

Rice in the Riverina

Prepared for the Independent Murray-Darling Basin Social and Economic Assessment Panel

A Marsden Jacob Report

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Key points

This Marsden Jacob case study report focuses on rice in the Riverina region of the Murray-Darling Basin. We use publicly available data, key stakeholder interviews and modelling to assess how activity levels could change subject to changing water availability in the future.

- Rice is an opportunistic crop where planting decisions by ricegrowers are determined by the availability of general security water, allocation prices, and relative crop prices. This means the consumptive pool of water used by rice varies from year to year.
- Prior to the Millennium Drought the Riverina rice industry typically used over 800 GL of water. This water supported more than 800,000 tonnes production per year.
- Water consumption reduced considerably during 2006-10. It then recovered, but not to pre-drought levels before again declining significantly under recent dry conditions.
- The number of farms planting rice has more than halved over the last 20 years. This fall is a function of many factors. Key factors include the volume of general security water available year to year, allocation prices, and the adoption of new irrigation layouts and large scale cropping equipment enabling ricegrowers to manage multiple farms and aggregations. These structural changes mean farmgate economics of rice are changing, as is the volume of water needed to operate at current settings.
- The rice industry is vertically integrated. The overwhelming majority of Australian rice production is processed and marketed through SunRice. SunRice's milling operations and rice sourcing strategies are being managed to address the business consequences of variable rice production in the Riverina.

- Milling operations and rice stockpiles are managed by SunRice to minimise the impact on the two Riverina mills of low crop volumes in dry years. SunRice applied this strategy during the Millennium Drought before water recovery started. Under low expected crops, SunRice reduces shifts across both Riverina mills. Further shift reduction and then mothballing all or part of the Deniliquin mill may occur depending on scale of crop and stockpiles.
- SunRice is diversifying overseas purchasing milling operations and investing in plant upgrades and R&D. Diversification is allowing SunRice to improve access to reliable high quality rice to diversify supply sources and minimise supply chain impacts of low crop years in Australia.
- The rice industry overwhelmingly utilises general security allocations and temporary water. Water availability for rice is primarily driven by the volume of general security allocations and temporary water prices. Other potential users of general security allocation and temporary water in the region is cotton. Ricegrowers are typically mixed farms and this can include corn and cotton growing. The expansion of cotton growing is like rice is opportunistic and depends on water availability and relative returns.
- The rice industry will continue to expand and contract (flex) annually in response to available allocations and temporary water prices. Available evidence indicates that the rice sector will rebound again when allocations are there. The scale of this will depend on how the underlying consumptive pool is affected by water recovery and climate change. Deeper and longer periods of low allocations and higher temporary water prices than previously experienced will lead to further farm enterprise diversification, and most likely longer term modifications to milling operations. Over the medium to longer term without a major wet sequence there is little prospect of the industry returning to and sustaining production over 800,000 tonnes per annum.
- There are strategies in play both by ricegrowers in the form of changing enterprise mix and selling residual allocations, and modifying milling and stockpiling strategies and sourcing grain from overseas operations to address the consequence of small or negligible Riverina rice crops.
- The farmgate impacts of further irrigation development in the Basin will be mainly observed in semi-interruptible agriculture enterprises and supply chain infrastructure that depend a mix of high and general security allocations, rather than sectors such as rice that rely on general security allocations and temporary water market.

- Rice growing will be affected if the area sown to cotton and corn continue to increase, and the management of winter crops continue to improve, leading to a higher proportion of the consumptive pool being used on these crops. The increases in rice prices will partly discourage expansion of cotton. But continued R&D investment in cotton and improvements in farm set up and methods and forward selling will continue to change the relative competitiveness of cotton growing and encourage its southern expansion.
- Arguably, however, in the longer term approaches to the management of milling operations will reflect the longer term commercial perception of the reliability of sourcing rice domestically and the capacity of the sector to source sufficiently high quality supplies externally.
- Our sense is that under further water recovery and the impacts of climate change the periods of very low allocation will be longer and deeper than previously experienced. These will not be sustainable for continued investment in regional mills in their current form. We would expect consolidation of Riverina mill capacity or more substantive modification of milling plant and operations to enable more extended mothballing for a larger proportion of Riverina milling capacity.

1. Introduction

At the request of the former Minister for Water, The Hon David Littleproud, the MDBA has convened an Independent Panel ('the Panel') to assess economic and social conditions in the Murray-Darling Basin. The Panel's assessment is a critical opportunity to shape understanding of current economic and social conditions in the Basin, and future Basin policy.

Marsden Jacob is supporting the Panel by delivering case studies of Basin industries with high water consumption dependency. Our case studies complement the regional impact modelling and trends and drivers analyses Marsden Jacob is completing for the Panel in parallel, through more detailed examination and ground-truthing, and a tighter regional focus.

The Panel asked that our reports look at each sectors current situation and their outlook. We were asked to be concise in our evaluations, and take into account how water reform, weather and climate, technology, prices, structural, demographic and preference change and other factors known to impact on industries in the Basin might impact in the future. The Panel will use the evidence from these case studies to support key findings and recommendations in the Panel's [draft report](#). The Panel encourages all readers of this case study to read the Panel draft report.

1.1 This discussion paper

This Marsden Jacob discussion paper focuses on rice in the Riverina. The Panel has made this document publicly available as part of its commitment to transparency. The views in this report do not necessarily represent the views of the Panel.

2. Rice farmgate situation in the Riverina

Rice growing in the Riverina is driven primarily by general security water allocations and allocation prices. Allocations and allocation prices are negatively related – water prices are higher when general security allocations are lower. Allocations are becoming smaller and more variable over time.

This case study summarises the rice farmgate situation in the Riverina and key farmgate trends and drivers.

2.1 Background

Rice farms in the southern MDB are found on clay-based soils in the Murrumbidgee Irrigation Area, the Coleambally Irrigation Area and Murray Irrigation District.

The industry relies on opportunistic cropping decisions of growers. The area planted to rice each year varies depending on a variety of factors. A primary determinant of area planted is the availability of NSW general security (GS) water and allocation water prices. NSW GS allocations and allocation prices underpin relative returns expected from the crop relative to other water and land uses.

Our ability to continue to produce rice is due to the returns per ML our growers are able to attract. This is due to the clean, high quality niche varieties we grow, consistently high yields, the world's most efficient rice watering practices, an integrated rice farming system enabling mutual benefit between rotating crops, world's best practice storage and milling, and highly sophisticated branded marketing.... (Ricegrowers' Association of Australia, 2016, p. 2)

SunRice markets its rice to over 50 countries (SunRice 2019a).

