Mallee Regional Innovation Centre

Drivers of Horticultural Development in the Victorian Mallee

A study for:
The Mallee Catchment Management Authority

Report

April 2021

THE UNIVERSITY OF MELBOURNE

LA TROBE UNIVERSITY

The Mallee Regional Innovation Centre

The Mallee Regional Innovation Centre (MRIC) is a joint venture between the University of Melbourne, La Trobe University and SuniTAFE, with the Mission to promote innovation in production through enhanced collaboration between regional partners and researchers.

The Mallee CMA commissioned MRIC to review the drivers of the growth in high-value irrigated horticulture in the region.

The research team for this project comprised:

Team member	Organisation	Specialism
Sue Argus	SunRISE Mapping & Research	Mapping and data analysis
Dr Timothy Clune	La Trobe University	Lecturer in Agri Business
Tim Cummins	Tim Cummins and Associates	Salinity impacts
Prof Bob Farquharson	University of Melbourne	Agriculture & Resource Economics
Prof Bill Malcolm	University of Melbourne	Farm management economics
Matthew Toulmin	MRIC	Economist

This report and the conclusions reached represent the judgment of the MRIC team based on their extensive professional experience and analysis across the issues. They do not report on nor necessarily represent the policies or positions of the Mallee CMA nor the stakeholders the team had the advantage of consulting.

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EXECUTIVE SUMMARY

ES1. Drivers of irrigation development

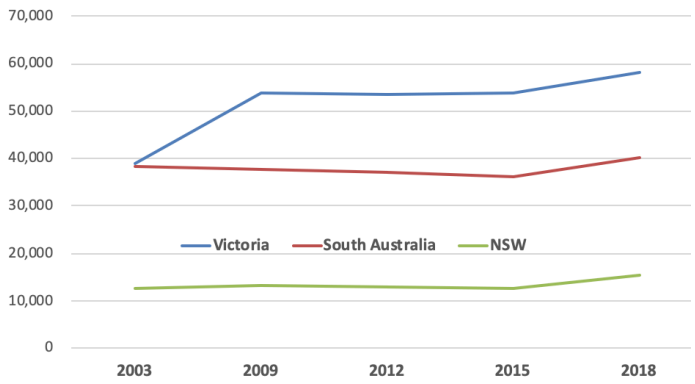
There has been significant expansion in the area of irrigated horticulture in the Victorian Mallee over the last twenty years. This increase has created potential challenges regarding salinity and other impacts for the River Murray and wider assets. The Mallee Catchment Management Authority (Mallee CMA) therefore commissioned the Mallee Regional Innovation Centre (MRIC) to review the factors that have driven this growth in irrigation development - with a priority focus on the almond and table-grape sectors across the Lower Murray Darling (LMD).

A multi-disciplinary team from the University of Melbourne and La Trobe University with local experts have collated input from industry stakeholders and industry and academic literature sources to identify the key drivers underpinning these changes and to highlight factors that will influence future development decisions.

ES2. Growth in irrigated plantings over time

There was significant growth in the total area of permanent irrigated plantings in the Victorian LMD, particularly in the period from 2003 to 2009, and again after 2015. This growth was not evident in the other states before 2015.

Figure ES1: Permanent plantings over time by state (ha)

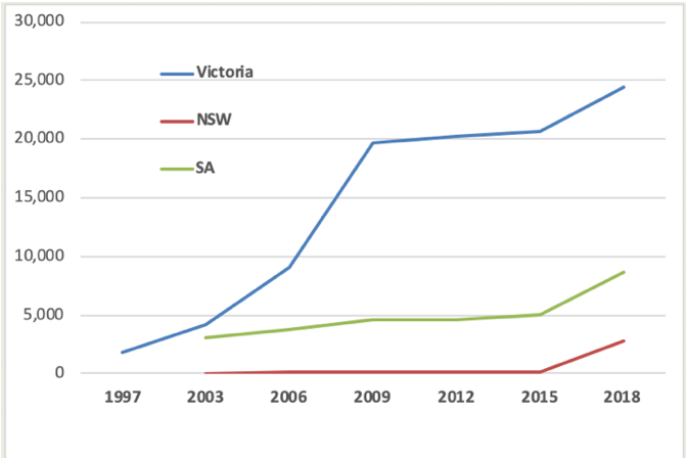


The development evident in all three states since 2015 has been prompted by good commodity prices, increased export opportunities and corporate investment.

a) Almonds

Almond production across the LMD grew from 2,000 hectares in 1997, to 33,000 hectares in 2018, 73% of which occurred in Victoria. This growth did not occur in other states until after 2015. Much of the early growth in Victoria was promoted by the tax advantages of the managed investment schemes (MIS).

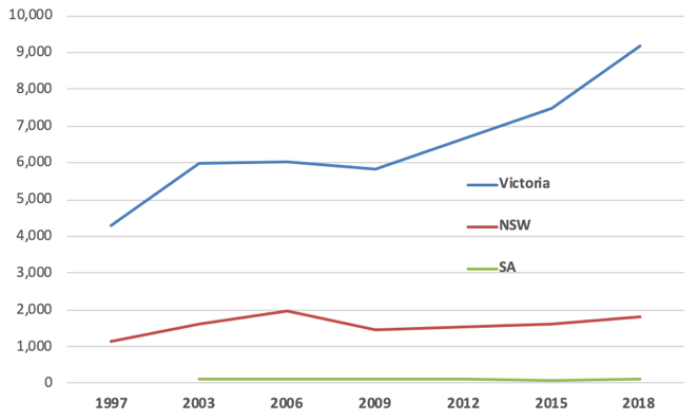
Figure ES2: Growth in almond plantings by state (ha)



b) Table-grapes

Table grape production grew from 5,000 hectares in 1997 to 10,000 hectares in 2018, with 90% of the total area located in Victoria.

Figure ES3: Growth in Table-grape plantings by state (ha)



ES3. Macro factors

Certain macro-scale economic and market factors were influential in promoting this expansion in the area of irrigated almonds and table grapes. These operated both on the demand and the supply side.

- Growth in demand: There has been sustained growth in demand for almonds and table-grapes at a global scale, both within established markets and in export markets in southern and south-east Asia.
- International free trade agreements: Expansion of access to export markets has been facilitated through the introduction of free-trade agreements between Australia and important overseas markets.
- Drought in California: California produces 80% of the world's almonds. That production was challenged by severe drought from 2011-2017. As a result, investors sought alternative locations for orchards.
- Corporate funds: Since 2015 there has been growth in the scale of investment funds seeking to invest in agricultural assets as a way to diversify their portfolios.
- Managed Investment Schemes (MIS): MIS were a significant factor in the initial development of the olive and almonds sectors in Victoria, due to their tax advantages - though these advantages ended in 2009.

ES4. Locational factors

Certain factors were significant in driving irrigation development within the LMD to new irrigation areas in Victoria.

a) Almonds

- **Agronomic requirements:** There were strong agronomic factors that led to the location of early investment decisions in the Victorian Mallee, as it offers a suitable climate and well-drained sandy soils.
- **Property Scale:** The almond sector sought the opportunity to operate at scale with highly mechanised production. Sunraysia could provide properties with appropriate size and freehold tenure.
- **Water entitlements:** ASIC required MIS proponents to demonstrate that they owned adequate water entitlements to meet irrigation requirements. Scheme proponents in Victoria were better placed to meet ASIC requirements for scheme compliance.
- **Salinity:** the salinity impact zoning in the Mallee encouraged investment upstream around Boundary Bend in preference to the older irrigation districts around Mildura.
- **Regulatory protocols:** There was a perception amongst developers at early stages that the process of applying for and achieving approval was easier in Victoria than in NSW, and that Victoria was more pro-development.

b) Table-grapes

The main growth in table-grape production since 1997 occurred predominately within the older established irrigation districts. Investment decisions on locations were largely driven by a need to be close to established infrastructure such as cool-stores and packing sheds.

ES5. Future factors and drivers

A range of factors will influence the likelihood of continuing growth in development in the two sectors. International demand and the availability of capital will both continue to create an impetus for growth in production. On the other hand, access to water, labour and pollination services are key headwinds that may constrain further development.

- Demand: There is evidence of robust continuing growth in demand in domestic markets and internationally through exports. This is true of almonds and of table-grapes. However, short- factors related to COVID and trade disputes may dampen demand in the short-term.
- Supply-side: The availability of global capital looking to deploy funds in agricultural assets will provide a continuing supply-side impetus, particularly in the almond sector.
- Production factors: A suite of different factors will influence the trajectory of future production:
  - Maturity: There is an inherent momentum for the production of both crops to continue to grow from the transition of non-bearing immature plantings to full maturity.
  - Land: there appear to be few constraints regarding access to suitable land for either sector. Growth in the almond sector will be targeted to NSW due to constraints in water deliverability
- Water issues: Reliable access to water is a critical factor in production. This covers both the overall volume of water available, its price on the markets and constraints in delivery at a catchment and local scale. These constraints provide incentives to site new investments away from the lower Murray reaches in the Mallee.
- Processing: There are five key almond processing facilities in the wider region. These processing facilities are currently close to capacity but there are commercial proposals for expansion.
- Pollination: The availability of pollination services may become a constraint on future almond production. Demand has increased as the total area of orchards has increased, at the same time as supply has reduced due to the recent bushfires. Commercial ventures have appeared in response to expand the availability of services. While moves towards a self-pollinating variety are a medium-term solution.
- Labour: The availability of labour, its retention and its cost are major business issues for the sector. This covers both operational and technical staff. This will tend to increase pressures for automation.
- Regulation: Current development in the almond sector is now focussed on NSW due to the perceived lower regulatory hurdles involved. Table-grape development is likely to expand both inside the existing pumped irrigation districts and increasingly at larger scale in the private diversion areas of Victoria.
- Salinity: The states have obligations to account for river salinity impacts arising from irrigation on land that was not developed for irrigation before 1988. Changes in rainfall patterns and improved irrigation practice have both contributed to reduced risks from raised saline water-tables.

1.0 | Project specifications

1.1 | Drivers of irrigation development

There has been a significant expansion in the area of irrigated horticulture in the Victorian Mallee over the last twenty years. This increase has created potential challenges regarding salinity and other impacts for the River Murray and wider assets.

The Mallee Catchment Management Authority (Mallee CMA) therefore asked the Mallee Regional Innovation Centre (MRIC) to review the factors that have driven this growth in irrigation development - with a priority focus on the almond and table-grape sectors. The MRIC team included specialist researchers from the University of Melbourne and La Trobe University as well as local experts. The members of the team are listed on the inside page of this report.

1.2 | Project objectives & stages

The objectives of the study set by the Mallee CMA were to:

- Validate the past record on irrigation development in the Victorian Mallee
- Investigate potential international, local and investor drivers of horticultural development in the Victorian Mallee, making comparisons with parallel developments in NSW and South Australia
- Provide insight on future irrigation development demand and the implications for salinity management.

The study did not focus on issues related to water availability for irrigation or possible constraints in its delivery as these issues were being addressed by other groups elsewhere.

1.3 | Project stages and milestones

The work program for the project was based around the following stages and milestones:

1. Drafting of an outline Issues Paper - July 2020
2. Discussions with informed stakeholders - August 2020
3. Review and analysis of issues & draft report - September 2020
4. Review of alternative scenarios for likely future levels of development - October 2020
5. Final report - December 2020.

1.4 | Consultation

The project team had the advantage of receiving advice and insights from discussions with a wide range of highly informed regional stakeholders. More than twenty such contacts were engaged in Stage 2 of the project - with the discussions framed around an Issues Paper from the project team, which was circulated by the Mallee CMA to interested parties, inviting them to contribute to the project.

Annex 1 lists the individuals engaged in this program. They fell into four main categories:

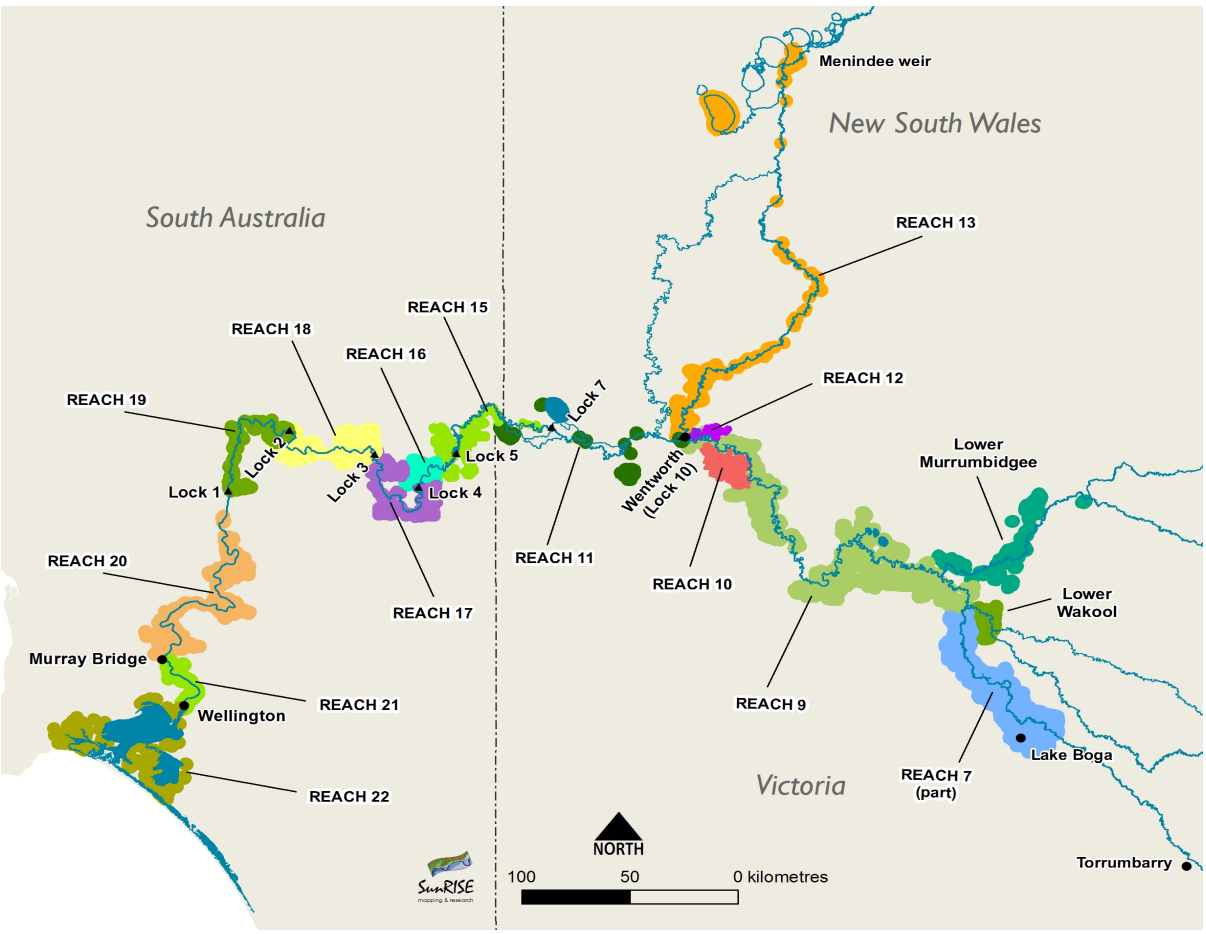
- Peak bodies and producers in the almond sector
- Peak bodies and producers in the table-grape sector
- Irrigation development business managers and advisors
- Agency staff

This report and the conclusions reached represent the judgment of the MRIC team based on the extensive professional experience of the members of the team across the issues. The report does not necessarily represent the policies or positions of the stakeholders we had the advantage of consulting, nor those of the Mallee CMA.

