FACT SHEET
AUSTRALIAN COTTON - OUR WATER STORY

AUSTRALIAN COTTON

Cotton is a natural fibre grown within a number of water catchments in mainly NSW and Queensland. There are also small areas of cotton in Victoria, the Northern Territory and Western Australia. Over 90% of Australian cotton farms are owned by Australian families.

Water is a farmer's most precious natural resource, particularly in the variable climate experienced in Australia. Good water stewardship and growing 'more crop per drop' has therefore been a focus of the Australian cotton industry for decades.

Without water crops will not grow, food and natural fibres would not be produced and regional communities could not thrive. Due to the unpredictable and complex workings of natural ecological systems and a variety of demands placed upon them by the community, governments and irrigators, the management of water can be complex and challenging.

This fact sheet aims to provide science-based information on the use and stewardship of water in the Australian cotton industry.

Water is stored in dams on the farm until needed.

TEN KEY POINTS

1. **Governments control water in Australia, with rules, laws and licences.**
   Farmers cannot take water whenever they want or need it. They must have a water licence which sets out how much water they can access each year.
2. **The natural environment including rivers, wetlands and floodplains always gets its water share first.**
   In the Murray-Darling Basin where most cotton is grown in Australia, water is allocated by State governments to the environment first, then critical human needs and lastly irrigation for farming.
3. **Cotton is an ideal crop to grow in Australia because it's adaptable to drought.**
   It gets planted once a year, and only if there's water in the rivers and dams. During dry times when there's not much water, there's not much cotton.
4. **Australia's cotton farmers are extremely efficient with their water.**
   To grow a bale of cotton takes 50% less water than 25 years ago.
5. **Cotton farmers only access their fair share of water.**
   They only get their share once the environment and communities have been taken care of, and all water is metered and measured at the farm gate.
6. **Cotton is not a "thirsty crop".**
   It uses about the same amount of water per hectare as other summer crops like soybeans and maize, and a lot less than almonds and rice.
7. **Farmers with a water licence can grow whatever crop they choose.**
   Many choose cotton because it gives them the best return for their business.
8. **If we stopped growing cotton in Australia there would be no more water in the system.**
   Farmers would use their water allocation to grow the next most profitable crop.
9. **A water licence does not guarantee a farmer a specific volume of water, but a share of the water that's available that year.**
   The amount goes up and down depending how much rain there's been and how full the dams are.
10. **Cotton farmers care about the health of our waterways.**
    They are proud people who are responsible caretakers of the land they live and work on.

WHAT IS IRRIGATION?

Irrigation is the application of controlled amounts of water to plants like backyard lawns and many other crops including cotton. This is different to 'dryland' or 'rainfed' crops that rely entirely on natural rainfall. Irrigation enables a farmer to apply water to the crop when it needs it. When water storages (dams) have water available, this also allows farmers to plan ahead.

Usually around 75% of the Australian cotton crop is irrigated. This changes each year depending on how much natural rainfall is received across the cotton growing catchments. Cotton is a drought and heat tolerant crop, well suited to climates with low rainfall where it is grown successfully as a rain-fed crop. Irrigation is also used to optimise yield and quality and to provide greater production stability and income security for farmers.

In the case of cotton, irrigation water is usually drawn from rivers (either directly or from a public dam or weir), floodwaters or underground sources (bores). This water is often stored on the farm in dams until needed and water can be 'carried over' from year to year to reduce the impact of dry years.