2.2 Seasonal production

Riverina rice production volumes vary considerably between years. This variation reflects water availability and water prices, relative crop prices and growing conditions (Figure 1).

Riverina rice crop planting decisions are finalised annually with optimal sowing windows for key varieties between mid-October and late November. These windows minimise cold-weather risks to crop establishment, and optimise the likelihood of fast uniform crop establishment and final grain quality.

Total Riverina rice water use will change depending on the season, but is normally below 10–16 ML/ha in the Riverina. While water use per ML varies across areas and year to year it is generally improving reflecting among other things, new farming methods such as direct drilling and new plant varieties including shorter season varieties. Information on current and expected water availability over the expected life of the forward crop before and during these windows is critical to ricegrower planting decision making.

In years of higher water availability, the Riverina rice industry typically produces around 5-650,000 tonnes and accounts for 98 per cent of Australian production (SunRice 2019b). The industry has capacity of grow and mill around 1 million tonnes of paddy rice. Five year average crop yields are generally in the order of 10.1 tonnes per hectare for all varieties (DPI 2019).

Figure 1 highlights how rice production fell dramatically during the Millennium drought then recovered for several years until the recent dry. In the Riverina, the C18 (the crop harvested in 2018) crop was 623,000 tonnes and the C19 crop 54,000 tonnes. SunRice has recently announced the C20 crop is expected to be smaller than the C19 crop (SunRice 2019a and SunRice 2019b).

Reflecting the annual opportunistic nature of the cropping system and relative returns per megalitre compared to other crops, rice is overwhelmingly grown with general security water or purchased allocation. Annual rice production closely reflects general security allocations and carryover held in a particular year (Figure 2).

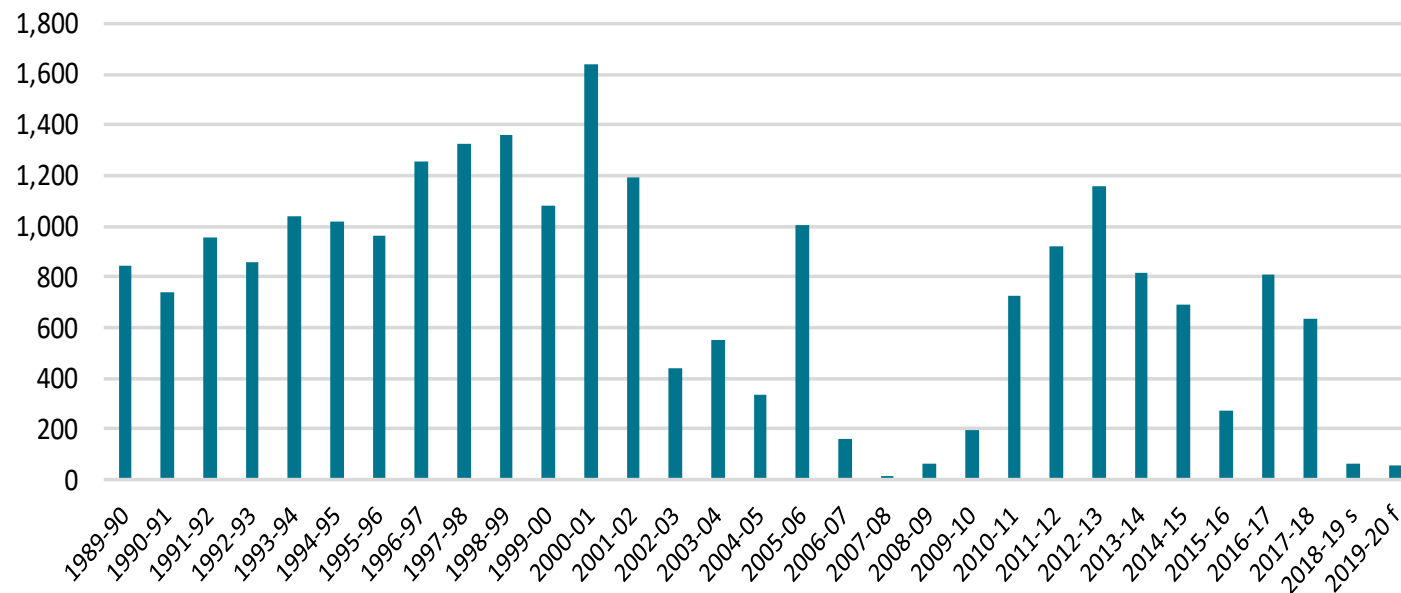
Table 1 Optimal sowing windows for key rice varieties in the Riverina

Variety	MIC/CIA – Ideal sow/first flush time			Murray Valley – Ideal sow/first flush time		
	Aerial / Dry broadcast	Drill	Delayed Permanent water	Aerial / Dry broadcast	Drill	Delayed Permanent water
Reiziq, Opus Topaz, Doongara	25 Oct – 5 Nov	20 – 31 Oct	10 – 25 Oct	20 Oct – 5 Nov	15 – 25 Oct	5 – 20 Oct
Sherpa, Langi	25 Oct – 10 Nov	20 Oct – 5 Nov	10 – 30 Oct	20 Oct – 5 Nov	15 – 30 Oct	5 – 25 Oct
Koshihikari, Illabong	-	-	-	20 – 30 Oct#	10 – 25 Oct	1 – 20 Oct
Viand	10 - 30 Nov	5 – 25 Nov	1 – 20 Nov	5 – 30 Nov	1 – 20 Nov	25 – 10 Nov
YRK5	-	-	-	-	1 – 20 Nov	25 – 10 Nov

Do not aerial sow or dry broadcast Koshihikari or YRK5 as this increases lodging potential

Source: NSW DPI (2018)

Figure 1: Australian rice production (kt)