1.5 | Study area

The study covers the three states in the Lower Murray Darling (LMD) region, viz. Victoria, New South Wales and South Australia. The main river reaches are shown in Figure 1.

Figure 1: Lower Murray Darling region



The data assessed therefore covers:

- River Murray Reaches 9, 10 & 11 in Victoria and NSW downstream of Lake Boga (part of Reach 7)
- The lower Murrumbidgee River from around Balranald and the lower Wakool River
- The lower Darling River covering Reach 13, downstream of the Menindee weir
- The River Murray in South Australia

The data throughout the report comes from a report for the MDBA produced by SunRISE Mapping & Research, [1] with the exception of the 1997 and 2006 data for Victoria and NSW which SunRISE provided separately for this study.

1.6 | This report

This report completes the last stage of the project and provides the final report. It covers:

- Evidence on the level of development by crop-type and location, over time
- Analysis of the macro drivers of the investment in horticultural development
- Assessment of the factors that drove investment in Almonds
- Assessment of the factors that drove investment in Table-grapes
- Analysis of factors that may affect future trends and developments

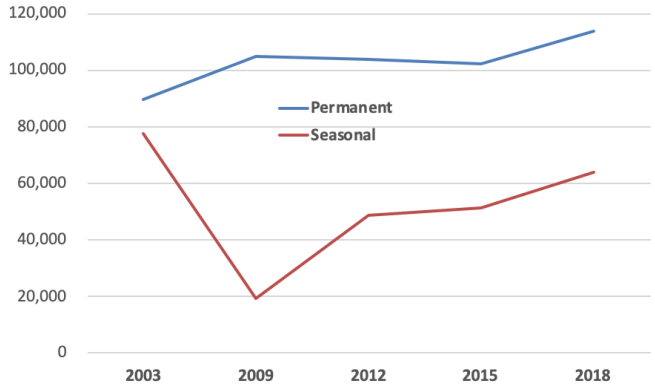
[1] MDBA (2019), *Irrigated crop area data for the Lower Murray-Darling 2003 to 2018.* Report from SunRISE Mapping & Research.

2.0 | Data on development over time

2.1 | Aggregate data

The first graph shows the changes in the overall area of irrigated development across all crop types for the entire LMD region over the period 2003 to 2018.

Figure 2: Area of irrigated development all crop type, all states within the LMD (ha)

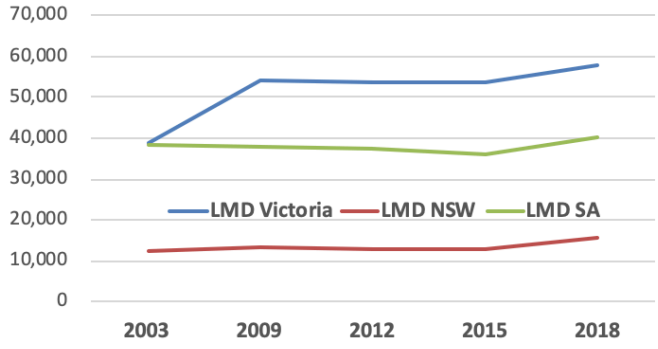


This chart shows a number of important features:

- For permanent crops it identifies three phases:
  - An initial period of growth from 2003 to 2009: much of which was prompted by the advantageous tax provisions for non-forestry managed investment schemes (MIS) then available
  - A period of relative stability or mild decline from 2009 to 2015, where production and growth were affected by the drought, the financial crisis and the impacts of the Basin Plan on water availability
  - Recovery and further development since 2015, which has seen a more positive business environment, with generally good commodity prices, increased export opportunities and raised corporate investment. This has prompted growth in all three jurisdictions
- For seasonal or annual irrigated crops, the variation over time is more extreme:
  - A severe reduction in the period between 2003 and 2009 - reflecting the impact of the drought on the level of allocation against lower security entitlements
  - A recovery up to 2012 with relative stability from 2012-2015
  - Resumed growth tracking the permanent plantings since 2015.

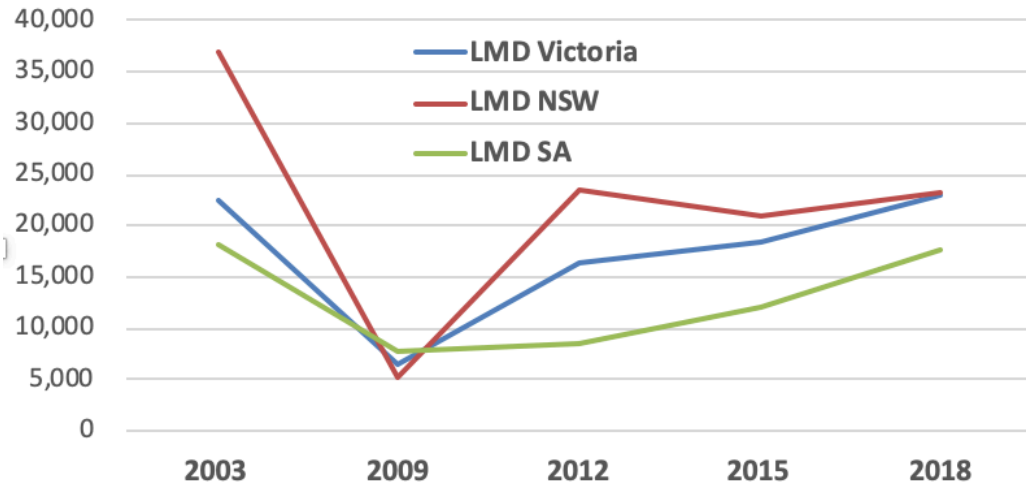
The next two charts show the area of irrigation plantings within the three states over the same time period, with separate charts for permanent and seasonal plantings.

Figure 3: Permanent plantings over time by state (ha)



This chart demonstrates that the initial period of growth up to 2009 occurred almost exclusively in Victoria, but that the growth since 2015 has been shared equally by all three states.

Figure 4: Seasonal/annual plantings over time by state (ha)

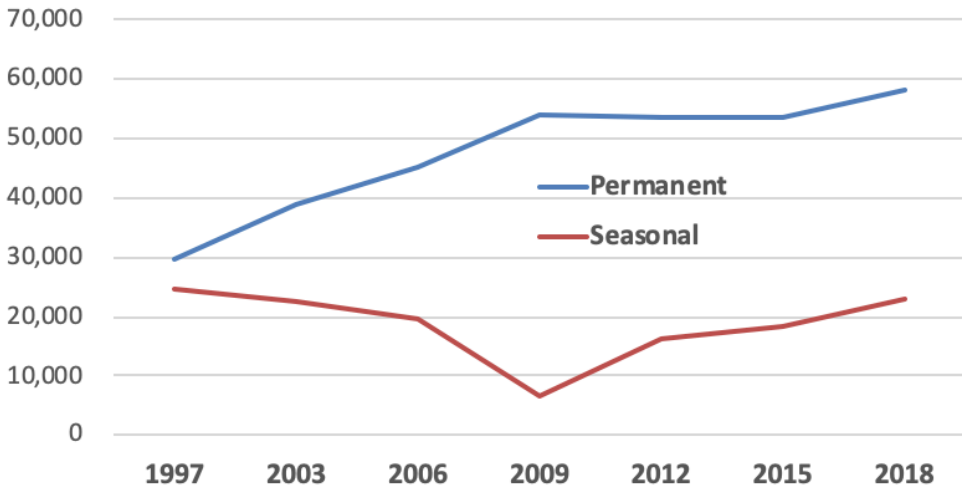


The equivalent chart for seasonal plantings (Fig 4) shows that the largest reduction in annual cropping between 2003 and 2009 occurred in NSW, although the pattern of changes was similar in all three states. The following sections review the relevant data for each of the three states separately, focussing on permanent plantings.

2.2 | Victoria

Data for the Victorian Mallee is available stretching back until 1997. This expands the timeframe of the analysis from the previous charts which covered all three states at a whole of LMD area only from 2003.

Figure 5: Irrigated crop area for Victorian LMD (ha)



This shows that the period of growth in permanent plantings in Victoria started well before 2003 and so continued for at least twelve years up to 2009. The area of seasonal crops irrigated follows two different trajectories:

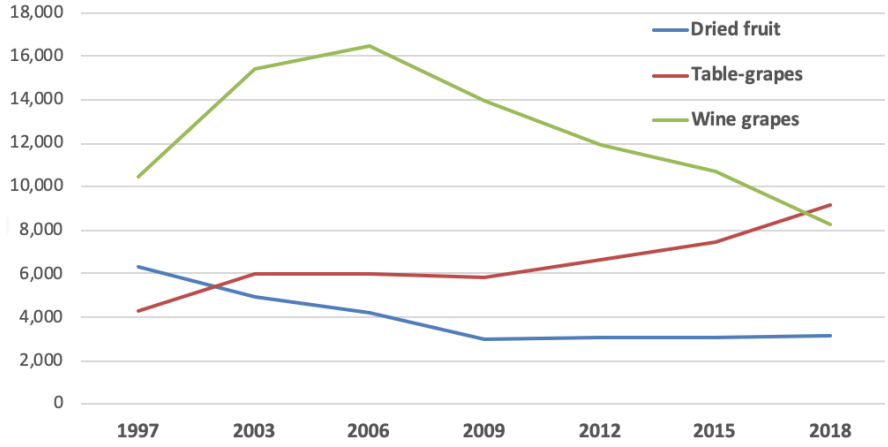
- In the period up to 2009 there appears to be a substitution effect with new permanent plantings taking the place of seasonal crops
- Since 2009 there has been a more equal pattern of growth between the two broad sectors.

The aggregate figure for permanent plantings presented above is analysed below for the major crop types.

a) Vine-based crops

The first analysis is for the three grape/vineyard based sectors:

Figure 6: Vineyard sectors under irrigation LMD Victoria (ha)



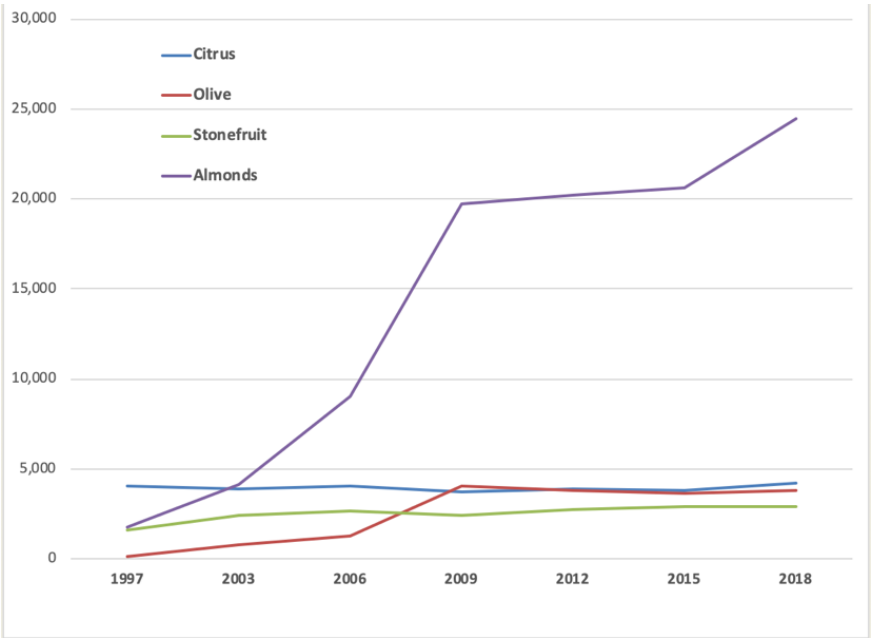
This chart reveals a number of different business trajectories:

- The wine-grape sector was subject to active promotion early in the period, with grants and tax offsets encouraging expansion, with an export boom in sales to the UK reaching a peak at $3bn in 2007. However, over-supply coupled with the financial crisis saw exports fall by more than 20% over the following two years. Since then, the area planted to wine-grapes has halved, from its peak of 16,470ha in 2006, to an area of 8,270ha in 2018. The reduction has been more marked since 2015 following the increase in prices in the water market
- The dried vine-fruit sector also halved in area from 1997 through until 2009, but has seen a stable business environment since then, with some evidence of a recent pick-up in demand and supply
- The table-grape sector has seen remarkable growth over most of the last twenty-five years, most notably since 2015, with a more than doubling of the total area under irrigation over the period since 2000.

b) Other Orchard Crops

The next chart records the area under irrigation in the Victorian LMD for a selection of orchard tree crops.

