,488	Subsidiary company of #5
8	8,230	Individual	#867	214	Family transfer
9	6,778	Individual	-	-	Family transfer
10	6,713	Company	#7	10,952	-63%
11	6,333	Company	-	-	NEW
12	6,101	Individual	#36	3,159	48%
13	5,585	Company	#12	5,585	0%
14	4,673	Individual	-	-	Family transfer
15	4,639	Individual	-	-	NEW

4. Murrumbidgee

Figure 32 Murrumbidgee land use map

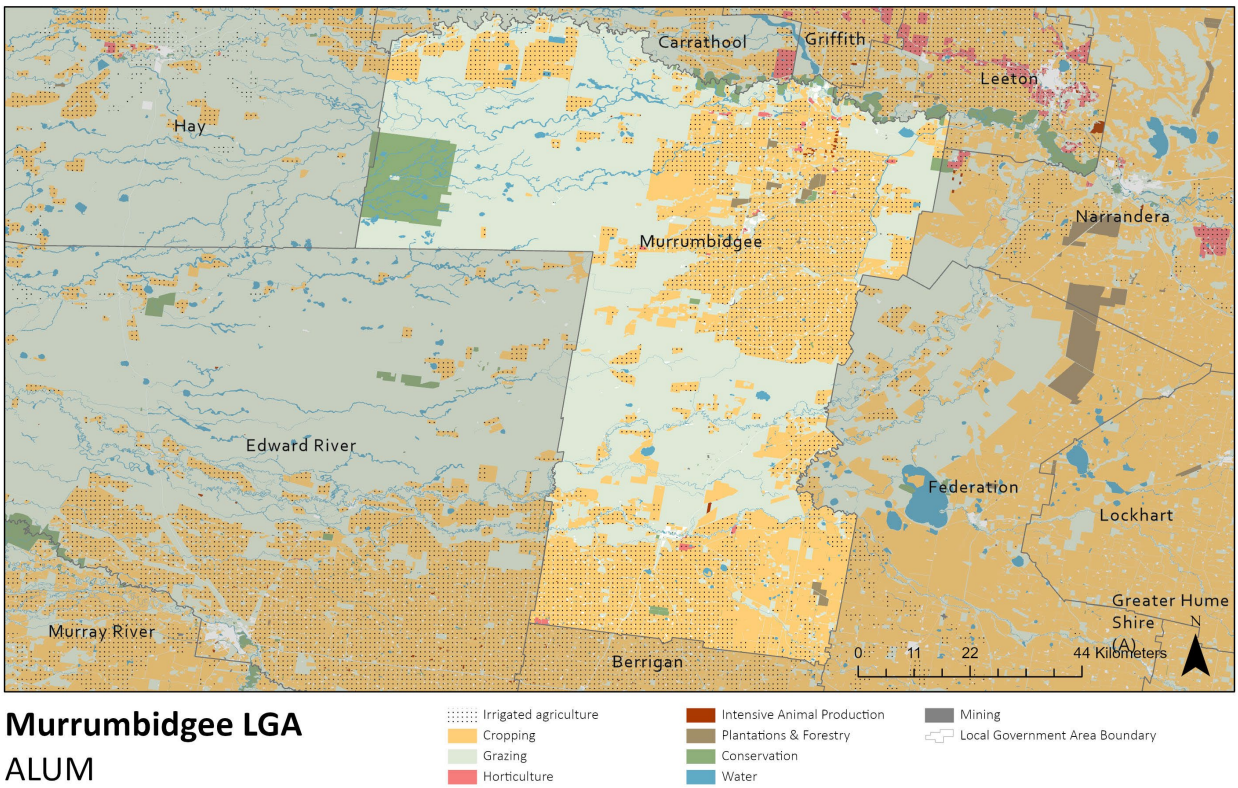

Table 25 Murrumbidgee land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	46.3%	0.2%
Cropping	52.4%	75.1%
Horticulture	0.3%	94.4%