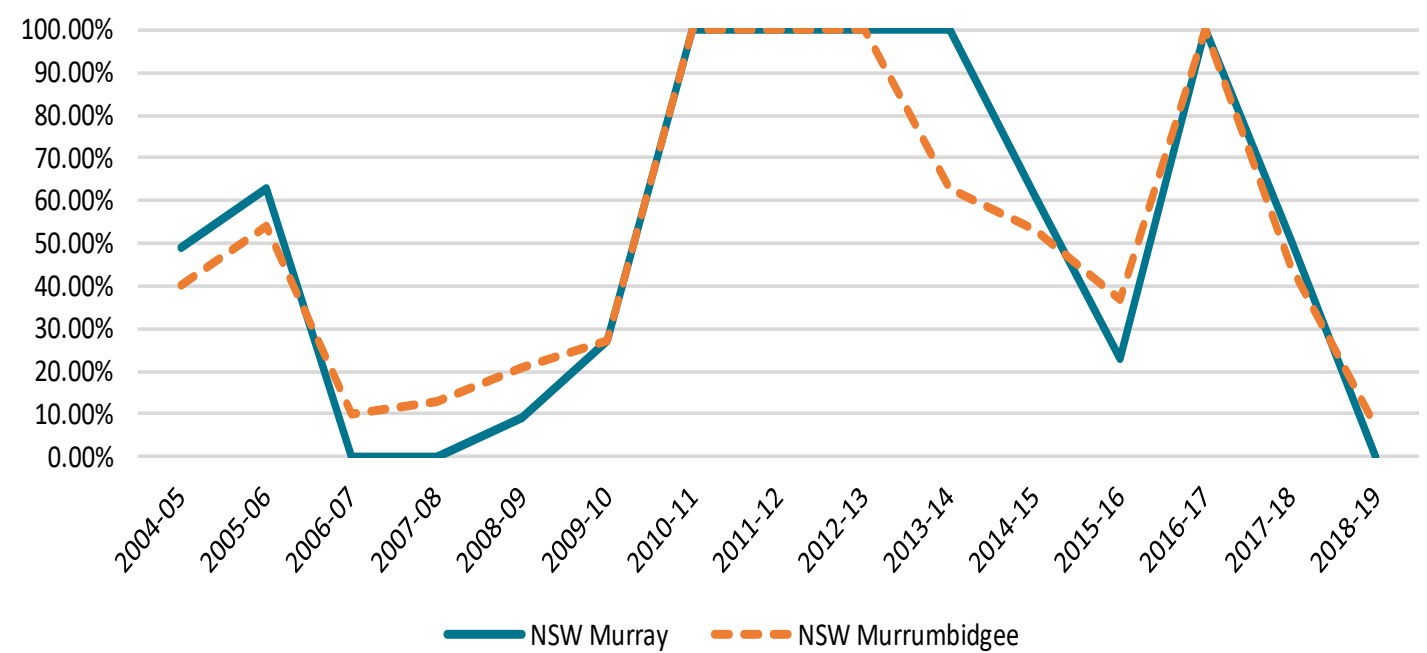
Source: ABARES (2019)

Rice is often used in a cropping rotation. Wheat, barley and maize may be grown after the crop to use the existing soil moisture and this can last up to two years following the rice crop. This effectively provides growers with three crops from one application of irrigation water.

Low general security allocations, reduced the available water held by rice growers and high allocation water prices relative to expected crop returns have encouraged growers with water to sell it for use on higher returning enterprises. There has been increasing competition from other crop uses, particularly cotton, though less so in the Murray Valley. In addition, increasing water demand by perennial horticulture below the Barmah Choke is having significant effects on the water

markets in the southern connected system. The factors driving this trend will continue to affect rice production into the future.

Figure 2: General security allocations in the two key rice growing regions



Note: Sum of available water determinations made throughout the season for general security allocations

Source: NSW Government, 2019

TCA and Frontier Economics (TCAFE) 2017 found that historically around 60-70% of the water available in southern NSW was used for rice production. The relative proportion used for rice has now declined to 35-45%.

TCAFE conclude this change has been driven by the adoption of higher value enterprises, or in the case of winter crop production, improved management, and investments in improved irrigation systems and layouts. Irrigators have gradually responded by shifting water away from rice towards other summer crops and winter crops. Reflecting change in commodity prices corn and cotton plantings have increased, initially in the Murrumbidgee Valley where cotton gins have been built at Darlington Point and Hay.

TCAFE expected that the area of winter and summer annual cropping systems in southern NSW would increase over the medium term under current commodity price trends. The diversification already seen in parts of the Murrumbidgee was expected to extend further and to spread into the NSW Murray (properties in the Victorian Murray are generally too small to take advantage of these systems) as irrigators become more familiar and more confident with these systems. TCAFE also expected areas sown to cotton and corn to continue to increase, and the management of winter crops to continue to improve and this will lead to a higher proportion of the consumptive water pool being used on these crops in the future. Automated irrigation systems and improved layouts will lead to increased crop yields, improved application efficiency and diversified cropping systems in both valleys.

However, areas planted to cotton and corn have fallen in recent seasons reflecting reductions in water availability. Cotton expansion in the Murrumbidgee may also be limited in the medium term by a variety of agronomic factors.

2.3 Area planted and water use

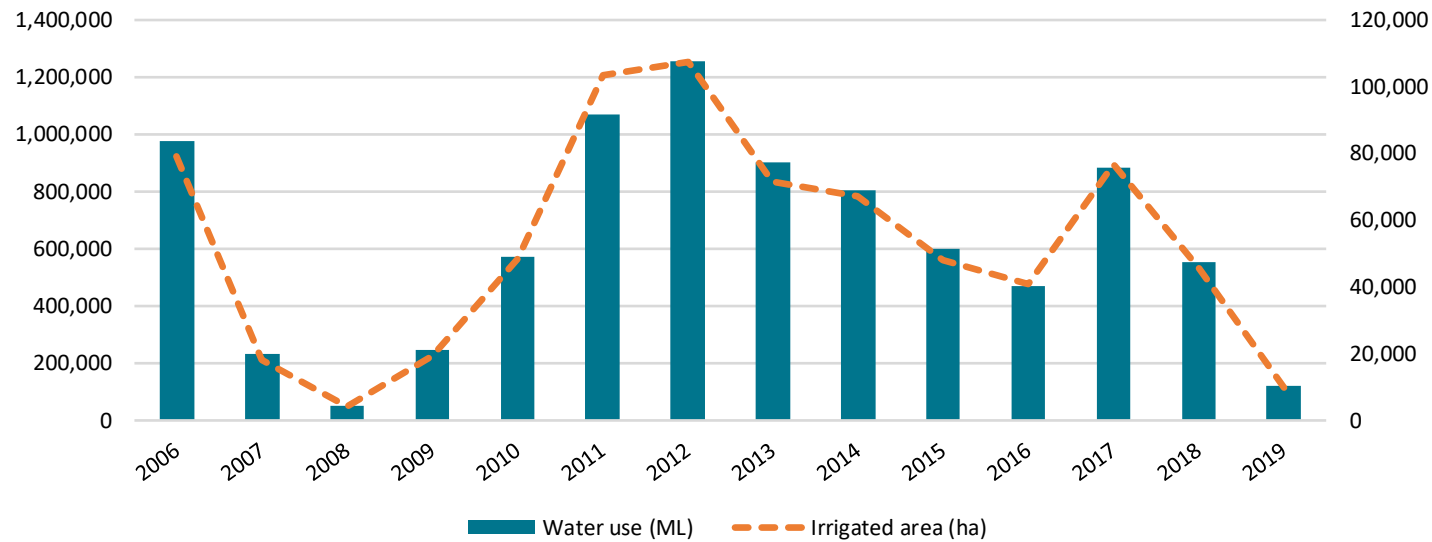
There is a long-run direct proportional relationship between water use by the rice sector and the total area irrigated (Figure 3). Rice industry water use data are also contained in annual compliance report of the NSW Irrigation Infrastructure Operators (IIOs). For example, the 2018-19 Murray Irrigation annual compliance report noted that rice water use was 40% of water delivered in 2017-18, whereas rice water use was only 4% of water delivered in 2018-19 (Table 2).