WATER IN AUSTRALIA – A HIGHLY REGULATED RESOURCE

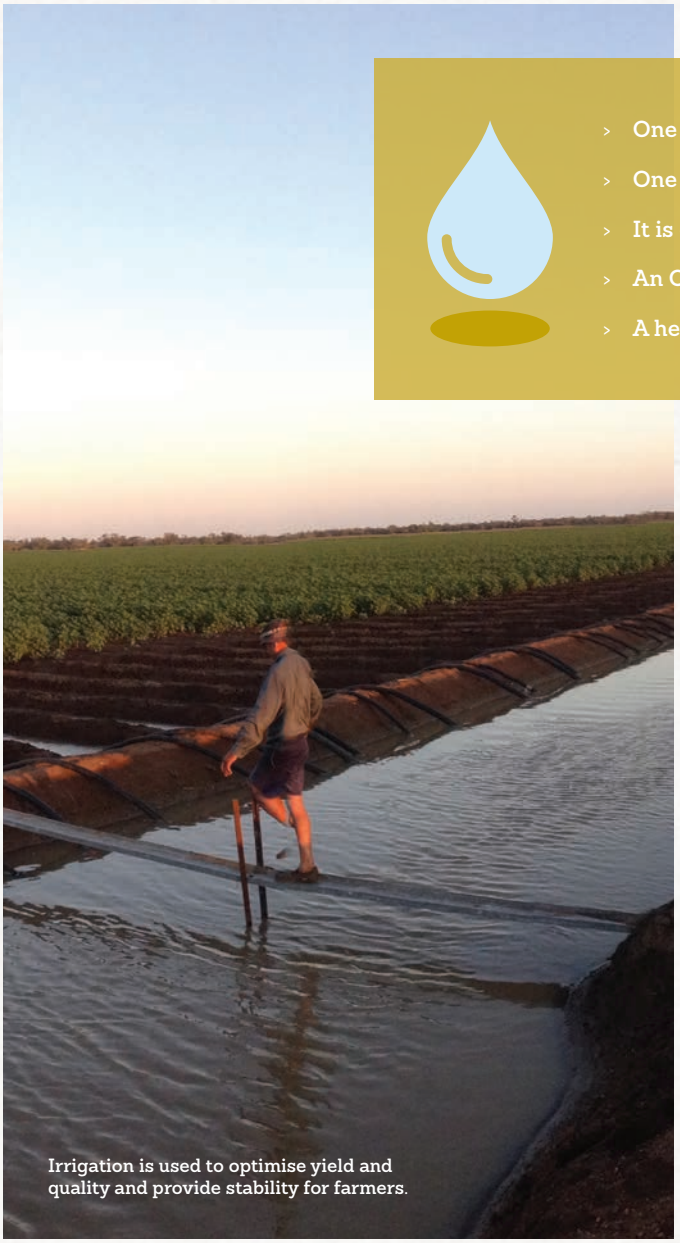
Water in Australia is a highly regulated natural resource managed primarily by State Governments. Since the Murray-Darling Basin Plan was launched in 2007, the Commonwealth's role has increased. As such no irrigator can take water whenever they need or want it.

All Australian water is technically owned by the Crown, with the vast majority governed by water licences issued by State Governments. The rules and terminology vary from State to State and between water catchments, however basic universal principles apply.

The most important is that the **basic needs of the environment and critical human requirements must be met before ANY water can be allocated to irrigation farmers.** This is to improve the health of rivers, wetlands, and flood plains.

Each water catchment has a localised plan that:

- sets out how water will be shared in the catchment
- determines priorities (ie who gets what)
- provides rules for ensuring the environment gets its basic requirements first. ("Planned Environmental Water")



Irrigation is used to optimise yield and quality and provide stability for farmers.

HOW WATER IS PRIORITISED

1. The environment/ environmental flows
2. Town water and stock and domestic supplies
3. Farmers holding irrigation licences

HOW DO GOVERNMENTS DECIDE HOW MUCH WATER TO ALLOCATE?

Every year State Government regulators assess how much water is available in the system. Rainfall, dam levels and inflows, evaporation rates and 'Planned Environmental Water' is all taken into account and used to determine how much water is available to be allocated to individual water licences.

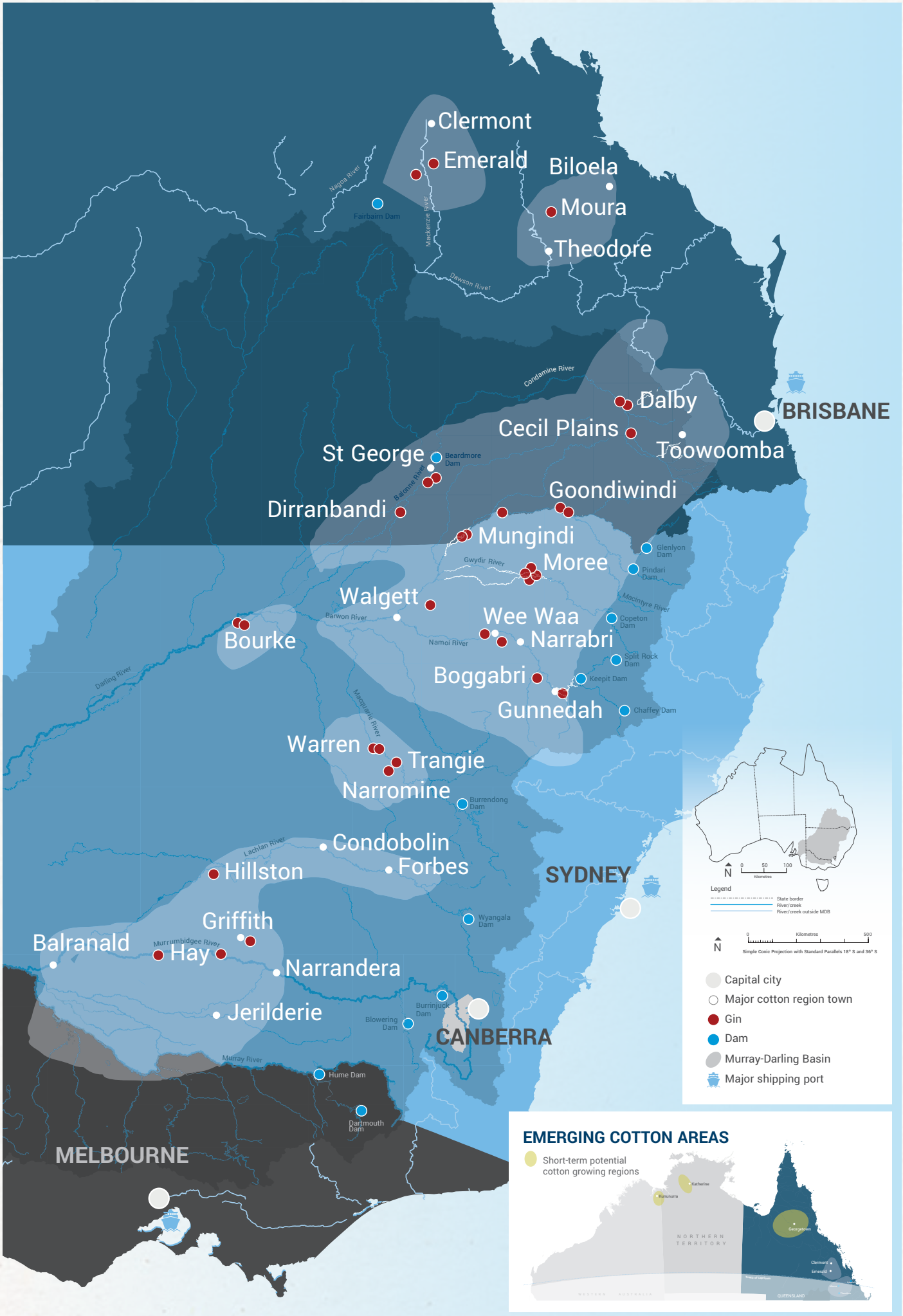
A water allocation licence (there are many different types) does not guarantee a specific volume of water, but a share of what is available in any one year. The share is normally expressed on the licence in megalitres. All irrigators pay for water.

