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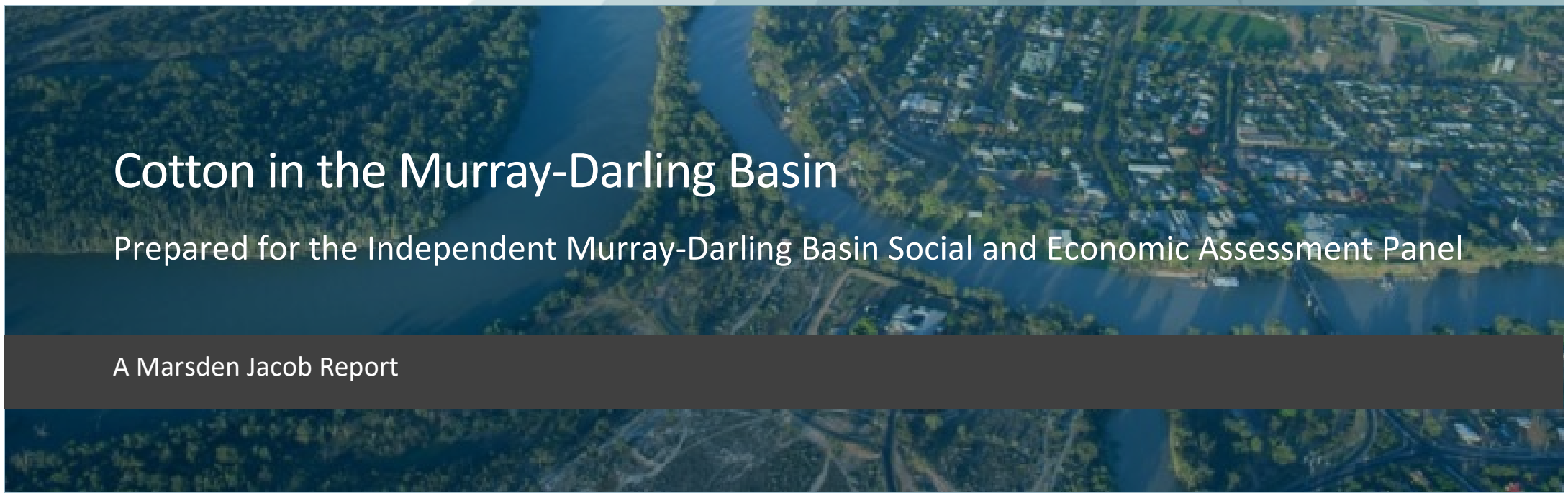

Cotton in the Murray-Darling Basin

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

A Marsden Jacob Report

Marsden Jacob Associates

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About Us
Marsden Jacob Associates are leading economics, public policy, markets and strategy advisors. We can help you shape the future wisely. We are a national practice of talented economists and policy advisors. We specialise in solving practical and real world problems relating to water, energy, environment, natural resources, agriculture, earth resources, public policy and transport. We work with a wide range of cross-disciplinary partner firms to deliver best project outcomes for our clients.

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Contents

Key points

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

- Cotton planting decisions in the Basin are mainly determined by general security water availability and allocation prices. Since cotton is usually a higher value crop than alternatives (such as sorghum and rice), cotton prices are usually not a major determinant of the area planted to cotton. However, irrigators in the Southern Basin will typically be more price-sensitive than those in the Northern Basin.
- Over the 14 years from 2004-05 to 2017-18, which includes the Millennium Drought, cotton farming has used an average of 1.6 million ML of irrigation water per year. Over the five years from 2013-14 to 2017-18, cotton farming has used an average of 2 million ML of irrigation water per year. Over these two same timeframes, the area planted to cotton averaged 388,000ha and 343,000ha, respectively. Note that these values include both irrigated and dryland cotton.
- Currently, typical water application rates are 7-8 ML/ha in the northern Basin and 9-10ML/ha in the southern Basin. Over time, water use efficiency is expected to improve, due to technological advances in irrigation infrastructure, management practices, and plant breeding. However, these improvements might be offset, either partially or fully, by the impacts of climate change.
- The Murrumbidgee/Riverina region is experiencing strong growth of cotton farming, with new gins opening in Carrathool and Hay in 2015, and a third new gin is set to open in Coleambally in 2020.
- The cotton industry will continue to expand or shrink annually in response to available water allocations and temporary water prices. Available evidence indicates that the cotton sector will rebound when allocations recover.
- Over the short to medium term, the allocation outlook for the Murray-Darling Basin is for lower than average rainfall and inflows, so cotton production over this timeframe is likely to be lower than the average of the last 10 years.
- Deeper and longer periods of low allocations and higher temporary water prices than previously experienced will reinforce the

diversification of enterprises that is common for cotton farming businesses.

- The cotton industry overwhelmingly uses general security allocations and temporary water. Another user of general security allocation and temporary water, particularly in the South, is rice. Cotton can offer higher returns than rice, so cotton is likely to outcompete rice for limited available water. Higher rice prices in recent years have made rice more competitive with cotton. However, unless these recent price increases represent a permanent increase in the long-term price of rice, cotton is likely to remain the higher returning crop of the two, on average.
- Employment in cotton farming has expanded in some areas and shrunk in others. Since 2011 there have been:
  - Reductions in employment in Far West and Orana (e.g. Narromine, Trangie, Warren); and
  - Significant increases in employment in Riverina (e.g. Griffith, Coleambally, Narrandera) and Murray (e.g. Hay).
- These trends align with recent developments for ginning, with new gins opening in Hay, Carrathool and Coleambally in the last five years.
- Employment in cotton ginning has expanded in some areas and shrunk in others. Since 2011:
  - Significant decreases in employment in Darling Downs (e.g. Dalby, St George) and Brisbane; and
  - Significant increases in employment in Riverina (e.g. Griffith, Coleambally, Narrandera) and Murray (e.g. Hay).
  - These trends align with recent developments for ginning (specifically, a gin at Carrathool) and the southward progression of cotton production. They are likely to be more pronounced in the near future, with the planned opening of a Coleambally gin in 2020.
- These examples show that the industry has proved to be dynamic in adjusting to changing economic and biophysical drivers, such as resulting from:
  - changes to water availability in the northern (less water or more variability) and southern (less likely to be negatively impacted by climate change) parts of the Basin; and
  - relatively higher prices for cotton, which make it a better value proposition than alternative crops (e.g. sorghum, rice), even in parts of the southern Basin that had not previously been farmed to cotton.
- The cotton supply chain has more options to expand and contract in response to changes in farm output at comparatively lower cost to other enterprises in the Basin. This means contraction in the supply chain does not necessarily signal over-development.

- 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 on a mix of high and general security allocations, rather than sectors such as cotton that rely on general security allocations and temporary market water.
- Our sense is that under further water recovery and the impacts of climate change, periods of very low allocation will be longer and deeper than previously experienced. However, whether climate change will significantly impact on the suitability of current cotton-growing regions remains to be seen, with more lab- and field-based research is required to draw robust insights.
- Under a range of water recovery scenarios, the following trends are expected:
  - In the Northern Basin, cotton production will decrease in proportion with any decrease in water availability following water recovery. This is because cotton is the dominant crop in the region, and is unlikely to be outcompeted for available water, except on rare occasions when the returns from alternative crops are higher, such as for currently high wheat prices.
- Cotton production will remain stable in the Southern Basin because cotton is likely to outcompete lower-value enterprises such as fodder crops and dairy and maintain its same level of access to water. In contrast, lower-returning enterprises are expected to experience production decreases.

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 cotton in the Basin. 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. Farmgate situation

In the Northern Basin, cotton is usually higher value and more profitable than alternative crops. Therefore, cotton growing is driven primarily by general security water allocations and allocation prices, and less so by changes in cotton prices. In the Southern Basin, a wider range of alternative crops typically are grown, which means irrigators are generally more price-sensitive than in the north.

2.1 Background

Cotton farming is most suited to cracking, self-mulching clay soils found on floodplains. These soil types expand and contract, depending upon the water content of the clay.[1] The main growing regions in NSW are the North West (includes Narrabri, Wee Waa), Riverina (includes Narrandera, Griffith), and Central West (includes Narromine, Trangie). The corresponding water sharing zones are Namoi, Murrumbidgee, and Macquarie, respectively. Other notable growing regions in NSW are the NSW Border Rivers and Gwydir regions. The main growing regions in the Queensland MDB are around Dalby and St George (Condamine-Balonne water sharing zone) and west of Goondiwindi (Border Rivers water sharing zone).

The industry relies almost exclusively on general security (GS) entitlements and temporary water purchases. The area planted to cotton each year varies, depending on a range of factors. The primary determinants are the availability of GS water and allocation water prices. GS allocations and allocation prices underpin relative returns expected from the crop relative to other water and land uses.