SunRice also reported that:

Extensive R&D has allowed us to increase yield per tonne for each megalitre of water used by 9% since 2012. While we currently yield, on average, 0.83 tonnes/ML, our target is to achieve 1.5 tonnes/ML. the recent uptake in drill seeding and delayed permanent water over aerial seeding has resulted in a step change by reducing water consumption by our

growers by up to 4.5 megalitres per hectare, with an added benefit of drill seeding resulting in four times less methane generation (SunRice 2018a).

Figure 3: Rice water use and irrigated area



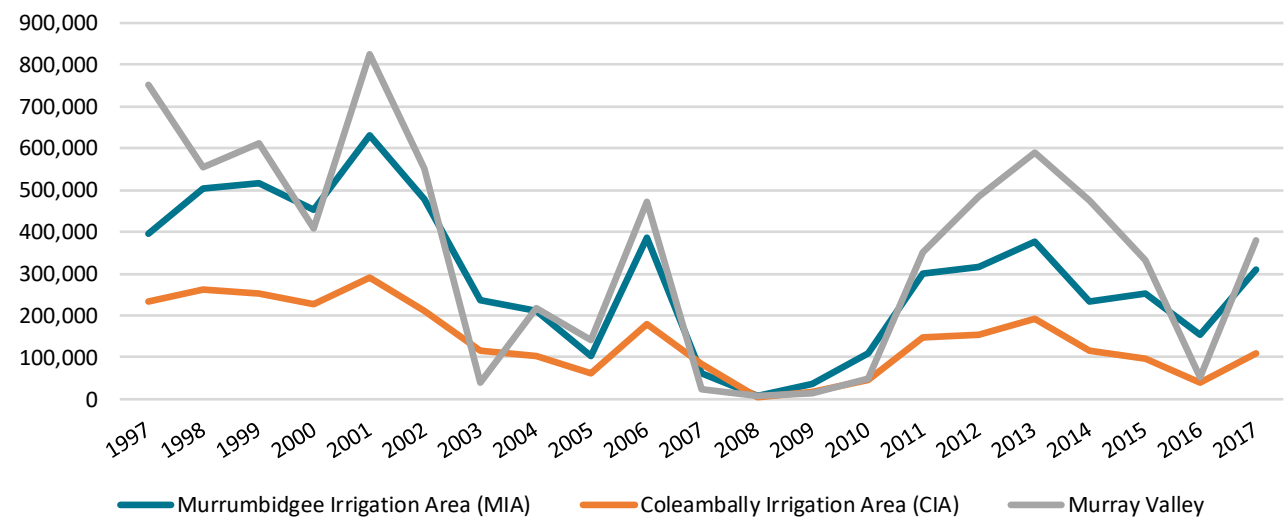
Source: MJA analysis of data provided by ABARES (2019)

Table 2: Comparison of crop type water use compared to previous years (ML)

	2018/19	2017/18	2016/17	2012/13
Annual Pasture	69,898 (24%)	165,043 (21%)	128,563 (18%)	218,725
Cotton	10,139 (3%)	22,307 (3%)	12,623 (2%)	N/A
Horticulture, other, undefined	15,432.7 (5%)	22,829 (3%)	17,388 (2%)	54,954
Permanent pasture	18,730 (7%)	44,794(6%)	46,878 (8%)	90,086
Rice	12,258 (4%)	309,324 (39%)	386,908 (53%)	686,412
Stock and Domestic	6,272 (2%)	6,577 (1%)	6,952 (1%)	14,096
Storage	4,823 (2%)	9,742 (1%)	25,699 (4%)	10,894
Summer crops	57,569 (20%)	69,926 (9%)	41,888 (6%)	N/A
Winter crops	92,420 (33%)	136,819 (17%)	59,645 (8%)	188,426
TOTAL	287,541	786,361	726,544	1,263,593

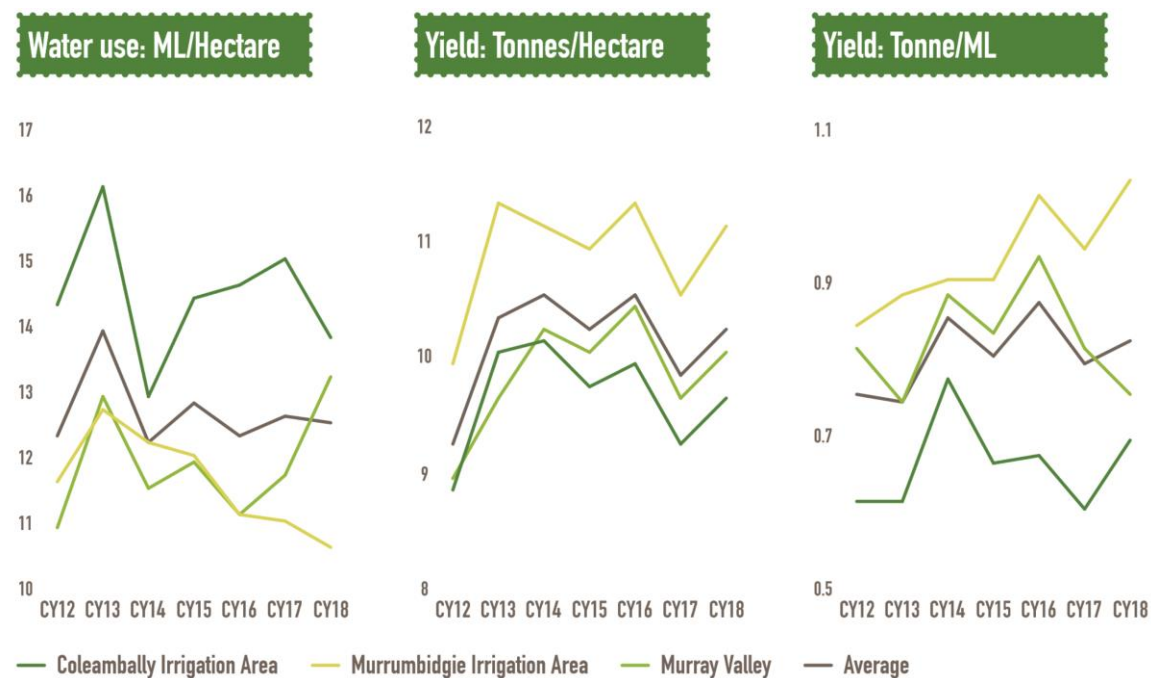
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Figure 4: Production by sub-region (tonnes)