Figure 33 Largest 50 landholders in Murrumbidgee

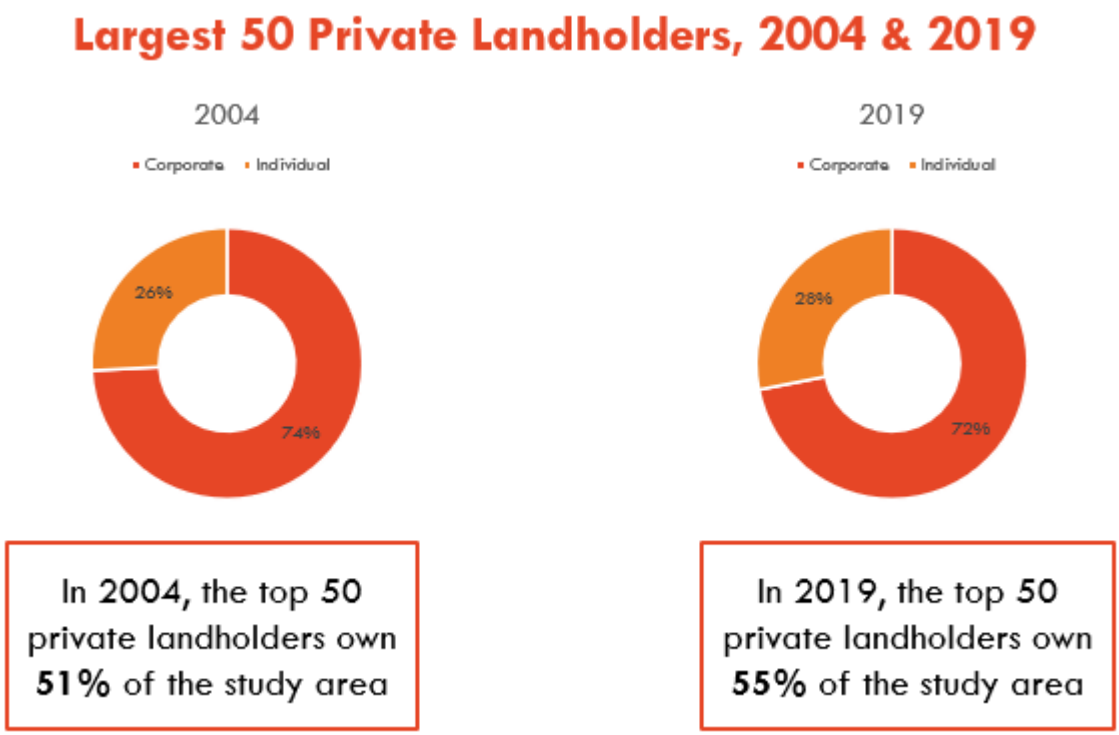

Table 26 Profile of top 15 largest private landholders in Murrumbidgee

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	89,355	Company	-	-	Corporate restructure
2	14,976	Company	-	-	NEW
3	12,742	Company	#2	12,779	0%
4	8,349	Company	#3	8,349	0%
5	8,277	Individual	#4	8,277	0%
6	6,583	Individual	#18	3,833	42%
7	6,171	Company	#5	6,174	0%
8	5,649	Individual	#6	5,649	0%
9	5,408	Company	#8	5,408	0%
10	5,068	Company	-	-	NEW
11	4,655	Individual	#20	3,655	21%
12	4,573	Company	#37	2,109	54%
13	4,541	Company	-	-	NEW
14	4,341	Company	#11	4,337	0%
15	4,239	Individual	-	-	NEW