Figure 7: Tree crops sectors under irrigation LMD Victoria (ha)



The story here is evident:

- Olives (shown **in red**) were a new crop for the region back in 1995 and grew in area from almost zero to 3,800ha by the end of the period. Much of the initial growth, up to 2009, was prompted by the financing structures and tax advantages of the MISs - so that in 2006, 70% of all olive developments were funded through this route. Boundary Bend Limited took over the management of Timbercorp's olive grove at Boort in 2006, covering an area of nearly 3,000ha, at the time claimed to be the largest single olive grove in the world. The overall area of production has been stable since 2015.
- The **citrus** and **stone-fruit** sectors have both demonstrated resilience in the face of changing business conditions and market expectations over the twenty-year period. Both sectors have recently reported improved business opportunities based on expanding export markets for fresh produce.
- The **almond industry** is clearly the stand-out sector in terms of growth and relative size. The sector has demonstrated year-on-year growth since 1997 but with three main phases:
  - A very high growth phase after 2003 (particularly after 2006) lasting until 2009 - driven largely by the incentives and advantages of the MIS framework
  - A period of adjustment and consolidation between 2009 and 2015
  - A period of further growth since 2015 driven by the opening-up of new markets and the interest of corporate finance in the sector.

This story is confirmed in the following table which shows an almost 40% per year average increase in the area planted each year over the six-year period from 2003 to 2009.

Table 1: Almond sector: average annual growth rate by period (ha)

	1997 to 2003	2003 to 2006	2006 to 2009	2009 to 2012	2012 to 2015	2015 to 2018
Growth (ha/yr)	400	1,620	3,560	167	135	1,292
% Annual change	23%	39%	39%	0.85%	0.67%	6%

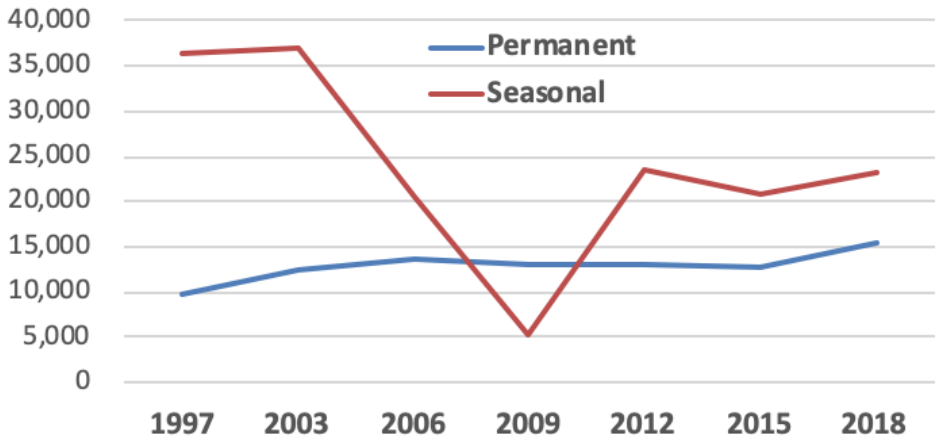
In the same way as with the olive sector, much of the growth up to 2009 was driven by the advantageous tax position of the Managed Investment Schemes. Despite the demise of these schemes the continued rise in the area planted over time confirms the underlying robustness of the investment model driven by growth in demand worldwide and increased access to export markets facilitated by the introduction of a number of Free Trade Agreements.

The following sections compare the equivalent values for New South Wales and South Australia for these sectors.

2.3 | New South Wales

The following chart confirms the overall position regarding the change in the area under irrigation in the NSW areas of the LMD. Note - this does not cover developments in the Murrumbidgee around Griffith and Darlington Point.

Figure 8: Total area under irrigation LMD NSW (ha)



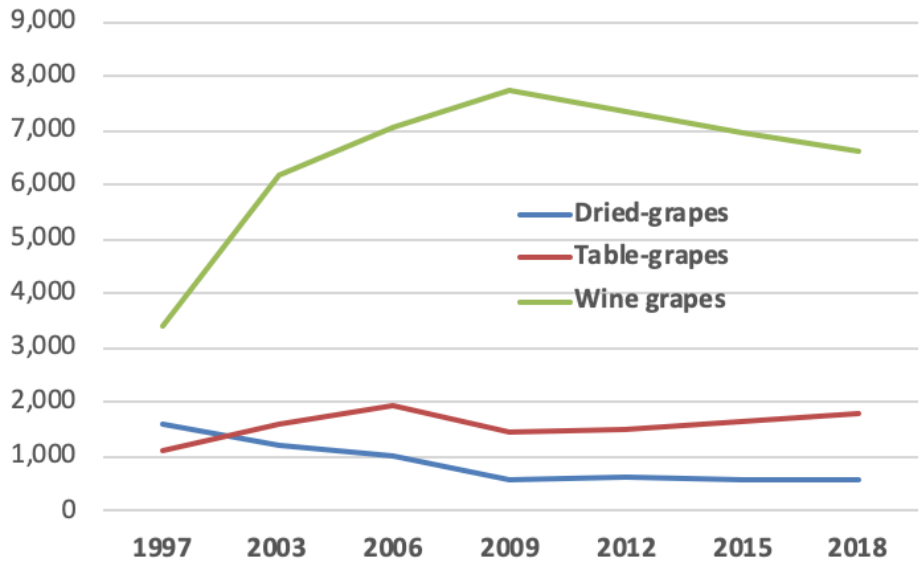
This chart identifies a number of trends:

- For permanent plantings a three-phase trajectory:
  - A period of sustained annual growth from 1997 through until 2006 - although at a lower rate than that evident in Victoria
  - A period of stability or decline from 2006 until 2015 under the combined stressors of drought, financial crisis and reduction in water availability
  - Resumed strong growth since 2015
- For seasonal plantings a four-phase trajectory:
  - An early period of growth up to 2003
  - A collapse in the area under irrigation in response to the drought up until 2009
  - A re-growth in irrigated annual crops up until 2012
  - A new equilibrium since then with annual adjustments in the area planted depending on the level and price of annual allocations, but with average irrigation at only 60% of the peak area irrigated in 2003.

a) Vineyard crops in NSW

The following chart confirms the area of vineyard crops irrigated in the NSW LMD over the period from 1997.

Figure 9: Irrigated vineyard production LMD NSW (ha)

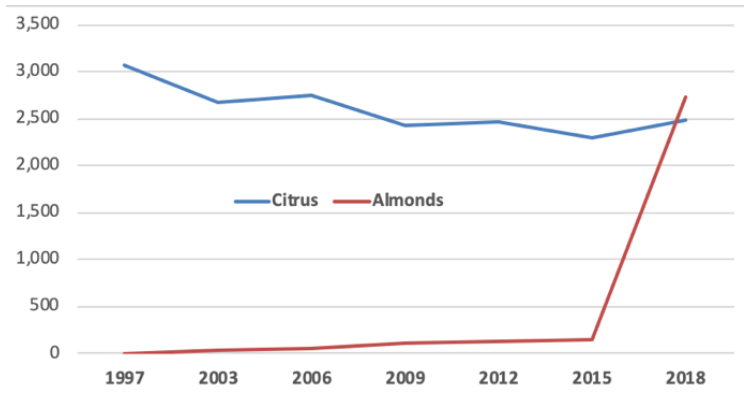


This chart tells a similar story to the trends in Victoria. There was the same significant growth in the area of irrigated wine-grapes in the period up to 2009 but a less substantial reduction since then, down to a total area equivalent to the current area of production in Victoria. The area of irrigated dried fruit fell from around 1,600ha in 1997 to 570ha in 2018, while table-grapes grew over the period, with a hiatus between 2006 and 2009, although the total area in 2018 at 1,800ha is still only 20% of the total area of irrigated table-grapes in Victoria.

b) Tree Crops in NSW LMD

The following chart shows the area of irrigated production for citrus and almonds in the NSW LMD area since 1997. In this chart the area for olives and stonefruit has been excluded as the areas are so small.

Figure 10: Irrigated tree-crop production LMD NSW (ha)

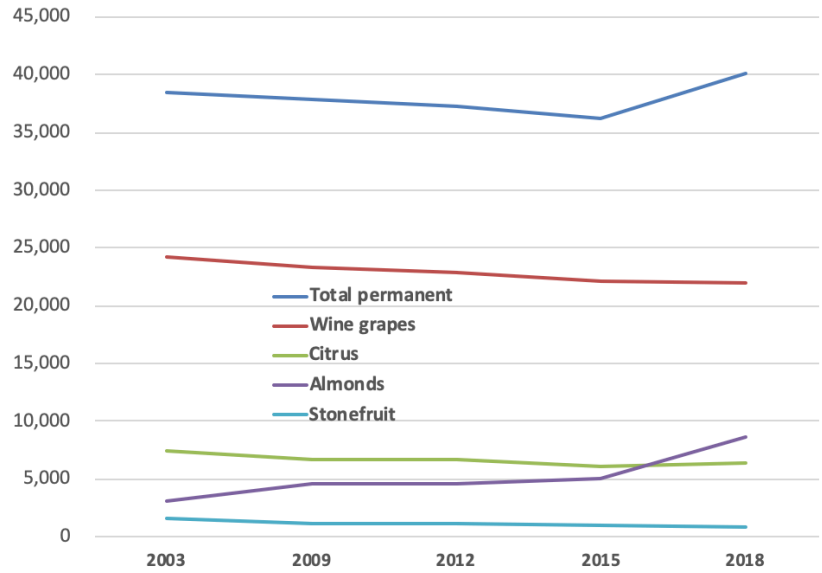


This chart shows a staged decline in the area of irrigated citrus production over the period, with some small recovery since 2015. By contrast, the almond sector was insignificant until 2015 but since then has increased significantly - although, once again, it is instructive to note that the total irrigated area in the NSW LMD in 2018 for almonds is only 11% of the total equivalent area in Victoria. It should be noted that these figures only cover the LMD area and so do not include irrigated production in the Riverina, which is dealt with in Section 4.6 below.

2.4 | South Australia

The comparative data for South Australia (SA) is more limited, lacking figures for 1997 and 2006. However, the trends are instructive. In this chart the total irrigated area of permanent plantings is shown along with data for key sectors. The table-grape sector is excluded as it totals only 100ha.

Figure 11: Irrigated production SA LMD (ha)



The main trends are:

- A gradual decline in the total area of irrigated permanent plantings up until 2015, evident for the three major sectors of wine-grapes (which avoided the boom-and-bust cycle in Victoria) citrus and stonefruit
- A slow expansion of the area of irrigated almonds, until a marked pick-up after 2015, with the total area in 2018 now 35% of the equivalent area for Victoria.

2.5 | Summary of changes by sector

This section provides an initial summary comparison of the development in irrigated production within the Lower Murray Darling between 1997 and 2018 across the three relevant jurisdictions for the two major sectors covered by this study, namely almonds and table-grapes. Later chapters provide an in-depth analysis of that development.

a) Almonds

The following chart and table record the growth in plantings of almonds across the three states.

Figure 12: Growth in almond plantings by state (ha)

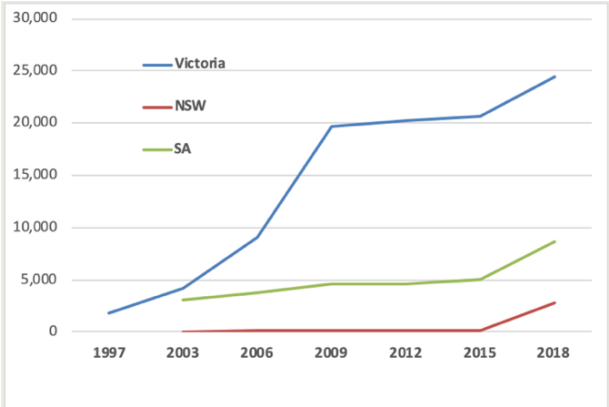


Table 2: Growth in area of almond plantings by state LMD (ha)

	1997	2003	2006	2009	2012	2015	2018
Vic	1,755	4,155	9,015	19,695	20,195	20,600	24,475
NSW		25	55	115	125	145	2,735
SA		3,020	*3,785	4,550	4,615	5,005	8,685

* Extrapolated data point.

This demonstrates:

- The substantial growth in Victoria up until 2009 in clear comparison with the other two states
- The period of consolidation between 2009 and 2015 across all three states
- Consistent growth across all three states since 2015.

It is important to record that the data for NSW does not include growth outside the Lower Murray Darling, e.g., at Griffith or Darlington Point. This growth outside the LMD is covered further in Section 4.4 (f).

b) Table-grapes

The equivalent figure for tables-grapes is shown below, across the three states:

Figure 13: Growth in Table-grape plantings by state (ha)

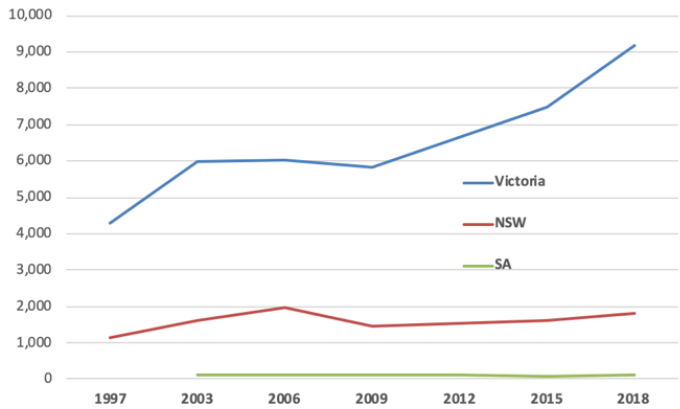


Table 3: Growth in area of table-grape plantings LMD (ha)

	1997	2003	2006	2009	2012	2015	2018
Vic	4,285	6,000	6,025	5,840	6,645	7,490	9,170
NSW	1,135	1,615	1,960	1,465	1,515	1,625	1,805
SA		100	*100	95	115	90	105

* Extrapolated data point.