- One megalitre (ML) = one million litres
- One gigalitre (GL) = one thousand ML = one billion litres
- It is generally estimated that Sydney Harbour holds about 500GL
- An Olympic size swimming pool holds about 2.5ML
- A hectare is about the size of 2 football fields

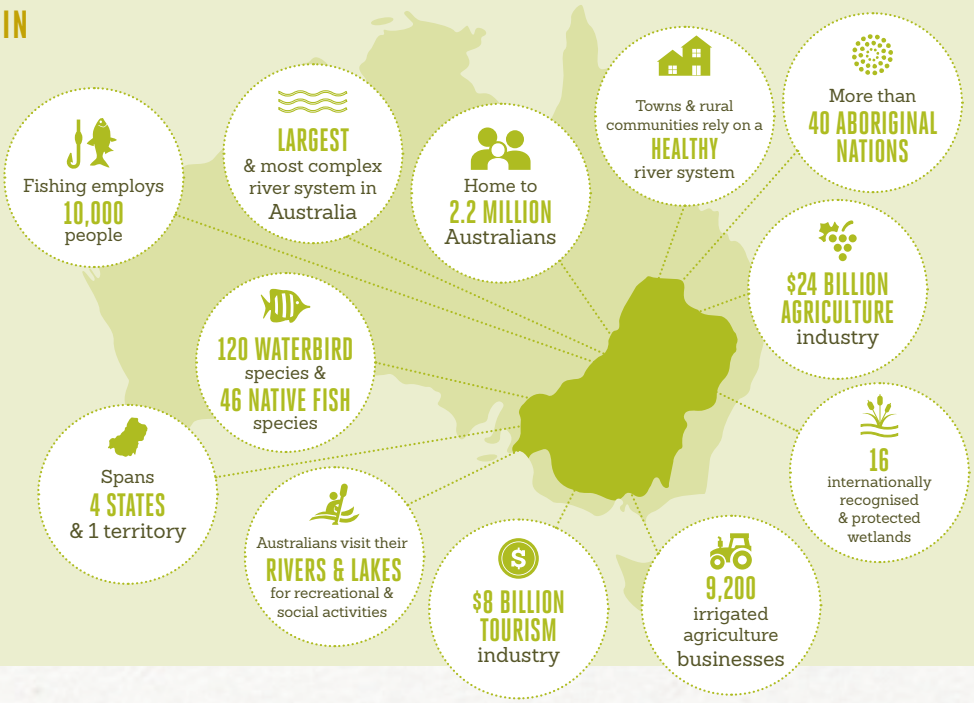
METERING AND MEASURING

To ensure compliance with the strict rules around water sharing, all irrigation water use within the Murray-Darling Basin must be metered or measured on the farm. Cotton Australia fully supports this.

NSW and Queensland are currently improving metering standards, by upgrading to new meters that are more accurate, tamper proof and capable of transmitting data with telemetry so it can be assessed from afar. The farmers, including cotton growers are complying with this new gold standard, at their own expense.