5. Edward River

Figure 34 Edward River land use map

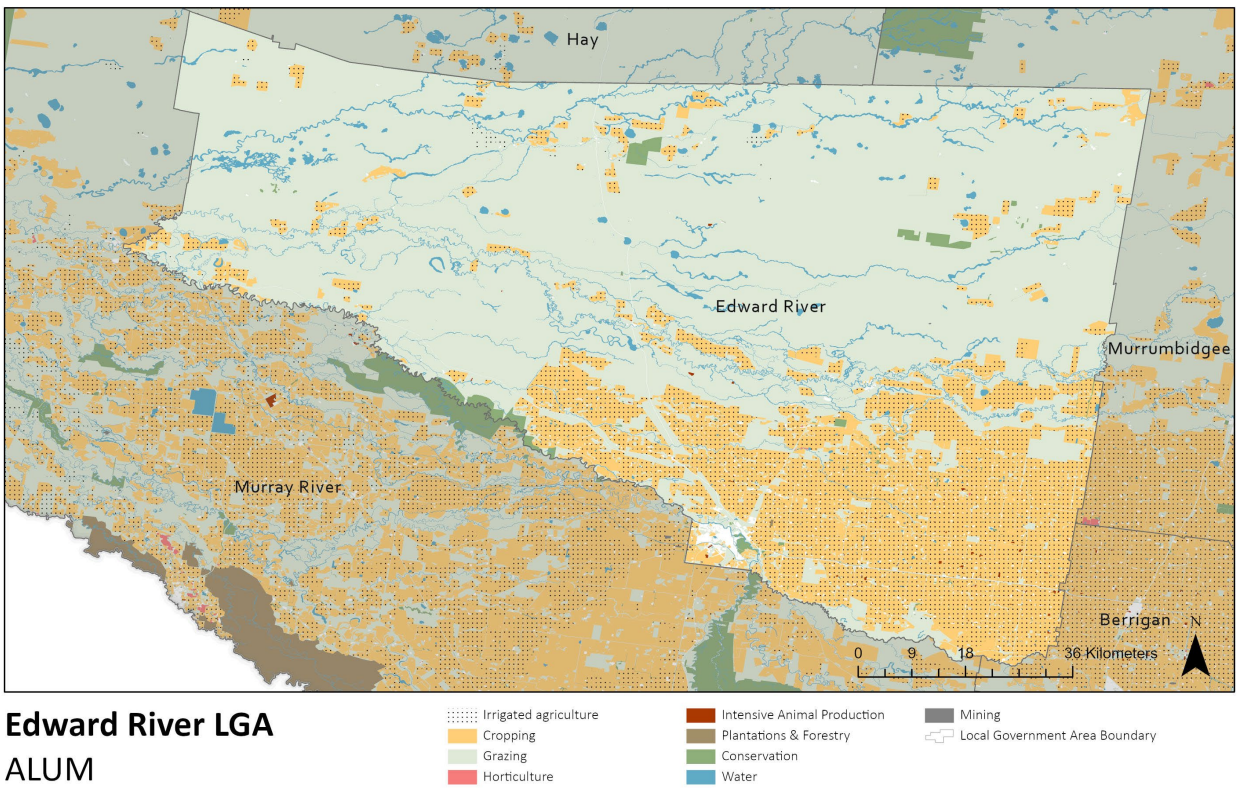

Table 27 Edward River land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	70.6%	0.2%
Cropping	28.3%	92.7%
Horticulture	0.0%	89.0%

Figure 35 Largest 50 landholders in Edward River

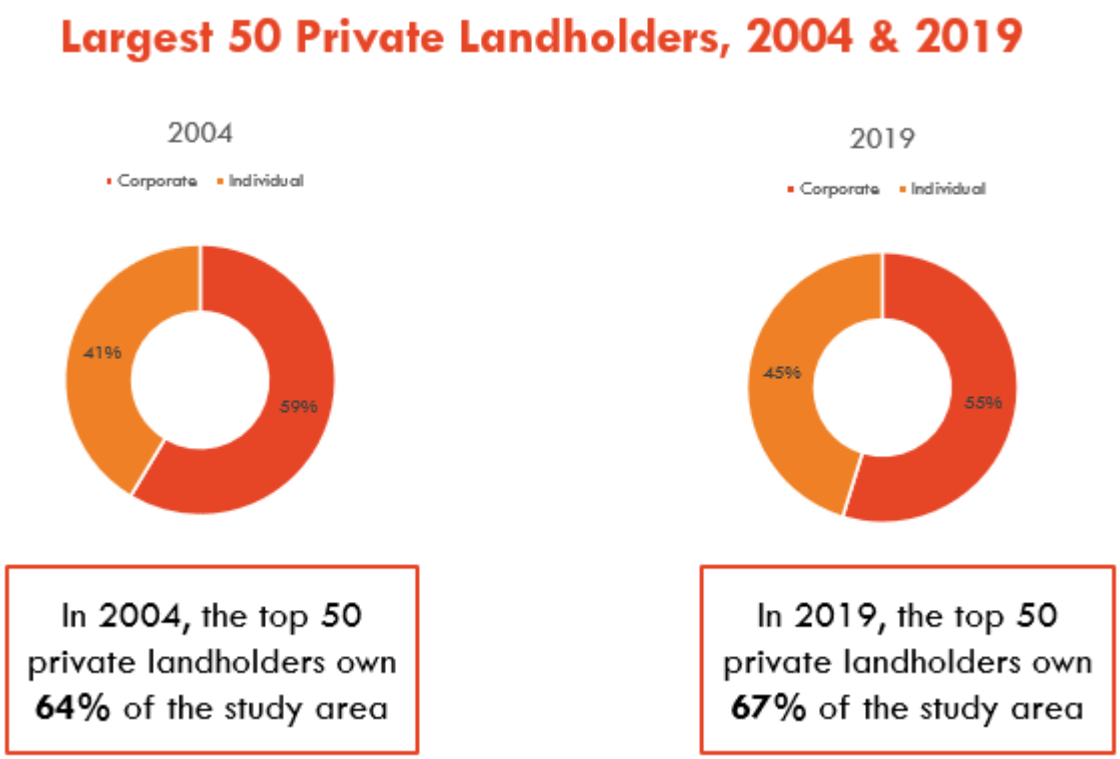

Table 28 Profile of top 15 largest private landholders in Edward River

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	94,298	Company	#1	94,303	0%
2	29,756	Company	-	-	NEW
3	27,247	Individual	#6	17,027	Likely marriage
4	22,002	Company	#3	21,196	4%
5	19,904	Individual	#4	19,904	Family transfer
6	15,159	Individual	#7	15,159	0%
7	14,538	Company	-	-	NEW
8	12,120	Company	#8	12,115	0%
9	11,775	Company	-	-	NEW
10	9,586	Individual	#13	9,586	0%
11	9,488	Individual	-	-	Family transfer
12	9,375	Individual	#16	6,786	28%
13	9,198	Company	#2	29,543	-221%
14	8,314	Company	-	-	NEW
15	7,904	Individual	#7	15,159	Family transfer