These comparisons show:

- The considerable growth in the area of irrigated table-grapes in Victoria since 2009, with growth at around 8% per year since 2015
- By contrast, growth in plantings of table-grapes in NSW and SA within the LMD has been limited.

3.0 | Macro trends and factors

This section reviews the major factors which have influenced horticultural plantings at a macro scale. This identifies important drivers of increased demand as well as factors that created incentives and impetus on the supply-side.

3.1 | Growth in demand internationally

There has been sustained growth in demand for both almonds and table-grapes at a global scale driven by several factors:

- Growth in demand for almonds within established markets as a snack food and within processed foods, as part of a wider move towards plant-based protein diets
- Expansion of export markets for discretionary food items in Asian countries.

a) Almond Board of California

80% of the world's almond production and supply comes from California, with 7,600 growers producing 1M tonnes annually, 67% of which is exported. The Almond Board of California plays a central role in marketing this product both within the USA and overseas, with the support of a significant budget. As a result, domestic consumption in the USA per head of population rose by 33% over the four-years from 2014/15 to 2017/18, at the same time as total export sales increased by 30%.

Table 4: Demand growth promoted by Almond Board of California[2]

		2014/15	2015/16	2016/17	2017/18
Domestic	lbs/head	1.71	1.8	2.07	2.28
Exports	Million lbs	1,173	1,218	1,425	1,517

The Almond Board of Australia has a voluntary levy which is paid on 99% of production, generating over $2 million per annum to support promotion of the domestic market and export market development. Australian producers also benefit from the commitment of considerable funds by the Almond Board of California to promote continued export demand growth (Figure 14) at a global scale.

b) Snacks and processed foods

Australian domestic consumption of almonds continues to grow both as a snack food and as a constituent element in processed foods. As the Almond Board of Australia reports:

Approximately half of the Australian almonds consumed domestically are in manufactured products where almonds remain by far the number one nut choice for inclusion in recipes of new products. Heading the list of new products are protein bars, snack packs and breakfast cereals. Almond milk, along with other plant-based milks continue to grow in popularity.[3]

This approach matches the Californian experience which reports that:

Nearly 11,000 new products with almonds were introduced in 2018. 80% of the new products came from the confectionary, snack, bakery, bar and cereal categories.[2]

This is also part of a global trend in developed economies towards plant-based sources of protein.

c) Middle-class demand in Asia

The last fifteen years have seen a marked expansion in demand for higher-quality food products in southern and south-east Asia. This demand has come from growth in the size of the middle-class population which is set to number over 3 billion by 2030. Asian-Pacific countries will see a growth in their middle-classes by over 500% in the 20 years up to 2030, compared with 2% growth in Europe and a decline of nearly 5% in America.[4] This population seeks higher-

[2] Almond Board of California (2020), Almond *Almanac 2019*
[3] Almond Board of Australia (2020), *Almond Insights 2019/20*
[4] World Economic Forum (2014), *Top ten trends - #8: The expanding middle class in Asia*

quality foods with more discretionary luxury items. Almonds and table-grapes are both key examples, with almonds in particular demand in India as part of celebrations at religious festivals.

The sustained investment in export market development by the Almond Board of California has helped create and expand this international demand, from which the Australian sector also benefits.

Figure 14: Almond Board of California (ABC) - Global Market Development[2]

3.2 | International free trade agreements

A second factor that has been responsible for the expansion in almond and table-grape production in the region since 2015 has been the expansion of access to export markets through the introduction of free-trade agreements between Australia and important overseas markets.

Free trade agreements (FTA) aim to reduce or eliminate barriers to trade in goods and services, as well as to promote cross-investment between countries. Australia now has fourteen such FTAs in force. The most significant ones for this study and their dates of implementation are shown in Table 5.

Table 5: Australian Free Trade Agreements[5]

Country	Acronym	Date
ASEAN	AANZFTA	2010-12
Malaysia	MAFTA	2013
Korea	KAFTA	2014
Japan	JAEPA	2015
China	ChAFTA	2015

The FTAs have been important in opening-up markets for Australian agricultural exports. The following quotes from the table-grape and almond sectors confirm the extent of that growth.

- **Table grapes:** the Australian Table Grape Association reported in 2019 that: *The value of Australian table grape exports in the 2019 season had eclipsed half a billion dollars for the first time ever - with the total export value at AUD$555M. Australia exported over 146,000 metric tonnes, marking a year-on-year rise of 33%.*[6]
- **Almonds:** In 2019, the Almond Board reported that: *The export volume of Australian almonds grew from 54,343 tonnes in 2017-18 to 60,894 tonnes in 2018-19. Almond exports earned the nation $552 million*.[3]

A related shorter-term factor in 2020 was the trade dispute between China and the USA which advantaged Australian growers:

> *The tariffs placed on the US by China as a result of their trade disagreements, have accelerated exports of almonds to China from 11,860 tonnes to 39,862 tonnes, an increase of 236%.* As a result: *Australian almond exports to China and Hong Kong grew from 2% of Total Exports in 2017-18 to 20% in 2018-19.* [3]

3.3 | Drought in California

As noted, California produces 80% of the world's almonds. That level of production depends on access to reliable water from rainfall and irrigation. That availability was challenged by severe drought from 2011-2017, with the period from late 2011 until 2014 being the driest in Californian history. As a result, existing producers of almonds and corporate investors sought alternative locations for orchards to complement California's production.

Alternative sites have been preferentially sought in the southern hemisphere to provide counter-seasonal supply. As Olam reports:

Australian almonds grow counter cyclically - when almonds are out of season in other large almond-growing regions like the US, they are in season here. This means we can deliver almonds to consumers around the world on an almost constant basis.[7]

The southern Murray Darling Basin in Australia was an attractive location in comparison to other potential locations, such as Chile and South Africa, because of the availability of land, secure water supply, established skills and infrastructure. Given the high levels of mechanisation in the almond sector, the relative labour cost advantage of other locations was not so pronounced.

3.4 | Corporate funds

A further factor which has been significant in the expansion of the almond sector since 2015 has been the growth in investment funds seeking to deploy capital in agricultural assets to diversify their portfolios. This interest has been more significant since the Global Financial Crisis in 2007/08, when agriculture was identified as a less volatile sector than other asset classes.

The top 30 institutional investors in farmland have an aggregate value of agricultural assets under management (AUM) of US$47bn. North America and Australia/New Zealand (ANZ) are the primary geographic focus for a majority of the top 30 farmland ag investors. The following table lists a number of these funds to give an indication of the range of investors and the scale of the investments to date, with a particular focus on those funds targeting Australia.

[5] www.dfat.gov.au/trade/agreements/Pages/trade-agreements
[6] https://www.freshfruitportal.com/news/2019/08/28/grape/
[7] www.olamgroup.com/locations/australia/almonds.html

Table 6: Top investors in agricultural assets worldwide - with a focus on Australia (Ag AUM US$bn)[8]

Rank	Type	Base	Target	AUM	Focus
1	Nuveen	USA	Farmland	8.5	Global
2	Hancock NRG	USA	Farmland	3.1	ANZ/USA
3	PSP Investments	Canada	Farmland	2.7	ANZ USA etc
4	Future Fund	Australia	Mixed	2.7	ANZ
5	Adecoagro	Luxembourg	Farmland	2.6	S America
6	Macquarie IRA	Australia	Farmland	2.2	S America ANZ
7	Rohatyn Group	USA	Farmland	2.1	ANZ, USA etc
10	UBS Farmland Investors	USA	Farmland	1.5	Global
11	New Zealand Super	NZ	Farmland	1.5	ANZ
12	Warakirri Asset Mgt	Australia	Farmland	1.4	ANZ
13	Rural Funds Mgt	Australia	Farmland	1.2	ANZ
25	Duxton Asset Mgt	Singapore	Farmland	0.7	ANZ ++
28	Aquila Capital	Germany	Farmland	0.5	ANZ
29	Kilter Rural	Australia	Farmland	0.5	ANZ

Examples of international funds which have recently invested in agricultural assets in Australia include:

- **The Ontario Teachers' Pension Plan:** which bought:
  - a 360ha avocado property from Jasper Farms in WA in 2018 for $180M
  - the 220 hectare 'Capel Farms' avocado property near Busselton in WA, for $20 million
  - Macquarie Group's 2,878 ha almond properties at Robinvale in 2015 for $115M
- **The Public Sector Pension Investment Board** in Canada (PSP Investments) which bought:
  - Almond properties and water entitlements off Olam in 2019
  - Webster's walnut business for $854M including 150,000ML of entitlement in the sMDB
  - BSB Feedlot in NSW in 2019 for $208M
  - Stahmann Farms, Australia's largest pecan and macadamia processor and marketer
- **The Royal Borough of Windsor and Maidenhead** on behalf of its Berkshire Pension Fund invested $30M in *Milltrust Agricultural Investments* which in 2017 acquired Cottrell Farms – a collective of citrus, avocado, and wine and table grape orchards in Sunraysia. This is one example of investments in Australian agriculture from UK local government pension funds which have recently been aggregated into a pooled vehicles such as the *London Collective Investment Vehicle*, which now represents the interests of 32 London Local Authority pension funds (including the City of London) with AUD$64 billion in funds under management.

Australian agricultural assets are an attractive part of an investment portfolio because of their low sovereign risk. Pension funds look for low volatility to fund a regular annual coupon and so irrigated almond production is attractive because almonds are:

- An international commodity driven by global prices not local factors
- With low volatility in yields due to
  - Scale of production
  - Mechanised production
  - Limited perishability

This compares with the far greater volatility from, say, table-grapes, which require a high labour input and demonstrate considerable variability in yields between seasons due to factors in production.

Projections suggest that this form of corporate funding will continue to seek opportunities to deploy capital in Australian agriculture and that almonds are seen as an attractive sector.

[8] High Quest Partners/Global Ag Investing (2020), *Global Aginvesting Rankings & Trends Report 2019.*

3.5 | Managed Investment Schemes

A Managed Investment Scheme (MIS) is a mechanism to allow funds from multiple, smaller investors to be pooled to create the quantum of funding needed for larger projects, which are then managed for those collective investors by promoters as a shared business activity. MIS are a popular vehicle for smaller investors as they provide access to asset classes that may be otherwise inaccessible to them. The concept was introduced to Australia in July 1998, by the *Managed Investments Act* (Clth), and was subject to the oversight and licensing requirements of the Australian Securities and Investment Commission (ASIC).

The attractiveness of MIS was enhanced by their taxation status. MIS were explicitly promoted to encourage investment by shareholders in Australian forestry and agricultural sectors, where tax concessions were used to overcome perceived failures in the market for risk, by sharing those risks between the private investor and the taxpayer. Under this approach investors in forestry and agricultural MIS could claim up-front tax deductions for the costs of their investments, including the fees paid to the scheme promoter. This tax-deductible status was a major attraction of MIS schemes for investors.

The MIS approach was a significant factor in the development of the olive and almonds sectors in Victoria, where key players included Timbercorp and the Great Southern Group - so for example, by 2007 Timbercorp managed 15,000 ha of orchards across a range of crops with a focus on olives and almonds. However, the attractiveness of the schemes fell early in 2007 after the government abolished the tax relief on non-forestry MIS. This change in the taxation ruling combined with the global financial crisis, drought and exchange rate parity were instrumental in the demise both of Timbercorp and the Great Southern Group in 2009. However, the analysis below suggests that the main reasons for the demise were related to financial not agronomic factors as the underlying business proposition behind the orchard plantings has proved to be robust as the current owners continue to expand production.

3.6 | Production values

One of the key drivers of investment decisions is the return that an investor can expect to make from the chosen crop in the selected location. The following table provides an indication of the relative yield and gross return that different sectors and crops can expect to generate in the Victorian Mallee.

Table 7: Yields and gross returns by crop type in Victorian Mallee[9]

Sector	Crop	Yield	Value	Yield	Water use	Return
		tonnes/ha	*$/tonne*	*$/ha*	*ML/ha*	$/ML
Grape	*Dried grape*	10.0	1,805	18,050	9	2,006
	Table grape	22.2	3,065	68,043	12	5,670
	Wine - grape	25.0	474	11,850	8	1,481
Citrus	*Mandarin*	35.0	1,000	35,000	10	3,500
	Navel	40.0	800	32,000	10	3,200
Fruit etc	*Avocado*	9.0	7,000	63,000	12	5,250
	Olive	2.6	5,350	13,910	12	1,159
	Stone fruit	15.0	2,597	38,955	12	3,246
Nuts	*Almond*	3.5	8,000	28,000	13	2,154
	Pistachio	3.0	11,063	33,189	13	2,553

These are gross returns not marginal values, but they are indicative of the relativities between crops. For example, they provide a pointer as to the attractiveness of moving from wine-grapes into table-grapes, given the greater return per hectare and per ML of water applied. However, the simple comparison does not adequately account for the costs of production or the relative risks between crops.

[9] MRIC team from multiple sources

3.7 | Summary of macros drivers

The expansion in both the almond and table-grape sectors appears to be driven by a real and continuing growth in demand in both domestic markets and overseas. The export growth is underpinned by increased access to markets following the introduction of the Free Trade Agreements and the very active market development activities of the peak industry groups such as the Almond Board of Australia and the Australian Table Grape Association.

There are also supply-side factors at play, most notably the growth in available capital from pension funds looking to expand their portfolios into low volatility agricultural assets, and their interest in diversifying away from the perceived risks to production in California due to drought, the introduction of stricter aquifer management plans and bush-fires.

This analysis suggests that the growth in production reflects robust underlying factors and compares favourably with some other historic sectoral growth drivers such as subsidies to promote wine-grape planting or the taxation advantages of MIS.

4.0 | Almonds

4.1 | Summary overview

This section confirms that Victoria represented the large majority of almond sector development in the Lower Murray Darling over the period from 2003, particularly up to 2015, and still represented 68% of the total area in 2018.