Source: SunRice (2018a)

Figure 5: Water use and yields



Source: SunRice (2018a)

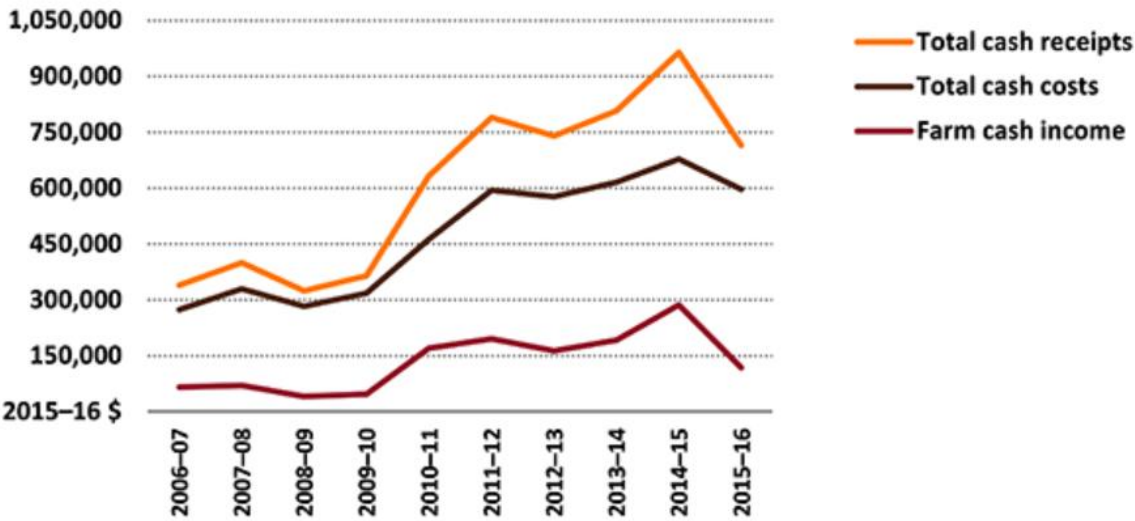
2.4 Farm returns and productivity trends

Rice crop prices generally fall as rice area planted increases. SunRice generally guarantees a fixed price and may seek to encourage planting by offering relatively higher contract prices as it did for C20 — this only occurs when volumes are expected to be significantly below long-term averages.

Cash income of rice producers typically falls with declines in total annual rice crop (Figure 6). Declines in rice returns may be partly offset for those able to plant smaller crop at higher prices (Figure 7). Income from other sources also typically increase but does not offset declines in rice income when rice production falls, in particular through sales of water not

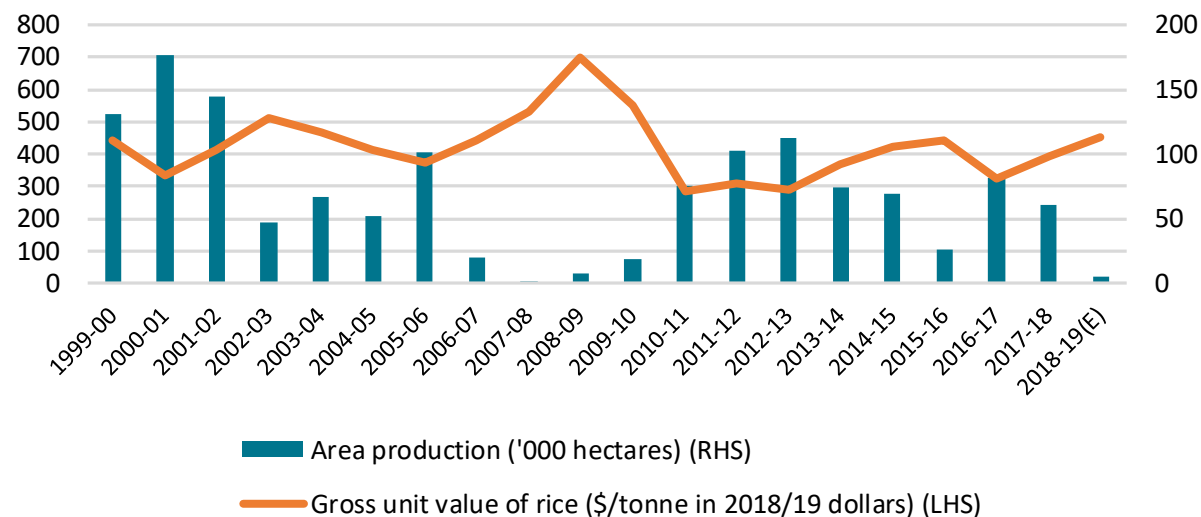
utilised and returns from other farm enterprises such as cereal crops from retained soil moisture from the previous rice crop.

