



2024 Grower Survey



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It is important to note that the responses contained within the CRDC Grower Survey provide a snapshot in time of grower data, but do not tell the full story. The Grower Survey is one of many research projects commissioned by CRDC to gather industry information. The results are not intended to be used in isolation, but rather in consideration of these other projects, such as the Australian cotton industry's Sustainability Framework and associated reporting, the industry's best practice program myBMP, extension program CottonInfo, and the significant program of R&D that is managed by CRDC. In conjunction with these programs, the Grower Survey helps the industry measure practices and inform continuous improvement. The results are as provided by growers and have not been independently verified. For any queries regarding the Grower Survey, please contact CRDC.

The Cotton Research and Development Corporation (CRDC) undertakes an annual survey of cotton growers to gather information about farming practices and growers' views on research, development and extension (RD&E). This information helps inform CRDC about the benefits of the research it invests in and priority areas for future research. Change in industry practice can be quantified by comparing information across the surveys conducted over the past 20 years.

Previous surveys have included a number of core annual questions and then a number of focus areas to investigate specific aspects of the farming system.

In 2017, CRDC undertook a review of the aims, purpose and design for the survey. The 2017 Grower Survey was developed by a working group including CRDC, Cotton Australia and researchers. The 2024 Grower Survey has been refined by the working group with reference to Grower Surveys undertaken between 2017-2023 and CRDC's Monitoring and Evaluation Framework and supplemented by research questions relevant to the seasonal conditions. This survey gathered mid-term assessment of growers' views of CRDC's performance against its Strategic Plan objectives and performance measures.

The 2024 Grower Survey included:

- Baseline information about growers and their farm business including respondents' demographics (region, farm area) and season and farm information (yields, area of cotton).
- A number of other focus areas, including:
 - irrigation;
 - R&D impact on farming systems;
 - nutrition and soil;
 - IPM and crop protection; and
 - workforce and training.
- As some questions are specific to cotton growers in the 2023-24 season, these questions will have a slightly lower sample size compared to most other questions. Also, due to the length of the survey, some questions are asked on rotation (to roughly 50% of respondents).

The results from the 2024 Grower Survey now follow. Ahead of this, we provide an explanation to assist readers in understanding and interpreting the results in this report.

How the survey was conducted

The 2024 Grower Survey was conducted using a CATI (Computer Assisted Telephone Interviewing) data collection methodology. This included:

- Growers being contacted and invited to complete the survey over the phone;
- Where this was not possible immediately, an interview appointment time was agreed and the interview completed at the agreed time.

When the survey was conducted

Surveys have usually been conducted in winter, focusing specifically on the preceding crop.

CRDC agreed that to ensure consistency over time, the Grower Survey should be conducted at the same time each year.

The 2024 Grower Survey opened on 5 June 2024 and ran until 28 June 2024. It is noted that there will be a small number of growers who will have not finishing picking at this time.

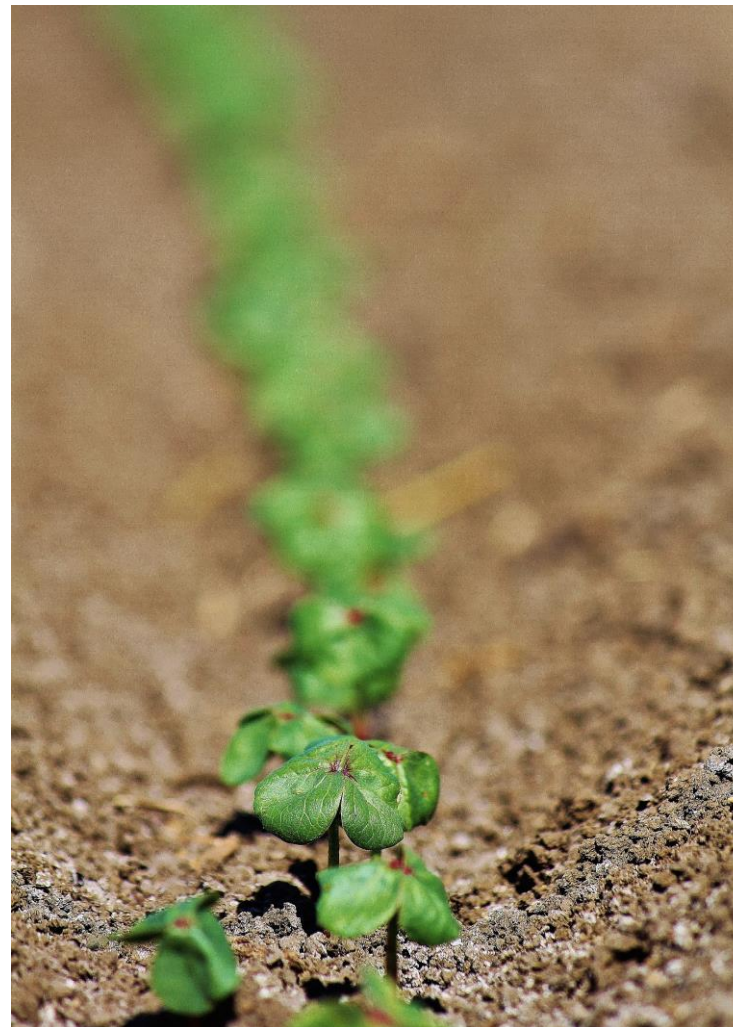
A look at the 2023-24 season

Approximately 509,000 hectares were planted to irrigated and dryland cotton in the 2023–24 season, a decrease on the 580,000 hectares the season before due to less favourable seasonal conditions.

At the time of reporting in August 2024, ginning is still occurring across the industry and so a final production number has not been reached. However, it is estimated that total production will reach 4.8 million bales.

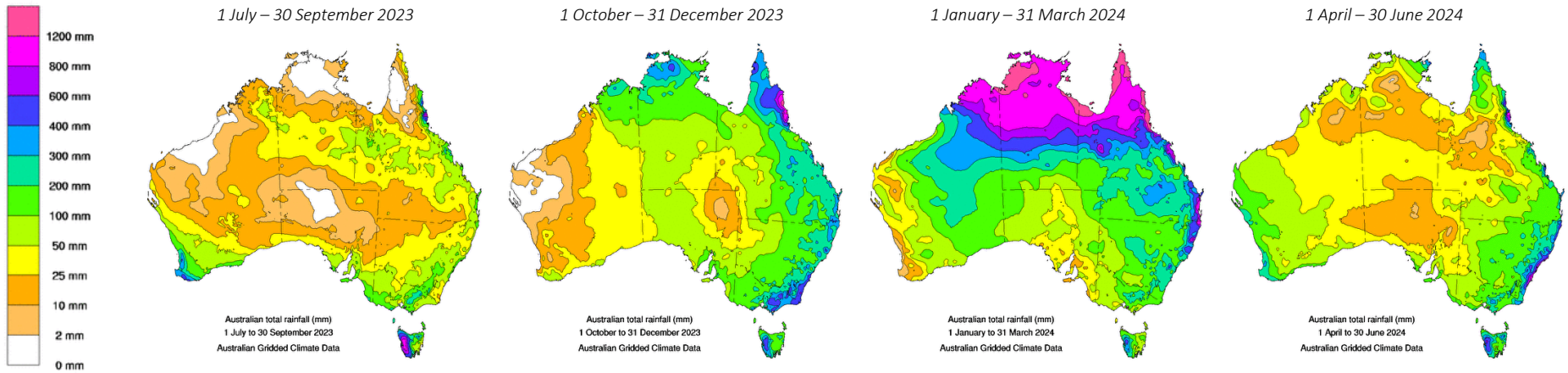
CRDC's investment in 2023-24:

