



AUSTRALIAN COTTON SUSTAINABILITY UPDATE 2022

AUSTRALIAN COTTON SUSTAINABILITY FRAMEWORK
PLANET. PEOPLE. PADDOCK.

IMPROVING AUSTRALIAN COTTON'S SUSTAINABILITY

Sustainability for the Australian cotton industry means running profitable and productive businesses in balance with natural and human resources. It also means being accountable to stakeholders for the industry's actions and impacts.

Since becoming the first Australian agricultural industry to independently assess its environmental impacts in 1991, the Australian cotton industry has been committed to continuously improving its sustainability. The industry is proud of long trends of improvement in many areas and knows more can be done in others. Managing sustainability, like growing cotton, is a complex process. The Australian cotton industry doesn't pretend to be perfect, but it will continue to strive to be a global leader in sustainable cotton production.

ABOUT THIS UPDATE

Time frame: The 12 months to 30 June 2022

Boundary: Australian cotton farms

Frequency: We produce comprehensive sustainability reports every five years, from 2014. In farming systems, where seasonal variations can make a single year look much better or worse than average, a five-year period gives a better picture of change over time. Between five-year reports, these concise annual updates give a summary of actions, progress and trends.

Transparency: An online data pack has links to data sources, explanations of methodologies, and assumptions for all data in this update. > [MORE DETAIL: AUSTRALIAN COTTON SUSTAINABILITY DATA PACK](#).

The data pack also provides pathways for improvement and additional context for readers wanting more detail. Links to other online documents are provided throughout this update, wherever you see > [MORE DETAIL](#).

New sections or restatement of previously reported data is clearly marked NEW in this update.

ABOUT PLANET. PEOPLE. Paddock.

PLANET. PEOPLE. Paddock. is the Australian cotton industry's sustainability framework. It guides work to identify the environmental, social and economic topics assessed as being most important to industry and its stakeholders; coordinate a whole-of-industry strategy to manage these topics, and; engage with stakeholders on actions and progress. PLANET. PEOPLE. Paddock. is not a compulsory standard or a brand. It provides a path for the entire industry to benefit from improving sustainability performance.

A Sustainability Working Group (SWG) comprised of industry representatives from Cotton Australia, the Cotton Research and Development Corporation (CRDC), CottonInfo, myBMP and the Australian Cotton Shippers Association oversees PLANET. PEOPLE. Paddock, and reports to the Boards of Cotton Australia and CRDC.

> [MORE DETAIL: FRAMEWORK OVERVIEW](#)

The Australian cotton industry acknowledges Australia's Indigenous people as the traditional custodians of our country, and recognises their continuing connection to lands, waters and culture. We pay our respect to Elders past, present and emerging, and extend that respect to all Indigenous peoples.



COVER IMAGE

The Australian cotton industry has been working for over two years with NRM Regions Australia on an ambitious collaborative project to improve the condition of native vegetation on Australian cotton farms.

SEE PAGE 10 FOR MORE DETAIL

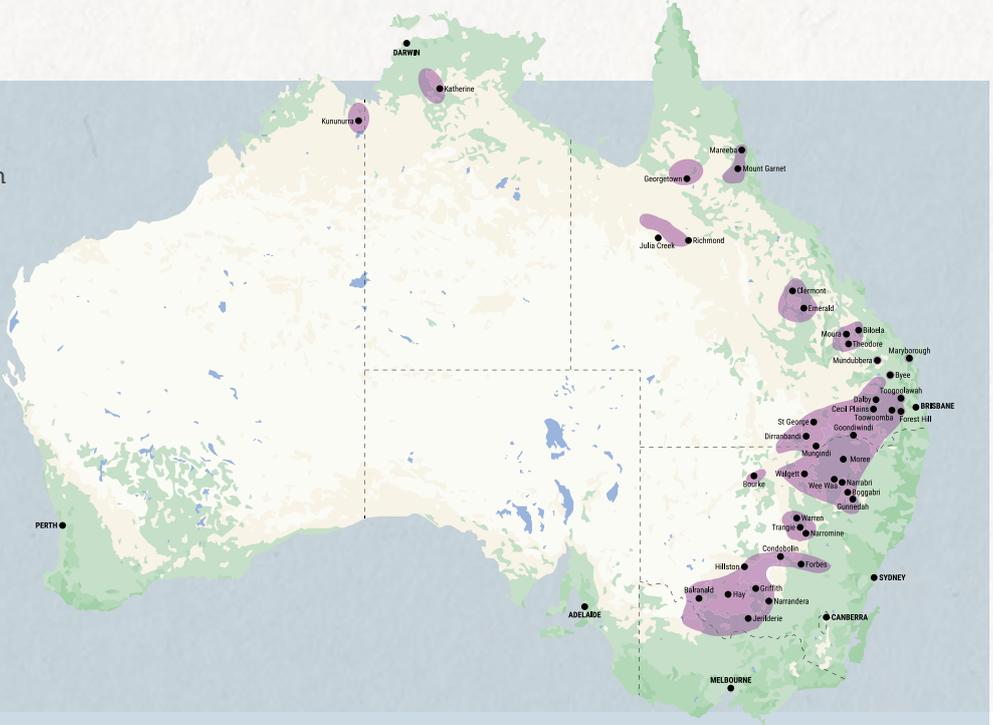
Photos used in this report are provided courtesy of Cotton Australia and CRDC.

ABOUT THE AUSTRALIAN COTTON INDUSTRY

Cotton is a renewable resource that is recyclable, biodegradable and 100 per cent natural. It is both a fibre and a food source. Used by civilisations around the world for thousands of years, cotton grows on a leafy, green shrub in the same family as the hibiscus species of plants.

Cotton is grown mainly on family farms in inland eastern Australia. In recent years, it has also expanded into parts of Northern Australia.

After harvest, cotton is sent to a gin where lint (fibre) is separated from seeds (food) and leaf (compost).



Source: CSD

Each kilogram of picked cotton is about:



40 per cent lint

Lint is spun into yarn to make a wide range of fabrics. Australia is the fourth largest exporter of cotton lint in the world. There are no spinning mills in Australia; all lint is exported.

Australian cotton **lint** has the key attributes of excellent length, strength and fineness, making it highly sought after by international markets.



50 per cent seed

Each kilogram of seed yields about 200 grams of cotton seed oil for cooking and food products. The remaining meal and hulls are used for stock feed.



Cotton seed **oil** has the key attribute of being cholesterol free.



Cotton seed **stock feed** has the key attributes of being high in fibre, protein and energy.



10 per cent leaf

Leaf and other organic plant matter is composted and added back into soil, under controlled and organised composting systems.



1 kg

OF AUSTRALIAN COTTON LINT CAN PRODUCE...