Figure 6: Rice farm cash income, rice farms, Murray-Darling Basin 2006-07 to 2015-16 – average per farm



Source: ABARES (2019b)

Figure 7: Rice area and gross unit value of rice



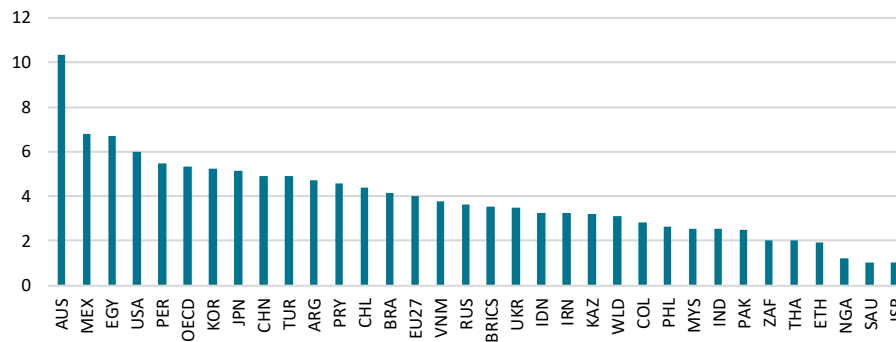
Source: MJA analysis of data in ABARES (2019)

Most rice-growing farms are diversified irrigated and dryland farm businesses engaged in multiple farming enterprises.

Diversified businesses switch the composition of their enterprise portfolio depending on seasonal conditions and expected enterprise returns. In 2015 ABARES estimated that most rice farms had four or more individual enterprises, including irrigated crops (such as rice, wheat, oats, oilseeds and cotton), dryland crops (such as wheat, oats, barley, oilseeds and hay) and livestock [Ashton and Van Dijk 2015].

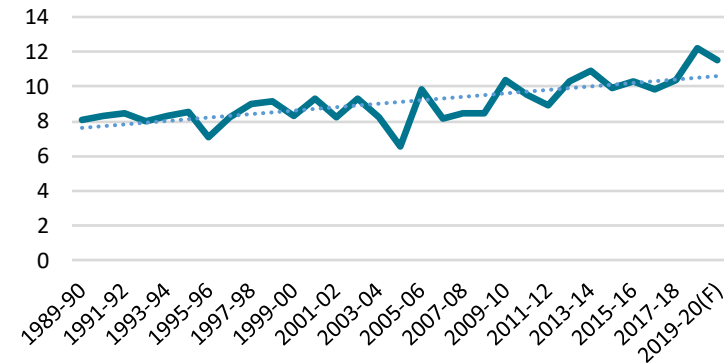
Australian rice yields are the highest in the world at around 10 tonnes per hectare in 2018 (Figure 8). Rice yields have been increasing over time from around 8 tonnes per hectare in 1989/90 (Figure 9). Water use efficiency is more difficult to assess as water use per hectare experiences volatility over time depending on water availability (Figure 10) (ABARES, 2019).

Figure 8: Productivity: tonnes per hectare (2018)



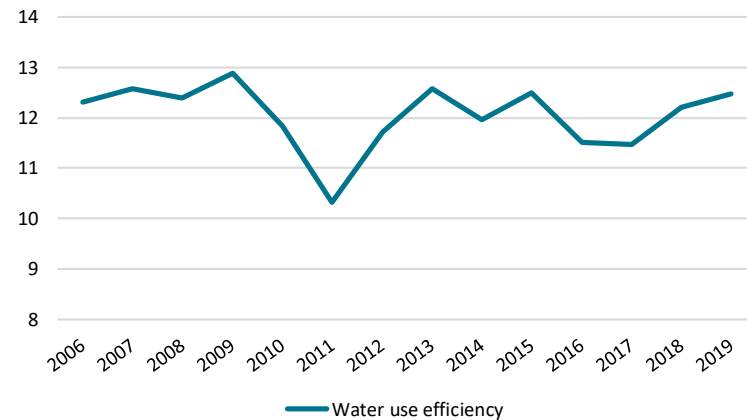
Source: OECD (2019)

Figure 9: Productivity: tonnes per hectare (time series)



Source: MJA analysis of ABARES data

Figure 10: Productivity: water use per hectare



Source: MJA analysis of ABARES data

2.5 On-farm upgrades

Ricegrowers (RGA) were a delivery partner under the OFIEP program. Most on farm upgrades have occurred through Ricegrower Murray and Murrumbidgee consortiums. A smaller number of farms participated under other delivery partners.

On-farm upgrades for Ricegrower Murray and Murrumbidgee consortiums focussed on internal reorganisation of the layout of farms with laser grading and user of reticulation works. These works improve the efficiency of water use and has also enabled farmers to achieve a range of on farm productivity gains through greater opportunities for economies of scale and scope.

2.6 Employment in rice milling

Rice industry employment covers a range of sectors including farming, milling, transport and input supplies. ABS does not formally define these works are employed in the rice sector. For example, the ABS 2016 census data on the 'rice growing' industry has employment estimated as zero. Instead these workers are allocated to other sector classifications such as cropping and food processing.

Growers in the NSW Riverina region (predominantly in the Murrumbidgee and Murray Valleys) form the vast bulk of the Australian rice industry's supply base. The number of Riverina farms growing rice varies yearly depending on seasonal circumstances. Prior to the last major drought, we estimate more than 2,000 Riverina farmers were rice growers. In FY18, rice was supplied by 628 Growers across 935 Riverina farms (SunRice 2019b)

It is important to recognise that the fall in rice farms does not imply these farms are sitting idle. As we discuss in section 2.2 rice is produced within mixed farming systems. When farmers don't produce rice they generally produce other commodities, and or trade available water.

While noting substantial seasonal variability, there has nonetheless been significant consolidation of farms as new irrigation technologies and farm layouts, new large scale machinery and grants for on-farm upgrades have been taken up by growers. Anecdotally, these larger farms have substantially improved labour productivity and resulted in fewer people directly employed at the farm gate.

3. Post rice farmgate situation in the Riverina

The rice supply chain is vertically integrated. SunRice has diversified its supply and milling capacity overseas to address variability of Riverina supplies. Domestic milling programs are varied to annually manage stockholdings from previous crops and expected yields of the next crop. Since November 2018, SunRice has announced 230 jobs losses across the two Riverina mills – including 100 in 2020 as milling reconfigurations occur as a result of the low C20 crop.

3.1 SunRice

The rice industry is vertically integrated — SunRice is the milling processor and value-added food manufacturer and marketer of nearly all rice grown in the Riverina. SunRice was publicly listed on the NSX in 2007, with B Class Shares restricted to current or former rice growers, employees and Directors. SunRice was publicly listed on the ASX in April 2019 with a dual-class share structure ensuring that only active rice growers are able to vote at Annual General Meetings and on the election of grower directors to the Board of Directors (SunRice 2018b).

The main assets held by SunRice during the listing included:

- Paddy storage, milling, packing and finished product storage and warehousing assets in the Riverina, utilised by the Rice Pool Business (more recently it has purchased milling and packing plant operations overseas – see below); and
- Approximately 30 major brands used by the Rice Pool and Profit Businesses around the world, including SunRice, Sunwhite, Trukai, Roots, Always Fresh and CopRice.