6. Hay

Figure 36 Hay land use map

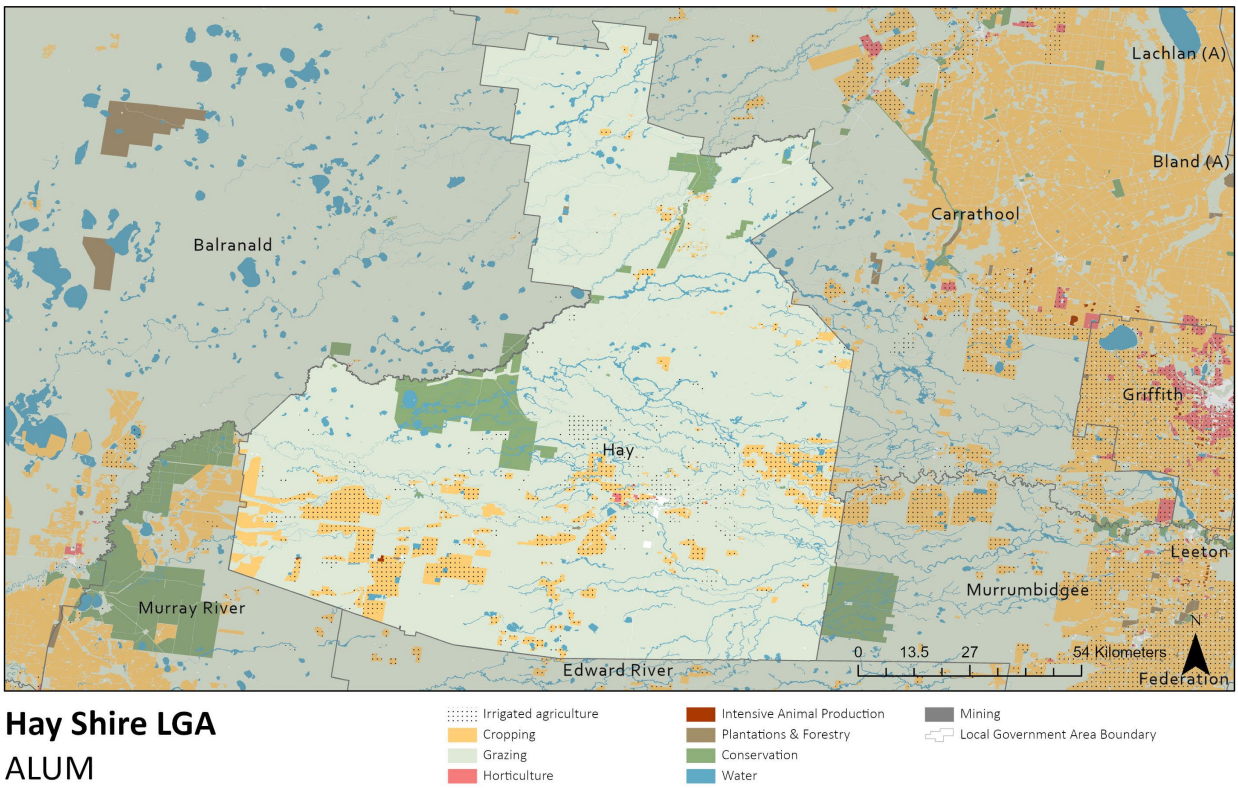

Table 29 Hay land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	90.3%	1.5%
Cropping	8.6%	79.0%
Horticulture	0.1%	88.6%