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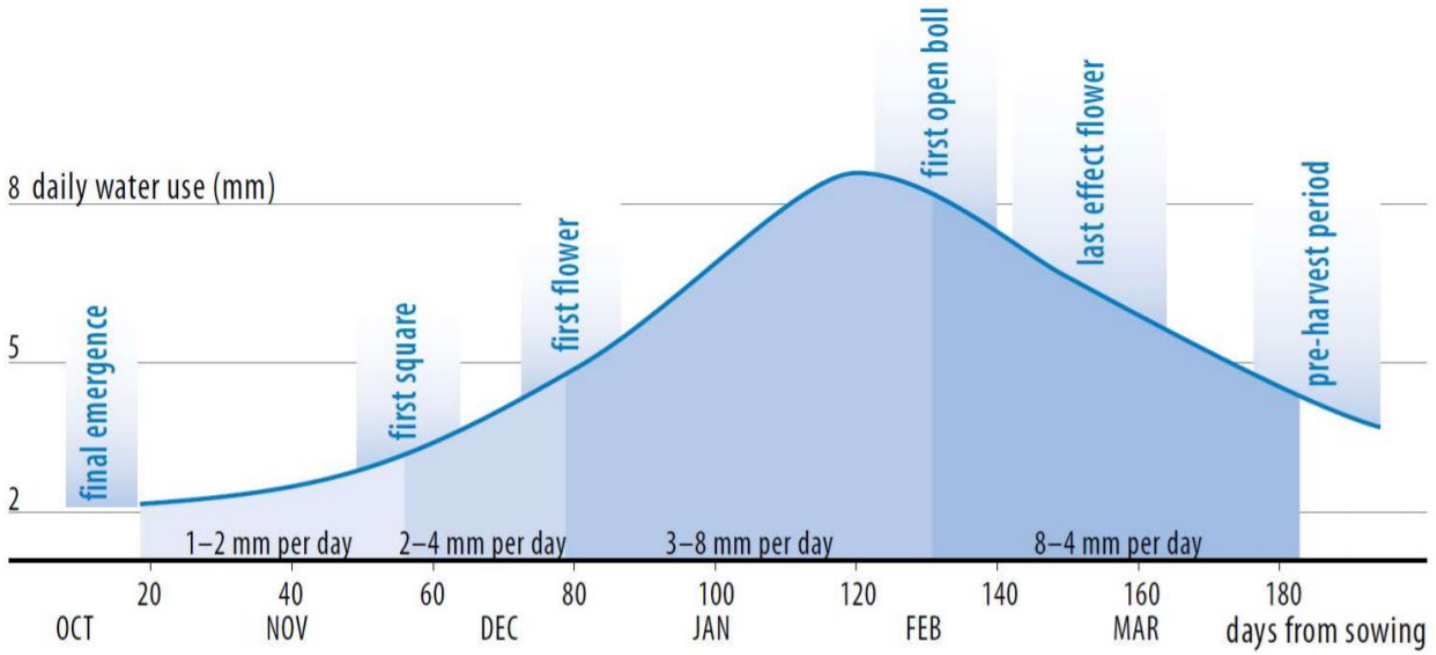
[1] Cotton Australia, How Cotton Is Grown, https://cottonaustralia.com.au/uploads/resources/CEK_Chap_5A_How_Cotton_is_Grown.pdf

2.2 Seasonal production

Areas planted to cotton vary considerably between years. This variation reflects, for the most part, water availability. Crop planting decisions are typically finalised in September or October, with harvesting typically taking place in March or April of the following year[2] (Figure 1). This timing reflects cotton preference for hot temperatures, low humidity and plenty of sunshine.

Figure 1: A stylised example of daily water use (mm/day) for cotton production



Source: WATERpak, CRDC 2012

[2] These windows might differ slightly from north to south, due to variations in the climate.

Cotton water use will change depending on seasonal conditions, but is normally around 7-8 ML/ha in the North West, and gradually increases for locations further south, reaching 9-10 ML/ha in the Riverina (Table 1). The main reason for this difference in water use is the rainfall deficit for southern regions compared to northern regions (Table 2).

Information on current and expected water availability over the expected life of the crop is critical to the cotton grower's planting decision-making.

2.3 Area planted and water availability

Areas planted to cotton vary considerably between years, where the main driver is water availability (Figure 2). Over the last 30 years, the annual area planted to irrigated and dryland cotton in NSW and Queensland has varied from a low of 63,000 ha in 2007-08 to a peak of 599,000 ha in 2011-12. The average area planted to irrigated and dryland cotton over this period is 336,000ha. Figure 2 illustrates the variability of area planted from year to year. Anecdotal evidence provided by several growers[3] also suggests that the typical behaviour is to plant a greater area than can be irrigated using current volumes of water stored on-farm, or by accessing water based on the announced allocation at the time of planting.

Table 1: Areas planted and irrigation application rates, 2016-17 and 2017-18

Region	Area planted ('000 ha)		Area irrigated ('000 ha)		Irrigation application rate (ML/ha)	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
North West	227.7	196.4	124.2	128.7	7.4	7.1
Central West	35.0	32.1	27.5	31.4	9.0	9.0
Riverina	36.8	55.6	36.6	55.6	9.4	9.6
QLD MDB	85.5	63.1	73.3	55.0	8.9	8.5

Source: Water use on Australian Farms, ABS

[3] Personal communication, Bourke SAP meeting, 12 December 2018

Table 2: Average rainfall for cotton producing regions

Region	Rainfall October to April (mm)	Rainfall December to March (mm)
Hillston	212	121
Narromine	303	183
Warren	310	194
Gunnedah	407	253
Coonamble	326	205
Wee Waa	391	251
Bellata	409	263
Moree	396	258
Croppa Creek	404	265
Goondiwindi	426	281
Dalby	488	319
Biloela	534	373
Emerald	489	356

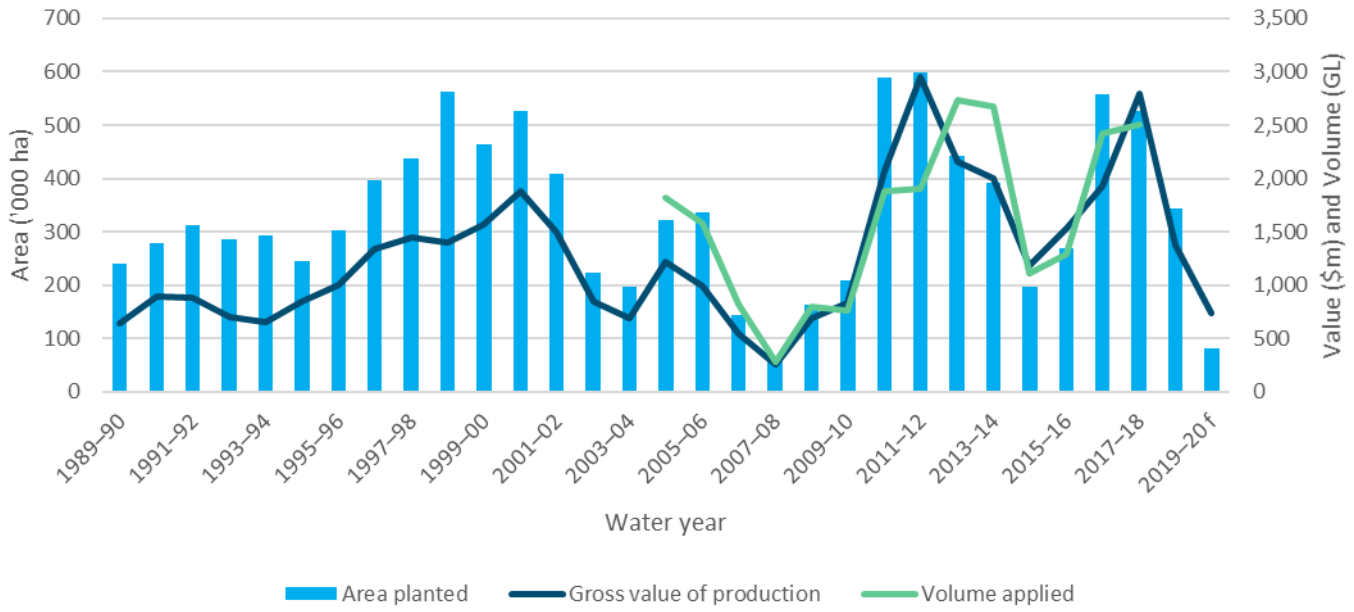
Source: Australian Cotton Production Manual 2018[4], Australian Rainman

In this sense, irrigators are gambling on higher water availability later in the growing season, due to increases in the announced allocation and in-season rainfall events. If sufficient water becomes available, the cotton crop is finished and

[4] https://irec.org.au/wp-content/uploads/Australian-Cotton-Production-Manual-2018.pdf

harvested. If insufficient water is available, some of the area planted to cotton is left as dryland (with reduced yields) or the crop is abandoned to make way for a winter crop, which generates lower returns per hectare but also requires less water.