Figure 15: Almond plantings in the LMD by state over time (ha)

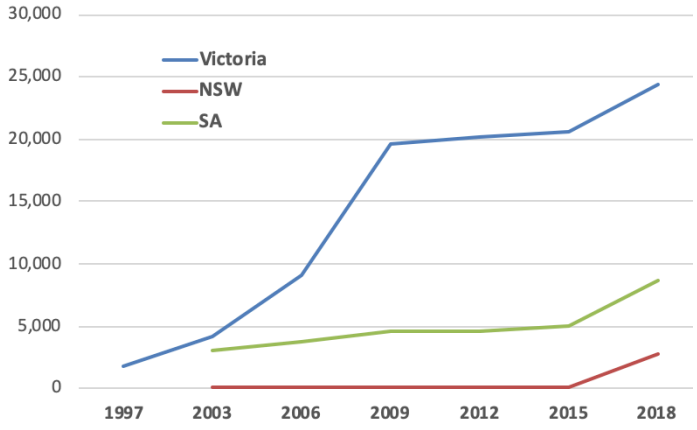


Table 8: Almond sector irrigated area LMD (ha)

	2003	2006	2009	2012	2015	2018
Vic	4,155	9,015	19,695	20,195	20,600	24,475
NSW	25	55	115	125	145	2,735
SA	3,020	3,785	4,550	4,615	5,005	8,685
TOTAL	**7,200**	**12,855**	**24,360**	**24,935**	**25,750**	**35,895**
Vic % of Total	58%	70%	81%	81%	80%	68%

The following sections focus on analysing the drivers and locations of that development.

4.2 | Stages in almond sector development

It is helpful to see the development of the almond industry as four sequential stages with different drivers and features:

1. Early, small-scale development in South Australia and then Victoria
2. Major expansion in Victoria under Timbercorp Ltd as part of the MIS initiative - from 2003 to 2009
3. Adjustment and restructuring post Timbercorp, the Millennium Drought and Global Financial Crisis - 2009 to 2015
4. Expansion since 2015 with significant corporate investment across all three states

1. Early development: The original almond development occurred in South Australia - initially in the Adelaide Hills and then at Waikerie in the Riverland. Early plantings in Sunraysia in the 1980s were led by the Blazey Family, founders of Defender Farms, who changed their name to Select Harvests, with John Bird as CEO from 1998, when they owned 730 ha producing 1,600 tonnes/yr.

2. Managed Investment Schemes: In the late 1990s, Select Harvests formed a strategic alliance with Timbercorp Ltd to develop and manage almond orchards through Managed Investment Schemes (MIS). This led to a significant expansion in the sector, with 16,000ha of plantings on greenfield sites. This growth was driven largely by the tax advantages in the MIS (see section 3.5). That period ended in 2009 with the demise of the major MIS proponents, following changes in the taxation position of non-forestry MIS and the combined forces of the drought and global financial crisis. It is generally agreed that it was the tax and investment structure that was unstable rather than the underlying agronomic or business factors, as the plantings have proven to be robust in terms of productive capacity and market demand, and the orchards have continued to generate value.

3. Post Timbercorp: The period immediately post the MIS structure saw Timbercorp's properties acquired by Select Harvests, Olam and Almas Almonds but then a period of adjustment and consolidation in response to the global financial crisis, exchange-rate parity, drought, floods and Basin Plan implementation.

4. Expansion since 2015: since 2015 there has been sustained further growth. Large players have expanded their existing orchards and new orchards have been established assisted by the increased availability of global capital seeking investment opportunities in Australian agriculture funded by international pensions funds. For example, the Hancock Agricultural Investment Group (as part of ManuLife) owns and manages 40,000ha in Australia on behalf of institutional investors, including almond and macadamia plantings. Recent transactions include:

- $120 million for 19,877ha of a combined cotton and almond property near Hillston from Harvard University's endowment fund
- $98M for 3,481ha Mooral property at Hillston from Rural Funds Group, including 800ha of almonds with a long-term supply contract to Select Harvests
- 85ha property Tharbogang Almond Orchards near Griffith
- 131ha property combined sector in the Riverland.

4.3 | Location of almond plantings

The map on the following page (Figure 16) shows the location of almond plantings over time in the Lower Murray Darling in Victoria and NSW:

The map shows:

- **Early properties** by 2003- dark green plantings by Defender Farms/Select Harvests at Wemen and Boundary Bend
- **Timbercorp** - light green up to 2009 - major expansion at Boundary Bend and Wemen
- **2009- 2015:** Yellow - minor expansion and restructuring, e.g., area north of Piangil was Olam optimising plantings at a previously owned Timbercorp orchard
- **2015-2020**: brown - more recent developments:
  - West of Wemen is a new orchard development by Bright Light Agribusiness
  - In NSW major new developments have occurred across the river from Piangil and south of the Murrumbidgee - mainly managed by Hancocks and goFARM

This locational mapping is confirmed in the data on the level of plantings by Private Diverter region over time.

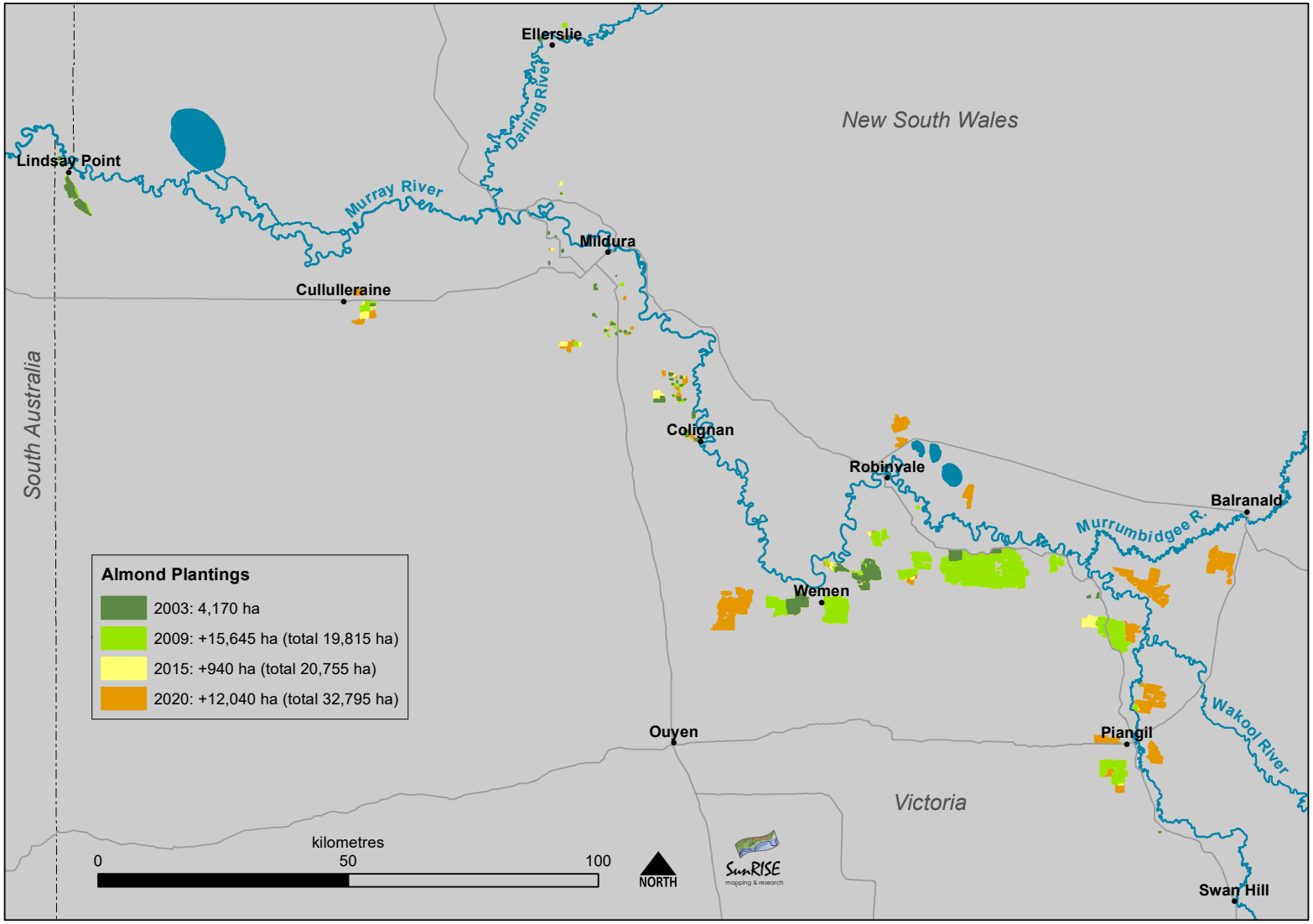
Table 9: Area planted to almonds by private diverter region in Victorian LMD (ha)

Region	1997	2003	2006	2009	2012	2015	2018	2019
Nyah			295	2,200	2,225	2,230	2,935	3,145
Boundary Bend	625	620	5,040	10,190	10,290	10,370	11,040	11,170
Wemen	170	2,275	2,380	5,595	5,260	5,515	7,475	8,215
Colignan	185	320	310	420	815	805	1,000	1,030
Lock 10 to SA Border	650	800	845	1,115	1,455	1,535	1,845	1,960
Total	**1,630**	**4,015**	**8,870**	**19,520**	**20,045**	**20,455**	**24,295**	**25,520**

This shows:

- Early developments before 2003 around Wemen and close to the SA Border at Lindsay Point
- Significant growth in plantings at Boundary Bend between 2003 and 2009
- Further growth around Wemen in the period up to 2009 and again after 2015
- Recent smaller-scale consolidation and expansion across most locations

Figure 16: Location of almond plantings by time period and location - LMD Vic and NSW



4.4 | Locational factors

Table 8 above identifies that 80% of almond development within the LMD occurred in Victoria up to 2015. This section reviews the factors that were significant in driving these locational decisions. The analysis is based on advice received during the consultation round and from published data.

a) Happenstance and inertia

Part of the factors are a matter of happenstance - one of the first investors was Defender Farms who were based in Victoria and once they had established their initial properties in Victoria there was inertia involved in changing investments away from a known base. Equally, the MIS programs were largely driven by companies based in Melbourne who had good contacts within decision making circles in Victoria.

b) Agronomic requirements

There were strong agronomic factors that led to the location of early investment decisions in the Sunraysia area of the Victorian Mallee. Almonds prosper where summer temperatures are hot and dry, with chilling during dormancy, but they do not tolerate frosts during bud burst, or rain while the fruit and husk is drying on the ground. Sunraysia offers:

- A suitable climate, with hot dry summers and low levels of rain in most years, providing the ideal setting for drying the product on the ground with little risk of rot or taint and with lower risks of pest infestation
- Suitable, well drained sandy soils with a fall for drainage

The area between Robinvale and Wemen was well suited to meet these requirements.

c) Property Scale

One of the key attractions of almonds for the MIS proponents was that the sector provided the opportunity to operate at scale with highly mechanised production. In order to achieve this, proponents sought properties with appropriate size and with freehold tenure. Sunraysia could deliver against these specifications.

Large-scale freehold blocks of 2,000ha had previously been established in Sunraysia through the *North-West Mallee Settlement Areas Act 1948*, under which the original freehold titles of 640 acres were resumed by the Government, amalgamated into a series of larger contiguous titles and released back to fewer farmers. This policy had been driven by the failure of the previous soldier settlement and closer settlement schemes due to the lack of scale.

These properties were also subject to a municipal planning scheme which allowed for irrigation development. This meant that they could be converted to horticulture under the existing land use provisions of the Planning Act, with an approvals process limited to meeting the New Irrigation Development Guidelines. The region also had a tradition of irrigation with established skills and logistics.

The Victorian properties were freehold and had largely been cleared of native vegetation which minimised the requirements for any environmental impact assessment, while the establishment of National Parks in the region had provided a register of rare and threatened species which made it easier to mitigate offset requirements.

By contrast, much of the available land in southern NSW was subject to Western Land leases, and areas in South Australia were generally of smaller scale. More recently the government in NSW has encouraged Western Land Lease holders to convert properties to freehold which has removed one of the factors which preferenced Victoria in terms of location.

d) Water entitlements

Victoria was also an attractive location regarding water entitlements. One of ASIC's regulatory requirements for non-forestry MIS was that scheme proponents had to demonstrate that they owned adequate water entitlements to meet future irrigation requirements. In the early development stages of the sector there was a strong contrast between Victoria, with its large volume of high reliability Water Rights, in comparison with NSW, with its very small volume of High Reliability entitlement and a larger volume only of the lower-reliability General Security entitlements. This meant that proponents in Victoria were better placed to meet ASIC requirements for scheme compliance.