5.3
T-SHIRTS



19
PAIRS OF SOCKS



1.1
PAIRS OF JEANS

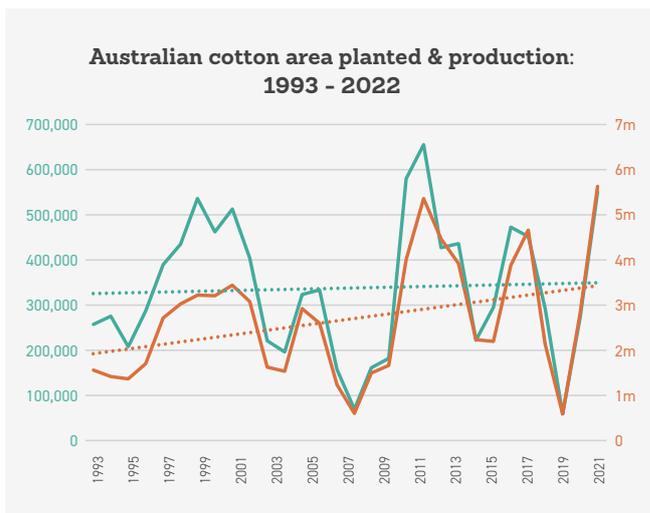
Cotton production matches annual water availability

As cotton is an annual crop, growers adjust the area of cotton they plant each year to reflect changing seasonal conditions. As a result, the area of cotton planted and amount of cotton picked each year is closely tied to water availability, which varies dramatically.

2021/22 INSIGHTS: PRODUCTION

Good seasonal conditions saw a large area planted and a record 5.6 million bales picked. Australian cotton growers have dramatically improved their productivity over time. The five-year average area planted to cotton has increased by 11 per cent from 1994 to 2022, but total production has increased 84 per cent.

Cotton has been grown in northern Australia in recent years. In 2021/22, 22,000ha was planted, representing about four per cent of the national area sown. Strict State and Territory regulations are in place to protect the unique environment in these areas. The cotton industry's objective is to respectfully cooperate with governments and communities in northern Australia to contribute to their stated sustainable development goals.



Source: Cotton Australia

— Area planted (ha) — Bales picked

Cotton is an important contributor to rural economies

Income earned by cotton growers helps pay wages and taxes that support roads, schools and services right around Australia. Cotton growers support regional economies.

In particular:

- more than 75 per cent of cotton grower business expenses are spent locally
- cotton farms employed an average of eight people in 2021/22
- cotton was grown in 65 local government areas in the 2021 Census, and contributed over 10 per cent of the gross crop value grown in 24 of them.

2021/22 INSIGHTS: ECONOMIC CONTRIBUTION

The value of agricultural commodities is closely tied to seasonal conditions and global prices. In 2021/22, the record crop picked, combined with historically high world cotton prices, was worth an estimated \$4.6 billion. This is by far the most valuable cotton crop ever grown in Australia.



Source: [ABARES](#)

PLANET. PEOPLE. PADDOCK. AT A GLANCE

Australian cotton sustainability: snapshot and trends

PLANET. PEOPLE. PADDOCK. is comprised of nine topics across environmental (PLANET), social (PEOPLE) and economic (PADDOCK) pillars. The table below provides a snapshot of progress, and more detail is on following pages. For each topic, 2021/22 annual change and the five-year trend is shown by:

-  Positive annual change or five-year trend, e.g. greenhouse gases reducing or yield increasing
-  No significant change or generally flat trend
-  Negative annual change or five-year trend, eg. injuries increasing or profitability decreasing.

Australian cotton and the SDGs

The UN Sustainable Development Goals (SDGs) provide a blueprint for humanity to achieve a just and sustainable world. To reach that future, everyone needs to play their part. Each Australian cotton targeted outcome is aligned to a relevant SDG: in this way, the Australian cotton industry aims to play its part to create a just and sustainable world.

> [MORE DETAIL: AUSTRALIAN COTTON AND THE SUSTAINABLE DEVELOPMENT GOALS](#)

	Targeted Outcomes	Five-year trend	2022	KEY 2022 TAKEOUT	SDG Alignment
PLANET	 Water Increase water use efficiency, within sustainable river & ground system limits			52% less water needed to grow a bale of cotton compared to 1997.	
	 Greenhouse gas emissions Contribute to the Paris Agreements' aim of a climate neutral world			Slightly lower yield and higher fertiliser increased emissions per bale	
	 Native vegetation Native vegetation management on cotton farms contributes to regional priorities			Major project to set native vegetation regionally appropriate targets has advanced	
	 Pesticides Support optimal crop production while having no negative impact on human & environmental health	 Bees  Algae	 	More rain combined with weed resistance management strategies increased herbicide environmental toxic load in recent years	 
	 Soil Health Sustained cotton productivity growth by improving soil health	No trend data		Practices consistent with regenerative agriculture continue to be commonly used by growers	
PEOPLE	 Workplace & working conditions Injury-free cotton farms, skills for innovative agriculture, and a diverse workforce that is treated ethically	 Skills  Diversity		Increased proportion of women and Aboriginal and Torres Strait Islander peoples working on farms and in gins	
	 Wellbeing Contribute to improved wellbeing of people living and working in cotton communities	Positive and negative trends for drivers of wellbeing		Advocating for a whole of agriculture approach to manage wellbeing	
PADDOCK	 Productivity Increase yield within sustainable environmental boundaries			Yield dipped slightly from 2021: two years of severe drought before that mean the trendline is flat	
	 Profitability Resilient farms able to invest in their business & community			Irrigated cotton is very important to whole farm profitability and resilience	



PLANET WATER



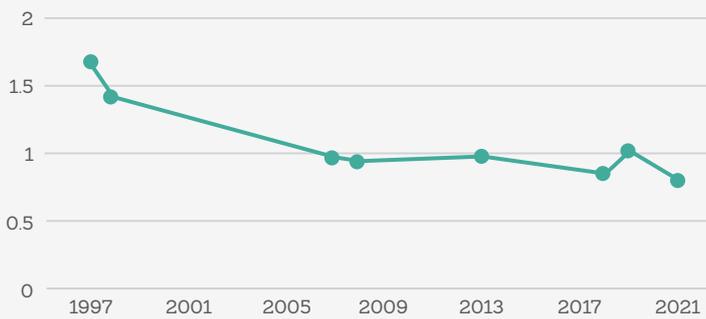
WATER

DRAFT FIVE-YEAR TARGET:

Improve irrigated cotton water use efficiency by 12.5 per cent.

+ 2020/21 **-** Five-year trend

Average ML/bale Sustainable Water Use Index (SWUI)



Source: Adapted from NSW DPI Research. This index is determined using all available water to the crop except soil water. It is the inverse of what is known as the partial GPWUI (Gross Production Water Use Index).

CONTEXT

The cotton industry’s approach to water use directly aligns to the SDG target of ensuring sustainable withdrawals of freshwater and substantially increasing water use efficiency:

- In Australia, water is highly regulated to ensure sustainable withdrawals of freshwater. Governments set sustainable water use limits, where basic environment and human needs must be met before any water is allocated for irrigation. Each year, farmers choose what crop is best to grow with water available to them.
- Cotton growers work to be as efficient as possible. Australian cotton growers have substantially increased water use efficiency. The Sustainable Water Use Index shows the volume of water needed to grow a bale of cotton reduced by 52 per cent from 1997 (chosen by NSW DPI as the baseline because it is the first year of representative and consistent data) compared to 2021.

2021/22 INSIGHTS



Data for 2021/22 is currently being collected for analysis. The latest available data from 2020/21 shows a return to a long-term trend of less water used to grow cotton in Australia. Higher temperatures and lower rainfall associated with severe drought in 2018/19 saw more evaporation, more plant stress, and more irrigation water needed to grow cotton. All of those factors combined to reduce yields and reduce water use efficiency in that drought year.