Figure 2: NSW and QLD cotton plantings, gross value of production, and volume of water applied, 1989-90 to 2019-20



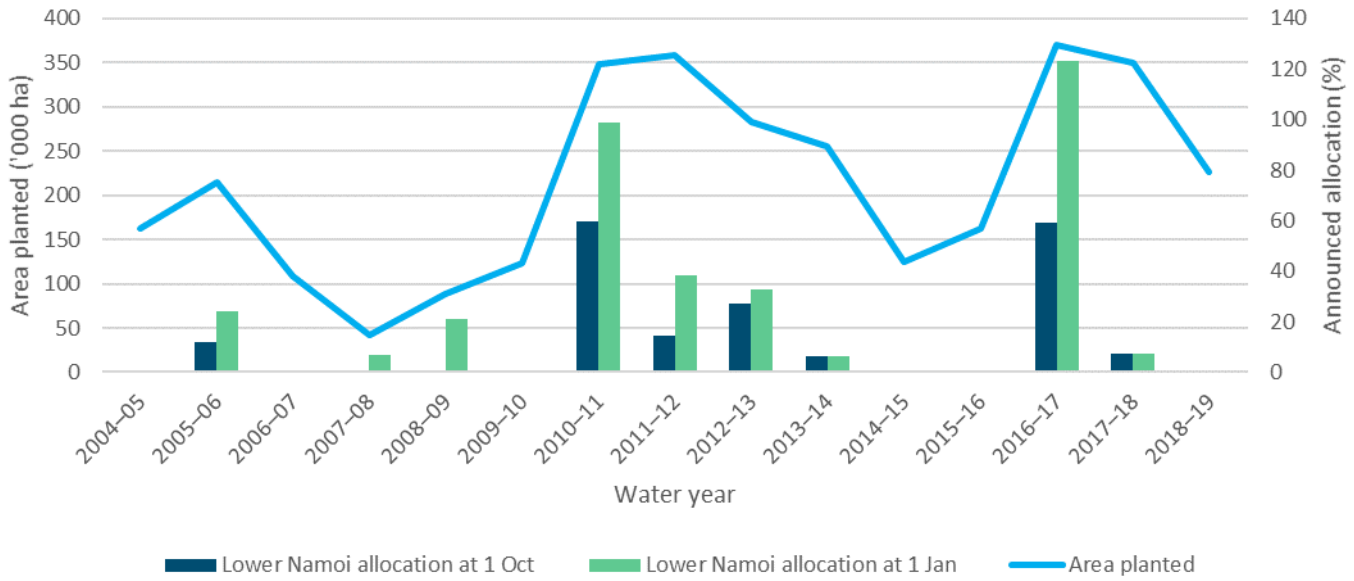
Source: ABARES, Australian Crop Report December 2019

The strong relationship between water availability and the area planted to cotton in NSW is illustrated in Figure 3. It can also be seen that the gross value of production (GVP) closely tracks the area planted metric (Figure 2). The GVP peaked at

just under $3 billion in 2011-12 (when area planted also peaked), and reached a low of $254 million in 2007-08 (when area planted was also at its lowest). Average GVP over this timeframe was $1.3 billion[5].

Announced allocations in the Lower Namoi are used as a proxy for water availability in NSW. Lower Namoi has been chosen because it is the major cotton growing region in NSW, and the water availability there is quite representative of the rest of the Basin. However, announced allocations can vary significantly between different water sharing zones, which means the relationship between water availability and area planted is likely to be stronger than indicated by Figure 3.

Figure 3: Area planted to cotton (NSW) and announced allocation, 2004-05 to 2018-19



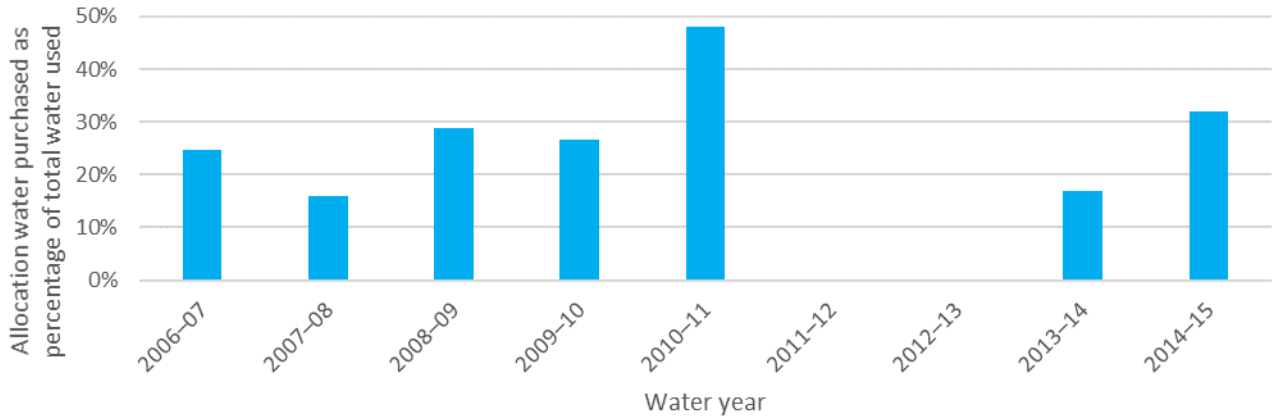
Source: ABARES, Australian Crop Report December 2019

[5] The GVP is reported in nominal terms. If reported in real terms (2019-20 dollars), this value would be slightly higher.

Some cotton growers supplement the water allocated from their entitlement holdings by also purchasing water on the temporary market. This strategy was used to greatest effect in 2010-11, when announced allocations for GS entitlements were relatively high and temporary water prices were relatively low. However, the relatively high returns from cotton, compared to substitute crops, means temporary water is also purchased when announced allocations for GS entitlements are low or zero, as was the case in 2006-07, 2008-09, 2009-10, and 2014-15. This market behaviour has two main drivers:

- Low announced allocations mean growers of other crops (such as rice) are better off selling their allocation on the temporary market because it will yield a higher return than growing a crop.
- Cotton growers are willing to purchase temporary water early (or late) in the season to ensure a crop can be planted (and sustained).

Figure 4: Temporary water purchases by net buyers, for cotton farms in the MDB, 2006-07 to 2014-15



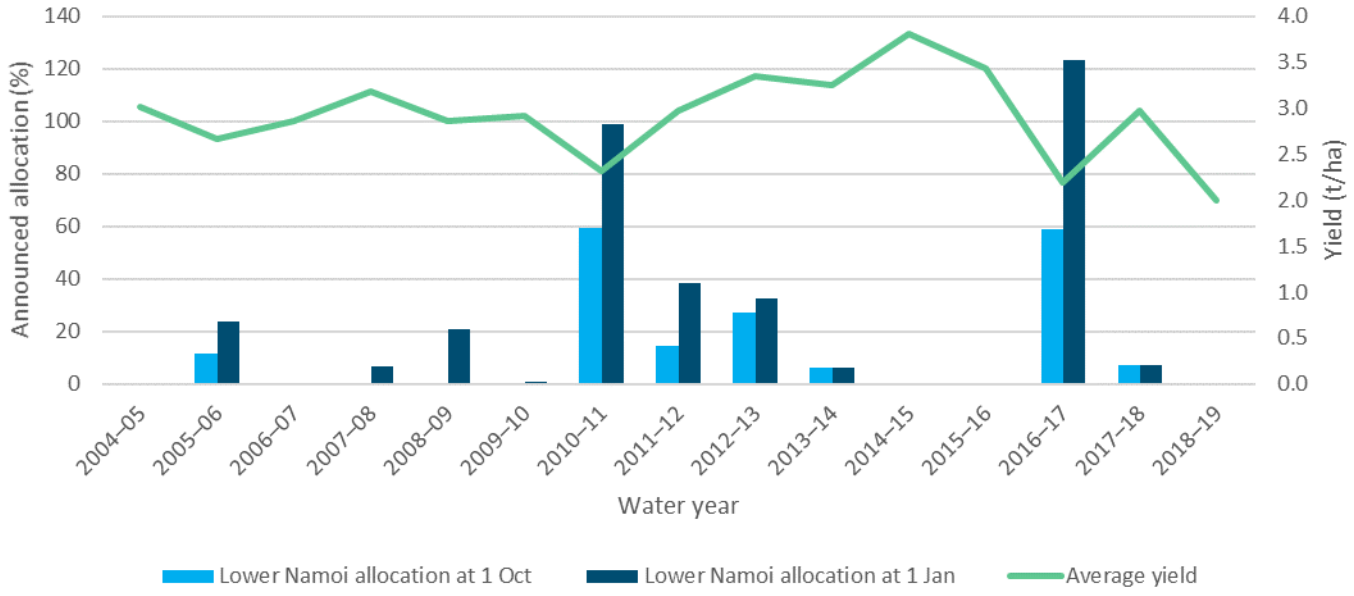
Source: ABARES, Cotton farms in the Murray-Darling Basin (2017)[6]
Note: Water trading data are not available for 2011-12 and 2012-13

[6] https://www.agriculture.gov.au/abares/research-topics/surveys/irrigation/cotton#references

2.4 Yield and productivity

Average cotton yields appear to have plateaued since 2004-05 (Figure 5). However, examining a longer time series shows a significant upward trend in average yields per hectare (Figure 6). Interestingly, over the last 10 years, two of the three lowest yielding seasons (2010-11 and 2016-17) have coincided with high water availability. This result suggests that lower average yields are likely the result of more marginal land being cropped to cotton during times of high water availability.