Clermont
Emerald
Biloela
Moura
Theodore
Nogoa River
Fairbairn Dam
Mackenzie River
Dawson River
Condamine River
Dalby
BRISBANE
Cecil Plains
Toowoomba
St George
Beardmore Dam
Balonne River
Goondiwindi
Dirranbandi
Mungindi
Glenlyon Dam
Gwydir River
Moree
Pindari Dam
Walgett
Macintyre River
Barwon River
Wee Waa
Copeton Dam
Bourke
Namoi River
Narrabri
Split Rock Dam
Darling River
Boggabri
Keepit Dam
Gunnedah
Chaffey Dam
Macquarie River
Warren
Trangie
Narromine
Burrendong Dam
Lachlan River
Condobolin
Forbes
Hillston
SYDNEY
Wyangala Dam
Griffith
Balranald
Murrumbidgee River
Hay
Narrandera
Jerilderie
Burrinjuck Dam
Blowering Dam
CANBERRA
Murray River
Hume Dam
Dartmouth Dam
MELBOURNE
N
0 50 100
Kilometres
Legend
State border
River/creek
River/creek outside MDB
N
0 Kilometres 500
Simple Conic Projection with Standard Parallels 18° S and 36° S
Capital city
Major cotton region town
Gin
Dam
Murray-Darling Basin
Major shipping port
EMERGING COTTON AREAS
Short-term potential cotton growing regions
Katherine
Kununurra
NORTHERN TERRITORY
Georgetown
Clermont
Emerald
QUEENSLAND
WESTERN AUSTRALIA

THE MURRAY-DARLING BASIN



Source: MDBA.gov.au

MURRAY-DARLING BASIN PLAN

The Murray-Darling Basin is Australia's largest inter-connected river system, covering one million square kilometres across four States and one Territory. Australia's Aboriginal people relies on its land and waters for connection to country, it's home to vast numbers of native plant and animal species and 40% of Australia's farms are located here. 96% of Australia's cotton is grown in the Murray-Darling Basin.

In 2012, widespread agreement that the environmental health of the Basin was declining saw the development of the Murray–Darling Basin Plan to manage the Basin's resources, and to improve its health.

WHAT DOES THE PLAN MEAN FOR IRRIGATION FARMERS?

In summary, the Plan decreases the amount of water available for irrigation, mainly by transferring water entitlements from farmers to the Commonwealth.

The Plan was designed to provide on average an additional 2.525 Gigalitres of actual water each year for the environment, achieved in two main ways:

- Purchasing water licences at market price from irrigators that volunteer to sell
- Funding more efficient irrigation infrastructure and water use efficiency projects

This plan is on track. The Murray–Darling Basin Authority estimates that the contracted surface water recovery in the Murray–Darling Basin, as at 30 June 2021, was 2,106.9 Gigalitres per year.

This extra water, held by the Commonwealth Environmental Water Holder, is released from dams to achieve specific environmental outcomes throughout the Murray-Darling Basin.

The amount of water preserved for the environment will increase from 58% to 66% when the plan is fully implemented in 2024.

THE COTTON PLANT

Cotton is sometimes referred to as "thirsty", which is simply not the case. Cotton is a desert plant that requires similar amounts of water per hectare to other summer crops planted in the same regions. As a desert plant it is well-adapted to surviving and producing a crop in hot conditions.

Cotton is an ideal crop to grow in the boom and bust river systems found in Australia because it's planted once a year, and is only planted when there's enough water available. Put simply, when there's limited water there's limited cotton. This is different to 'permanent' plantings such as grapes and fruit trees that need water to survive every year, whether it's available or not.

In years of drought when there are no water allocations, farmers can sometimes utilise water that was allocated to them in previous years. This allows them to maintain their businesses, employees and communities for longer during droughts.

> "The plan has had at least 35 reviews, 14 of which were independent, since its inception in 2012.
>
> The plan has always been a compromise, despite this it should be implemented. This is a once in a generation reform that corrects 100 years of overuse, and will take a generation to achieve.
>
> - NATIONAL FARMERS FEDERATION, 1 FEB 2019"

> **Cotton and rice are annual crops.**
>
> They lend themselves, given that nature, to much more frequent and flexible choices by the farmers as to whether to plant, how much to plant and when to plant. Adaptation to drought is achieved by such choices. Permanent plantings — vines, other tree fruits, nuts — are in a very much more vulnerable position, because their normal life-cycles are measured in years, sometimes decades.
>
> - MURRAY-DARLING BASIN SA ROYAL COMMISSION REPORT 2019, PG 31

COTTON'S IRRIGATION REQUIREMENTS

Like all crops, the irrigation requirements of cotton in Australia vary depending on the region and the season. Temperature, relative humidity, wind and soil moisture all affect the plant's water needs at different times.

The adjacent table shows average volumes of water required by various crops commonly irrigated in the Murray-Darling Basin. As you can see cotton's water requirement is neither the highest or the lowest, and is not that different to many other crops.

Cotton Australia supports all farmer's right to choose the most appropriate crops to grow.