Water used to produce a bale of cotton lint has reduced significantly since 1997, but the rate of reduction is declining: efficiency gains are harder to maintain as growers get closer to what is physiologically possible for a plant.



COMPLIANCE (NEW)

We are now reporting water law compliance. We report the number of farmers in the NSW Natural Resources Access Regulator public register who we know grow crops including cotton (the extracted water may not have been used for just the cotton crop). Currently there is no publicly available data for water enforcement actions from other states and territories.

Water use non-compliance (NSW)		Prosecution	Enforceable undertaking
2017/18	All NSW Cotton	4 2	
2018/19	All NSW Cotton	1 0	
2019/20	All NSW Cotton	1 0	
2020/21	All NSW Cotton	2 0	1 0
2021/22	All NSW Cotton		1 1

Source: NSW Natural Resources Access Regulator public register

Data restated

Measuring industry-wide water use is very complex (see methodology under the water use graph). CRDC commissions NSW DPI to undertake benchmarking research. During 2021/22, NSW DPI refined several years of previous data to restate water use data reported in previous sustainability updates; changes are shown in this table. While data for some recent years is higher, NSW DPI has confirmed the long-term trend has not changed: the average volume of water used to grow a bale of cotton has more than halved from 1997 to 2021.

	Previous SWI	Restated SWI
2018	0.83	0.85
2019	0.76	1.02
2022	0.71	0.80

Source: NSW DPI research

OUTLOOK

Risks

- Climate change: Less rain and higher temperatures will reduce inflows to rivers and increase plant stress, which may combine to limit yield increases.

Opportunities

- A large range of GPWUI between growers suggests there is still potential for some growers to increase their water efficiency.

What are Science Based Targets?

Science Based Targets (SBTs) are a formal methodology for companies to calculate their 'fair share' of greenhouse gas emissions. In 2023, the methodology was extended to freshwater, land and biodiversity. While SBTs have been developed for companies, we are exploring if they can be adapted and applied at an industry scale.

Priorities

PATHWAYS:

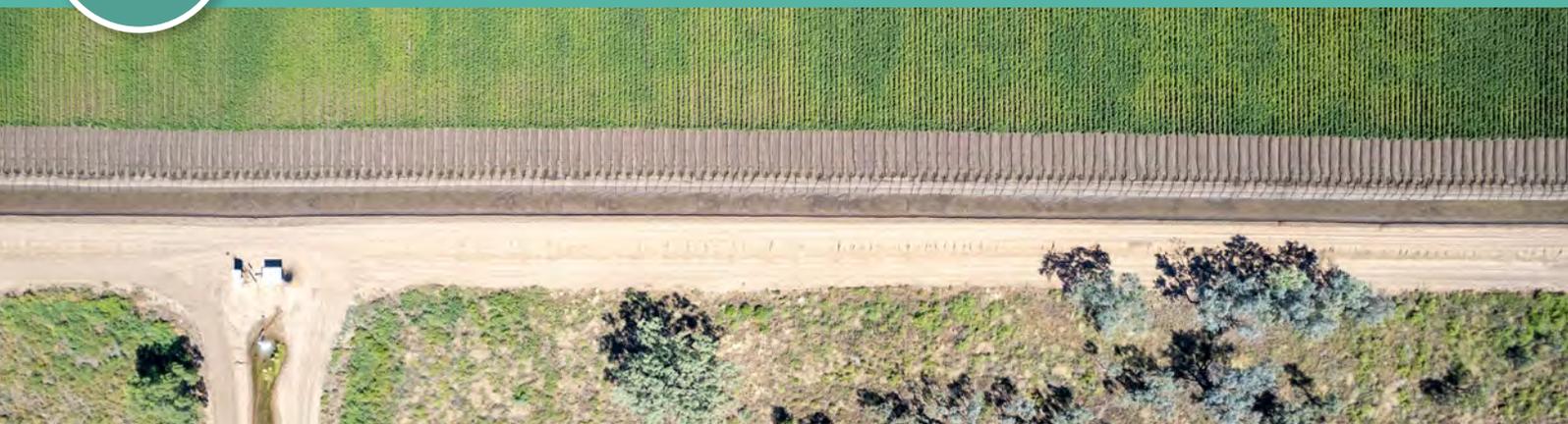
- Continue to develop and adopt practices to reduce water losses across the irrigation system

OTHER:

- Investigate a Science Based Target for water quantity and quality to replace the current draft target based on a long-term trend of 2.5 per cent less water per year to grow a bale of cotton since the early 1990s. A closer review of the data has shown while that trend is correct, most of the gains were made in the early years: the pace of improvement has slowed to about 0.3 per cent per year since 2007. This suggests the current draft target is not realistic and needs to be reviewed, which we plan to do with input from stakeholders.



PLANET GREENHOUSE GAS EMISSIONS

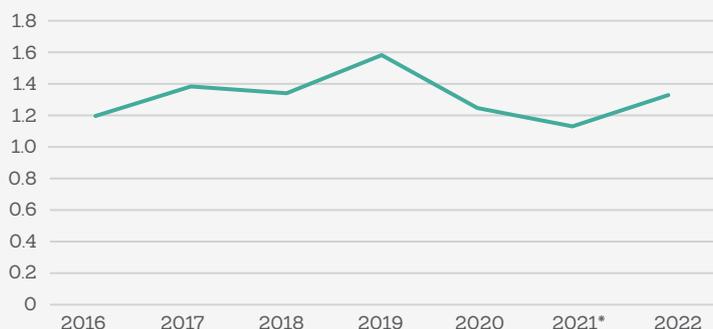


GREENHOUSE GAS EMISSIONS

DRAFT FIVE-YEAR TARGET:
Under development

2021/22 Five-year trend

Australian cotton farm GHG emissions, kg CO₂-e / kg lint



Source: Ekonomou A., Eckard R.J. (2021). University of Melbourne C-GAF based on the Australian National Greenhouse Gas Inventory methodology. *Data for 2021 N use is calculated from a Cotton Consultants of Australia survey; all other N data from CRDC grower surveys.

CONTEXT

Growing, ginning and transporting cotton to port is estimated to account for about 0.2 per cent of Australia’s greenhouse gas emissions (GHGs).

Nitrogen (N) is essential for plant growth, but N fertiliser also accounts for about 70 per cent of on-farm cotton GHGs (fertiliser manufacturing and field emissions). Reducing the amount of N used to grow a kg of cotton is therefore essential to reduce GHGs.

2021/22 INSIGHTS



GHGs per bale increased by an estimated 15 per cent compared to the previous season. This is because emissions per bale are driven largely by yield and the amount of N applied per hectare; in 2021/22 a two per cent decrease in yield and a six per cent increase in N per hectare led to an increase in emissions per bale.

Improving N use efficiency is a major challenge for the industry, as many growers err on the side of maximising yield from their once-a-year income from their cotton crop and may apply more N than is needed. This is a complex behavioural task we are continuing to work on.

OUTLOOK

Risks

- Climate change may have positive and negative effects on cotton production. Increased CO₂ and higher temperatures may increase yield in well-watered crops, but water availability and affordability may be a challenge.

Opportunities

Farmers wanting to reduce greenhouse gas emissions from crop production face a conundrum: N fertiliser accounts for the majority of cropping emissions, but N is also essential for plant growth.