Figure 5: Average cotton yield (NSW) and announced allocation, 2004-05 to 2018-19

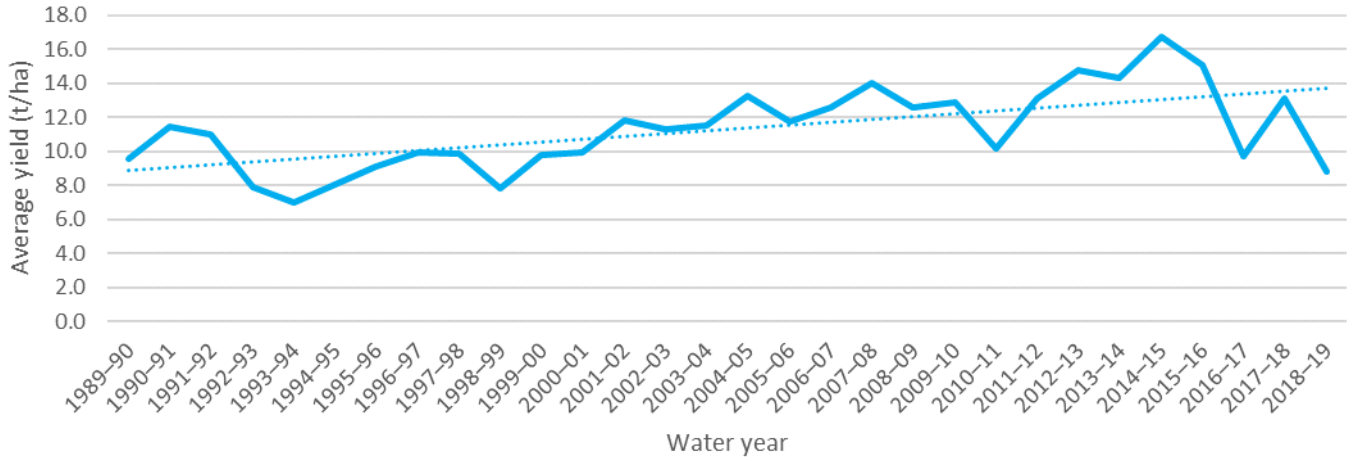


Source: ABARES, Australian Crop Report December 2019

Several other factors must also be taken into account when considering the trends in Figure 6 and Figure 7. First, the data used for this analysis, due to data limitations, are highly aggregated. Therefore, productivity changes relevant to only particular regions or cotton varieties might not be observable at this level of aggregation. Second, the time series for which

adequate data are available is quite short. Third, and possibly most important, the gradual southward transition of cotton production must be considered. Due to less favourable climatic conditions, cotton grown in the southern Basin will typically be lower yielding than cotton grown in the northern Basin. Our discussions with growers indicate maximum yields achieved in the North are around 15 bales/ha, compared to 11.5-12.5 bales/ha in the South[7]. Average yields differ by a similar degree. Additionally, differences in average rainfall mean cotton grown in the South will typically require 1-2ML/ha more irrigation than cotton grown in the North. This combination of factors likely, at least partly, explains the apparent downward trend in average yield (ML/ha) since 2005-06 (Figure 7). Rather than a decrease in the productivity of cotton varieties, slightly lower yields (t/ha) are likely due to a significant shift in the regions where irrigated cotton is grown. In the last five years, two new cotton gins have been opened in the Murrumbidgee, at Hay and Carrathool, and another is to open in Coleambally in 2020, in response to increasing cotton production in the region.

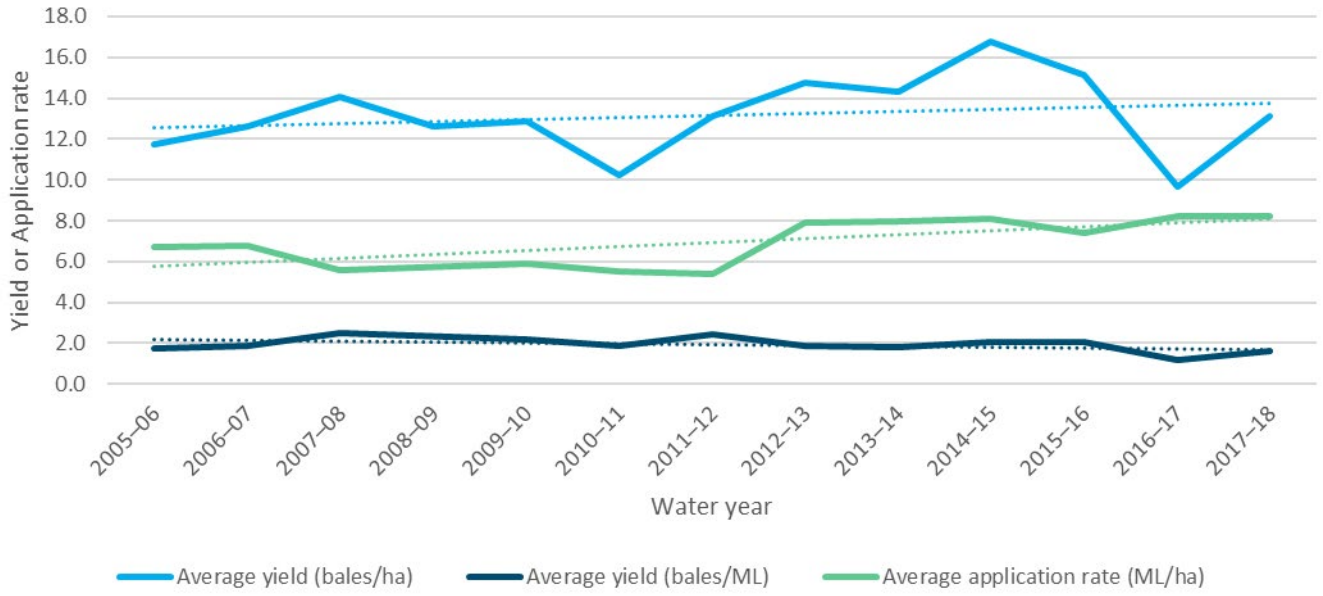
Figure 6: Average cotton yield for NSW, 1989-90 to 2018-19



Source: ABARES, Australian Crop Report December 2019

[7] Personal communication, Bourke SAP meeting, 12 December 2018

Figure 7: Average cotton yield (NSW) and average application rate (NSW), 2005-06 to 2017-18



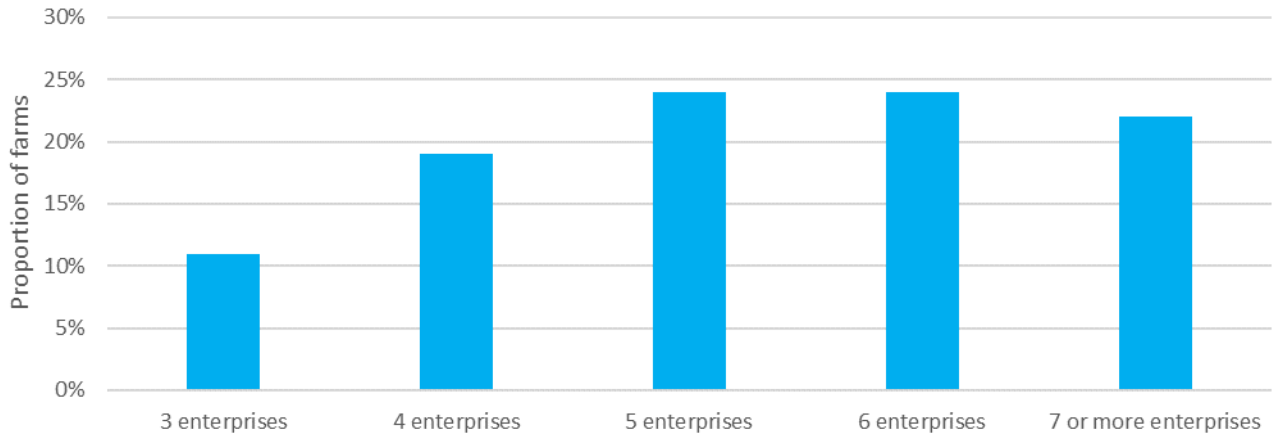
Source: ABARES, Australian Crop Report December 2019

2.5 Enterprise mix

For risk management purposes, most cotton farms produce more than one agricultural commodity, including crop and livestock outputs. Based on ABARES farm surveys, cotton growers had the most diversified mix of commodities of all irrigated industries in the Murray-Darling Basin between 2006-07 and 2015-16.[8] Enterprise mixes included irrigated and dryland cotton, wheat, grain sorghum, barley, oilseeds, grain legumes, and livestock.