- \$18.720 million – CRDC's expenditure in delivering year one of Clever Cotton on behalf of cotton growers and the Australian Government. Of this, \$13.956 million was directly invested in RD&E projects.
- 196 – RD&E projects
- 86 – research partners
- 3 – pillars: Paddock, People, Planet

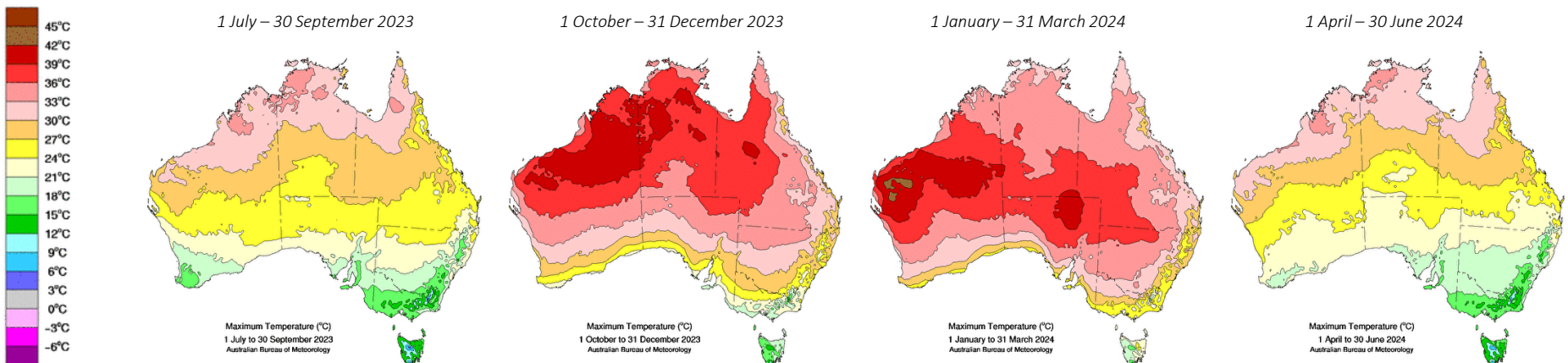


Rainfall and temperature across the 2023-24 season

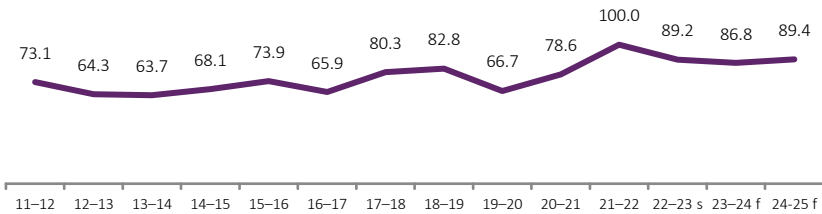
Total rainfall (in mm) by calendar quarter of the 2023-24 season



Mean maximum temperature (in degrees Celsius) by calendar quarter of the 2023-24 season



Index of cotton prices received by farmers (Australia)

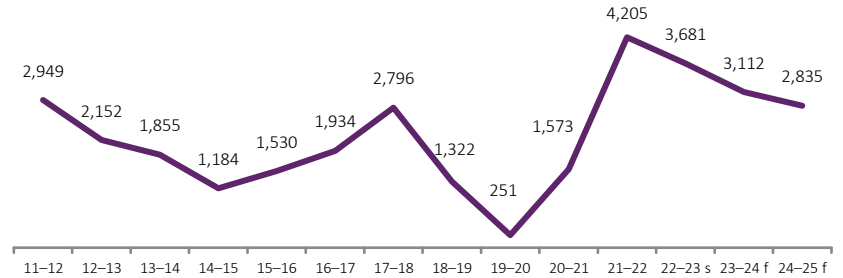


f ABARES forecast. s ABARES estimate.

Notes: The indexes for commodity and price groups are calculated on a chain-weighted basis using Fisher's ideal index with a reference year of 2021-22 = 100. Indexes for most individual commodities are based on annual gross unit value of production. Prices used in these calculations exclude GST. Details for establishments with estimated value of agricultural operations (EVAO) of \$5,000 or more from 1994-95 to 2014-15; and EVAO of \$40,000 from 2015-16.

Sources: ABARES; Australian Bureau of Statistics

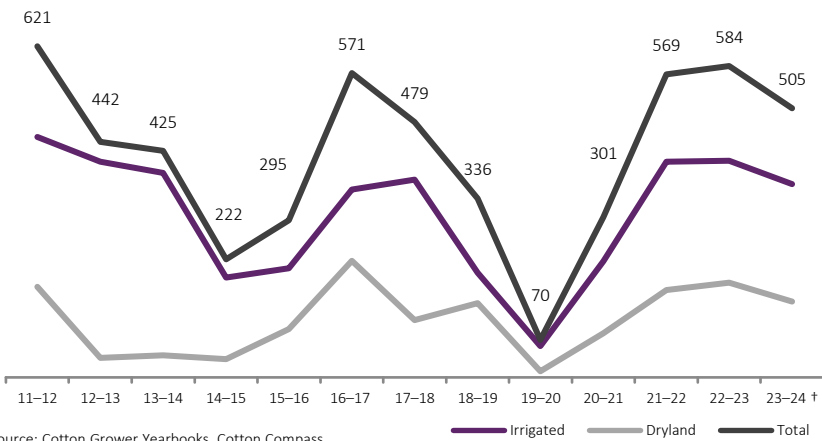
Gross value of cotton lint production (Australia) (\$m)



f ABARES forecast. s ABARES estimate. Figures are value delivered to gin
Notes: The gross value of production is the value placed on recorded production at the wholesale prices realised in the marketplace. The point of measurement can vary between commodities. Generally the marketplace is the metropolitan market in each state and territory. However, where commodities are consumed locally or where they become raw material for a secondary industry, these points are presumed to be the marketplace. Prices used in these calculations exclude GST. Details for establishments with estimated value of agricultural operations (EVAO) of \$1,500 or more until 1980-81; \$2,500 or more from 1981-82 to 1985-86; EVAO of \$20,000 or more from 1986-87 to 1990-91; EVAO of \$22,500 or more from 1991-92 to 1992-93; EVAO of \$5,000 or more from 1993-94 to 2014-15; and EVAO of over \$40,000 from 2015-16.