Figure 37 Largest 50 landholders in Hay

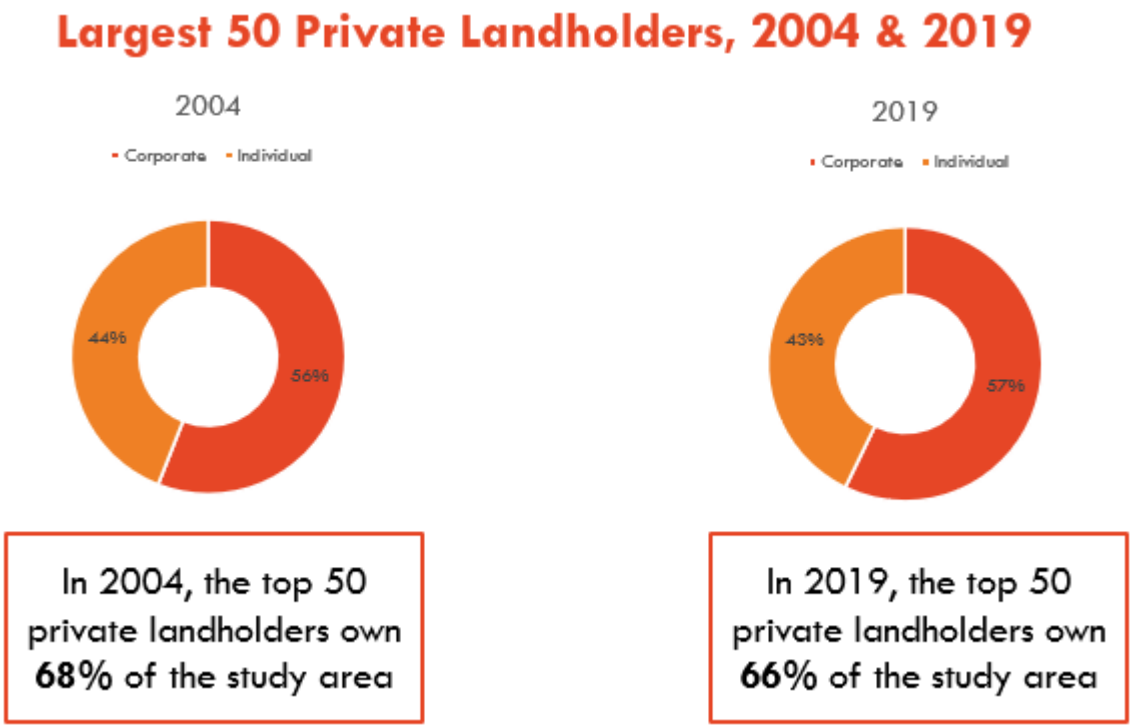

Table 30 Profile of top 15 largest private landholders in Hay

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	93,018	Company	-	-	Company restructuring
2	28,942	Company	2	33,701	-16%
3	28,198	Company	3	28,198	0%
4	19,180	Individual	9	19,180	0%
5	18,919	Individual	-	-	Family transaction
6	18,475	Company	-	-	NEW
7	17,978	Individual	109	2,476	Family transaction
8	17,921	Individual	133	1,617	91%
9	14,883	Company	-	-	NEW
10	14,534	Company	-	-	NEW
11	13,891	Company	124	1,965	86%
12	13,240	Individual	19	10,853	18%
13	12,747	Company	14	17,098	-34%
14	12,279	Company	-	-	NEW
15	11,646	Individual	17	11,646	0%

7. Balranald

Figure 38 Balranald land use map

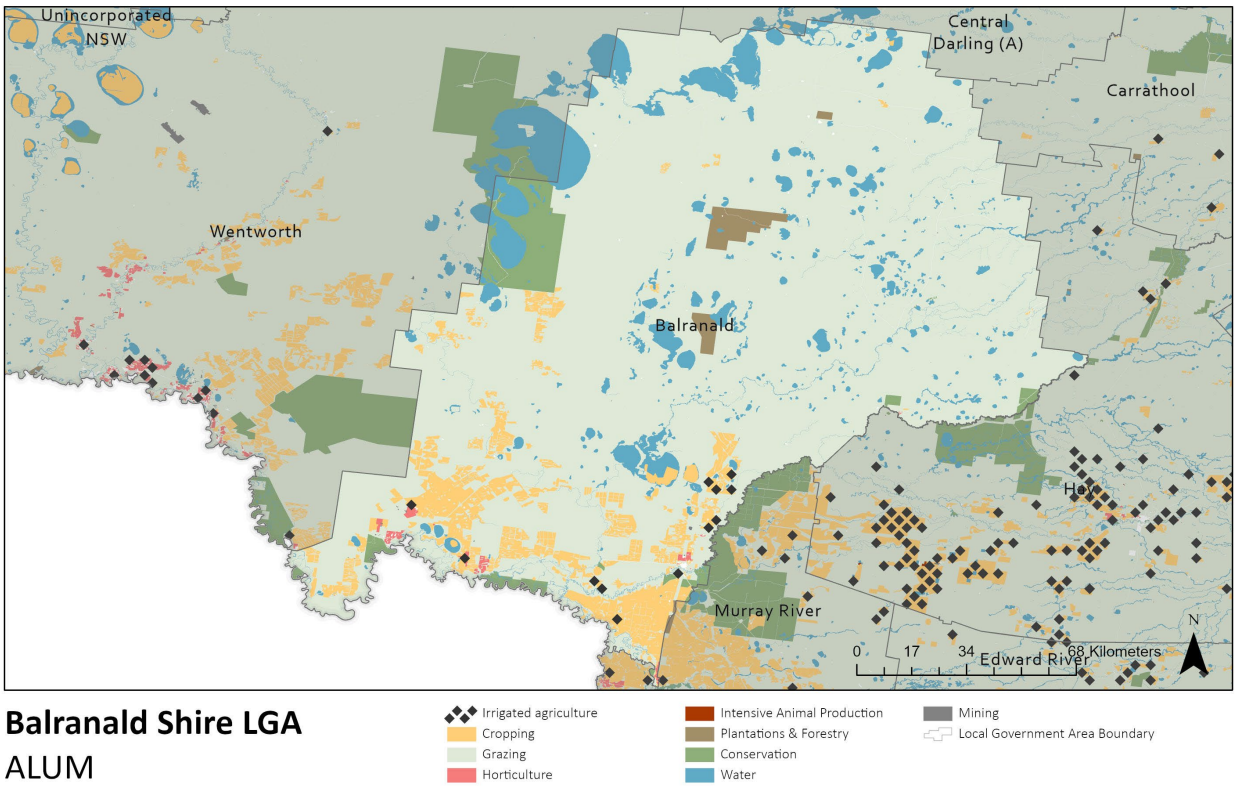

Table 31 Balranald land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	94.7%	0.1%
Cropping	4.5%	2.8%
Horticulture	0.2%	72.3%