In financial year 2019, the SunRice Group revenues were \$1.2 billion and net profit after tax of \$45 million (SunRice 2019a). SunRice sources rice for its products both domestically and overseas from a range of countries, including Pakistan, India, Thailand, Vietnam, mainland China, Cambodia, Taiwan and the U.S.

In normal production years SunRice facilities employ approximately 600 people in the communities of Leeton and Deniliquin (SunRice 2019a and SunRice 2019c).

SunRice also have significant rice storage and animal feed assets across the Riverina region which contribute to this employment. In such years, SunRice estimates it generates close to \$400 million in direct expenditure in these communities (SunRice Pers Comms).

3.2 Milling operations

SunRice operates two key mills in the Riverina:

- **Deniliquin** 450,000 tonne per annum processing capacity and
- **Leeton** 350,000 tonne per annum processing capacity.

A mill previously operated by SunRice at Coleambally is now operated by Coprice (a business unit of SunRice) as a stock feed mill and will employ 10 people (SunRice 2019e).

SunRice also operates a small mill at Brandon in north Queensland to process crop grown on largely the Burdekin, Tully and Gordonvale areas. Rice growing in North Queensland has increased to just over 6000 tonnes per year.

SunRice has indicated increasing rice production from the region is part of its five year strategic plan – supporting research in varietal breeding crop nutrition and disease management. In addition, the 2022 Growth Strategy seeks to maximise SunRice's competitive advantages:

- The provenance of Riverina Rice: Riverina Rice is recognised as amongst the best in the world for quality and taste. In order to deliver on the 2022 Growth Strategy, SunRice is encouraging Riverina Growers to produce premium varieties to meet global food trends and demand, particularly in discerning markets willing to pay a premium for quality. The reputation of Riverina Rice and the strength of SunRice's brands is also leveraged to benefit the Profit Businesses in terms of market access and product

expansion.

- SunRice's global supply chains: The SunRice Group's existing supply chains and quality assurance systems allow it to flex its multiple supply sources to respond to market dynamics and opportunities. Under the 2022 Growth Strategy, the SunRice Group will use its supply chains to meet demand across its markets, while assuring quality through its established systems. The Group's supply chains are also able to be used to introduce new products to market across categories and geographies (SunRice pers comms 18 December 2019)

The Murray Valley is the source of the largest increases in crop output in years of high water availability. As such the Deniliquin mill provides flex to SunRice milling operations depending on the size individual season crops and the strategy for the management of seasonal stockpiles. During Millennium drought SunRice mothballed the Deniliquin mill for three years when rice crops were small. During this time SunRice processed solely through the Leeton mill. SunRice reduced the daily operational hours of the Deniliquin plant during 2019 on the back of the smaller 2018 rice crop.

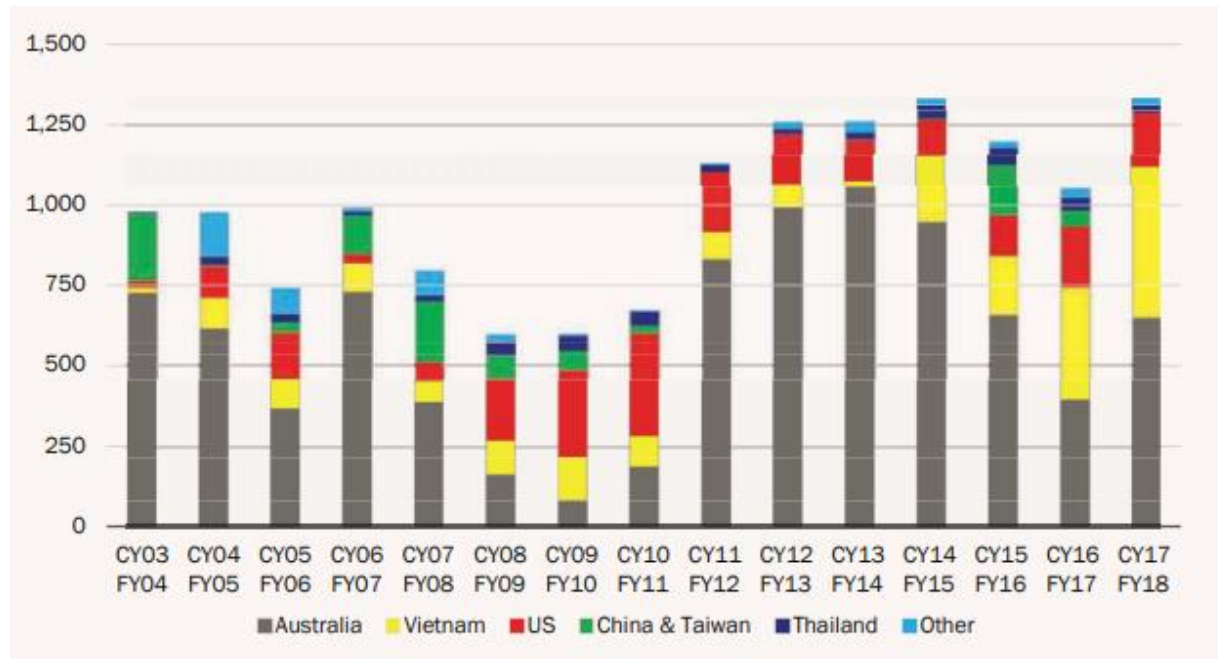
Leeton appears to be preferred to Deniliquin for milling for two reasons (1) Leeton Mill is also less subject to variation given some access of growers to high security water and the IVT limits on trade out of the MIA (2) MIA general security allocations have historically been marginally higher than MI general security allocations in low allocation years.

3.3 Increasing reliance on overseas supplies and mills

SunRice has increasingly been sourcing rice internationally to meet increasing demand and offset variability of the supply of rice from the Riverina. SunRice is primarily sourcing overseas rice from Vietnam and United States of America (Figure 11).

SunRice established its international subsidiary Ricegrowers Singapore in 2016 to help develop an Asian strategy, lead global rice procurement, and to house an Asian sales office.

Figure 11 Global supply sources for SunRice sales – paddy tonnes equivalent



Source: SunRice (2018c)

In October 2018 SunRice took over a 260,000 tonne per annum (dry paddy) capacity rice mill in Vietnam's Dong Thap Province. SunRice had previously sourced contract-grown medium and long grain crops from there to support sales orders, particularly from the Pacific. The mill was upgraded during the first half of 2019 to increasing whitening and polishing capacity. SunRice also has a 100,000 tonne capacity mill in Sacramento, California, and milling and packing plants in Jordan and Papua New Guinea (SunRice 2019a and SunRice 2018a).