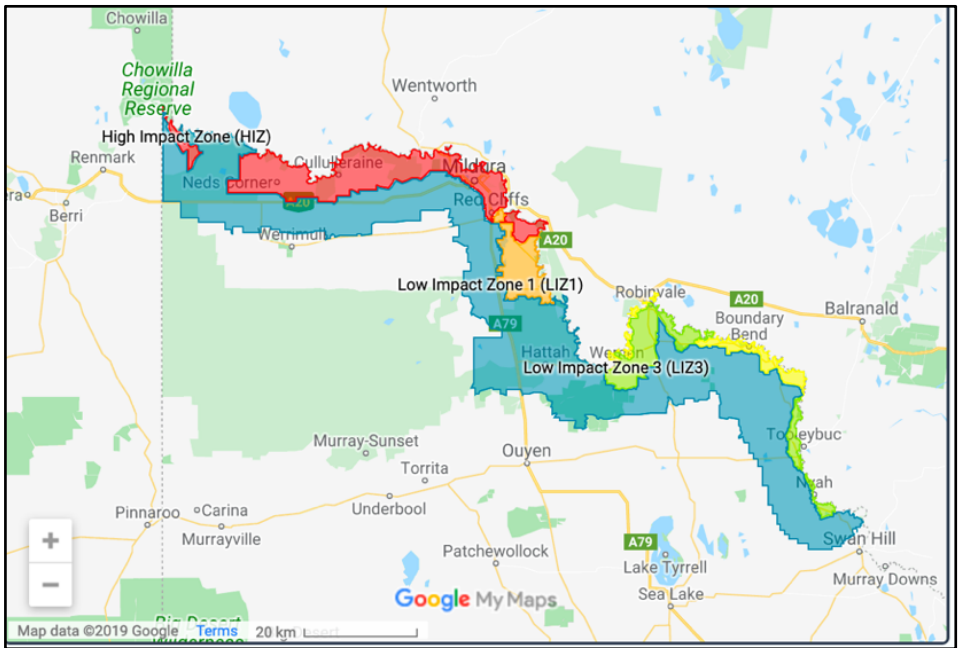
Investors sought the ability to establish a private diversion for their water supply preferring a pumped pipeline from the river as this gave them greater control over supply risks than relying on accessing supply from an established irrigation district. There were then practical issues regarding the relative ease of access to the river - where

proponents preferred schemes to be located within 2km for water access, which was relatively easy to meet in Victoria and less so in NSW. Equally, planning laws in Victoria gave landholders automatic rights of access to the river across neighbouring properties.

e) Salinity

One factor which affected the decision on where to locate was the relevant salinity impact zone in the Murray Mallee in which the proposed property was located, as shown in the map below. This encouraged investment upstream around Boundary Bend in preference to the older irrigation districts around Mildura. The importance of this factor is expanded further below at Section 6.6.

Figure 17: Murray Mallee Salinity Zone Mapping[10]



f) Regulatory protocols - early stages

There was a perception amongst developers at early stages that the process of applying for and achieving approval was easier in Victoria than in NSW, and that Victoria was more pro-development. In particular, it was felt that Victoria had well-coordinated protocols between the two large Councils and the regional agencies of the Department of Primary Industries (DPI) and Lower Murray Water (LMWater) covering:

- Soil surveys
- Approval to take and use water
- Annual Use Licence validation
- Impacts for salinity control
- Planning controls regarding works - such as pump stations, pipe laying etc
- Assessment of native vegetation impact and offsets

Under this approach the agencies had the mantra that an application received in January could be approved in time for crops to be planted and growing in July, provided they met clear criteria. These regulatory protocols that provided certainty still apply in Victoria.

By contrast, the equivalent area of NSW in the LMD was perceived as:

- Having a less coordinated processes across multiple agencies in different locations
- Many smaller shire councils less focussed on development

[10] https://www.lmw.vic.gov.au/for-irrigators/salinity-zone-mapping/

Similarly South Australia was characterised by:

- Smaller scale properties, and
- A perception by some growers that SA would impose tighter salinity controls

Once developers had grown accustomed to a clear process and had worked with individual public servants, then there were benefits from dealing with an established process and people that they knew in Victoria.

g) Recent developments in NSW

More recently, the almond sector has seen new developments being located at Griffith and Darlington Point in the Murrumbidgee, and at Hillston in the Lachlan. Most of this expansion was initially by existing irrigation businesses converting from annual crops or citrus rather than outside investors. More recently, larger corporates have invested in the area, although still at a smaller scale than in Victoria, e.g., Olam has 3,100 ha in NSW -vs 12,000 ha in Sunraysia.

This recent growth in NSW outside the Lower Murray Darling region has been driven by:

- A recognition of water delivery constraints in the lower reaches of the River Murray in NSW and Victoria
- Access to a more diversified water portfolio in NSW with multiple sources including groundwater
- A perception that development controls are now less restrictive in NSW than in Victoria

On this last point, developers commented that over the last five years NSW has presented a lower cost for development than Victoria. This was reported as being apparent in a lower cost for land capability assessment and approvals, the absence of charges for salinity, no AUL requirements and easier arrangements for the clearing of remnant vegetation within guidelines. Section 6.8 below reviews the salinity control aspects further.

The alluvial soils in the Murrumbidgee and Lachlan are less attractive in agronomic terms than the sandy soils in the Mallee as they can get waterlogged, and the climate is not as dry, so pests and disease are more difficult to manage. But there can be higher yields despite greater risks. These same issues also apply to exploratory developments in Victoria above the Barmah Choke, which is less exposed to water delivery constraints.

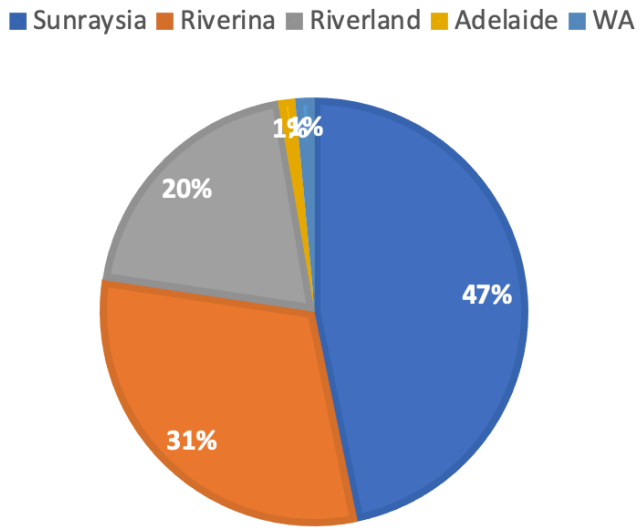
4.5 | Almond market characteristics

The area of production of the almond sector at a national scale in 2020 was around 53,000ha of which 17,000ha were new plantings and so non-bearing. Nearly half of that production was in Sunraysia in Victoria.

Table 10: Location of almond production across locations (ha) [11]

Location	Area	% of total
Sunraysia	24,786	47%
Riverina	16,234	31%
Riverland	10,571	20%
Adelaide	669	1%
WA	753	1%
Total	**53,013**	

Figure 18: Relative locations of almond plantings



The total area of production yields around 100,000 tonnes of product a year of which 74% is exported. In addition, around 2,750 tonnes are imported for domestic consumption.

Table 11: Market destination

Destination	Tonnes	%
Domestic	26,755	26%
Exports	76,556	74%
Total	**103,311**	

The large majority of these exports are exported to neighbouring countries in Asia, the Pacific and Oceania.

Table 12: Export markets

Export market	%
Asia & Pacific	78%
Europe	16%
Middle East & Africa	5%
Americas	1%

[11] All data in this section comes from: Australian Almond Board (2020), *Almond Insights 2020*

4.6 | Investor and enterprise types

The expansion of almond orchards has taken place largely through investment in greenfield sites in the private diversion regions upstream of Mildura around, for example, Boundary Bend. These developments involve a number of different enterprise forms which often involve one entity owning the property and its assets and a separate entity managing the property:

- *Investment funds:* some of the growth has involved developments promoted by investment funds. In these cases, a financial entity seeks to include agricultural land or water within its investment portfolio but does not want to carry the burden or risks around farm production. That day-to-day management is then devolved to a specialist farm management company, such as Southern Cross Farms.
- *Specialist producers*: by contrast there are specialist producers such as Olam International who are commodity traders and whose priority is the production and trading of a chosen crop. They do not want to tie up capital in owning land. The example below reports on an approach whereby Olam International sold assets to Canada's Public Sector Pension Investment Board (PSP Investments).

One of PSP Investments' related entities will buy the 89,085 megalitres of permanent water rights from the Singapore-based global food and agribusiness Olam. Olam said it had struck a new tiered-revenue-sharing agreement with PSP Investments for the almond orchards, related assets and water rights. Olam will pay PSP Investments a share of revenue from the orchards for an initial 25 years, in an arrangement that includes an option for an additional 25 years.

"Consistent with our asset-light approach to tree crop production, this arrangement will enable Olam Orchards Australia to focus on operations and continue to deliver best-in-class products and services to customers," said Ashok Krishen, the managing director and chief executive of Olam's edible nuts business. "I am confident this partnership with PSP Investments will help lead the industry in sustainable farming and agricultural practices and protect critical natural resources, such as water, in Australia," he said.

PSP Investments managing director Marc Drouin said the agreement with Olam was complementary to its other permanent crop investments around the world. "Our agreement with Olam Orchards Australia is consistent with our strategy to partner with best-in-class operators who take the long-term view and to invest in high-quality agricultural assets globally," he said.[12]

[12] Sydney Morning Herald, December 3, 2019

5.0 | Table-grapes

5.1 | Summary development data

The production and marketing of table grapes is challenging technically and financially. Table-grapes have exacting production requirements to ensure optimal fruit size and quality. Prices, yields and quality are all volatile. Table-grape growing is therefore an activity that is best suited to family operations, because of the flexibility available in labour supply and the timeliness of interventions which are of the essence in production and marketing. A family enterprise can also provide access to the financial reserves required to match volatile market conditions.

This section confirms that most of the growth in the table-grape sector within the LMD since 1997 occurred within Victoria.

Figure 19: Area of table-grape development within LMD (ha)

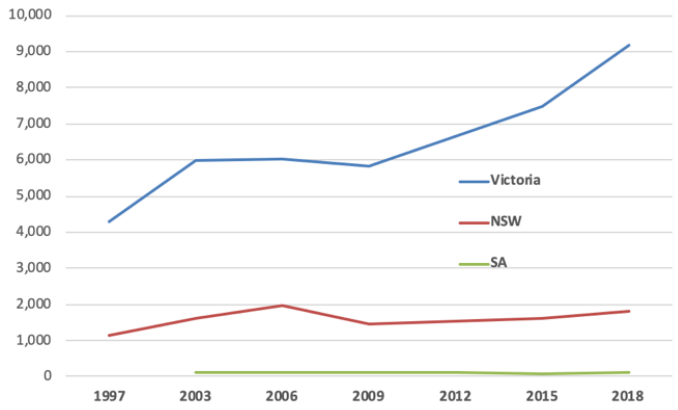


Table 13: Growth in area of table-grape plantings by state within LMD (ha)

	1997	2003	2006	2009	2012	2015	2018
Vic	4,285	6,000	6,025	5,840	6,645	7,490	9,170
NSW	1,135	1,615	1,960	1,465	1,515	1,625	1,805
SA		100	*100	95	115	90	105

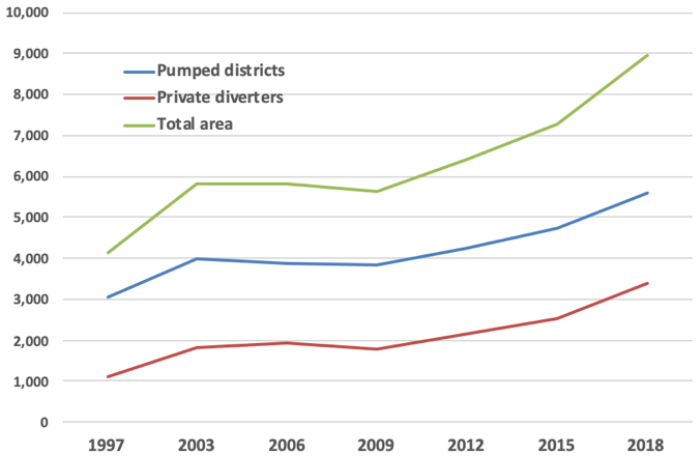
* Extrapolated data point.

The following sections expand on this analysis.

5.2 | Victorian development

This section analyses the data on the development of the table-grape sector in Victoria over time.

Figure 20: Area of table-grape development within Victorian Mallee (ha)



This figure shows three distinct phases in the growth of the sector.

1. Early stages: up to 2003

In its early stages the industry was supported by government agencies and staff members (such as Keith Leamon), who helped nurture the transition from dried-fruit and the development of quality assurance standards.[13] The initial location in Robinvale was determined largely by the available skills and expertise from existing wine-grape growing families.

2. Stability: 2003 to 2009

A period of stability between 2003 and 2009 due to drought and the global financial crisis

3. Export-led growth from 2009

The growth since 2009 has been driven by access to export markets as the domestic market was largely mature. Although there had been some export penetration before, this was mainly informal and not always fully compliant with export requirements. This placed the trade at risk of stricter enforcement of administrative protocols. A group of growers in the industry therefore decided that a more structured and formal approach was required.

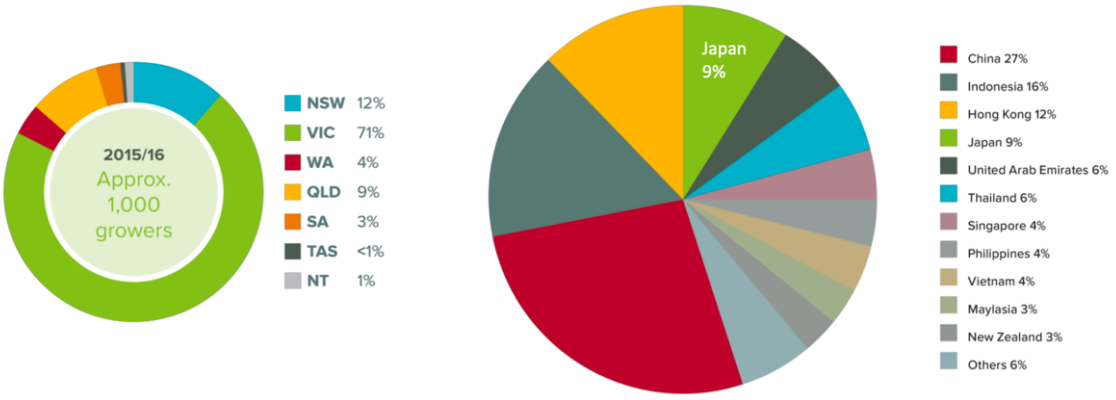
A first step was to form a national body to represent the industry, which would provide a formal basis for the negotiation of access to export markets. This led to the creation of the Australian Table Grape Association (ATGA) in 2007, with a CEO and levy powers to raise the funds and establish the capability to engage officials in Australia and potential export markets to negotiate market access terms and arrangements.