Current actions like improving the efficiency of N application and having legumes (which fix N in the soil) as part of the mix of crops that are rotated in a field between years can reduce GHGs. According to University of Melbourne's Professor of Sustainable Agriculture Richard Eckard, there are two new pathways which could dramatically reduce emissions from N fertilisers:

- Green fertiliser to reduce manufacturing emissions: several projects are underway to make ammonia from hydrogen sourced from renewable energy, rather than fossil fuels. Industrial scale production is possible by the end of this decade and small-scale ammonia production is being developed using surplus solar energy. This will eliminate emissions from the manufacturing process.
- Enhanced efficiency fertilisers to reduce field emissions: these can reduce GHG emissions from N applied to fields. These products cost more but do not increase yield; discussions are underway nationally to find a way to reduce the cost for farmers.

Priorities

PATHWAYS:

- Improve N use efficiency and reduce use of fossil fuel energy
- Increase storage of carbon in vegetation on farms

OTHER:

- Work with other industries to provide clear and consistent information to farmers on reducing emissions, increasing sequestration, and the pros and cons of participating in carbon markets
- Investigate a Science Based Target for greenhouse gas emissions.





NATIVE VEGETATION

DRAFT FIVE-YEAR TARGET:

Regionally appropriate targets under development

+ 2020/21 **+** Five-year trend

	2021	2022
Mean per cent farm managed for conservation	3	8
Average width (m) of riparian area	178	186

Source: CRDC Cotton Grower Survey.

CONTEXT

On average, about 21 per cent of the area of a cotton farm has remnant native vegetation. The majority of this is grazing land, and some is actively managed for conservation: it is not cropped or normally grazed.

New: Change of topic name

This topic used to be called 'Biodiversity'. Biodiversity is all living things in a place, and is extremely hard to measure at industry scale. In consultation with stakeholders, we have decided to focus current efforts on enhancing native vegetation on cotton farms, and look to expand this focus to animals and other biodiversity in future.

Native vegetation benefits cotton growers, including by providing habitat for birds, bats and insects that eat cotton pests. However, improving native vegetation condition on farms is slow, and can be hindered by many factors including drought, cost, time, or lack of knowledge of what needs to be done. All of this makes native vegetation on hundreds of private farms difficult to measure and manage.

OUTLOOK

Risks

- Increasing global market and government expectations on farmers to reduce the loss of areas of high biodiversity significance.

Opportunities

- Shape a solution to manage and measure native vegetation on cotton farms in a way that meets market expectations and is appropriate for the Australian context
- Measure and value native vegetation ecosystem services.

Priorities

Recognising the increasing market access risks and opportunities around native vegetation on farms, the Australian cotton industry has conducted grower research to understand how to increase farm revegetation. It has also collaborated for over two years with Natural Resource Management (NRM) Regions Australia and the seven NRM regions where cotton is traditionally grown. This work has developed an ambitious model that involves:

- Clear, regionally appropriate cotton farm native vegetation targets and priorities for action, aligned to existing regional NRM plans
- Cost-effective but robust data collection to measure impact across the industry, using consistent

2021/22 INSIGHTS



Grower surveys have reported the mean proportion of a cotton farm's area managed for conservation as three to four per cent for several years. The 2022 grower survey saw this figure increase to eight per cent. The data suggests this was a result of grazing land being left ungrazed, but we need more future data before we can confidently say this is a new trend.

The industry is developing a new model to measure and manage remnant native vegetation extent and condition on cotton farms. This model may use remote sensing or satellite data instead of grower surveys. Current technology limitations mean we will initially be able to report only area of remnant woody vegetation, and not if it is occasionally grazed.

indicators aligned to common customer sustainability frameworks

- Bringing all the advice, financial and other support into regional hubs to make it easier for individual farmers wanting to preserve or increase native vegetation to take action.

We are consulting with cotton growers and other stakeholders on this model in 2023. This is ground-breaking work: it's new, it's complex and there are many barriers to success. We can't tell growers what to do with their land, but through this project we hope to achieve two things. First, to clearly show the growing market access and reputation risks and opportunities; and second, to gain support for a process designed to fit Australian farming systems, increase access to premium cotton markets, and build trust in the Australian cotton industry.



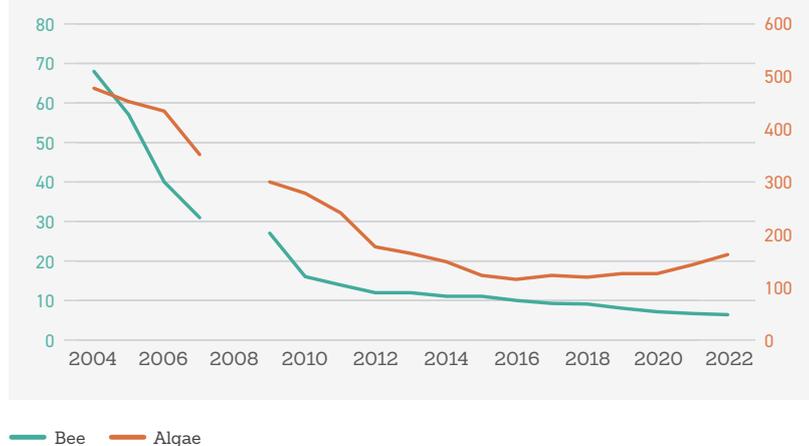
PESTICIDES

DRAFT FIVE-YEAR TARGET: Reduce Environmental Toxic Load (ETL) for bees and algae by 5 per cent

Bees: + 2020/21 + Five-year trend

Algae: ✗ 2020/21 ✗ Five-year trend

ETL: five-year rolling average



Source: CRDC commissioned research. No data was collected in 2008 due to drought.

CONTEXT

Pesticides (including insecticides and herbicides) are part of a cotton grower’s pest control toolbox called Integrated Pest Management (IPM). IPM is a management approach to choose the tool that best controls pests with the least risk to human and environmental health. All pesticides in Australia are approved by the government regulator: if a grower chooses a pesticide to control a specific pest, it has been assessed as safe to use as directed by the label.

Pesticide use has changed over time: the volume of insecticide applied declined by 95 per cent per hectare between 1994 and 2019 as genetically modified cotton and IPM was introduced. In the same period, a move to rely less on tilling the soil to control weeds increased the volume of herbicide used by 20 per cent (but less tillage has also likely increased soil carbon and moisture, and reduced fuel use).

However, volume does not paint a full picture of potential impact as it doesn’t take into account the differing toxicity of pesticides; Environmental Toxic Load (ETL) is a measure of hazard that does this. The five-year average ETL for bees (an insecticide indicator species) and ETL for algae (a herbicide indicator species) has declined by 91 per cent and 66 per cent respectively from 2004 to 2022. This suggests the pesticide hazard has significantly declined over the longer term. A draft target of a five per cent ETL reduction over five years indicates industry’s desire to always minimise any impact from pesticides, but will be very hard to achieve with the significant reductions made over recent decades.

> [MORE DETAIL: ENVIRONMENTAL TOXIC LOAD ANIMATED EXPLAINER](#)



OUTLOOK

Risks

- New diseases and changing spectrum of pests and disease
- Changing consumer expectations on pesticide use
- Loss of certain pesticides if used incorrectly to cause off-farm impacts, such as spray drift.

The industry works to prevent off-farm pesticide impacts by supporting a number of best practice spray application initiatives such as training and extension.