WATER REQUIREMENTS FOR VARIOUS IRRIGATED CROPS GROWN IN THE MURRAY-DARLING BASIN (MEGALITRES PER HECTARE)

Rice **	13.1
Almonds *	13
Mature citrus ***	10-12
Maize ****	8-9
Lucerne for Hay *****	8.8
Wine grapes **	8.2
Fruit trees, nut trees, plantation or berry fruits **	7.5
Cotton **	6.5
Soybeans *****	6
Sorghum *******	5.2
Grapevines **	5.2
Vegetables **	4.9
Sunflowers *****	3.9
Summer Mungbeans *******	3.4
Pastures **	2.7

* *Australian Almond Board, 2021: www.australianalmonds.com.au*
** *Source ABS: Water Use on Australian Farms, 2019-20*
*** *NSW Dept of Primary Industries 2018 (for Sunrasia and Riverland areas)*
**** *GRDC Maize Grow Notes 2014*
***** *NSW DPI Farm Enterprise Budget Series, Central and Southern Zone 2012*
****** *Crop and Pasture Science 2013 (a peer-reviewed, 23 year review of cotton's seasonal water use)*
******* *Source: WATERpak — CRDC 2012*
******* *Assessing Yield Water Use Efficiency in the Murray Valley and Riverina Wine Regions 2012/13*

Cotton is a desert plant that's planted once a year, and only when there's enough water available.

AGRICULTURAL WATER USE AND COTTON'S FAIR SHARE

Each year the Australian Bureau of Statistics (ABS) reports on how much irrigation water was used on Australian farms. Each year tells a different story about which crops or industries used the most or the least, largely dependent on how much water is available in the system.

When times are dry, cotton doesn't use much at all because when there's no water available there's not much cotton grown. But when the system is full of water, cotton often uses a bigger percentage because it's a popular crop for farmers to grow in the Murray-Darling Basin.

This doesn't mean it uses more water per hectare, or that it's a water guzzler or a thirsty crop. It means that in that year, farmers chose to "spend" more of their water allocation on cotton (because it's very profitable) instead of something else.

The data from the "ABS Water Use on Australian Farms" report is often used to prove "cotton uses all the water" insinuating that without cotton there'd be more water available for the environment. In fact when there's plenty of water available the data actually shows which are the most popular crops to grow.

The pie chart below shows water use by crop type for the Murray-Darling Basin in 2019-20. This was a dry year, and the biggest decrease in water use in the region was for cotton, down 76% to 287,700 megalitres. That's because when there's no water in the system, very little cotton is planted, making it an ideal crop for the boom and bust system we have in the Murray-Darling Basin.

FARMERS CHOOSE COTTON BECAUSE IT DELIVERS THE BEST RETURN ON THEIR WATER

Boyce Chartered Accountants produce an Australian cotton crop analysis to track the economic performance of cotton farmers. For a 10 bale/ha crop at $450/bale, the return is $692/ML. This is considerably higher than returns for other broadacre irrigated crops.

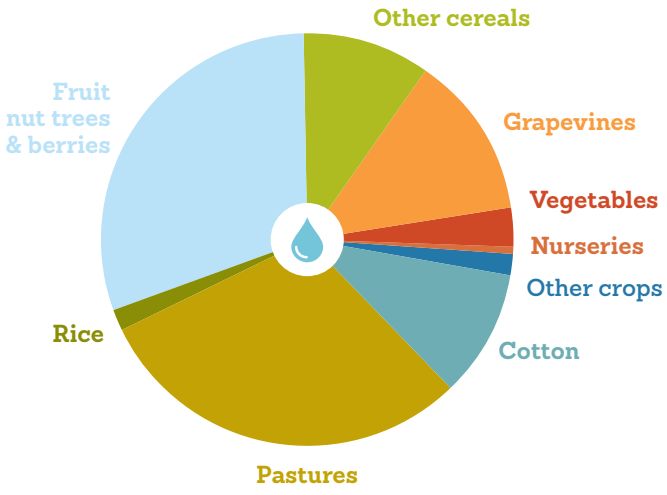
MORE CROP PER DROP: WATER USE EFFICIENCY IN AUSTRALIAN COTTON

1. The Australian cotton industry has achieved a 50% increase in water efficiencies since 1992. In other words, it now takes half the water to grow a bale of cotton.
2. Australia is now the most water efficient producer of cotton in the world and this performance continues to improve year on year.
3. Australian cotton growers produce yields three times the world average, making them incredibly efficient producers of cotton globally.
4. Cotton growers are highly motivated to conserve water wherever possible due to:
   - Water being the farmer's most precious natural resource
   - Its unreliability from year to year
   - The high cost of water
5. Farmers use a range of innovative practices to conserve and recycle water.