The primary target for this approach was the China market. There had been informal exports into China before, but this had been through agents in Hong Kong, which did not allow Australian growers to win the full commercial benefit of their quality and did not provide direct access to Chinese buyers. The exercise led by the ATGA and industry representatives was protracted and challenging but eventually led to an agreement for market access. This was greatly helped by the signing of ChAFTA, the Free Trade Agreement with China which came into effect in 2015.

The sector had the advantage that table-grapes were already established as a premium product in Chinese supermarkets, so growers did not have to educate the market to accept a new product. Equally, as a perishable product with a short shelf-life, the USA was unable to supply China for six months of the year and Australia was close to the market, with only a 14-15 day sea-freight voyage. Australia was well placed to compete in these markets with Chile and South Africa on quality and price given the challenges in production. New varieties over the last five years are now providing a wider range of seedless grapes over a longer season, with good storage and eating qualities.

The sector now has access to a wide variety of export destinations in the region as well as China including Japan, South Korea, Vietnam, Malaysia, Thailand and Taiwan. About half of the industry (mainly larger growers) export direct to buyers in export markets with the other marketing their product through merchants who manage the export accreditation protocols and contract negotiations with end buyers.

Figure 21: Australian table-grape exports: sources and destinations[14]



[13] The Vine magazine, May 2020: www.driedfruitsaustralia.org.au/vine-magazine-may-2020/
[14] Hort Innovation Table Grape 2017-2021 SIP

5.3 | Locational decisions

Investment decisions on locations for growth are largely driven by a need to be close to established infrastructure such as cool-stores and packing sheds. Property sizes inside the irrigation districts are also suited to table grape production. Traditionally, properties were based on the 25-acre (10ha) soldier settlement blocks and many growers still manage successfully on a 50-acre double block. Some recent developments suggest that future growth is likely to involve larger scale.

Evidence on the growth in production since 1997 shows that the growth has occurred predominately within the older established irrigation districts. This has occurred through the amalgamation of existing properties, the development of vacant land or the conversion of properties previously planted to dried fruit or wine-grapes, many of which had been dried off as a result of the Millennium Drought, high water prices or the slump in wine prices in the early part of this century.

Most of the available properties in Robinvale have been converted to table-grapes, so growers are now looking at sites in Merbein or larger greenfield sites in private diverter areas with good access to established infrastructure within the pumped districts.

The following tables confirm the location of table-grape development over time split between the traditional pumped districts (Table 14) and the private diverter regions (Table 15).

Table 14: Table-grape development: Pumped districts (ha)

	1997	2003	2006	2009	2012	2015	2018	2019
Nyah	25	25	20	15	20	20	10	10
Robinvale	1,405	1,730	1,680	1,650	1,765	1,915	2,080	2,095
Red Cliffs	475	665	640	660	740	825	995	1,110
Mildura	990	1,315	1,275	1,260	1,430	1,590	1,955	2,095
Merbein	150	240	275	270	310	385	550	605
Total	**3,045**	**3,975**	**3,890**	**3,855**	**4,265**	**4,735**	**5,590**	**5,915**

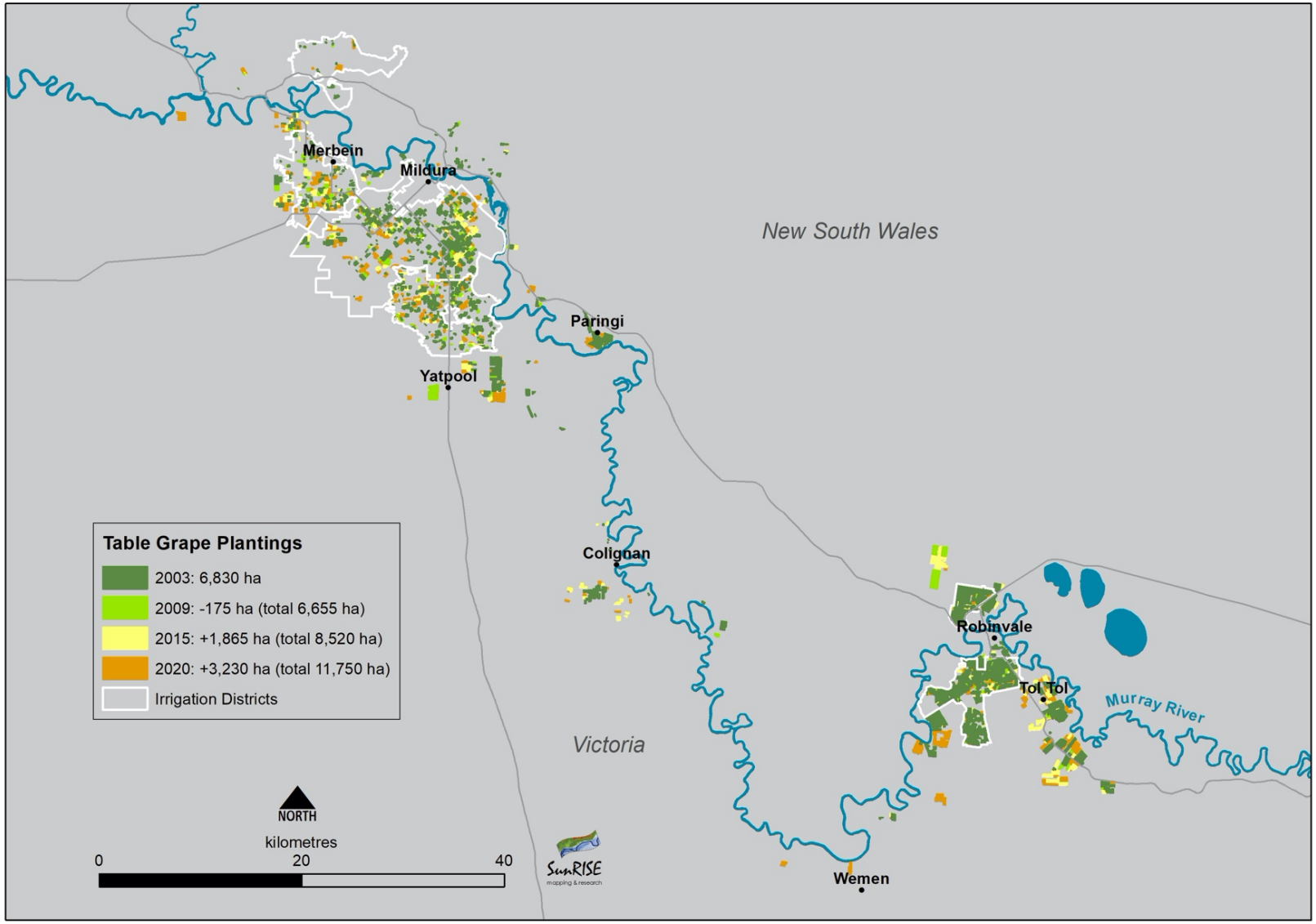
This Table shows the dominance of Robinvale and Mildura in the older pumped districts, with Robinvale as the initial centre of development, although Merbein is now a preferred location for new investment, given the availability of vacant land and access to reliable water supply.

Table 15: Table-grape development: Private Diverter regions (ha)

	1997	2003	2006	2009	2012	2015	2018	2019
Nyah	90	140	125	120	120	120	135	145
Boundary Bend	545	810	820	795	1,010	1,265	1,605	1,680
Wemen	235	270	250	185	190	195	320	485
Colignan	175	460	560	535	635	675	875	940
Mildura River	65	150	160	160	210	290	440	455
Total	**1,110**	**1,830**	**1,915**	**1,795**	**2,165**	**2,545**	**3,375**	**3,705**

The development in the private diverter regions has generally been located close to the pumped districts to give access to shared infrastructure. The following map shows the location of these new developments over time (Figure 22).

Figure 22: Location of table-grape developments over time Victoria and NSW LMD



5.4 | Business structure

The table-grape sector has traditionally been characterised by:

- Multiple, small-scale, family-based enterprises - often first-generation immigrants
- Separate, independent businesses
- With full vertical integration across growing, packing, sales and marketing

It is likely that this structure will evolve over time with the need to meet demanding export contract specifications and to provide export markets with:

- A constant large volume of supply
- The full range of varieties
- Across a long season - potentially over the full 12 months of the year
- As part of a wider supply contract covering multiple products

These pressures will drive towards a business model with:

- A smaller number of larger businesses. This follows the US model where larger properties are now the norm.
- With specialisation of functions, e.g.:
  - growing of specific varieties
  - packing, cool-stores
  - sales management
  - export marketing and accreditation building on established merchants

This model matches the approach which has become established in the apple and pear sector in the Goulburn Valley, where a small number of large players now play a role as an aggregator procuring produce from across a large number of smaller producers and holding contracts with the major retail outlets.

5.5 | Looking ahead

Three factors have been critical for the success of the sector:

- Access to export markets - particularly China
- Access to water - the ability to service that growth has depended on the flexibility and certainty of the water market to ensure that growers are able to access the additional water they need to meet irrigation requirements
- Access to capital to fund expansion. Most of this has come from internal business reserves. However, there is evidence of corporate funds playing a role in the sector, for example:
  - The Buy and Lease back arrangements by which MAI acquired Cottrell Farms in 2017[15]
  - Asian investors seeking direct control over product supply for an established retail chain and a safe location for capital

There is optimism within the industry about the continued growth of the sector in the region over the next decade:

- The strength of ongoing demand is there from export markets - despite some short-term hiatus around COVID and uncertainty on diplomatic tensions with China. There is likely to be greater competition from other southern hemisphere suppliers such as Peru
- Water will be a limiting factor - although the sector has the capability to outbid other users in the water market
- Further irrigable land is available within the established districts and elsewhere alongside the river (see Section 6.3 below)
- There is an ambitious generation of younger producers keen to win economies of scope and scale
- Labour has been a concern, but the sector can afford to pay proper wages and new varieties are extending the season and diversifying the product range allows 12-month hire contracts.

[15] www.globalaginvesting.com/milltrust-acquires-permanent-crop-aggregation-cottrell-farms/

6.0 | Factors and drivers

This chapter reviews the factors that are likely to influence future developments in the two sectors of almonds and table-grapes.

6.1 | Demand

There is evidence of continuing growth in demand both in domestic markets and internationally through exports. This is true of almonds and of table-grapes. High levels of almond supply in California in 2019/20 led to a fall in world prices which is likely to promote an increase in overall demand. Conversely, the recent bushfires in the state will depress Californian production in the current season, reducing production, boosting prices and supporting access for Australian producers.

The COVID pandemic is likely to have a medium-term impact on demand growth for both sectors as trading links become harder to establish and maintain, as they often rely on strong personal relationships. However, the recovery of the Chinese economy appears to be faster and so the impacts on demand less than initially feared.

Exports of almonds and table-grapes may also fall foul of the current diplomatic tensions between Australia and China, following on from restrictions imposed on exports of Australian barley, wine and seafood.

Both risks may be offset and reduced somewhat by the recent signing of the *Regional Comprehensive Economic Partnership* (RCEP). The RCEP is a new free trade agreement covering China, Australia, Japan, New Zealand, and South Korea, along with members of the Association of Southeast Asian Nations such as Indonesia, Malaysia, the Philippines and Thailand. RCEP will encompass 30% of the world's economic output covering 2.2 billion people.[16]

It is expected that this framework will provide an avenue for more normal trading arrangements to be re-established with China and that the RCEP will also kick-start the regional economies of many ASEAN countries post COVID.

6.2 | Supply-side impetus

The availability of global capital looking to deploy funds in agricultural assets will provide a continuing supply-side impetus, particularly in the almond sector. The economic disruption caused by COVID is likely to increase the relative attractiveness of agriculture as an asset class over other classes, such as commercial property and manufacturing, which have both been harder hit by the downturn.

In Australia *Eligible citizens can apply to access up to $10,000 of their super … If they have been adversely financially affected by COVID-19.*[17] This will affect the size of the Super Funds available in Australia for investment in Agriculture - although this has only been a small source of investment capital for the sector. By contrast, neither Canada nor the USA has a mechanism to allow early drawdown of Super Funds. COVID is therefore unlikely to impact on the quantum of international funds available for investment.

The increased presence of international capital in horticultural sectors is likely to change both the ownership of productive agricultural assets and the structure of the industry, for example leading to separation between the ownership and control of land, water, production and marketing within the same enterprise. These changes will affect the decisions and incentives of different players as they may have divergent investment horizons and drivers, which will differ from assumptions based on the standard owner/occupier model.

6.3 | Land

There appear to be few constraints regarding access to suitable land for either sector:

- **Almonds:** There is plenty of land in the Murrumbidgee around Darlington Point of appropriate scale for almond production from previously irrigated summer cropping, and around Hillston on the Lachlan River, even though this expansion of the almond sector into the Murrumbidgee will create some extra production challenges.
- **Table-grapes:** The table-grape sector has largely sought to expand within the confines of the established pumped irrigation districts in Victoria. There is surplus vacant land available in all the districts around Mildura, with 31% of the land in the Merbein District and 20% of the area in the Mildura District recorded as vacant

[16] www.theguardian.com/business/2020/nov/15/china-and-14-asia-pacific-countries-agree-historic-free-trade-deal
[17] www.ato.gov.au/individuals/super/in-detail/withdrawing-and-using-your-super/covid-19-early-release-of-super/

permanent lots[18], as well as land currently occupied by wine-grape and dried fruit sectors who could make land available for conversion to table-grapes. There are also examples of larger new developments outside the pumped districts on suitable land close to processing infrastructure such as cool-stores and packing sheds.