[8] This research has not been updated since 2016; however, these trends are unlikely to have materially changed.

Figure 8: Number of farm enterprises for cotton farms in the MDB, 2006-07 to 2015-16



Source: ABARES Murray–Darling Basin Irrigation Survey

2.6 On-farm upgrades and water use efficiency improvements

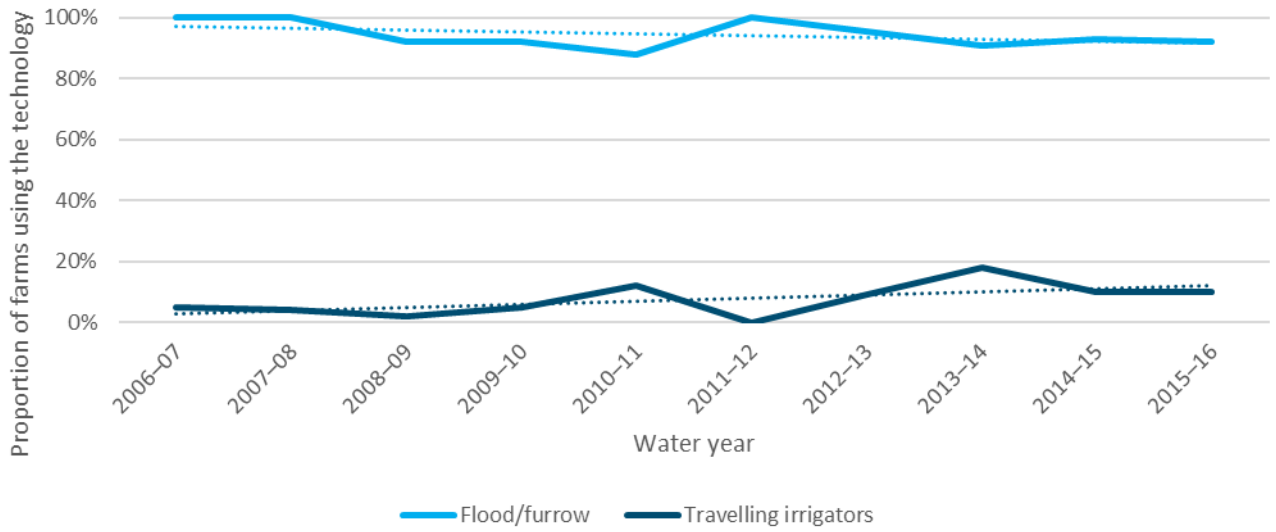
This section provides an overview of the main irrigation technologies used on cotton farms, and where water use efficiency (WUE) improvements have been made.

2.6.1 Main irrigation technologies used on cotton farms

For cotton farms in the Murray-Darling Basin, flood/furrow irrigation is, by far, the dominant irrigation technology used. However, there has been a gradual upward shift in the proportion of farms using travelling irrigators (e.g. lateral move, centre pivot). This upward trend has been assisted by government-funded water recovery programs, where infrastructure upgrades are exchanged for water entitlements, and will likely continue due to the southward transition of cotton production into regions where water availability is typically more reliable/less variable and, therefore, investment in travelling irrigators is more likely to be economically viable.

The water efficiency gains from adopting travelling irrigator technology are only realised when the technology is in use. Therefore, higher reliability catchments are more suited to this type of technology, because it can be operated for most seasons. For lower reliability catchments, which describes most of the Northern Basin, the technology would likely be operated less frequently, meaning the high upfront capital cost might not be justifiable for some irrigators. However, this is not to say that overhead irrigation is not used in the north. For example, centre pivots are known to be used in Border Rivers region, such as in the North Star, Texas, and Bonshaw areas.

Figure 9: Main irrigation technologies used on cotton farms in the MDB, 2006-07 to 2015-16



Source: ABARES Murray-Darling Basin Irrigation Survey

2.6.2 Water use efficiency improvements

Water use efficiency improvements in cotton growing can result in a range of benefits, which include:

- Lower application rates which 'frees up' water to be used elsewhere on the property or traded.

- Improved ability to control the timing of application allows more planning flexibility in terms of applying water at the most optimal time.
- Higher flow rate that results in more optimal in-field application rates, more efficient transfer of drainage water, and reduced transmission time thereby reducing in-channel losses.
- Improved uniformity provides equal access of water to crops increases the likelihood of a more uniform crop within a field or across a property.

Based on previous research conducted by Marsden Jacob Associates, on-farm infrastructure upgrades can result in significant improvements in water use efficiency (Table 3).

Table 3: Estimated water use efficiency improvements for different on-farm infrastructure upgrades

	WUE improvement	
Infrastructure upgrade	ML/ha	Bales/ML
Overhead sprinkler systems	1-2	0.2-0.4
Storage improvements – improved flow rates and uniformity	0.3-1.0	0.06-0.2
Storage + Recirculation + Pump	0.5	
Storage + Recirculation + Laser levelling	0.4-1.0	
Storage + Laser levelling	1.5-2.0	
Pump stations and piping	0.15-1.2	

Source: MJA analysis of various data sources

Some irrigators have chosen to undertake infrastructure upgrades independently, while other irrigators have done so in conjunction with government funded infrastructure and water recovery programs, including the Irrigated Farm Modernisation Program, On-Farm Irrigation Efficiency Program, and Private Irrigation Infrastructure Operators Program.

2.7 Employment

Table 4 illustrates where cotton growing takes place across NSW and Queensland, based on self-identified industry of employment data reported in the 2011 and 2016 Censuses. These values will necessarily under-report the scale of cotton growing employment because cotton farming is typically one component of a multi-enterprise farming business (see Figure 8). These figures must also be viewed within the wider context of general declines in cotton growing employment between 2011 and 2016 (-31% for NSW and -35% for Queensland) in response to seasonal and water availability conditions. Nonetheless, some obvious trends emerge, including:

- High relative reductions in employment in Far West and Orana (e.g. Narromine, Trangie, Warren); and
- Significant increases in employment in Riverina (e.g. Griffith, Coleambally, Narrandera) and Murray (e.g. Hay).

These trends align with recent developments for ginning, with new gins opened in Hay and Carrathool in the last five years, and another in Coleambally to open in 2020.

Finally, cotton is not grown in the Sydney or Brisbane metropolitan areas — so these jobs involve office/advisory roles, rather than hands-on cotton farming.

Figure 10 and Figure 11 illustrate that cotton farms, on average, employ more permanent staff than any other industry. However, other contract services (e.g. spraying, harvesting) represent a much higher proportion (12%) of total costs compared to other industries, where these services represent 3-4% of total costs. Therefore, the employment effects of changes in water availability are likely to be felt more strongly by providers of contracted services than cotton farm employees. That said, the average cotton farm employs 3.3 workers either casually or as contract labour, and there has been an average of 650 cotton businesses operating over the last five years. This translates to approximately 2,000 workers employed casually or as contract labour, who are susceptible to the upswings and downswings associated with cotton farming.

Table 4: Employment in cotton growing (SA4 level data)

SA4 region	2011	2016	Change
NSW	**969**	**669**	**-300**
Central West	8	0	-8
Far West and Orana	204	110	-94
Murray	10	25	+15
New England and North West	541	369	-172
Riverina	60	115	+55
Sydney (combined)	25	21	-4
NSW – undefined	121	29	-92
Queensland	**760**	**493**	**-267**
Darling Downs – Maranoa	535	352	-183
Central Queensland[9]	126	79	-47
Toowoomba	12	11	-1
Brisbane (combined)	4	15	+11
Other Queensland	12	25	+13
Queensland – undefined	71	11	-60