WATER USE ON AUSTRALIAN FARMS 2019-20 – VOLUME OF WATER APPLIED (MEGALITRES) MDB

805,274	Pastures, including lucerne, cereals and other crops grown for grazing, cut for hay and silage
757,093	Fruit and nut trees and berries
375,476	Grapevines
287, 750	Cotton
278,513	Other cereals for grain or seed (excl, rice)
90,676	Vegetables
53,173	Rice
45,232	Other crops
10,556	Nurseries, cut flowers and turf

TOTAL
2,703,741 ML



This lateral move watering system uses less water, and is becoming more commonplace on our cotton farms.

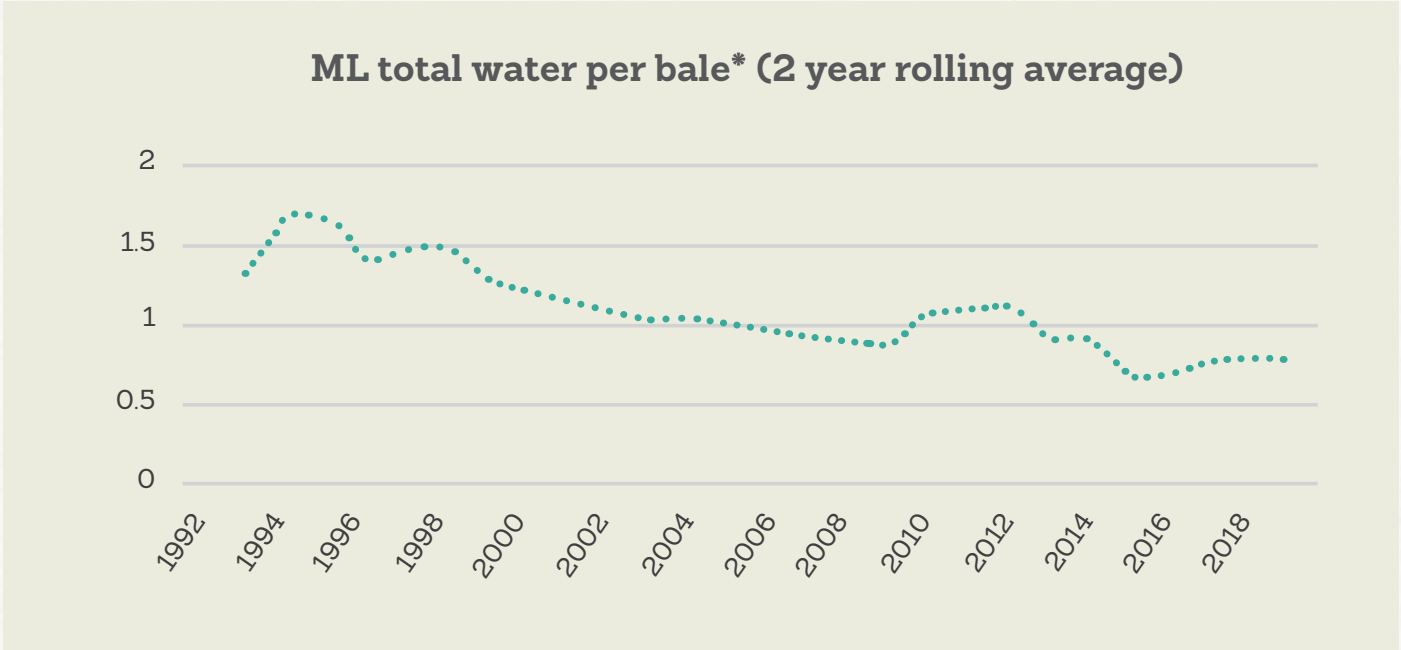
GROWER PRACTICES AND IMPACT

Underpinned by millions of dollars in research, cotton growers have continuously improved on-farm water management for decades. They have changed farming practices, using water technology and innovation to grow 'more crop per drop'.

Common on-farm practices include:

- Efficient watering systems such as lateral move sprinklers, automated irrigation and bankless channels
- Water budgeting and in-field soil moisture probes and canopy sensors to ensure plants are only watered when needed
- Recycling systems to collect and re-use water
- Mulching and stubble retention to retain soil moisture
- Deepening storages and other methods to reduce evaporation
- Thermal imaging and electromagnetic surveys to identify leaks in dams, pipes and channels for repair

Cotton growers also contribute to water stewardship outcomes for their broader catchments, for example by managing and restoring wetlands, maintaining riparian zones and controlling invasive species to improve the condition and health of cotton water catchments.



Irrigated cotton yields and irrigation water applied in Australia, 2001-12 (1 bale - 227kg)

WATER STEWARDSHIP AND RIVERINE HEALTH

*my*BMP is the Australian cotton industry's Best Management Practices program. It began in 1997 and over time has been improved to become one of the most comprehensive cotton sustainability programs in the world.

*my*BMP is available to every Australian cotton grower and provides self-assessment mechanisms, practical tools and independent auditing to continually improve cotton production. Around 80 percent of cotton growers are registered and participating in the program. *my*BMP consists of 10 modules and over 400 checklist items.