Technology is also being utilised via a number of industry investments:

- Cotton Australia provides SataCrop, a digital platform that enables mapping of crops and sensitive areas so operators can be better informed.
- In 2021/22 CRDC and the Grains Research and Development Corporation jointly invested \$5.5 million in a five-year partnership to develop a spray drift hazardous weather warning system that will provide real-time weather data and alerts to growers and spray operators about the presence of hazardous inversions.
- CRDC in partnership with the Department of Industry, Science, Energy and Resources, have supported a program aimed to revolutionise agricultural spray application. In 2023, the \$2.6m program will deliver two commercial solutions; an IoT static sensing and tracking product as well as specially designed software to create a system that helps operators with the entirety of the spray application process; and smart spray application systems integrated into farm robots.

Opportunities

- New IPM methods, including natural and genetic controls.

Priorities

PATHWAYS:

- Continue to seek access to and adoption of the full range of cultural, mechanical, biological, chemical, genetic and technological tools needed to support best practice pest, weed and disease control.

OTHER:

- Investigate a Science Based Target for pesticides to complement or replace the current draft target.

2021/22 INSIGHTS

From 2021 to 2022 the five-year average ETL for bees decreased four per cent, and the five-year average ETL for algae increased 13 per cent.

The increase in algae was driven by higher weed pressure, which in turn was the result of two years of well above average rainfall. Increased use of residual herbicides – which have a higher toxicity than knockdown herbicides – as part of the industry’s coordinated resistance management strategy also contributed to the increase. While seasonal conditions have a large impact on annual pesticide use, the cotton industry’s use of ETL allows us to transparently report trends. The five-year average ETL for algae is likely to remain high in coming years due to the ongoing impact of recent very wet years causing very high weed pressure. Importantly though, while the hazard is high, the actual risk to the environment remains low when pesticides are used as directed by the label (see Context section for the role of the government regulator).

In the coming year, the cotton industry plans to work more closely with growers and agronomists to understand ETL and factor it into their decision-making process. We are also continuing research into alternative methods to effectively control pests, such as the new BioClay spray for silverleaf whitefly. The commercialisation of sensor sprayers that detect and spray only weeds in a field will also help reduce ETL in future years.



SOIL HEALTH

DRAFT FIVE-YEAR TARGET:

Waiting for nationally consistent soil indicators before baselines and a target can be set.

	2022
% of growers who conserve crop residues	98
% growers using minimum tillage	86
% of growers using cover cropping	56
% of growers using rotation systems including legumes	81

Source: CRDC grower survey.

CONTEXT

Healthy soil is a living, dynamic environment, full of microbial and macroinvertebrate life that help to recycle essential plant nutrients, improve soil structure, and support pest and disease suppression. Because healthy soil is alive, the Australian cotton industry has been encouraging cotton growers to follow two principles essential for a living system: provide food and provide shelter to the organisms within soil.

Food is provided through practices including crop rotations, cover cropping, and applying organic fertilisers and nutrients. Practices that provide shelter include minimum tillage, conserving crop stubble, and use of integrated pest, weed and disease management to minimise chemical impacts. These best management practices have started to be called 'regenerative' in recent years, but Australian cotton growers have been using them for many years.

Carbon farming?

The confusing hype around soil carbon farming suggests farmers can make easy money via carbon credits and reduce greenhouse emissions at the same time. The reality is it is very difficult to permanently increase soil carbon levels, and there are many costs and risks associated with soil carbon farming.

As with most things in farming, it's complicated, and there is no 'right' answer for every farm business. We are working to help farmers make better informed decisions on carbon farming. For now, our message is:

1. If you want to make additional money - soil carbon credits is a high risk way of doing this
2. If you want to reduce net emissions - for many farms it will be more effective to reduce N application, reduce fossil fuels, and store carbon in more native vegetation
3. If you want to improve productivity - adopting food and shelter practices that improve soil health (and increase soil organic carbon) is a good thing to do.

2021/22 INSIGHTS



Soil's complexity and regional differences make it difficult to measure at industry scale. A National Soil Strategy was released in 2021, and will deliver nationally consistent key performance indicators and methods to measure and report soil conditions. The cotton industry supports this strategy.

Until those agreed measures are in place, the industry is encouraging greater adoption of practices to provide food and shelter to soil organisms. The 2022 CRDC Cotton Grower Survey indicated very high levels of common soil health practices. The complexity of farming systems is one reason preventing even greater adoption; for example many growers are required to occasionally till their cotton fields as part of the industry's resistance management strategy, which makes greater uptake of minimum tillage difficult.

OUTLOOK

Risks

- Loss of soil fertility or erosion through inappropriate management practices.

Opportunities

- Increased yield through improved soil health.

Priorities

PATHWAYS:

- Continue to adopt practices appropriate for each farming system that provide food and shelter to soil organisms.

OTHER:

- Support work to develop nationally consistent soil health indicators.



THE AUSTRALIAN COTTON SOIL HEALTH FRAMEWORK



Healthy soil is alive. The **principles** that support soil life are:

Protect soil habitat

1.

Maximise soil cover

2.

Minimise disturbance

Feed soil organisms

3.

Maximise living roots

4.

Maximise biodiversity

Some cotton farming **practices** that enable these principles are:

- Maintain standing stubble
- Cover crops
- Compost

- Utilise minimum tillage
- IPM & correct pesticides use
- Fertiliser matched to yield
- Precise application of water
- Prevent invasive species

- Utilise cover cropping
- Intercropping
- Diverse crop rotation

- Rotate crops in the field
- Biological amendments
- Livestock grazing

Together, these practices impact physical, chemical and biological soil **properties**, including:

Soil organic carbon

Soil structure

Nutrients

Dispersion

Salinity

Sodicity

Acidity

Soil organic matter

Bulk density

Compaction

Which, in turn, impacts the ability of soil to perform the **functions** needed for a cotton farm, including:

Crop production

Nutrient storage and cycling

Water infiltration and holding

Root recovery

Pest and disease suppression

Erosion and runoff reduction

Resilience to weather extremes



THREE STEPS TO A CIRCULAR COTTON FARMING SYSTEM

A circular farm seeks to reduce the consumption of finite resources by eliminating waste and pollution, and recycle resources at their highest value instead of putting them in landfill as 'waste'.

A surprising amount of circularity already takes place on Australian cotton farms, as this graphic shows. Past the farm gate, industry is already working with partners on end-of-life solutions for cotton-rich textiles.

The Sustainability Working Group has assessed circularity

at the farm level as being important, but less important (or material) than the topics we are already managing with PLANET. PEOPLE. Paddock. This means circularity and waste management will continue to be managed but other topics will be given priority, within the resources industry has available.

For example:

- Reduce fuel via more renewables
- Reduce fertiliser by improved soil health
- Reduce machinery by upgrading, not replacing

1
REDUCE INPUTS

2
REDUCE POLLUTION & RESOURCES GOING TO LANDFILL

3
UPCYCLE ALL LEFTOVER RESOURCES TO THEIR HIGHEST VALUE





OCCUPATIONAL HEALTH AND SAFETY

DRAFT FIVE-YEAR TARGET: Zero fatalities; reduce serious injuries by 30 per cent.

	2014	2019	2022
Total fatalities in 5 years	5	6	na
Mean annual serious injuries	44	38	na

Source: Aghealth.