Figure 39 Largest 50 landholders in Balranald

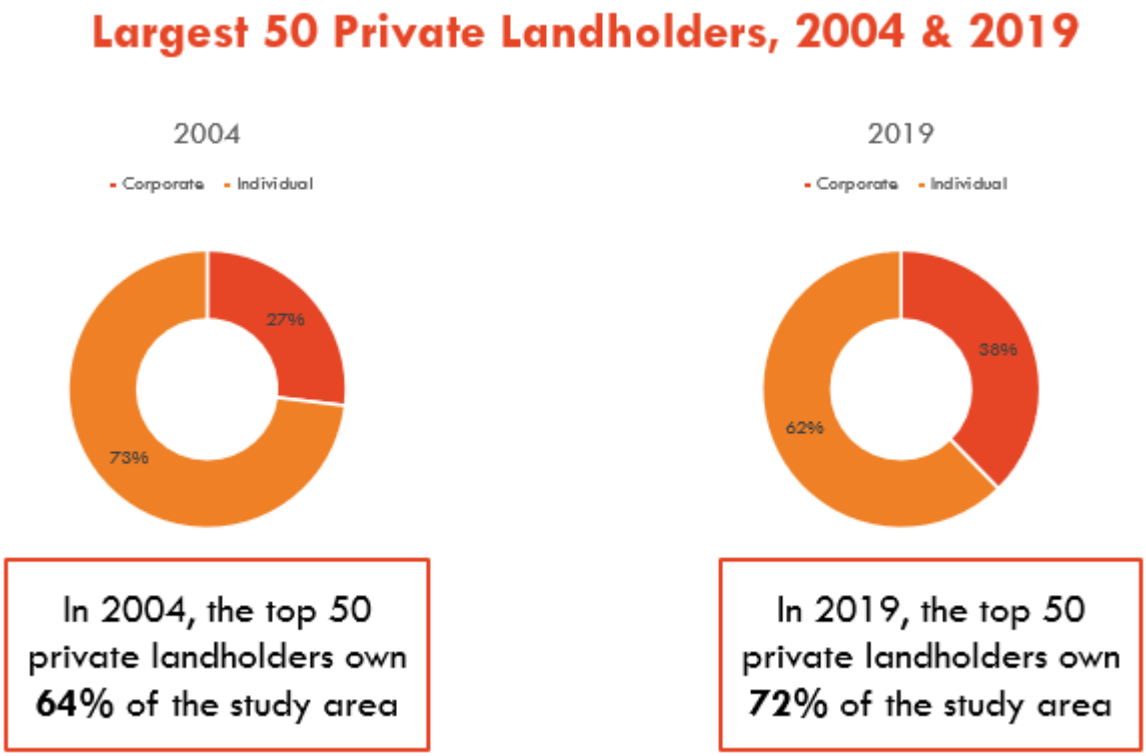

Table 32 Profile of top 15 largest private landholders in Balranald

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	85,944	Company	-	-	NEW
2	65,594	Company	-	-	NEW
3	65,332	Company	#1	65,331	0.001%
4	64,080	Individual/s	-	-	Family transfer
5	61,325	Company	-	-	NEW
6	48,132	Individual/s	-	-	Family transfer
7	43,860	Individual/s	#6	43,860	0.000%
8	41,987	Company	-	-	NEW
9	41,732	Individual/s	-	-	Family transfer
10	32,051	Company	#14	29,983	6.5%
11	31,234	Individual/s	#10	31,219	0.0%
12	30,976	Individual/s	#12	30,976	0.0%
13	30,403	Individual/s	#13	30,403	0.0%
14	30,264	Individual/s	#22	22,925	24.2%
15	28,909	Individual/s	-	-	Family transfer