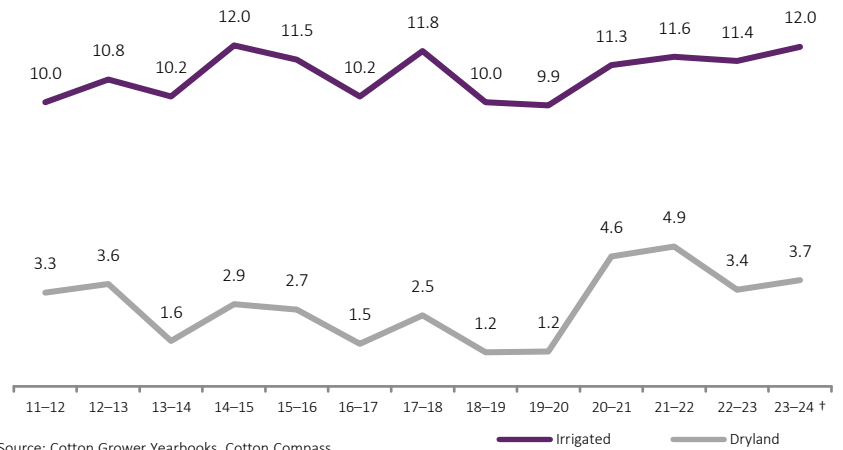
Sources: ABARES; Australian Bureau of Statistics; Cotton Australia

Cotton crop areas (Australia) ('000 ha)



Source: Cotton Grower Yearbooks, Cotton Compass

Average cotton yields (Australia) (bales/ha)



Source: Cotton Grower Yearbooks, Cotton Compass

Growers were asked to provide estimates of three yield measures they achieved for the 2023-24 growing season. These were average yield across their entire crop, and the highest and then lowest yield from one field for the same crop.

This provides a sense of the breadth of performance across their farms.

The results provided by growers indicate the variation across fully irrigated, partially irrigated and raingrown/dryland areas.

- For fully irrigated areas, the 2024 survey reported an average yield of 11.93 bales per hectare. This reported result is up on that reported in 2023 (up 1.74).
- For raingrown/dryland areas, the average yield was 4.05, also up slightly on the 2023 yield result.
- Results for partially irrigated growers were not reported due to the small sample size.

What were your yields for the 2023-24 cotton growing season across the cotton areas?

Base: All growers who grew cotton during the 2023-24 season; n varies (Fully Irrigated, n = 176, Raingrown/Dryland, n = 45)
Part irrigation not reported due to low sample size.

	Fully Irrigated (bales per ha)	Raingrown/Dryland (bales per ha)
Average yield	11.93 2023: 10.19	4.05 2023: 3.67
Yield achieved by your highest-yielding field (average of grower-reported yield)	13.57 2023: 11.96	5.09 2023: 4.33
Yield achieved by your lowest-yielding field (average of grower-reported yield)	10.13 2023: 8.19	3.36 2023: 2.95
Range of variation from average yield	3.44 2023: 2.77	1.73 2023: 1.38

The results above are results of survey measurements reported at an overall level – covering all regions and farm sizes.

Key results by Region and Size of Total Farm Area (fully irrigated results only)

	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Average yield	11.21	10.73	11.92	12.15	13.58	12.22

The commentary to the left provides high-level insights into the results at an overall level, and (where applicable) results across two main segments – Region and Size of Total Farm Area

The base represents the cohort of respondents to the question (e.g. all growers who grew cotton during the 2023-24 season and responded to the survey), and the number that provided an answer to the question (176 growing fully irrigated cotton, 45 growing raingrown/dryland cotton). Growers did not necessarily answer each question – as a result, the base across questions may vary.

The results below are results of survey measurements reported at two key segment levels: Region (six categories) and Size of Total Farm Area (three categories). For example, in Central Queensland 14 respondents answered the question, reporting an average yield of 11.21 bales per hectare across fully irrigated cotton fields.

Key results by Region and Size of Total Farm Area (fully irrigated results only)

	Central QLD (n=14)	Darling Downs (n=27)	Macintyre Balonne (n=19)	Northern NSW (n=59)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=83)	Large (n=36)
Average yield	11.21	10.73	11.92	12.15	13.58	12.22	11.39	12.05	12.52
Highest yield from one field	13.88	12.09	13.28	13.68	14.98	14.32	12.76	13.72	14.57
Lowest yield from one field	8.48	9.29	10.42	10.40	12.53	10.20	9.90	10.17	10.41
Range of variation from average yield	5.41	2.80	2.86	3.28	2.46	4.12	2.86	3.55	4.16

Segments were categorised as follows:

Region (based on Region at Q1)

- Central QLD
- Darling Downs
- Macintyre – Balonne
 - Border Rivers
 - St George/Dirranbandi
- Northern NSW
 - Gwydir
 - Lower/Upper Namoi
 - Bourke

- Macquarie
- Southern NSW
 - Lachlan
 - Murrumbidgee
 - Murray

Size of Total Farm Area (based on cropping area – full irrigation, part irrigation or raingrown/dryland - at Q2)

- Small (< 1,000 ha)
- Medium (1,000 – 5,000 ha)
- Large (> 5,000 ha)



Snapshot of key findings

2023-24 Cotton Crop



13%

Total farm area under cotton production in 2023-24



994 ha

Grower-reported average of hectares under cotton



11.93 bales/ha

Grower-reported average yield on fully irrigated cotton area

Irrigation



79%

Incidence of furrow irrigation on fully-irrigated cotton fields



55%

Changed or are considering changing irrigation systems



63%

Adopted or considering adoption of automation to irrigation systems

R&D impact on Farming Systems



51%

Contributed data to industry R&D (e.g. participation in trials or monitoring activities on-farm, providing on-farm data, info to researchers or industry projects)



31%

Held cotton industry research trials on-farm in the 2023-24 cotton growing season



82%

Agree that CRDC/CottonInfo have contributed to improving their productivity and sustainability

Nutrition and Soil



55%

Are assessing or are planning to assess their carbon footprint



34%

Have made changes to their cotton production system in order to lower their carbon footprint

19% - Nothing / not sure

15% - Don't know enough about it

14% - Cost involved / financial burden

Top three perceived barriers to lowering their carbon footprint

IPM and Crop Protection



52%

Reported at least one of five listed diseases on-farm during the 2023-24 cotton growing season



39%

Have monitored the disease inoculum levels in their soil



69%

Actively use a variety of tools, tactics and systems to enhance on-farm biosecurity

Workforce and Training



98%

Agree that it's important to them that workers feel like a valued part of their farm business



76%

Over the last 12 months, reported reviewing workplace hazards at least once every two to three months (e.g. hazard identification and action planning)



46%

Currently use automation on-farm (including automation for irrigation)

FOCUS AREA

Farm Profiles

Area and distribution of farm land

Based on the information provided by respondents to the 2024 Grower Survey, we have estimated:

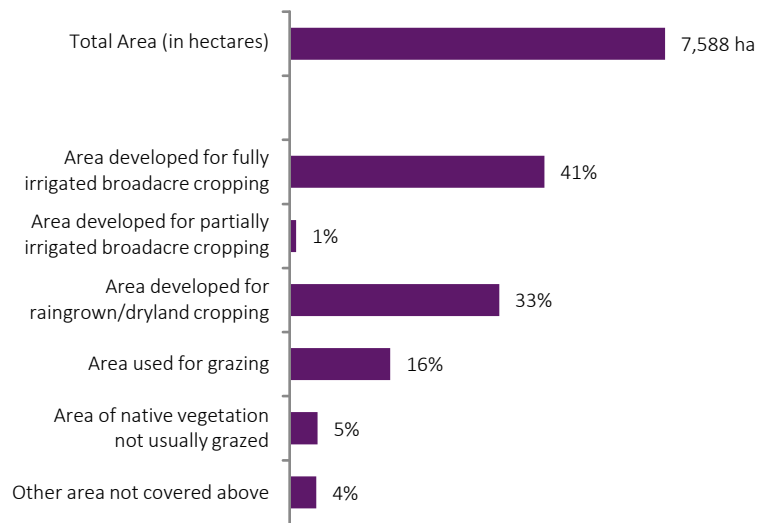
- o An average (across all regions and farm sizes) total farm size of 7,588 ha;
- o 75% of the land area was developed and available for cropping or other uses including cotton; with
- o Growers again this year reporting that the majority of the developed area is either fully irrigated or developed for raingrown/dryland farming; whilst
- o 25% of their total farm area remains in use for grazing, native vegetation or other.

The nature of cotton farming obviously varies across the different growing regions and farm sizes as illustrated in the results shown below.



What is the total area of your farm (in hectares), and of the total area of your farm, what is the area attributed to the following?

Base: All growers; n = 228



Key results by Region and Size of Total Farm Area

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
Total area (ha)	6,341	1,706	10,593	6,478	5,973	5,642	781	4,717	26,529
Full irrigation	39%	42%	31%	34%	26%	66%	58%	34%	30%
Partial irrigation	1%	2%	0%	1%	2%	1%	0%	1%	2%
Raingrown/Dryland	28%	45%	31%	40%	49%	6%	22%	38%	41%
Grazing	23%	4%	26%	17%	15%	18%	10%	19%	18%
Native vegetation	5%	3%	7%	5%	4%	3%	4%	4%	7%
Other	4%	4%	4%	3%	4%	7%	6%	4%	2%

FOCUS AREA

2023-24 Cotton Crop

Cotton area and farming systems

Key information about the growers' area planted for the 2023-24 season was collected during the survey. Based on the feedback provided by cotton growers responding to the 2024 CRDC Grower Survey we note that:

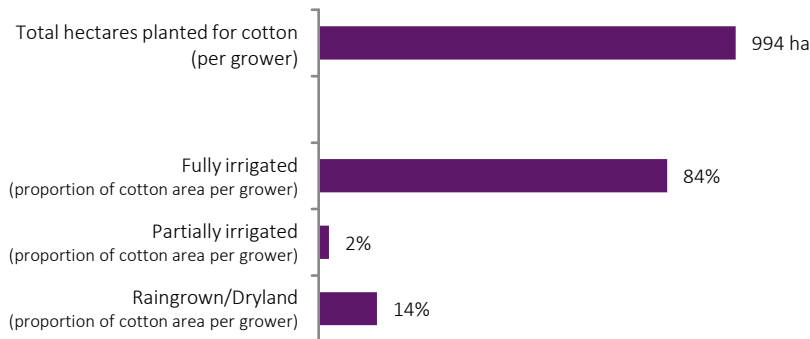
It has been estimated that the average area of cotton planted was 994 ha:

- On average, 84% of cotton area per grower was fully irrigated;
- 2% was partially irrigated; and
- 14% was raingrown/dryland.

Based on the feedback provided by growers, it is estimated that just over four in five (82%) were growing cotton on a single irrigation type, with the majority of these (73%) growing cotton only on fully irrigated hectares.

What was the total number of hectares planted for cotton during the 2023-24 cotton growing season? And of these hectares, how many hectares were fully irrigated, partially irrigated or raingrown/dryland?

Base: All growers who grew cotton during the 2023-24 season; n = 198



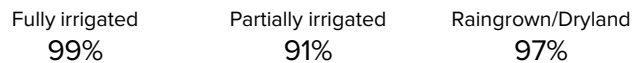
Key results by Region and Size of Total Farm Area

	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
Total area (ha per grower)	1,031	340	1,370	1,345	706	710	192	607	3,082
Fully irrigated	81%	83%	83%	73%	100%	100%	91%	79%	82%
Partially irrigated	4%	2%	10%	2%	<1%	0%	1%	3%	3%
Raingrown/Dryland	16%	15%	7%	25%	0%	0%	8%	17%	15%

And of these hectares, how many hectares were picked or are planning to be picked (e.g. not ploughed in due to flooding, spray drift, hail etc.)?

Base: All growers who grew cotton during the 2023-24 season; n = 198

Average proportion of area picked or planning to be picked (per grower)



Yields for the 2023-24 cotton growing season

Growers were asked to provide estimates of three yield measures they achieved for the 2023-24 growing season. These were average yield across their entire crop, and the highest and then lowest yield from one field for the same crop.

This provides a sense of the breadth of performance across their farms.

The results provided by growers indicate the variation across fully irrigated, partially irrigated and raingrown/dryland areas.

- For fully irrigated areas, the 2024 survey reported an average yield of 11.93 bales per hectare. This reported result is up on that reported in 2023 (up 1.74).
- For raingrown/dryland areas, the average yield was 4.05, also up slightly on the 2023 yield result.
- Results for partially irrigated growers were not reported due to the small sample size.

Average yield change by Region and Size of Total Farm Area (fully irrigated results only)

	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Average yield (2023-24)	11.21	10.73	11.92	12.15	13.58	12.22	11.39	12.05	12.52
Average yield (2022-23)	10.93	10.36	12.24	11.17	11.11	7.29	9.45	10.30	11.68
Difference	+ 0.28	+ 0.37	- 0.32	+ 0.98	+ 2.47	+ 4.93	+ 1.94	+ 1.75	+ 0.84

What were your yields for the 2023-24 cotton growing season across the cotton areas?

Base: All growers who grew cotton during the 2023-24 season; n varies

(Fully Irrigated, n = 176, Raingrown/Dryland, n = 45)

Part irrigation not reported due to low sample size.