Source: ABS Census data

[9] Formerly: Fitzroy

Figure 10: Average number of workers per farm at the peak, 2017-18

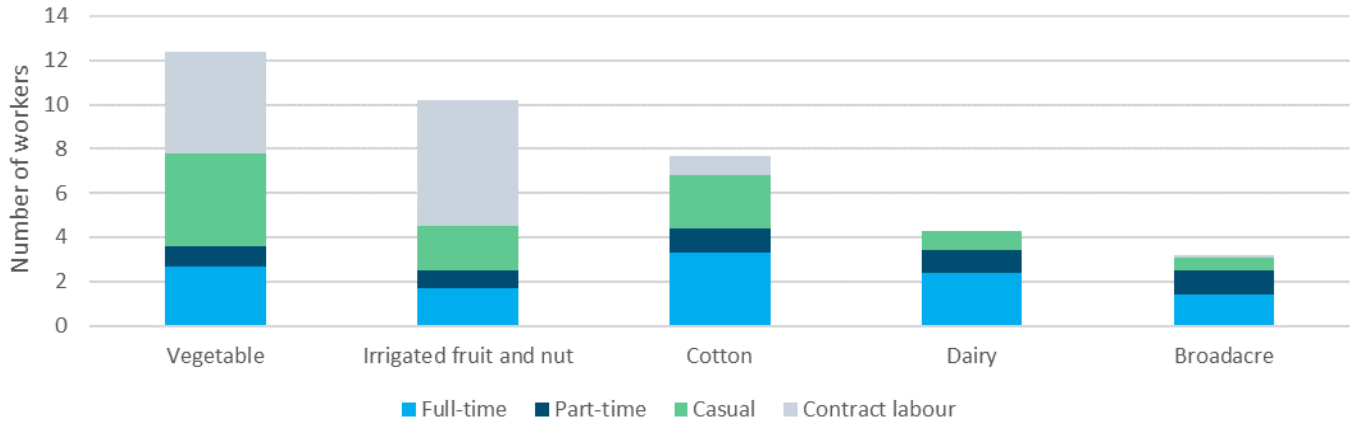
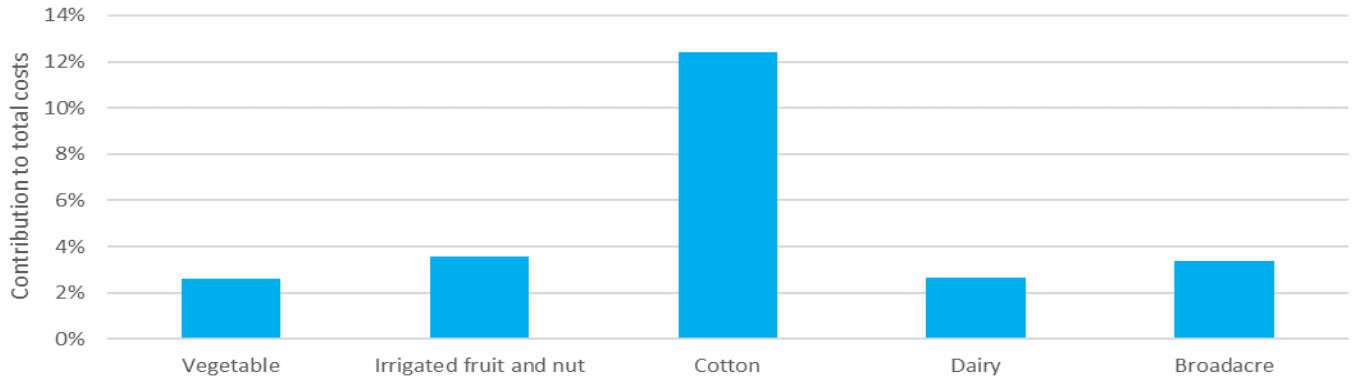


Figure 11: Contribution of other contract services to total costs, 2017-18



Source: ABARES, Demand for farm workers: ABARES farm surveys 2018[10]

[10] https://www.agriculture.gov.au/abares/research-topics/labour/labour-survey-2018#download--the-full-report-and-data

3. Post farmgate situation

The cotton industry has highly developed supply chains generating export income and regional employment.

3.1 The value chain

There is limited vertical integration and no single desk for the aggregation and processing of cotton. Instead, at least six ginning businesses operate across the Murray-Darling Basin regions of NSW and Queensland – Namoi Cotton, Queensland Cotton, LDC, Auscott, RivCott, and Carroll Cotton.

Cotton growers sell their cotton to independent merchants, who then arrange for delivery to world markets. This stage of the supply channel is highly competitive.

Prices received by growers are heavily influenced by the world price, which depends on a multitude of factors, including global economic growth, global supply factors (weather, water availability, pest and disease outbreaks, stockpiles, etc.), and global demand factors (consumer tastes and preferences, and prices of alternative fibres such as synthetics).[11] The 'world price' is that of the Intercontinental Commodity Exchange (ICE) No.2 Cotton futures contract, which is a US-based contract. To determine the price paid for cotton in Australia, the ICE price is adjusted based on the AUD/USD exchange rate, perceived market risks, and delivery costs.[12]

The majority of cotton produced is sold using forward contracts (up to five years in advance). Price risk is also hedged using derivative products such as options, swaps, and on-call contracts.

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[11] Cotton Australia, Economics of Cotton in Australia (2018): https://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-the-economics-of-cotton-in-australia
[12] Farmarco, Pricing of Australian Cotton (2019): https://www.farmarco.com.au/commodities-pricing-cotton.php

Australian cotton is sold into a globalised market, which is supplied by approximately 100 cotton-producing nations. Australian cotton can attract a price premium due to its high-quality characteristics and reliability/consistency. Australia's main cotton exporting ports (Sydney, Brisbane, and Melbourne) are conveniently located to Asian markets, to where most of Australia's cotton is exported.[13]

3.2 Ginning operations

There are at least 31 cotton gins operating in NSW and Queensland[14], with one more that will begin operations in 2020 (Table 5). These gins are located close to the major cotton growing regions. The Namoi, Barwon-Darling, and Condamine-Balonne (all in the Northern Basin) currently home to the highest concentrations of gins. However, the last 5 to 10 years has seen a significant expansion of cotton production southward; particularly into the Murrumbidgee. All four gins located in this region having been opened within the last 10 years and two have been built in the last five years.

3.3 Exports

Year-on-year, close to all of the cotton produced in Australia is exported. Figure 12 illustrates that exports typically move in line with production each year; however, there is a small degree of stockpiling, such as during 2004-05, 2010-11, and 2011-12, where the stockpile is typically run down within the next two to three years. Stockpiling is used to balance global supply and demand, or takes place in response to low world prices with the intention of capitalising on higher future prices.

It should also be noted that Australia's reliance on China has reduced since the early 2010s, with India and Vietnam[15] becoming more significant export destinations. However, the trade landscape drastically changed in July 2018 with China's imposition of a 25% additional import tariff on US raw cotton. This policy change will reduce the competitiveness of US cotton in the Chinese market and provide Australia with an opportunity to increase market share.[16]

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[13] Cotton Australia, Economics of Cotton in Australia (2018): https://cottonaustralia.com.au/cotton-library/fact-sheets/cotton-fact-file-the-economics-of-cotton-in-australia
[14] Note: There might be some private gins that have not been included in this count.
[15] Which are less profitable markets.
[16] ABARES, Cotton: September quarter 2018, https://www.agriculture.gov.au/abares/research-topics/agricultural-commodities/sept-2018/cotton

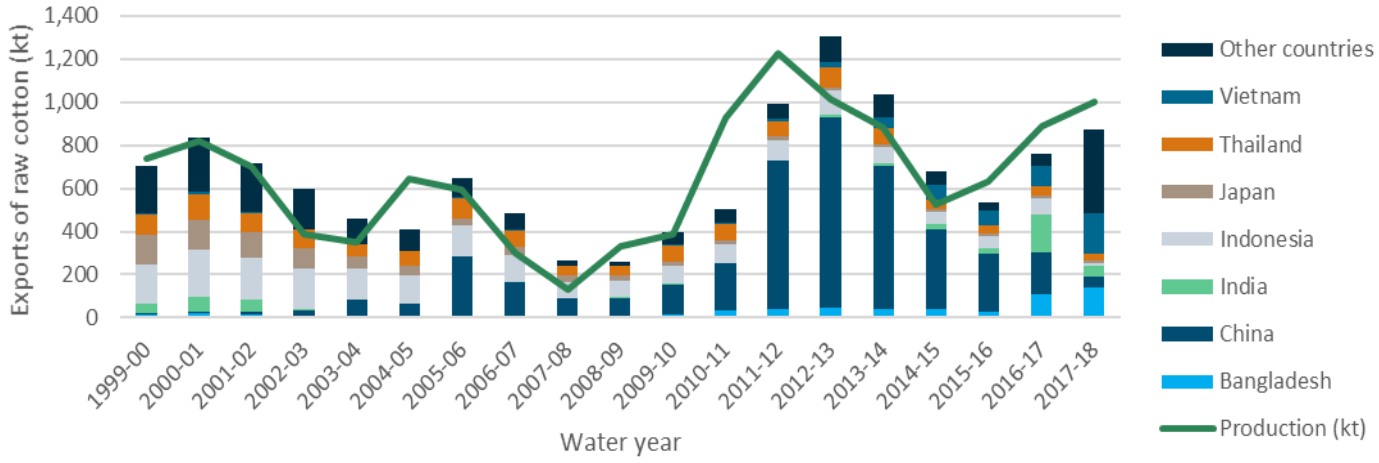
Table 5: Cotton gins operating in NSW and Queensland MDB regions

Water source	Number of gins	Gin operators
Condamine-Balonne	5	Queensland Cotton (Olam), LDC
Central Queensland	2	Queensland Cotton (Olam), LDC
Border Rivers	3	Namoi Cotton
Barwon-Darling	5	Queensland Cotton (Olam), Namoi Cotton
Gwydir	2	Namoi Cotton, LDC
Namoi	7	Queensland Cotton (Olam), Namoi Cotton, Auscott, Carroll Cotton
Macquarie	3	Namoi Cotton, Auscott
Lachlan	1	Namoi Cotton
Murrumbidgee	4[17]	Southern Cotton, Queensland Cotton (Olam), RivCott, Auscott

Source: Industry websites

[17] This figure includes a new gin in Coleambally – a joint venture between Southern Cotton and Queensland Cotton (Olam) – which will commence operations in 2020.