8. Wentworth

Figure 40 Wentworth land use map

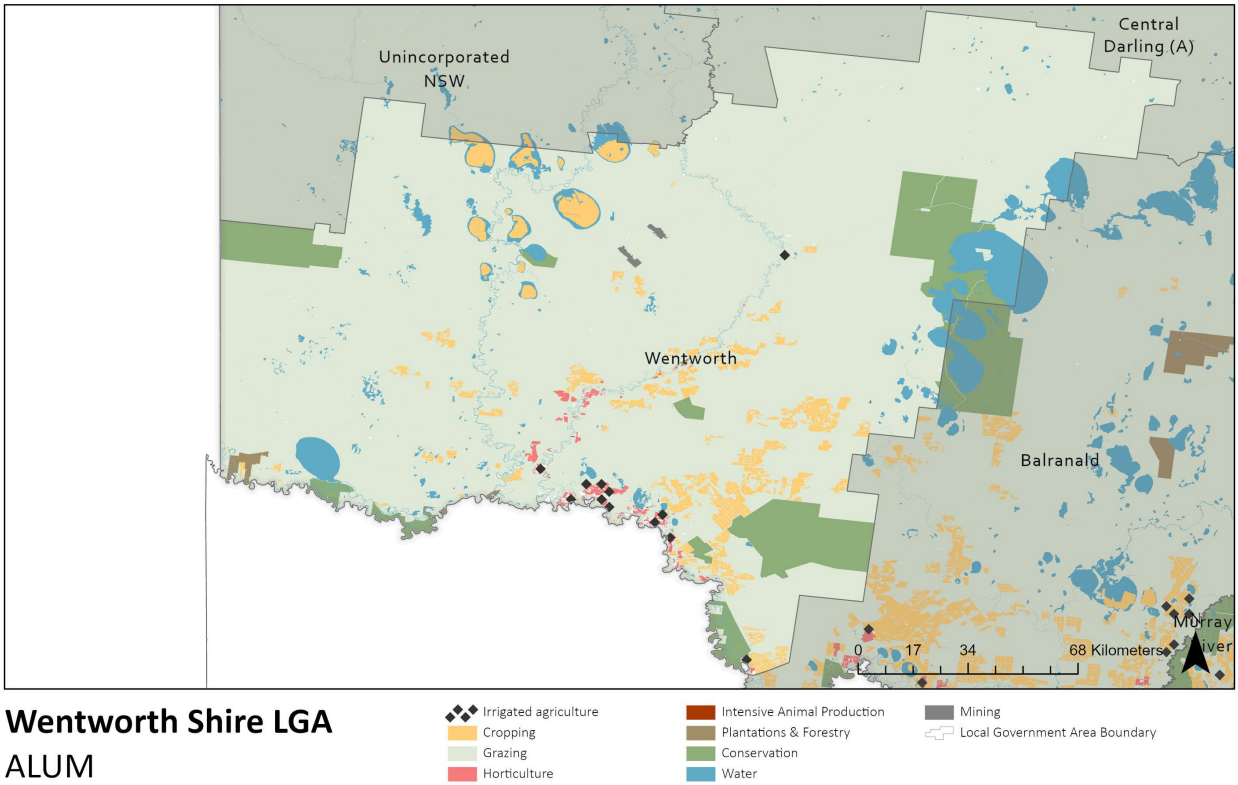

Table 33 Wentworth land use overview

Primary Agricultural Activity	% of Total Agricultural Land (Area)	% of Area Irrigated
Grazing	97.0%	0.0%
Cropping	1.2%	0.2%
Horticulture	0.5%	80.0%