	Fully Irrigated (bales per ha)	Raingrown/Dryland (bales per ha)
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Yield achieved by your highest-yielding field (average of grower-reported yield)	13.57 2023: 11.96	5.09 2023: 4.33
Yield achieved by your lowest-yielding field (average of grower-reported yield)	10.13 2023: 8.19	3.36 2023: 2.95
Range of variation from average yield	3.44 2023: 3.77	1.73 2023: 1.38

Key results by Region and Size of Total Farm Area (fully irrigated results only)

	Central QLD (n=14)	Darling Downs (n=27)	Macintyre Balonne (n=19)	Northern NSW (n=59)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=83)	Large (n=36)
Average yield	11.21	10.73	11.92	12.15	13.58	12.22	11.39	12.05	12.52
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FOCUS AREA

Irrigation

This section of results from the 2024 Grower Survey covers questions asked about irrigation on-farm.

Some of the insights provided by growers are detailed below.

Furrow still dominant, but more systems being used

Growers who were growing cotton on fully-irrigated fields in 2023-24 were asked what type of irrigation system they were using. Furrow (or manual siphon) was reported by almost four in five growers (79%), a slightly lower result than in 2021 (85%) when this question was last included in the survey.

Conversely, there was a higher reported incidence of growers using an overhead system (i.e. lateral or centre pivot; 28% said this) or a bankless system (i.e. GL Bay, Rollover Bays, Flat Bays; 21% said this). Both systems saw an increased incidence than when last reported in 2021 (up 9% and 6% respectively).

Growers were also asked if they had changed any of their irrigation systems in the last 2 years, or were considering a change in the next 5 years – over half (55%) reported an actual change or considering a change. Not surprisingly, most reported they would move away from a furrow system, with around half indicating they changed or would consider changing to a bankless system. Reasons for the change of system include labour savings (86% said this), improved water use efficiency (71%), and ease of management (56%).

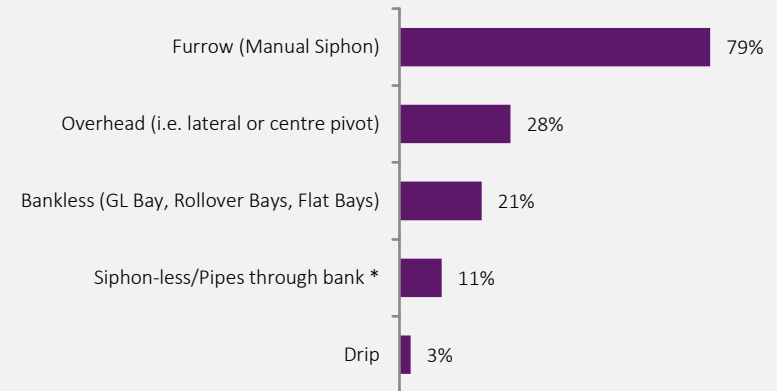
For those that did not change systems and were not considering this, factors in their decision making were the financial cost (54% of this cohort said this), the water use efficiency (31%), happy with the system they have (21%), and the ease of management (20%).

Automation adopted into irrigation systems, but there remains some barriers.

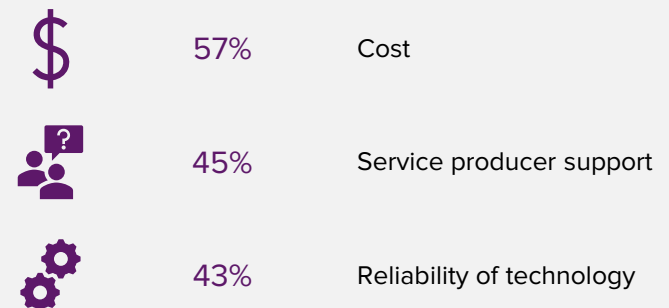
Growers were asked if they have adopted automation to their irrigation systems, or were considering this – just under two in three (63%) reported they have done this or were considering it. For those who reported this, the most common forms of automation adopted were telemetry (27% said this), remote control (25%), gates (22%), and channel level management (19%). There was also a small cohort who reported they were considering adopting automation into their irrigation systems, but were not sure or were still considering / investigating what automation to adopt.

In saying this, it's clear that there are still some barriers for growers. Over half (57%) reported that the cost of adopting irrigation automation was a barrier, with service provider support (45%) and reliability of technology (43%) the next highest barriers reported.

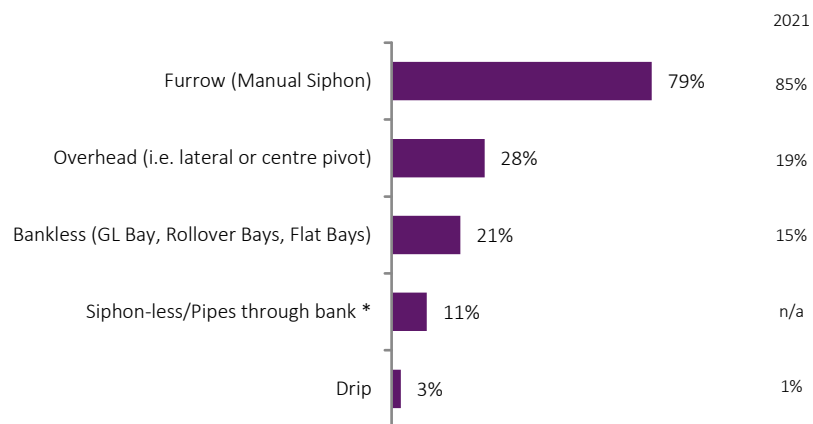
Irrigations systems in use as reported by fully-irrigated cotton growers



Top three barriers to adopting irrigation automation



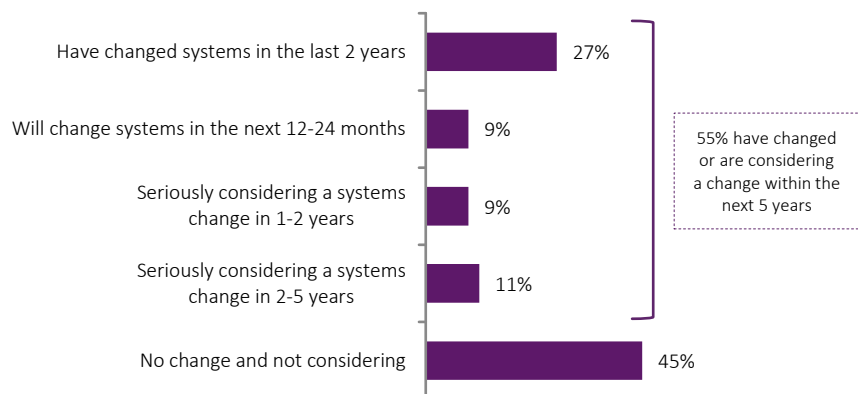
Proportion of growers who reported using each system for growing cotton during the 2023-24 season
 Base: All growers who grew cotton during the 2023-24 season on **fully irrigated** hectares; n = 177