CONTEXT & 2021/22 INSIGHTS

Currently, agriculture is one of the most dangerous industries in which to work. In 2020/21 there were 46 fatalities on Australian farms. In 2021/22 this reduced to 20. Tractors, side by side quad bikes and utes continue to be the leading cause of fatalities and injuries. OHS data specifically for cotton farms is not available for 2022.

WORKING CONDITIONS

DRAFT FIVE-YEAR TARGET: No target.

	2011	2016	2021
Skills			
% post-school qualifications	39	49	50
Diversity			
Gender: % female	21	23	28
Age: % < 29 years	25	22	24
Age: % 30-49 years	43	41	35
Age: % >50 years	32	37	39
% Aboriginal or Torres Strait Islander	5.2	5.5	6.9

Source: ABS Australian Census. NB. Census data is the best we currently have, but it gives an incomplete picture of the industry, as farmers growing other crops or livestock may not choose 'cotton growing' as their primary occupation, and it is done in August when seasonal employment in cotton is lowest.

CONTEXT

NEW: Change of name

This topic was previously called 'Workplace' and comprised health and safety, diversity and skills. 'Working conditions' has been added to reflect the increasing importance the global textile industry is placing on assurance human rights are being upheld and modern slavery obligations are being met, even in countries like Australia with legislative protections.

Working conditions covers fair pay, diversity, provision of training, avoiding exploitation of vulnerable workers, and no forced labour. These are all important aspects of the UN Guiding Principles on Business and Human Rights.

CONTEXT & 2021/22 INSIGHTS

The agricultural technology revolution is presenting many opportunities to increase productivity, while climate variability and natural capital constraints present ongoing challenges to managing a farm. Having a diverse, skilled workforce and a reputation for a safe, inclusive workplace will be increasingly important to manage these risks and opportunities.

Skills and training

Employees on cotton farms and gins are relatively highly educated. Ongoing training is needed across the industry to ensure growers have the skills and adopt the best practices the industry needs and expects.

Diversity

Census data from 2021 shows higher proportions of women and Aboriginal or Torres Strait Islanders working in the cotton industry compared to previous years.

Exploitation, forced labour and fair pay

No data currently available. The industry is advocating a whole-of-agriculture approach to develop low cost but robust methodologies to provide evidence that human rights are upheld on Australian farms.



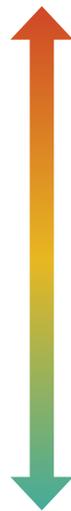
Human rights and modern slavery

Human rights recognise the inherent value of each person, regardless of background, where we live, what we look like, what we think or what we believe¹. The UN Guiding Principles on Business and Human Rights are the recognised global standard around preventing and addressing business-related human rights harms.

Modern slavery describes situations where offenders use coercion, threats or deception to exploit victims and undermine their freedom. Modern slavery is a term used to describe serious exploitation. It does not include practices like substandard working conditions or underpayment of workers².

LEARN MORE: WHERE DOES MODERN SLAVERY FIT?

Modern slavery happens at the most extreme end of a spectrum that ranges from decent work to serious criminal exploitation.



MODERN SLAVERY

Worker cannot refuse or cease work because of coercion, threats or deception.
Worker may also be deprived of personal freedom.

DANGEROUS OR SUBSTANDARD WORKING CONDITIONS

Worker can refuse or cease work but not doing so may lead to detriment.
Worker is not paid fairly and does not receive some or all entitlements.
Worker may be required to work excessive hours.
Workplace is unsafe.

DECENT WORK

Workers' rights respected.
Worker free to refuse or cease work.
Worker paid fairly (at least the minimum wage).
Workplace is place.

Graphic source: Commonwealth Modern Slavery Act 2018: Guidance for Reporting Entities

¹ Australian Human Rights Commission

² Australian Government Department of Home Affairs

OUTLOOK

Risks

- Trauma, loss of productivity, and pressure on rural health systems from injuries or fatalities

Opportunities

- Provide evidence of decent working conditions to meet increasing customer demand and help attract new and seasonal labour
- Increase leadership, education and advocacy for safe practices on farm to reduce safety risk and make the industry more appealing to new workers.

Priorities

- Collaborate with other agricultural sectors to improve data collection and build a skilled and resilient farming workforce.





WELLBEING

DRAFT FIVE-YEAR TARGET:

Contribute to a coordinated wellbeing strategy with other stakeholders for cotton regions by 2024.

2021/22: Initial discussions with some stakeholders began.

2021/22 INSIGHTS



A lag in Regional Wellbeing Survey reporting means the most recent data is for 2020/21. The key data and insights from the Regional Wellbeing Survey are provided by University of Canberra:

- a continued decline in ‘global life satisfaction’ (measured by growers rating their satisfaction with their quality of life). Cotton growers reported significantly low wellbeing compared to other farmers between 2020 and 2021. From 2018 -2020 many cotton regions experienced severe drought; while conditions were improving in 2021, there is a lag before water allocations and increased crop yields occur, and this lag likely explains the relatively low satisfaction of cotton growers’
- great volatility in perceived physical health, which may be due to the younger cohort of cotton growers compared to other farmers and the general population
- cotton growers, grain growers and horticultural farmers all had similar levels of psychological distress, and all were higher than beef graziers (10.3). This suggests high levels of psychological distress amongst cotton growers were likely at least in part driven by the same seasonal factors (drought followed by storms and floods) that influenced the high levels of psychological distress amongst farmers that grow ‘crops’
- wellbeing of cotton communities depends on social connection. Cotton growers have significantly higher levels of community involvement, relative to other farmers and Australian community.

Cotton Growers	2018	2020	2021
Global Life Satisfaction, mean 0-100 (higher is better)	77.3	74.3	63.6
Physical health, % reporting very good or excellent health (higher is better)	34.4	80.6	58.2
Mental health, mean 6-30 Kessler 6 psychological distress scale (lower is better)	12	14.2	13
Community wellbeing, mean 1-7 (higher is better)	5	5.8	5.1
Community involvement, mean 1-7 (higher is better)	4.4	5.3	4.1

CONTEXT

‘Wellbeing’ is defined by the University of Canberra’s Regional Wellbeing Survey as being a state in which a person can realise their own potential and contribute to their community. Wellbeing is influenced by a combination of physical, mental, financial, social and other factors. This complexity means no single organisation – or single industry – is responsible for the wellbeing of individuals in a community.

The industry plans to work with other stakeholders – such as government, other industries, communities and individuals – across cotton growing communities to understand what drives wellbeing, and contribute to a collaborative approach to improve it. With a strategy in place, the cotton industry can then understand how it can best contribute to the wellbeing of people in cotton communities.

OUTLOOK

Risks

- Stress drivers, including financial and workload
- Access to facilities and services
- Population drift from rural communities.

Opportunities

- Coordinated action with government, community and other industries to improve regional wellbeing.

Priorities

- Continue to seek opportunities to contribute to regional and whole-of-agriculture wellbeing strategies.