The Water Management module includes 70 checklist items and brings together the latest research and knowledge on water to assist cotton growers to manage water more responsibly and efficiently.

In addition the Sustainable Natural Landscape, Soil Health and Petrochemical Storage and Handling Modules contain standards for managing natural assets, ensuring riverine and soil health and improving water quality.

In 2021 more than 25% of Australia's cotton was produced from fully accredited *my*BMP farms. These are certified by qualified independent auditors that meet the Exemplar Global Environmental Management Systems Auditor Standards.

Certified *my*BMP farms have achieved the following benchmarks:

- Compliance with water access legislative requirements
- Used tools to schedule irrigations and monitor soil water levels
- Estimated soils capacity to hold and store water for each field and soil type
- Estimated losses from storages and channels
- Maintained storages to minimise leaks and seepage
- Maximised crop yields by understanding and managing underground water quality
- Calculated and recorded the farm's irrigation water use index
- Identified problem areas in irrigation fields and addressed them
- Matched flow rates to soil, slope and run length so furrows come out evenly
- Where established, planned for and installed pressurized irrigation systems with a professional so they work effectively, and ensured drip irrigation systems are operating effectively

Peter, Diana and Andrew French of "Nandina" are part of the 20% of Australian cotton farms fully accredited in *my*BMP.

WATER RESEARCH AND DEVELOPMENT

In the past two decades, the Cotton Research and Development Corporation (CRDC) has invested millions of dollars in water use efficiency and this continues to be a focus of industry R&D.

Key areas of focus include:

- Alternative, more efficient irrigation systems and technologies
- Maximising the efficiency of dams and channels
- More efficient ways to deliver water to the crop
- Achieving uniform application of water to cotton plants
- Monitoring water use and getting the timing of irrigations right
- Promoting investment in water-smart infrastructure

The industry has also contributed significantly to knowledge, management and improvements in regards to the water catchments in which cotton is grown. Cotton water research, development and extension has led to improvements in understanding of groundwater resources, improved resource condition and wetland ecology.

MANAGING WATER IN A CLIMATE OF CHANGE

The Australian climate can be extreme, and farmers must deal with variables ranging from damaging frosts and floods, to heatwave events and droughts that may last many years.

Climate change is intensifying these extremes even further. The country is experiencing hotter temperatures and rainfall events that are less frequent, but more intense. Established climate patterns that have long allowed farmers to plan their seasons with some reliability are now becoming less predictable.

The cotton industry is investing in both climate adaptation and climate mitigation research. Research being conducted in climate – controlled chambers is aiming to identify the best management options for growing cotton under increased temperatures and CO^2 levels.

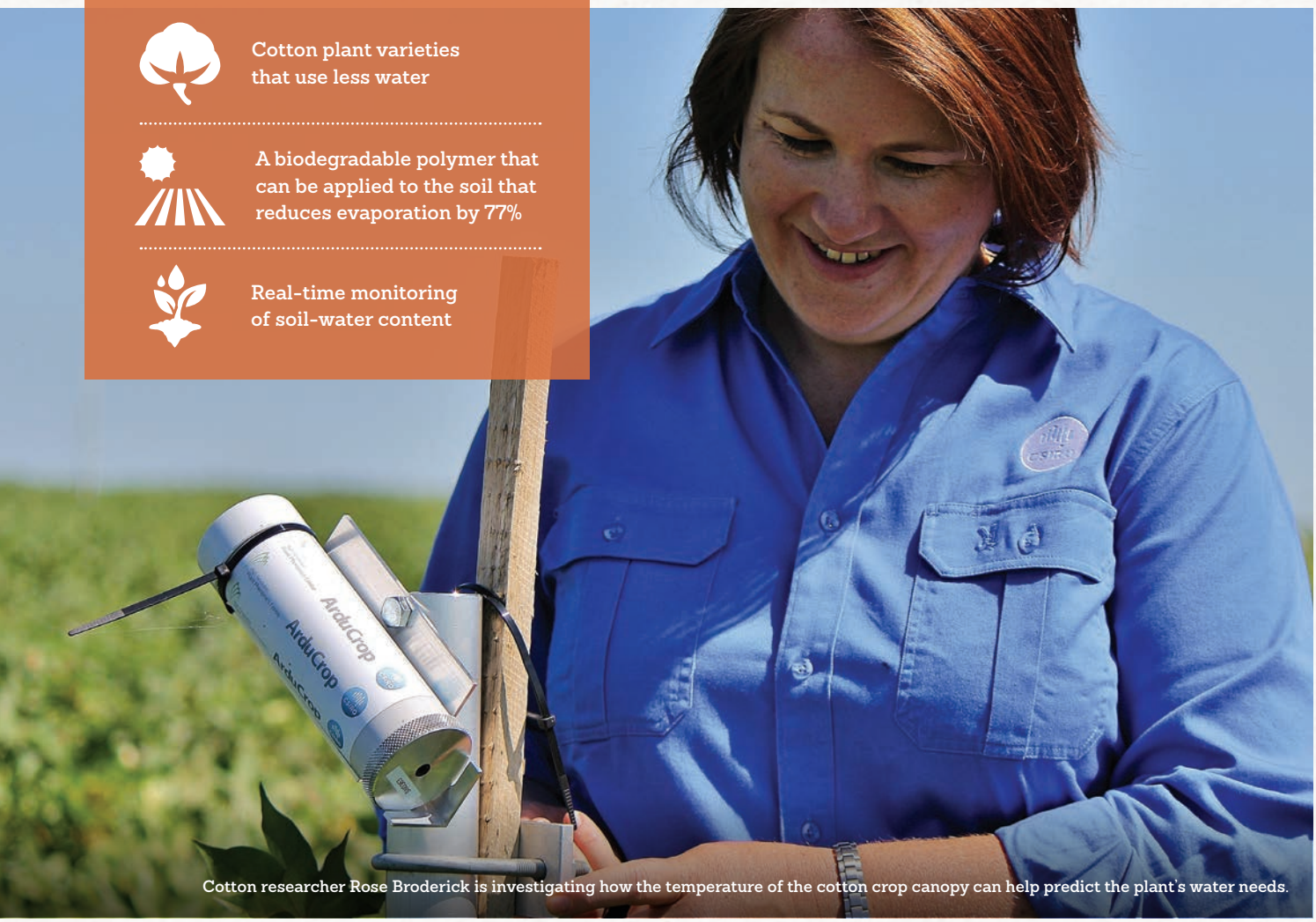
As well as its continued focus on improving water use efficiency, the industry has on-going work to improve nitrogen use efficiency and energy use efficiency as part of reducing the industry's GHG emissions and helping cotton farmers to prepare for the future.