Key results by Region and Size of Total Farm Area

	Central QLD (n=14)	Darling Downs (n=27)	Macintyre Balonne (n=19)	Northern NSW (n=60)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=84)	Large (n=36)
Furrow	93%	78%	68%	80%	95%	72%	67%	82%	92%
Overhead	43%	48%	21%	28%	25%	13%	33%	25%	28%
Bankless	14%	7%	32%	12%	15%	53%	16%	24%	22%
Siphon-less/Pipes through bank	21%	4%	16%	3%	20%	16%	12%	11%	8%
Drip	0%	7%	0%	2%	10%	0%	5%	2%	0%

Have you changed any of your irrigation systems in the last 2 years or are you considering a change?
 Base: All growers who grew irrigated cotton during the 2023-24 season; n = 182



Key results by Region and Size of Total Farm Area

	Central QLD (n=15)	Darling Downs (n=27)	Macintyre Balonne (n=22)	Northern NSW (n=61)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=88)	Large (n=37)
Have changed in the last 2 years	27%	26%	27%	16%	35%	47%	25%	31%	22%
Will change in the next 12-24 months	7%	11%	14%	13%	5%	0%	7%	6%	19%
Considering in 1-2 years	13%	7%	5%	10%	10%	6%	4%	11%	11%
Considering in 2-5 years	13%	7%	14%	16%	15%	0%	5%	11%	19%
No change and not considering	40%	48%	41%	44%	35%	47%	60%	41%	30%

* Examples presented to the respondent were "(Small or Large Pipes through the bank, Pontoon, Siphon-less with tail water backup, all having slope down the row)".

55% or n = 101 have changed in the last 2 years or will change / consider changing their full irrigation system(s) in the next 5 years. . .

From what system to what new system [“did you change” / “are you changing to” / “are you considering changing to”]? *

Base: All growers who grew irrigated cotton during the 2023-24 season AND have changed or are considering a change to their irrigation systems; n = 101

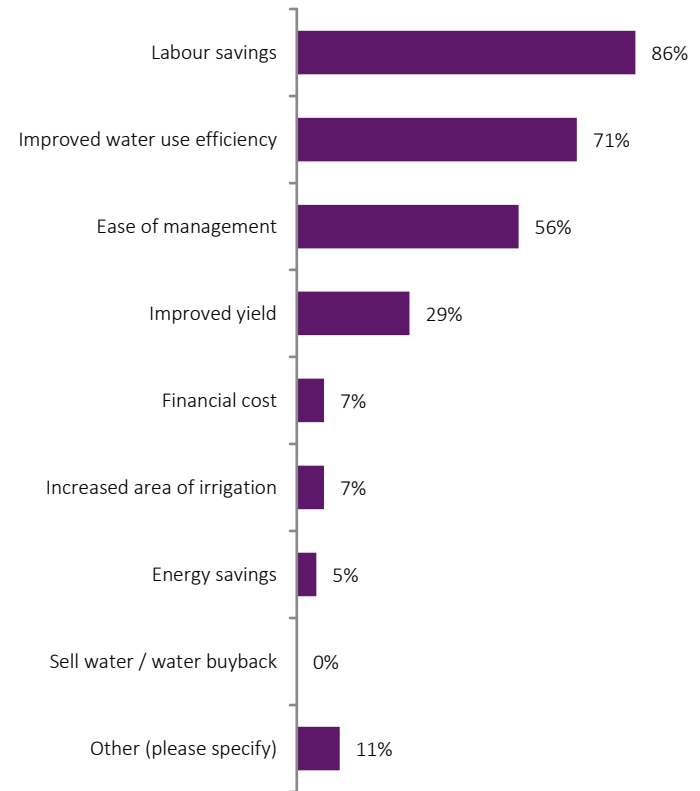
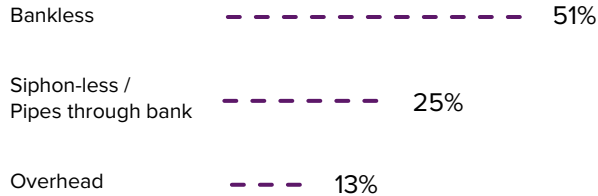
Please select the top three factors driving your decision to change your irrigation systems.

Base: All growers who grew irrigated cotton during the 2023-24 season AND have changed or are considering a change to their irrigation systems; n = 101

Of the n = 101 who have changed or are considering a change to their irrigation systems,

87%
are changing from a furrow system.

The top three systems these growers are changing to are...

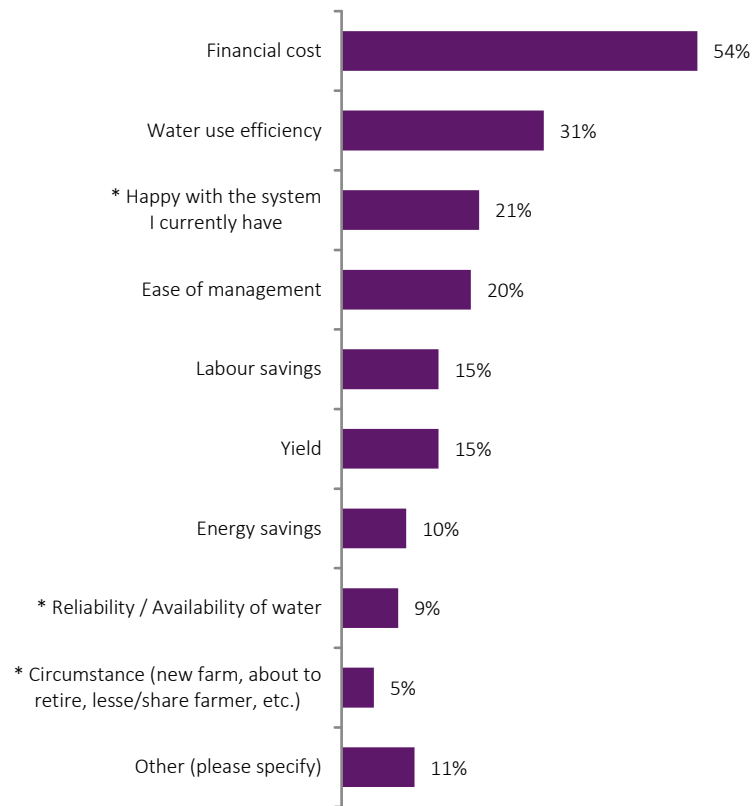


Factors driving decision to not change

45% or n = 81 have not changed and are not considering changing their full irrigation system(s) in the next 5 years. . .

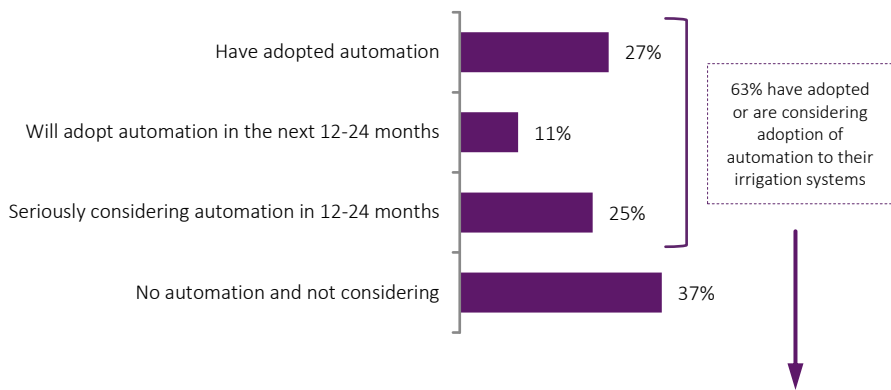
Please select the top three factors driving your decision to not change your irrigation systems.