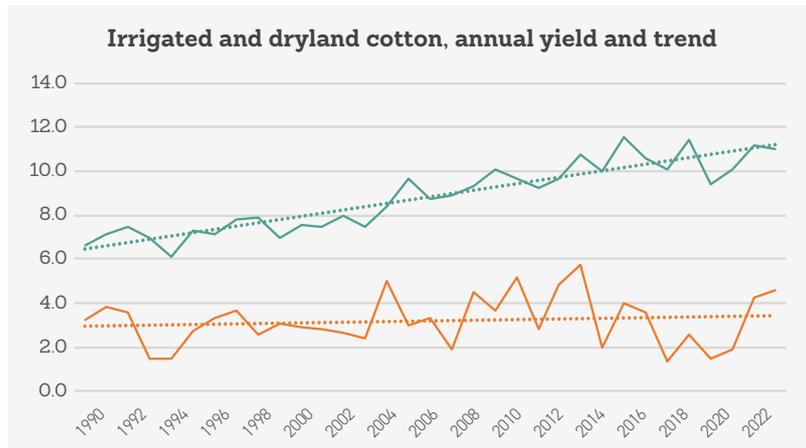
Paddock Productivity



PRODUCTIVITY

DRAFT FIVE-YEAR TARGET:
Increase irrigated cotton yield by 12.5 per cent.

2021/22 Five-year trend



Source: Australian Cotton Production Forecast

— Irrigated — Dryland

2021/22 INSIGHTS



Average irrigated yield was 11.0 bales per hectare, 0.2 bales per hectare less than the previous season average.

These two most recent seasons mark a return to good growing conditions after years of drought, but are still well below the 2024 draft five-year target of 12.4 bales per hectare. This draft target will be unlikely to be met.

CONTEXT

With the world's population forecast to increase to 9.7 billion in 2050, farmers need to produce more food, fibre and foliage with the same or fewer resources.

The Australian cotton industry invests in research to increase yields, and to encourage cotton growers to adopt research and new technologies. At the same time, PLANET. PEOPLE. PADDOCK. works to reduce negative impacts and increase positive impacts on people and nature – while still growing more cotton with fewer inputs. This is in line with the Global Biodiversity Framework's call for more sustainable intensification.

In most farming systems, water is the greatest limiting factor to yield. The long-term data for Australian cotton clearly shows efficient use of irrigation water, within sustainable river system limits, drives yield increases much more than is possible in rain-grown crops. The five-year average irrigated yield of Australian cotton increased by 55 per cent from 1994 to 2002; in the same period the average dryland yield increased by just eight per cent.

OUTLOOK

Risks

- Extreme weather events limiting yield potential.

Opportunities

- Introduction of new technologies and farming systems to increase yield.

Priorities

PATHWAYS:

- Establish an industry-owned data platform to deliver increased profitability and productivity through better decision-making, facilitating innovative research to deliver better solutions
- Build resilience to an increasingly variable climate with limited water and reduced inputs.



PROFITABILITY

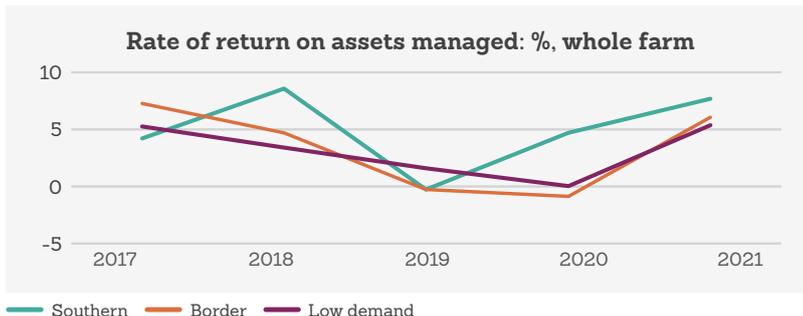
DRAFT FIVE-YEAR TARGET:

No target will be set.

+ 2020/21 **×** Five-year trend



Source: Australian Cotton Comparative Analysis. Boyce Chartered Accountants.



Source: Agripath.

CONTEXT

Profitability is essential for all farmers. Profitable cotton growers can invest in the technologies and practices needed to adapt to a changing environment and market, and contribute to local communities.

Many factors influence the profitability of cotton production. Some of these (seasonal conditions, global cotton prices and exchange rates) are outside the control of the industry. Others (yield and operating costs) can be influenced by individual decisions; these are the areas industry invests in research and innovation.

A profitability target will not be set because there is significant regional and seasonal variation in profitability; because short-term profitability should not be encouraged at the expense of other sustainability topics, and; because each farm business will have a different view on acceptable levels of profitability.

OUTLOOK

Risks

- High input costs continue to put pressure on margins
- A 26 per cent decrease in cotton price for 2022/23 compared to 2021/22 (ABARES).

2021/22 INSIGHTS

Cotton growing profitability varies greatly. There is no measure for 2022 due to a lag in data, but the 2021 season was very profitable after two of the least profitable, drought-affected seasons on record.

NEW: ROAM indicator. This year we have calculated whole farm return on assets managed (ROAM). Operating profit per hectare of cotton is useful, but cotton is only one part of a farm business. The financial sustainability of the whole farm business underpins a growers' resilience and ability to manage through poorer seasons.

Five-year analysis across three regions of southern NSW ('Southern'), northern NSW and southern Queensland ('Border'), and areas of lower historical irrigation water use ('Low demand') show a strong correlation between irrigated cotton contribution to total farm gross margin and therefore whole farm ROAM. The analysis of farms that grow irrigated crops, dryland crops and livestock revealed irrigated cotton makes the most significant contribution to whole farm profitability, provided it is grown well. The authors of the research found the potential for losses if grown poorly is a very strong incentive for cotton growers to pay attention to managing environmental, risk and agronomic factors well: all of which translate to a more financially sustainable whole farm business.

Opportunities

- Increasing demand for traceable, sustainable fibres – especially for premium products
- Reducing input costs with increased resource efficiency and more adoption of technology.

Priorities

PATHWAYS:

- Establish an industry-owned data platform to deliver increased profitability and productivity through better decision-making, facilitating innovative research to deliver better solutions
- Enhance the value and market access of Australian cotton.

HOW THE AUSTRALIAN COTTON INDUSTRY MANAGES SUSTAINABILITY

Strategy

The Australian cotton industry’s strategy to be a recognised global leader in sustainable cotton production has three pillars:

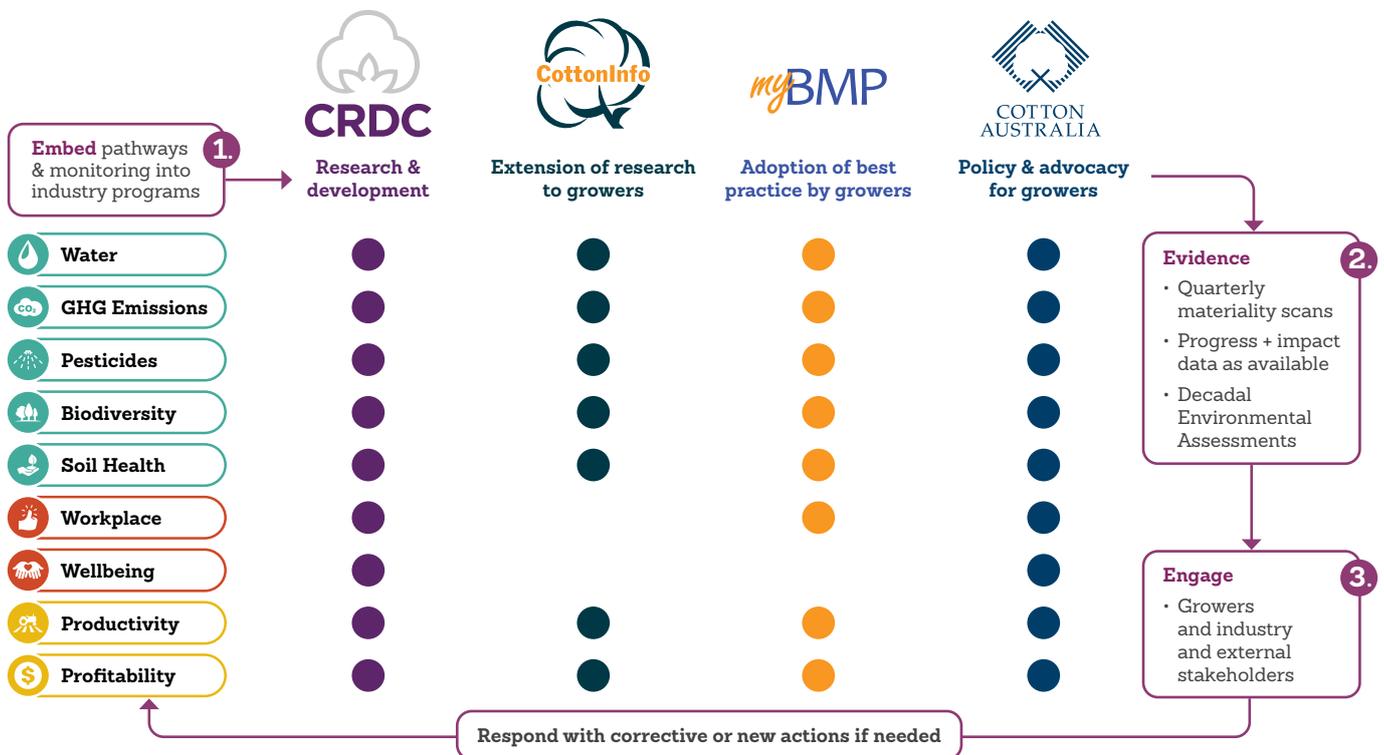
1. **Embed** the systems and culture needed to support effective sustainability management
 > [MORE DETAIL: GOVERNANCE SECTION \(ON RIGHT\)](#)
2. **Evidence** to demonstrate credible progress, to make informed decisions
 > [MORE DETAIL: INDICATOR & TARGET SELECTION](#)
3. **Engage** frequently and transparently with internal and external stakeholders.
 > [MORE DETAIL: STAKEHOLDER ENGAGEMENT](#)

Governance

The Australian cotton industry has formed a Sustainability Working Group (SWG) to coordinate its sustainability work. The SWG is comprised of industry representatives from Cotton Australia, CRDC, CottonInfo, myBMP and the Australian Cotton Shippers Association. The SWG reports to the Boards of Cotton Australia and CRDC.

Risk and opportunity management

Each quarterly SWG meeting includes a scan of potential risks and opportunities. These are identified through sources including stakeholder feedback, peer-based norms, and market and regulatory developments. The SWG assesses emerging issues for materiality, and considers the progress of existing actions to achieve targeted sustainability outcomes. If new or corrective actions are needed, these are discussed with key personnel in the industry’s well-established programs for research and development, extension, adoption, and policy.



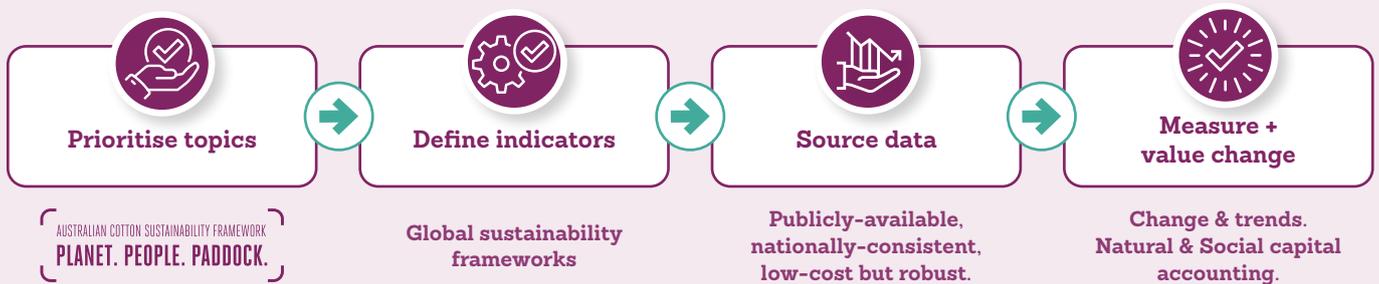
2021/22 INSIGHTS

EVIDENCE

Within a continually evolving sustainability landscape, the Australian cotton industry began work on an ambitious plan to improve industry scale sustainability data collection and reporting by 2024. Indicators have been chosen from major current and emerging sustainability frameworks, such as the International Sustainability Standards Board, Global Reporting Initiative, Taskforce for Nature Related Financial Disclosures and Science Based Targets. Industry will also explore if it can make better use of data to value natural and social capital at an industry scale, using globally recognised methods to do this.

Through this work, we aim to improve decision-making for three stakeholder groups:

- 1. Growers and industry stakeholders:** better data to give growers confidence to adopt or maintain practices that create economic and natural value.
 - > Benefit to industry: increase yield and resilience.
- 2. External stakeholders:** better data to allow them to make more informed decisions on whether to buy Australian cotton, work for the industry, partner with the industry etc.
 - > Benefit to industry: increase trust.
- 3. Sustainability Working Group:** better data to monitor progress and understand impacts.
 - > Benefit to industry: more efficient resource allocation.



ENGAGE

In 2021/22 an Australian Cotton Sustainability Reference Group (ACSRG) was formed to provide a two-way process to help industry better understand stakeholder expectations, discuss its sustainability performance, and be questioned or challenged where needed by a diverse group of experts

and thought leaders.

The ACSRG involves representatives from cotton apparel brands and retailers, environmental organisations, First Nations, governments, merchants, regulators, community organisations, health and safety, cotton growers, researchers,

input providers and other broadacre agriculture sustainability frameworks.

We work hard to provide a format and agenda that meets ACSRG expectations. The ACSRG has asked to meet every six months, in an online forum to maximise efficiency and minimise greenhouse gas emissions.



ACSRG #1, November 2021

Agenda

- PLANET. PEOPLE. Paddock. overview
- Deep dive on topics ACSRG nominated pre-meeting

Outcome

- More information and discussion sought on human rights and native vegetation.



ACSRG #2, May 2022

Agenda

- Providing evidence of human rights: is this a problem or opportunity?
- Native vegetation: pitfalls that may prevent ambitious targets being achieved

Outcome

- Human rights: clear actions industry can take (see Human Rights section)
- Native vegetation: comprehensive list of barriers to be built into project design (see Native Vegetation section).

AUSTRALIAN COTTON SUSTAINABILITY FRAMEWORK

PLANET. PEOPLE. PADDOCK.



This Sustainability Report has been developed by the Sustainability Working Group on behalf of the Australian cotton industry.

We encourage you to provide feedback on how we can improve this Report or our management of sustainability.

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www.cottonaustralia.com.au | www.crdc.com.au

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