Figure 12: Volume of Australian exports of raw cotton, by destination



Source: ABARES, Agricultural commodity statistics 2018

3.4 Employment

Table 6 illustrates where cotton ginning takes place across NSW and Queensland, based on self-identified industry of employment data reported in the 2011 and 2016 Censuses. Unlike for cotton growing, these values will likely be representative of the scale of cotton ginning employment because cotton ginning is a specialised occupation. Between 2011 and 2016, some obvious trends emerge, including:

- Steady employment in Central Queensland (e.g. Emerald, Biloela) and Toowoomba (e.g. Gatton);
- Significant decreases in employment in Darling Downs (e.g. Dalby, St George) and Brisbane; and
- Significant increases in employment in Riverina (e.g. Griffith, Coleambally, Narrandera) and Murray (e.g. Hay).

These trends align with recent developments for ginning (specifically, a gin at Carrathool) and the southward progression of cotton production. Also, these trends are likely to be more pronounced in the near future, with the planned opening of a Coleambally gin in 2020.

Table 6: Employment in cotton ginning*

SA4 region	2011	2016	Change
NSW	**320**	**289**	**-31**
Central West	0	0	0
Far West and Orana	43	38	-5
Murray	0	30	+30
New England and North West	200	157	-43
Riverina	11	56	+45
Sydney (combined)	0	0	0
NSW – undefined	66	8	-58
Queensland	**259**	**135**	**-124**
Darling Downs – Maranoa	136	78	-58
Central Queensland[18]	22	18	-4
Toowoomba	23	21	-2
Brisbane (combined)	54	14	-40
Other Queensland	0	4	4
Queensland – undefined	24	0	-24

*SA4 level data
Source: ABS Census data

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[18] Formerly: Fitzroy

4. Cotton outlook

The outlook for cotton and its value chain will depend on a range of internal and external factors. These include: crop prices; farm and supply chain productivity; general security and temporary water availability, reliability, and price; exchange rates; and global politics.

Much of what follows is based on the ABARES Agricultural commodities report for September 2019. This analysis has also been supplemented using a range of other sources, including Cotton Australia and the CRDC.

4.1 Key internal factors

How farmers manage on farm risks and the growth of southern cotton will be important factors that drive the cotton outlook. Four aspects of risk management are highlighted below.

4.1.1 Managing the impacts of spray drift and disease

Cotton is the dominant crop in the Northern Basin and as such, crops on neighbouring farms will usually be cotton and will typically have been planted at similar times, be at similar stages of development, and require chemical application (e.g. pesticides) at much the same time. Therefore, the risks associated with spray drift – when off-target contamination of weed and pest control programs on one property impact on a neighbouring property – are relatively low, but significant. For example, in 2017-18, 12% of crops were reported as damaged by spray drift in the Macquarie Valley. Marsden Jacob estimated that the attributable loss of profit from these spray drift incidents was in the order of several millions of dollars. In contrast, the much wider variety of crop types planted in the Southern Basin greatly increases the risks, and potential costs, associated with spray drift.

In response to the growing problem of spray drift, particularly in the South, Cotton Australia announced the release of SataCrop, in partnership with Precision Crop Technologies in June 2019. SataCrop is an improvement on the previous technology – CottonMap – because it maps all crop types, rather than only mapping cotton. It is hoped that SataCrop will make growers and applicators of all products better informed, before spraying chemicals.[19]

Regarding diseases, colder temperatures and slower cotton seedling development in the Southern Basin leaves crops more susceptible to diseases than cotton grown in the Northern Basin. For example, black root rot has become more prevalent, particularly in the Murrumbidgee region. Anecdotal evidence suggests black root rot can reduce yields by up to 6 bales/ha. Early infections of alternaria leaf spot were also observed in the 2017-18. The impacts of diseases can be managed using crop rotations, such as cotton-wheat-fallow or cotton-wheat-corn-faba bean.[20]

4.1.2 Coping with climate change

Climate change presents challenges to cotton production. Warmer air temperatures[21] and wider weather extremes, resulting from rising atmospheric CO_2 concentrations, might significantly impact plant growth and crop productivity. These impacts could be positive or negative. For example, increases in CO_2 concentrations might increase yields and extend growing seasons. However, higher temperatures could also cause fruit loss, reduce water use efficiencies, lower yields, and reduce fibre quality. Also, more frequent extreme weather events are likely to increase the year-to-year variability of yields.

In response to these challenges, research is underway into cultivars tolerant to abiotic stresses – such as hotter, drier, and more water-logged conditions – and better understanding of whole system management strategies. Future environments are predicted to produce larger cotton plants that require more water, so varieties with smaller, more compact leaves and higher photosynthetic rates are likely to be preferred.

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[19] CRDC, Spotlight Summer – 2019-20, https://www.crdc.com.au/sites/default/files/pdf/Spotlight%20Summer%20-%202019-20.pdf
[20] CRDC, Spotlight on Cotton R&D (2019), https://www.cottoninfo.com.au/sites/default/files/documents/Autumn19.pdf
[21] Simulation model results for Emerald, Dalby, St George, Goondiwindi, Moree, Bourke, Narrabri, Warren, and Hillston show an increase in the number of days above 35C and a reduction or no change in the number of cold shocks during the growing season, apart from some NSW growing regions in January and February (CRDC, 2019).

In conclusion, whether climate change will significantly impact on the suitability of current cotton-growing regions remains to be seen, with more lab- and field-based research required to draw robust insights.

4.1.3 Best management practices and premium markets

myBMP is a voluntary farm and environmental management system for Australian cotton growers. The scheme is aligned with internationally recognised quality assurance programs and marketing initiatives for sustainable cotton production. In addition to potentially achieving higher or less variable yields, or lower variable costs, by adopting best management practices, being myBMP certified gives participating growers increased market access and, potentially, higher prices. Required management practices cover: Biosecurity; Energy input and efficiency; Fibre quality; Human resources and Workplace health and safety; Integrated pest management; Sustainable natural landscapes; Pesticide management; Petrochemical storage and handling; Soil health; and Water management.

Achieving appropriate certification allows access to premium markets. Principally, cotton from a myBMP-certified farm can be sold through the Better Cotton Initiative, which is an increasingly popular hurdle requirement for the world's major textile and clothing brands.

4.1.4 Southern migration of cotton growing

Although cotton has been grown in the Riverina on a large commercial basis, mostly in the Hillston valley, since the mid-1990s, significant expansion in the South has occurred over the last 5 to 10 years, to take advantage of more reliable water availability (Table 7). In response, two new cotton gins have been opened in Hay and Carrathool, in the last five years, and a third is expected to open at Coleambally in 2020. Up to this point, it appears that ginning operations have geographically relocated in a timely fashion, such that there is currently ample capacity to process cotton grown in the Southern Basin. Similarly, gins in the Northern Basin are well located to cater to the current locations of cotton growing operations. In future, the challenge will be for ginning operations to keep pace with any significant shifts in the locations of major cotton growing operations.

Table 7: Reliability of selected NSW catchments (General security allocations), 2004-05 to 2018-19

Catchment	Announced allocation (%):	At 1 September	At 1 October	At 1 January	At 1 February
NSW Border Rivers Class A	Median	100	100	100	100
	Average	78	85	86	86
Gwydir	Median	0	2	5	5
	Average	5	12	26	30
Upper Namoi	Median	100	100	100	100
	Average	78	81	84	84
Lower Namoi	Median	0	0	7	11
	Average	4	12	24	27
Macquarie	Median	4	2	7	7
	Average	20	23	26	27
Lachlan	Median	0	0	0	0
	Average	8	11	18	19
Lower Darling	Median	30	50	100	100
	Average	49	56	62	71
Murrumbidgee	Median	20	30	34	35
	Average	24	31	46	48
NSW Murray	Median	8	20	46	49
	Average	18	28	48	50