Base: All growers who grew irrigated cotton during the 2023-24 season AND have not changed or are not considering a change to their irrigation systems; n = 81



Have you adopted automation to your irrigation systems recently or are you considering adoption?

Base: All growers who grew irrigated cotton during the 2023-24 season; n = 102 †



Key results by Region and Size of Total Farm Area

	Central QLD (n=9)	Darling Downs (n=17)	Macintyre Balonne (n=9)	Northern NSW (n=34)	Macquarie (n=12)	Southern NSW (n=18)	Small (n=36)	Medium (n=45)	Large (n=21)
Have adopted automation	22%	41%	22%	32%	25%	17%	31%	29%	19%
Will adopt in the next 12-24 months	0%	12%	11%	15%	17%	6%	8%	7%	24%
Considering in 12-24 months	44%	24%	11%	15%	25%	39%	19%	27%	29%
No automation and not considering	33%	24%	56%	38%	33%	39%	42%	38%	29%

What irrigation automation equipment [“have you adopted” / “are you adopting” / “are you considering”]? *

Base: All growers who grew irrigated cotton during the 2023-24 season AND have adopted or are considering adoption of automation to their irrigation systems; n = 64 †

- 27% - Telemetry (e.g. LoRaWAN, FieldNET)
- 25% - Remote control
- 22% - Gates (e.g. Padman)
- 20% - Listed the system (e.g. laterals, bankless channel)
- 19% - Channel level management
- 14% - Pump automation

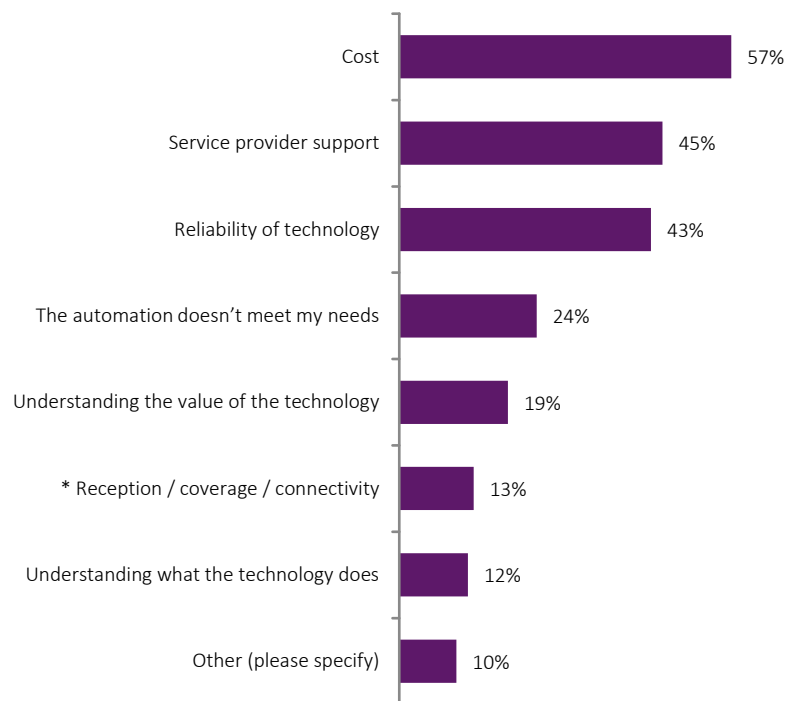
11% said they were not sure or were still considering / investigating.

Results above are a subjective coding of verbatim answers from respondents.
 † Question was asked on rotation to roughly 50% of respondents.

Barriers to adopting irrigation automation

With regard to irrigation automation, what do you see as the barriers to adoption?
Please select all that apply.

Base: All growers who grew irrigated cotton during the 2023-24 season; n = 102 †



Key results by Region and Size of Total Farm Area

	Central QLD (n=9)	Darling Downs (n=17)	Macintyre Balonne (n=9)	Northern NSW (n=34)	Macquarie (n=12)	Southern NSW (n=18)	Small (n=36)	Medium (n=45)	Large (n=21)
Cost	56%	47%	44%	53%	75%	67%	61%	53%	57%
Service provider support	56%	59%	67%	32%	50%	44%	42%	49%	43%
Reliability of technology	56%	53%	22%	44%	42%	39%	47%	42%	38%
The automation doesn't meet needs	22%	24%	44%	9%	33%	33%	31%	18%	24%
Understanding the value of technology	11%	29%	0%	24%	8%	22%	31%	13%	10%
* Reception/coverage /connectivity	11%	24%	11%	18%	8%	0%	8%	13%	19%
Understanding what the technology does	22%	18%	0%	12%	8%	11%	19%	7%	10%
Other (please specify)	22%	0%	11%	6%	33%	6%	8%	9%	14%

* Coded from Other (please specify) answers.

† Question was asked on rotation to roughly 50% of respondents.

FOCUS AREA

R&D Impact on Farming Systems

This section of results from the 2024 Grower Survey covers questions asked about the impact of R&D on farming systems.

Some of the insights provided by growers are detailed below.

RS/EO perceived to be beneficial – for grower and for industry

Remote sensing/earth observation (RS/EO) is a rapidly growing area of technology. Growers were asked what benefits they saw in RS/EO products, both to them and also to the industry.

When considering the benefits of RS/EO for **themselves**, helping them to maximise yield (72% said this), increase efficient water use (69%) and reduce costs (62%) were the top three benefits reported. Only one in seven (14%) reported that they did not see any benefits of RS/EO products to them.

When considering the benefits of RS/EO for **industry**, helping industry to manage productivity (80%), sustainability (76%) and social license / advocacy (58%) were the top three benefits reported. Similar to above, a comparatively small number of growers (11%) reported that RS/EO products would not benefit the industry.