6.4 | Water issues

Reliable access to water is a critical factor in production. This relates both to the overall volume and price of water on the markets and issues related to constraints in delivery at a catchment and local scale.

a) Overall volume of available water

Projections for future climate change and the implementation of the Basin Plan will reduce the size of the total consumptive pool available for irrigation. This will affect the volume of water available across the southern connected basin and prices within the allocation market. The following table shows the level of water-use by different irrigation areas over the last five years which illustrate the relative volume used in different districts under different climate scenarios

Table 16: Surface Water use by irrigators in different districts by climate scenario (GL)[19]

Season & Climate Scenario		SA	NSW		Vic		Total
		Murray	Murray	M'bidgee	GMW	LMW	
2015/16	Dry	391	404	1,102	1,234	*503*	**3,634**
2016/17	Wet	344	855	1,311	994	*424*	**3,928**
2017/18	Average	410	1,060	1,347	1,433	*537*	**4,787**
2018/19	Very Dry	434	536	707	1,137	*570*	**3,384**
2019/20	Drought	400	233	404	550	*510*	**2,097**

This table shows that the horticultural sectors, who are the major customers serviced by Lower Murray Water, represented 24% of total demand across the southern connected basin in a drought year such as 2019/20, whereas in wet years, such as 2016/17, this demand only represented 10.8% of total supply. Increased demand in dry years will push up prices in the annual allocation market. However, both the almond and table-grape sectors can out-compete most other players in the water markets.

The above figures represent demand from current production. However, there is an inherent momentum for the volume of production of both crops to continue to grow from the transition of non-bearing immature plantings to full maturity. This non-bearing element currently represents 17% of table-grape plantings and 28% of almond plantings.

The fact that aggregate demand reduced in the 2019/20 season despite drought conditions suggests that the level of horticulture development may have reached its maximum potential in the region, as any further growth could not be effectively serviced in the event of further drought conditions.

b) Water delivery: Catchment scale

Deliverability of water will act as a constraint on future development of perennial horticulture in the Murray below the Barmah Choke. Due to these concerns about water delivery risks, the Australian Almond Board called for a 'moratorium' on new development in May 2019.[20]

Objective: *To ensure the Murray-Darling Basin river system and its environs are healthy and can sustainably support a prosperous, diverse irrigated agricultural sector and its communities.*

Actions: *1. A moratorium on all new water use licences for greenfield irrigation developments pending a review of the system's capacity to deliver water to support more development, without adverse third-party or environmental impact.*

No formal moratorium was introduced by either state government. However, in July 2019 the Victorian Water Minister Lisa Neville announced that the government had placed strict conditions around new irrigation works

[18] Mallee CMA: *Mallee Horticulture Crop report - 2019 Addendum,* pp 50 & 57.
[19] RMCG (2020), *Water Update – Southern Connected Basin*
[20] Australian Almond Board (2019), *Murray-Darling Basin: Water Policy Position,* May

licences to extract water from the Murray River downstream of Barmah Choke and around increases in water extraction in the region. As a result, she directed Lower Murray Water and Goulburn Murray Water to refer all licence applications in the region to her for assessment for the following 12 months.[21]

Delivery issues in the Murray and their management are being further investigated by the MDBA with Victoria, New South Wales and South Australia. This includes investigating ways to optimise river operations. For example, the Infrastructure Fund provided $3 million for a study on '*capacity delivery shortfall project in the River Murray*' as agreed at the Ministerial Council meeting on 19 June 2020.[22] A range of options are being investigated including the construction of a bypass to the Choke and the introduction of new trading rules to protect flows in the lower Goulburn.[23]

c) Water delivery: Irrigation Districts

There are also practical limitations on how much land inside the older established irrigation districts can be devoted to table grapes due to the design capacity of the delivery systems. The delivery networks in the Merbein and Red Cliffs districts were designed to deliver a maximum of 9 ML/ha/year, which was sufficient to support traditional crops like dried fruit. However, table grapes, with their larger, more vigorous canopies, typically require 12 ML/ha/year or more.

The capacity of the delivery network is rationed in accordance with *delivery shares*, the instrument against which LM Water levies its fixed charges. Meanwhile, the maximum volume that can be applied per hectare of irrigable land is determined by a condition on each irrigator's water-use licence, which is known as the annual use limit (AUL). LM Water requires prospective table grape growers to purchase additional delivery shares from other growers on the same pipeline (usually downstream in the network) before they will increase the annual use limits on their water-use licences to the equivalent of 12 ML/ha or more.

In effect, this means that if all irrigation water use inside these districts were to be devoted solely to table grapes, only 75% of the land inside these districts could be irrigated - without major changes to the delivery network. In practice, it is likely that a mix of crops will continue to be irrigated inside the irrigation districts, so the proportion devoted to table grapes will be somewhere between the current 34% and the potential upper limit of 75%. This suggests a proportion of future expansion in table-grape production is likely to occur in the private diversion areas relatively close to the irrigation districts.

6.5 | Almond processing

There are currently five main almond processing facilities in the wider region:[24]

- Almondco – Renmark South Australia: Almondco represents 85 per cent of Australian growers and processes about 30 per cent of the national almond crop. Almondco receives the crops of more than 140 growers annually.
- Costa Brothers – Swan Reach: The $6 million facility was recently commissioned and can handle 1,500 tonnes to 5,000 tonnes of kernels per season.
- Laragon – Lindsay Point: In 2010 Laragon completed the final stage of its Lindsay Point $2 million expansion. This gave the facility the ability to process in excess of 10,000 tonnes per year.
- Olam – Carwarp: Olam opened its $60 million Carwarp hulling and processing plant in 2013. Olam processes its own orchard production and purchases almonds from other private growers for processing.
- Select Harvest – Carina West: Select Harvest processes its orchard production at Carina West and at Thomastown. Select Harvest also processes contracted production from other privately owned orchards.

A press release from Almondco suggests additional processing capacity will come online to meet any growth in supply.

The processor receives products from more than 85 per cent of the country's growers and is already upgrading its Renmark plant, following a $28.5 million loan from the South Australian Government. While this upgrade is due to be

[21] www.stockandland.com.au/story/6264969/*strict-conditions-imposed-on-new-sunraysia-developments*

[22] MDBA Media communiqué: *Murray Darling Ministerial council meeting 19th June - re Delivery shortfall and the Barmah Choke,* 23 June 2020

[23] Premier of Victoria, News Release, *Delivering For Basin Water Users,* 13 August 2020

[24] Marsden Jacob Associates (2020), *Horticulture below the Barmah Choke*, Prepared for the Independent Murray-Darling Basin Social and Economic Assessment Panel

completed by mid-2021, Almondco said it was already planning to invest further in its sites across the Riverland and New South Wales citing an increase in almond orchards in the Murray-Darling Basin. [25]

6.6 | Orchard pollination

One factor that is affecting current and planning for future production for almonds relates to pollination services.

Traditionally, the almond sector preferred 6.5-7 hives/ha. There has been some tightening in supply alongside growth in demand meaning that orchards now have to make do with 5-6 hives/ha. Aggregate demand has increased as the total area of almond orchards has increased from 30,000ha in 2015 to 53,000ha by the end of 2019 - i.e. an extra 23,000ha. This extra demand has pushed up the price of hives from historic seasonal charges of around $5/hive, to around $160/hive in the current season. A projected growth target of 60,000ha would require over 300,000 hives, which represents a large proportion of the entire current industry.

At the same time supply has been affected by:

- The recent bushfires which saw the loss of 20,000 hives
- Restrictions on access to native forests in NSW
- Revised policies on fire management and back-burning

Historically, beekeepers saw honey production as their main source of income. This meant that pollination services were seen as a side-line. Continued growth in demand with constraints to supply will see a reversal of this balance, with prices rising accordingly. Traditionally, beekeeping and pollination services were fully contracted out to multiple small businesses. Given tighter supply risks, some businesses, such as Duxton Bees, are moving into ownership roles to guarantee access, reduce business risks and create commercial opportunities.

Recent developments in new varieties may also provide a solution as reported by Michelle Wirthensohn, senior research fellow at the University of Adelaide, who also leads the industry national breeding program:

Australia's booming almond industry could soon become more sustainable as researchers breed self-fertile and more water-efficient trees in efforts to improve the nuts' environmental footprint.[26]

Latest feedback on this program suggests that this research may translate into commercial products sooner than originally anticipated. However, even so, almond trees have an expected lifespan of 20-25 years so it will be several years before any such developments have a major impact on the current area of 53,000ha of bearing almond trees as they have a reasonable lifespan, let alone the 15,000ha recently planted and not yet bearing.

6.7 | Labour

The availability of labour and its cost is also a business focus for the sector. This covers both operational and technical staff. Before 2010 there were a limited number of players which allowed them to set market rates. The growth in the number of major participants since then has increased competition for labour, whilst the general market for labour has tightened with increased skill levels and tighter standards. Attraction and retention are now a major challenge for irrigated horticulture. As a result, pay rates and training expectations have increased. The COVID pandemic has had a severe impact on seasonal labour availability, in particular backpackers. This will have a major impact on those horticultural crops dependent on manual harvesting.

6.8 | Salinity management

The River Murray reaches of the Lower Murray Darling Region are underlain by highly saline aquifers that are hydraulically connected to the river. The groundwater in some of these aquifers is as salty as sea water. Sustainable irrigation relies on ensuring that water application for irrigation matches the needs of growing crops and minimises drainage beyond the rootzone. Exceeding plant requirements results in drainage which ultimately enters these aquifers adding to the hydraulic pressure that pushes more salt from those aquifers into the river.

[25] https://www.abc.net.au/news/rural/2020-11-04/orchard-boom-across-murray-darling-basin-drives-almondco-growth/12844192
[26] ABC Rural News (2020), *Almond industry set to be more sustainable as new solutions sought to reduce environmental footprint,* www.abc.net.au/news/rural/2020-09-28/almond-industry-could-become-more-sustainable-with-new-trees/12693776

Under Schedule D of the *Murray-Darling Basin Agreement*, New South Wales, Victoria and South Australia are each legally obliged to account for the river salinity impacts arising from irrigation on land that was not developed for irrigation before 1988.

a) Salinity Impact Zones in the Victorian Mallee

In line with this obligation, Victoria has implemented a conservative approach to avoiding, minimising, mitigating and offsetting salinity impacts from irrigation. The salinity planning framework in Victoria divides the Victorian Mallee into a series of salinity impact zones. Further expansion of the irrigable area is not allowed in the high salinity impact zone (HIZ), while in the other zones, developers must pay charges to offset their salinity impacts on the river and environment. The charge for the highest of the low impact zones, L4, is ten times greater than for the lowest impact zone, L1. The 2018 Mallee Horticulture Crop Report shows that irrigation development since 1997 has, as a result, been concentrated overwhelmingly in the L1 zone.

Looking ahead it seems likely that:

- **Almonds:** there will be limited new development of almond orchards within the Victorian Mallee
- **Table-grapes:** there will expansion of table-grape production, but this will be through the conversion of vacant land or other sectors, mainly within the existing irrigation districts. This includes an obligation on any new developments to acquire sufficient Annual Use Licence from other growers to cover projected irrigation rates.

Given these projections, it seems unlikely that there will be any material impact on current groundwater levels or salinity from future developments in these two sectors within the medium term.

b) Salinity accounting

Each state must inform the MDBA of the magnitude of the impacts of any new irrigation development, following procedures established through Schedule D to the Agreement. The MDBA keeps a register of those salinity impacts and the measures used to offset them. Under Schedule D, each state must take whatever action may be necessary to keep the total of any salinity credits in excess of, or equal to, the total of any salinity debits in its part of the register. The registers are regularly audited by the MDBA appointed Independent Audit Group (IAG) for Salinity. Victoria has maintained compliance with the Register since its inception and anticipates it will remain compliant into the future.

In 2020 the IAG reported that the registers show that NSW, Victoria and South Australia are currently in net credit. However, in the case of NSW the IAG-Salinity added the following Statement:

The IAG-Salinity is very concerned that the developments in NSW are occurring without any salinity planning framework, as required in both SA and Victoria. This is giving uncertainty both to the developers and the Basin States. There is currently 5,800 ha of new development that has occurred since 2006 and the IAG-Salinity was informed that there is potentially another 3,500 ha, some of which is in a high salinity impact area. It is estimated that 6 EC debit already exists for the developments completed since 2006 and there is a potential for another 3.5 EC for potentially further development. With no salinity zoning policy in NSW, developers cannot be encouraged/directed to go to lower impact zones.[27]

[27] MDBA (2020), *Report of The Independent Audit Group for Salinity July 2017–June 2019*, Murray-Darling Basin Authority, Canberra (https://www.mdba.gov.au/sites/default/files/pubs/report-independent-audit-group-salinity-2019.pdf)

Annex 1: List of consultees

The following table lists the regional stakeholders who were included in the program of discussions and consultation during stage 2 of the program. However, the views in the report represent the judgments of the MRIC project team not necessarily those of the stakeholders consulted.

Table 17: List of consultees

Name	Role	Entity
Almond industry		
Ross Skinner	CEO	Almond Board of Australia
Deidre Jaensch	Industry Development Manager	Almond Board of Australia
Troy Richman	General Manager	Almas Almonds
Toby Smith	Commercial Manager	Olam
Ben Brown	Technical Manager	Select Harvests Ltd
James Capillari	Grower Director for Riverina	Almond Board of Australia
Table-grapes		
Jeff Scott	CEO	Australian Table Grape Association (ATGA)
Josef Lazzara	Director	J & F Lazzara & Sons
Andrew Cottrell	Director	Cottrell Farms
Nick Muraca	Ex Chair ATGA	Grower at Robinvale
Advisors/Managers		
Peter O'Donnell	Executive Director	Southern Cross Farms
Tony Hickey	Partner - Performance Consulting	Findex - Crowe Horwath
Liam Lenaghan	Managing Director	goFARM Australia Pty Ltd
Agencies		
Jeremy Giddings	Regional Manager Irrigation	Agriculture Victoria
John Cooke	Former Senior Manager Mallee	Department of Sustainability and Environment
Brett Millington	CEO	Mildura Development Corporation
Fiona Murdoch	Regional manager	DELWP
Melissa Tylee	Manager Sustainable Irrigation	DELWP
Owen Russell	Former licensing manager	Sunraysia Rural Water Authority
Myles Parker	Leader Southern Horticulture	NSW DPI
Tracie Scarfone	Team leader	WaterNSW licensing