Figure 41 Largest 50 landholders in Wentworth

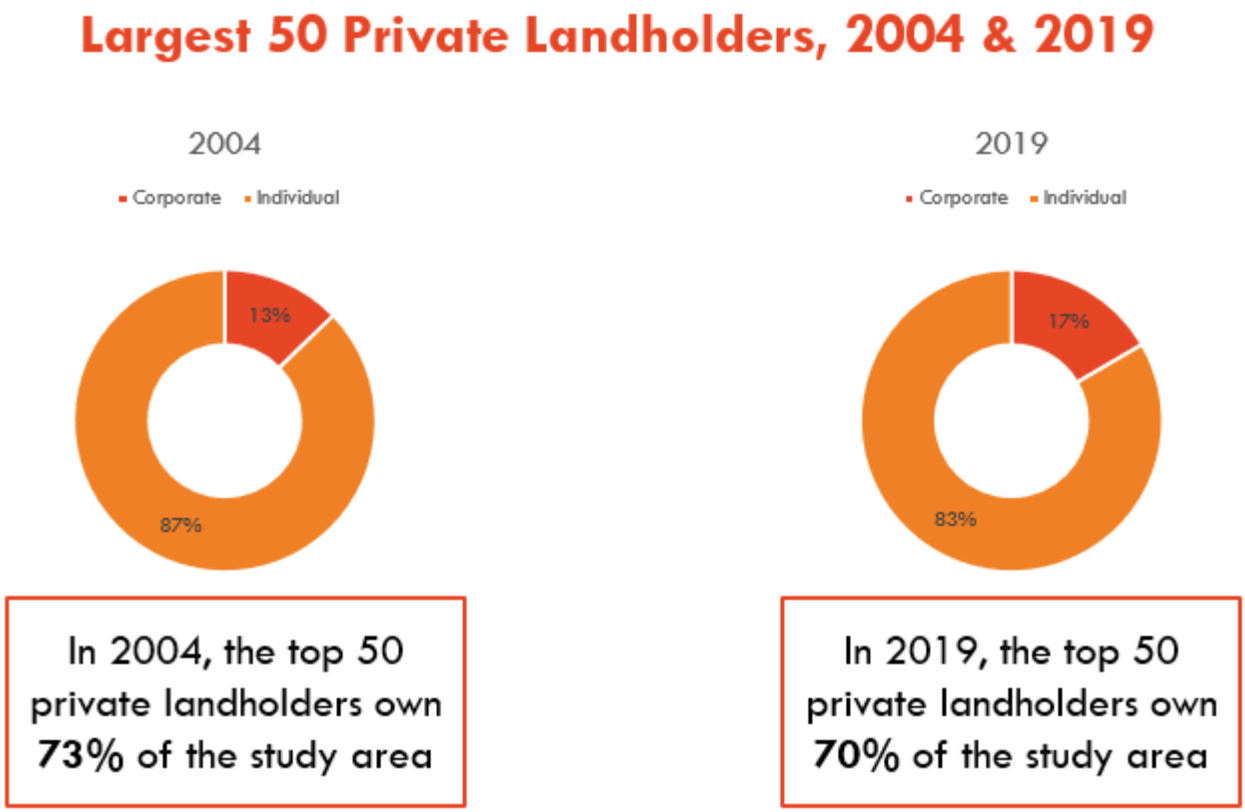

Table 34 Profile of top 15 largest private landholders in Wentworth

2019 Rank	2019 Area (ha)	Type of owner	2004 Rank	2004 Area (ha)	Change in holding %
1	65,732	Individual	#4	65,809	0%
2	65,450	Individual	#5	65,219	0%
3	57,837	Individual	#2	74,457	-29%
4	50,818	Company	-	-	NEW
5	49,076	Individual	#10	49,022	0%
6	48,942	Individual	#9	49,179	0%
7	48,808	Individual	#8	49,328	-1%
8	46,841	Individual	#6	52,258	-12%
9	45,674	Company	#1	88,388	-94%
10	42,754	Company	-	-	NEW
11	41,263	Individual	-	-	Family transfer
12	40,500	Individual	#13	40,586	0%
13	38,516	Individual	#35	23,691	38%
14	36,639	Individual	-	-	Family transfer
15	34,189	Individual	#34	23,973	30%

Appendix C: Themes for Future Research

Themes for future research: Consistent feedback from participants was that a more meaningful picture of year-on-year change in the Riverina could be obtained through an analysis of irrigated vs non-irrigated areas within LGAs and that through averaging land churn rates at the LGA scale, important differences between these areas of land are obscured. It has not been possible to address this within this report, and further research should investigate the differences between rates of change occurring on irrigated and non-irrigated land.	Page 15
Themes for future research: The 2020-2022 period has been one of great change in the way land changes ownership in NSW. The COVID-19 pandemic, combined with the end of the most intense period of drought in recent years, record low interest rates, record high commodity prices and an intense La Niña, have significantly affected some of the trends of previous years. For example, in 2022 the volume of agricultural land changing hands in NSW reached a 14 year high and land values have significantly increased Australia-wide (Rural Bank, 2022). As such, it is important to consider annual churn rates beyond the period explored in this report. Future research should dive into these themes in more detail. As more data is collected through the land-titles registration method presented in this report and other outcomes of our project, we hope that more light will be shed on these important trends affecting the ownership and management of land in rural NSW.	Page 21
Themes for future research: Land ownership change is only one part of a highly complex story. Land use changes without an accompanying change of ownership were identified as occurring in response to changing climatic conditions, including switching to drought tolerant breeds of sheep and cotton beginning to be grown further south than is traditional. Land use changes were also identified as linked to the increasing sophistication and diversification of farms including into mixed enterprises, renewable energy generation, biodiversity offsets and intensification. Further research is required to determine the extent to which these trends are occurring and to highlight the implications of these changes for agricultural futures in the Riverina region. This section also highlighted that there are significant intra-LGA variability between land ownership trends occurring on irrigated land, noting that in Wentworth one of the primary irrigation areas is declining whilst another is thriving. Further research is required to determine place-specific trends.	Page 35

Appendix D: Focus group indicative questions

The following is a list of the indicative questions submitted to stakeholders ahead of the focus group sessions.

- Who owns/is buying agricultural land in the LGA/region? How is land ownership relevant to different agricultural sectors/for the LGA/region?
- How does drought impact on rates of types of land ownership changes/sales? E.g., grazing, cropping, horticulture, irrigated/non irrigated land.
- In what ways is the composition of farm ownership changing in the LGA/region? E.g., Individuals/families, large companies, small companies, non-local/local.
- What is the profile of new entrants? Are existing owners increasing their holdings, landowners exiting/decreasing the scale of their holdings?
- Are different types of farms more likely to be bought/sold?
- How have planning and subdivision policy and instruments shaped drivers of rural land ownership change in NSW over time in the LGA/region?
- To what extent is fragmentation of agricultural land occurring in the LGA/region? What are the local drivers/pressures to fragment land?
- What has the impact of subdivision/new dwelling policies been on:
    - the conversion of farmland to non-farm uses
    - changes in average farm property size
    - construction of new dwellings for non-agricultural purpose.

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