WATER R&D IN THE PIPELINE

Cotton plant varieties that use less water

A biodegradable polymer that can be applied to the soil that reduces evaporation by 77%

Real-time monitoring of soil-water content



Cotton researcher Rose Broderick is investigating how the temperature of the cotton crop canopy can help predict the plant's water needs.

Cotton researcher Katie Broughton is growing cotton in climate controlled chambers to see how it responds under various temperature and CO^2 levels.

COTTON AUSTRALIA'S WATER POLICY POSITIONS

Murray-Darling Basin Plan

Cotton Australia:

- supports the full implementation of the Murray-Darling Basin Plan, with complementary measures to drive real environmental outcomes.
- believes all stakeholders should work together to focus on optimising environmental outcomes, while minimising the social and economic impacts of the Plan.

Water Theft

Cotton Australia:

- has zero tolerance for water theft, or any illegal activity by any cotton grower and believes offenders should face the full force of the law.
- believes water theft is unacceptable as it is essentially stealing from fellow farmers, the community and the environment.
- prioritises and promotes compliance with all laws related to cotton production
- supports growers through the *my*BMP (Best Management Practices) program that sets high standards for growers, above and beyond legal obligations.
- acknowledges that three recent cases of malpractice ('water theft') have unfortunately tarnished the reputation of thousands of honest irrigators and believes we must acknowledge the vast majority do the right thing.
- does not comment on ongoing legal proceedings. The judicial process must be allowed to run its course, free from commentary and prejudice.

Water Compliance

Cotton Australia:

- supports robust and transparent compliance with water licencing rules in a manner that protects the rights of the environment, irrigators and other water users.
- acknowledges that compliance systems have been found inadequate and that reforms were needed.
- strongly supports reforms announced by the Australian, NSW, and Queensland Governments since theft allegations were made public in mid-2017.
- strongly supports efforts to ensure that compliance is transparent, effective, and cost effective.

Water Rights

Cotton Australia:

- believes farmers who buy or lease water entitlements/ licenses should be free to use that water to grow whichever crop they choose.
- does not support compulsory acquisition of water licences and believes that where water needs to be acquired for environmental purposes, this should only be obtained from farmers willing to sell.
- believes where water licences are acquired, full and fair compensation should be made.
- supports investment in on and off-farm infrastructure projects to improve water efficiencies, where they are recognised by entitlement holders as offering good value for money and where participation is entirely voluntary.

Bird numbers are one great indicator of water quality and quantity on Australian cotton farms

LINKS TO FURTHER READING/LISTENING

Cotton Australia website
www.cottonaustralia.com.au

NSW water allocations
https://www.industry.nsw.gov.au/water/allocations-availability/allocations/summary

Queensland water allocations
http://www.sunwater.com.au/latest-news/sunwater-announces-water-allocations-for-2018-19

Murray-Darling Basin Plan
https://www.mdba.gov.au/basin-plan/plan-murray-darling-basin

Commonwealth Government progress on recovering water for the Murray-Darling Basin
https://www.mdba.gov.au/progress-water-recovery

MORE INFORMATION

www.australiancotton.com.au

cotton2market@cotton.org.au

AUSTRALIAN COTTON