3.4 Employment

Riverina rice milling operations in good years typically operate throughout the year processing stockpiles from the previous harvest. SunRice employs approximately 600 regular staff in the Riverina and another 300 at harvest.

This number is considered an average across years and can vary depending on water availability and growing conditions. Further details on this local employment variability is provided in the next section.

SunRice has reported concern about losing valuable skills and staff when forced to scale back its operations and was therefore exploring all available options with employees and unions to retain as many people as possible, including re-locating staff and job sharing.

Box 1: A profile of publicised milling employment impacts

2008: During the Millennium drought the Deniliquin mill shut and reopened three years later with reemployment of staff.

2016: SunRice revamped milling programs and 50 jobs were lost. The Deniliquin plant reduced the current two mills operating on five-day, 24-hour shift patterns to one mill remaining on its existing hours and the other to be cut back to a five-day, eight-hour shift.

2018: Since November 2018 there has been a reduction in the SunRice mill workforce of 132 employees.

- November 2018 - 100 job losses. The 24-hour running time at Deniliquin's Mill Two dropped to five days a week next month, and Mill One to wound back to 16 hours, five days a week on January 31, then stop operating in April 2019.

2019: By July 2019 the Deniliquin mill was operating 40 hours a week. At Leeton, the plant will reduce its around-the-clock operation from seven days to five days in April.

October 2019 - 32 job losses. SunRice took two key decisions which it expects will maintain some form of milling at its Deniliquin and Leeton mills through 2020. SunRice also offered record fixed paddy price contracts for C20 of \$750 per tonne for Medium Grain Reiziq, \$950/t for Koshihikari and up to \$1500/t for organic paddy.

Source: various media and SunRice press releases

4. Riverina rice outlook

The outlook for Riverina rice and its value chain will depend on a range of internal and external factors. Factors including crop prices, farm and supply chain productivity, general security and temporary water availability, reliability and price, and competition for water by other uses will all impact on the outlook for rice growers.

In this chapter we focus on factors that will determine the Riverina rice outlook over the next decade.

4.1 Key internal factors

Two key internal influences on future outcomes are crop prices offered by SunRice and changes in farm and supply chain productivity.

Rice prices

In the face of low allocations and high water prices this season, SunRice announced fixed price contracts of \$750 per tonne for crop harvested in 2020 for Medium Grain Reiziq, \$950 per tonne for Koshihikari and up to \$1,500 per tonne for organic grain to encourage growing rice. The fixed price contracts are designed to replenish paddy and seed stocks, underpin SunRice's Riverina milling program and assist SunRice in meeting premium demand in markets (SunRice 2019d).

SunRice has recently announced the C20 crop is expected to be lower than the C19 crop (the second lowest on record) and as a result milling operations will be modified and will result in the loss of milling jobs. Reconfiguration of the mill program will commence in April 2020 – taking total job losses to 230 since reconfiguration commenced in November 2018 (SunRice 2019c).

Improving farm and supply chain productivity

Ricegrowers Ltd and SunRice are investing in a range of R&D to improve crop varieties and improve water use efficiency and improve farm system resilience to reduced allocations. SunRice is investing in varietal and pest and disease research in northern rice systems in North Queensland.

Individual growers will continue to invest in on-farm works to improve the economies of scale of rice farms – particularly in relation to improving the water use efficiency of their crops as well as labour productivity. This is likely to result in further amalgamation of rice farms and the development of more flexible farm systems to enable farms to produce alternative crops in years of insufficient water to grow rice.

These new systems will require more complex managerial and technical farming skills. They will also require an increased ability to manage risk as water availability declines and become more volatile. While improving rice productivity the investment by its nature is also likely to provide individual farmers opportunities to flex into alternative crops such as cotton and winter cereals.

SunRice is investing in R&D in its overseas operations to improve the quality and reliability of rice production. Overtime this will help to offset the risks to the reliability of supply of rice from the Riverina.

4.2 Key external factors

Two key external factors affecting future outcomes are the availability of water and the expected reliability of general security.

Availability and price of general security and temporary water

We discussed in our earlier literature review for the Panel and in our Horticulture Below the Choke Case study that increasing competition for water by new horticulture ventures is combining with less water available in the consumptive pool to increasing temporary market prices. In turn this is driving up allocation and entitlement prices.

As new perennial horticulture plantings increase and mature below the Barmah Choke we anticipate competition for water will increase. This will drive a sustained increase in temporary water prices in normal or drier years. Increasing temporary water prices will drive increasing entitlement prices.

Increasing demand for land will likely see these rice systems particularly in Murray irrigation above the Barmah Choke compete for land with large scale larger scale horticulture and cropping operations– wishing to lower costs of aggregation and minimise right to farm issues.

Step change in general security entitlement reliability?

The most recent assessment¹ by the NSW government of the 'cap factors' of general security (GS) entitlements made a downward revision to the long term volume expected to be available to these entitlements. The long term diversion limit equivalence (LTDLE) for Murray GS was revised down from 0.810 to 0.699, and Murrumbidgee GS was revised down from 0.640 to 0.591. The LTDLE are not a proxy for the 'reliability' of GS entitlements since the estimation takes into account historical information on usage and carryover.

There has been a long term decline in allocations to low reliability and general security entitlements over the past decade compared to the previous 20 years. Key questions are whether lower general security reliability is the new norm, and whether general security allocation has gone through a step change.

Over and above a general reduction in yield due to drier conditions on average, SunRice has expressed concern that there has been a step change in the volume of water that is available for general security (GS) allocations. In commissioned advice by SunRice, RMCG (2019) propose that a step change has occurred and is the result of water recovery, drier conditions and institutional factors.

The first two factors are well known and previously dealt with elsewhere in this discussion paper. RMCG point to a range of institutional factors that may reduce general security allocation. RMCG estimate the loss to be in the order of 2000 GL per year. Leaving an estimated 1415 plus GL available for general security use. They consider factors contributing to the 2000 GL loss include:

- Extra allowance for delivery losses by increased downstream flows for environment

- Changing operations including spills from Lake Victoria
- Policy changes prioritising high security over lower security water
- Increased spills
- Victoria prioritising Carryover over low reliability water share allocations
- Irrigation carryover impacts affecting private spills and accumulated dead storage, and conversion of water to higher reliability.

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