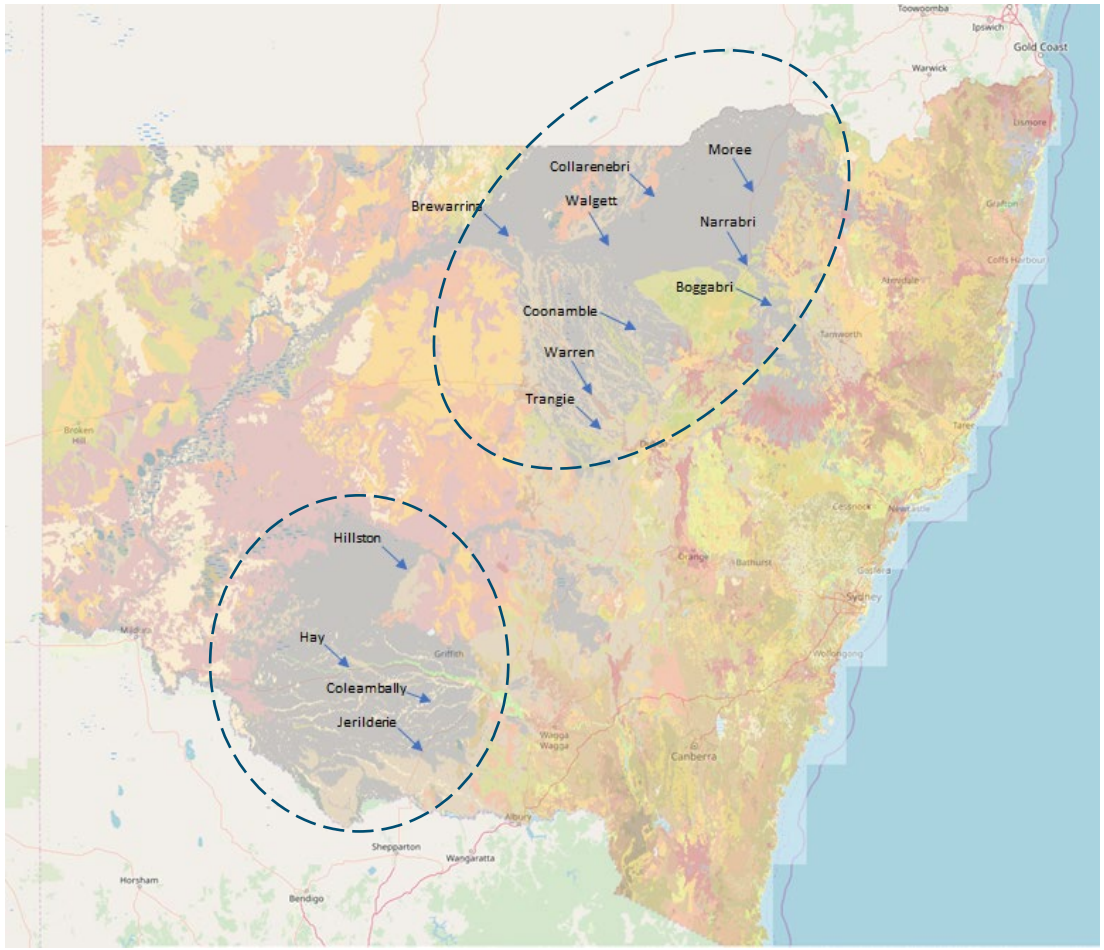
Source: Waterflow™

Regarding potential future expansion of cotton growing in the South, Figure 13 illustrates the soil types, as they vary across NSW. For cotton growing, the preferred soil type is vertosols, which are marked in grey.

Figure 13 shows that further expansion of cotton growing in the South will likely be limited by the availability of vertosols, which stretch as far west as Balranald, and as far east as Leeton and Narrandera. Of course, climate suitability also plays a part. Some of the limitations imposed by soil types and climate might be overcome through the development of new cotton varieties. However, for the near future, the majority of cotton production in NSW is likely to be limited to the circled regions in Figure 13.

Finally, it should be noted that the circled areas in Figure 13 should serve as a guide only. For example, cotton has been grown in the NSW Border Rivers region (east of the dotted line) for many years, where some centre pivot irrigators grow cotton as part of their annual cropping mix.

Figure 13: NSW map of soil types



Source: SEED Web Map – Office of Environment and Heritage, 2017, Land and Soil Capability Mapping for NSW, NSW OEH, Sydney

4.2 Key external factors

Key external factors affecting the outlook for cotton are the downside risks of the uncertain textile market and low water availability.

4.2.1 Uncertain textile market and oversupply likely to result in lower prices

First, trade tensions between China and the US have negatively affected the prices of all textile fibres. This price decrease has been driven by new tariffs on China's garment and textile exports. Further, textiles are primarily traded in US dollars, so any devaluation of the yuan against the US dollar will likely put downward pressure on the prices received by Australian growers.

Second, supply is expected to outstrip demand in 2019-20, which will increase stocks and push prices down. World cotton production is expected to rise due to increased areas planted in the United States, India, and Pakistan, which represents a recovery from a relatively poor season globally in 2018-19.

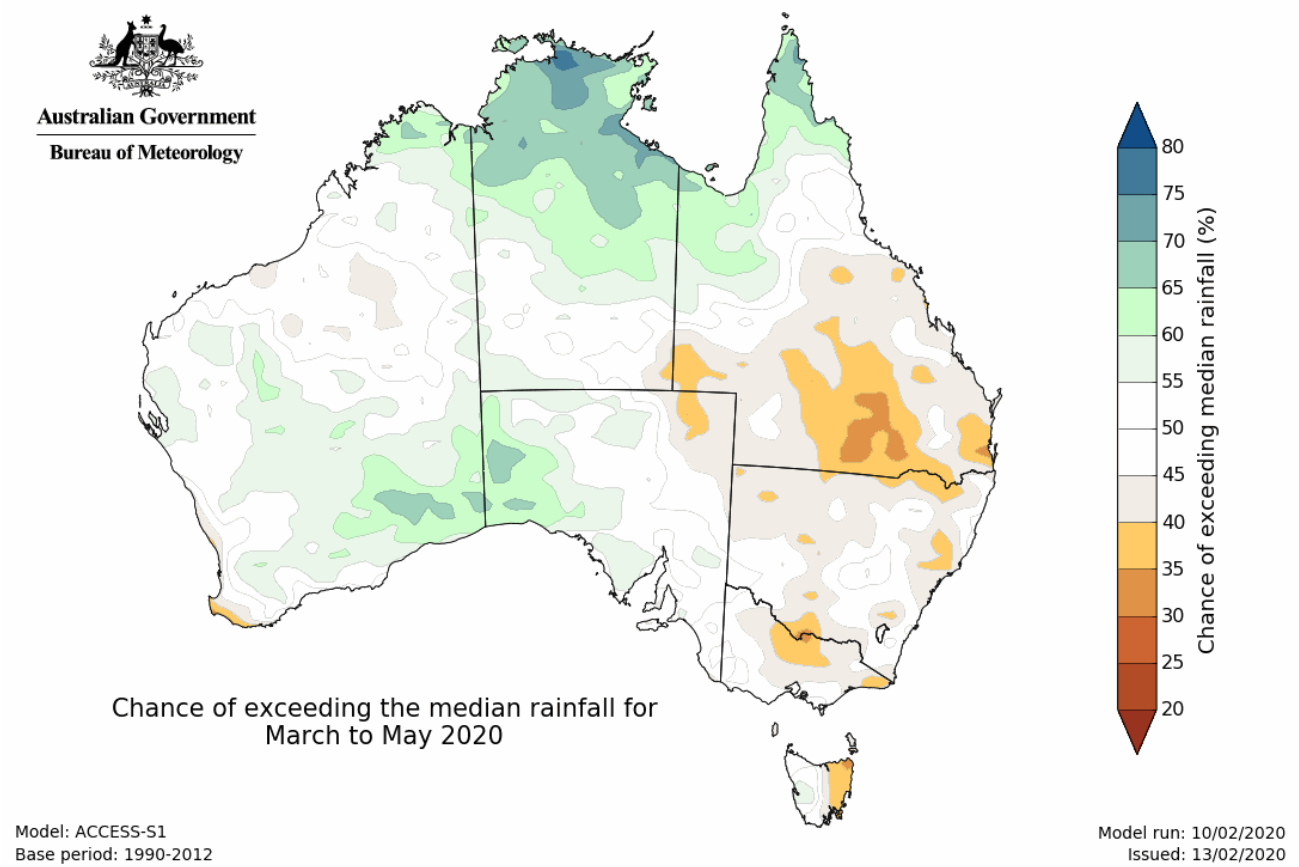
4.2.2 Low water availability for MDB cotton growers

General security allocation outlooks are unfavourable in most of the major cotton-growing regions, due to low dam storage and soil moisture levels, and low forecast rainfall and inflows for eastern Australia (Figure 14).

Under a range of water recovery scenarios, the following trends are expected:

- In the Northern Basin, cotton production will decrease in proportion with any decrease in water availability following recovery. This is because cotton is the dominant crop in the region, and is unlikely to be outcompeted for available water, except on rare occasions when the returns from alternative crops are higher, such as for currently high wheat prices.
- Cotton production will remain stable in the Southern Basin because cotton is likely to outcompete lower-value enterprises (e.g. dairy) and maintain its same level of access to water. In contrast, lower-returning enterprises are expected to experience production decreases.

Figure 14: Rainfall outlook to May 2020



Source: Bureau of Meteorology