Benefits of remote sensing/earth observation (RS/EO)

Benefits for them		Benefits for industry
Maximise yield	1.	Productivity
Increase efficient water use	2.	Sustainability
Reduce costs	3.	Social license / advocacy

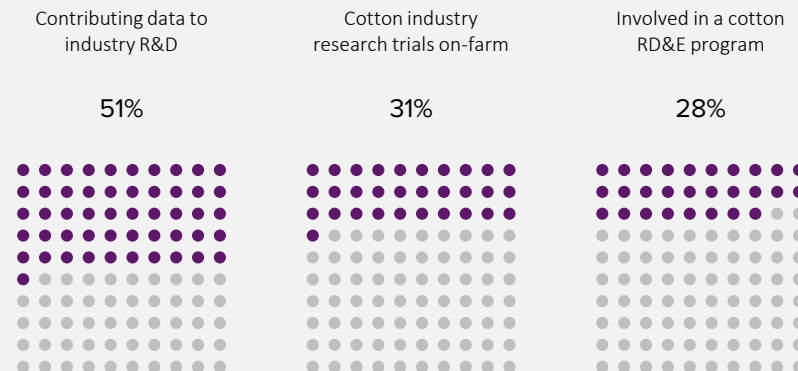
Growers involved in R&D, with opportunity to grow

Growers were asked how they were involved in cotton RD&E via the following three pathways:

- 51% reported they were contributing data to industry R&D (such as through participation in trials or monitoring activities on farm or providing on-farm data or information to researchers or industry projects);
- 31% reported they had at least one cotton industry research trial on their farm during the 2023-24 cotton growing season; and
- 28% reported they were involved in a cotton RD&E program during the 2023-24 cotton growing season.

Just over half (55%) reported they were involved in at least one of the three pathways listed above, with one in five (21%) reportedly involved in all three.

Involvement in cotton RD&E



R&D Impact on Farming Systems

Irrigated cotton field history

Thinking about your cotton field history, of the IRRIGATED cotton hectares in 2023-24, how many were...

Base: All growers who grew cotton during the 2023-24 season on irrigated hectares; n = 182

	% of growers with at least one hectare of this history *	2021:
Back-to-back cotton, i.e. cotton grown in the same field in the 2022-23 and 2023-24 seasons	49%	15%
Following Summer fallow, i.e. no crop in the 2022-23 Summer or 2023 Winter, but cropped in 2021-22 Summer or 2022 Winter	34%	41%
Following long fallow, i.e. no crop in the 2023 Winter, 2022-23 Summer, 2022 Winter or 2021-22 Summer	46%	46%
'Double cropped', i.e. following crop in Winter 2023 that was harvested	12%	5%
Following a cover crop, i.e. crop planted and terminated/not harvested (i.e. sprayed out, slashed, crimped, incorporated)	7%	7%
New fields, i.e. never had cotton grown there previously	3%	5%

	Average proportion of cotton area with this history	2021:
Back-to-back cotton, i.e. cotton grown in the same field in the 2022-23 and 2023-24 seasons	27%	8%
Following Summer fallow, i.e. no crop in the 2022-23 Summer or 2023 Winter, but cropped in 2021-22 Summer or 2022 Winter	26%	37%
Following long fallow, i.e. no crop in the 2023 Winter, 2022-23 Summer, 2022 Winter or 2021-22 Summer	34%	43%
'Double cropped', i.e. following crop in Winter 2023 that was harvested	7%	3%
Following a cover crop, i.e. crop planted and terminated/not harvested (i.e. sprayed out, slashed, crimped, incorporated)	4%	4%
New fields, i.e. never had cotton grown there previously	1%	4%

Key results by Region and Size of Total Farm Area *

	Central QLD (n=15)	Darling Downs (n=27)	Macintyre Balonne (n=22)	Northern NSW (n=61)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=88)	Large (n=37)
Back-to-back cotton	100%	48%	82%	34%	65%	16%	39%	50%	62%
Following Summer fallow	13%	41%	27%	26%	45%	53%	39%	31%	35%
Following long fallow	13%	41%	32%	67%	60%	31%	32%	51%	57%
'Double cropped'	13%	30%	0%	7%	0%	19%	12%	16%	0%
Following a cover crop	0%	7%	9%	2%	15%	13%	9%	7%	3%
New fields	0%	0%	0%	3%	5%	6%	2%	5%	3%

Key results by Region and Size of Total Farm Area

	Central QLD (n=15)	Darling Downs (n=27)	Macintyre Balonne (n=22)	Northern NSW (n=61)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=57)	Medium (n=88)	Large (n=37)
Back-to-back cotton	87%	16%	58%	17%	24%	5%	26%	26%	32%
Following Summer fallow	5%	32%	18%	21%	33%	45%	31%	23%	26%
Following long fallow	6%	27%	17%	56%	37%	25%	28%	36%	40%
'Double cropped'	2%	21%	0%	4%	0%	12%	9%	9%	0%
Following a cover crop	0%	5%	7%	1%	4%	10%	5%	4%	1%
New fields	0%	0%	0%	2%	2%	3%	1%	2%	1%

* Multiple field histories could be reported – results may not add to 100%.

Thinking about your cotton field history, of the RAINGROWN | DRYLAND cotton hectares in 2023-24, how many were.....

Base: All growers who grew cotton during the 2023-24 season on raingrown/dryland hectares; n = 46

	% of growers with at least one hectare of this history *	2021:
Back-to-back cotton, i.e. cotton grown in the same field in the 2022-23 and 2023-24 seasons	7%	5%
Following Summer fallow, i.e. no crop in the 2022-23 Summer or 2023 Winter, but cropped in 2021-22 Summer or 2022 Winter	17%	23%
Following long fallow, i.e. no crop in the 2023 Winter, 2022-23 Summer, 2022 Winter or 2021-22 Summer	74%	56%
'Double cropped', i.e. following crop in Winter 2023 that was harvested	7%	5%
Following a cover crop, i.e. crop planted and terminated/not harvested (i.e. sprayed out, slashed, crimped, incorporated)	2%	5%
New fields, i.e. never had cotton grown there previously	4%	5%

Key results by Region and Size of Total Farm Area *

	Central QLD (n=4)	Darling Downs (n=7)	Macintyre Balonne (n=2)	Northern NSW (n=32)	Macquarie (n=0)	Southern NSW (n=0)	Small (n=9)	Medium (n=27)	Large (n=10)
Back-to-back cotton	50%	0%	0%	0%	-	-	11%	4%	10%
Following Summer fallow	25%	29%	50%	13%	-	-	22%	11%	30%
Following long fallow	25%	71%	50%	81%	-	-	44%	85%	70%
'Double cropped'	25%	14%	0%	3%	-	-	11%	4%	10%
Following a cover crop	0%	0%	0%	3%	-	-	0%	0%	10%
New fields	0%	0%	0%	3%	-	-	11%	0%	10%

Key results by Region and Size of Total Farm Area

	Average proportion of cotton area with this history	2021:	Central QLD (n=4)	Darling Downs (n=7)	Macintyre Balonne (n=2)	Northern NSW (n=32)	Macquarie (n=0)	Southern NSW (n=0)	Small (n=9)	Medium (n=27)	Large (n=10)
Back-to-back cotton, i.e. cotton grown in the same field in the 2022-23 and 2023-24 seasons	6%	5%	50%	0%	0%	0%	-	-	11%	4%	7%
Following Summer fallow, i.e. no crop in the 2022-23 Summer or 2023 Winter, but cropped in 2021-22 Summer or 2022 Winter	15%	23%	13%	23%	50%	13%	-	-	22%	10%	25%
Following long fallow, i.e. no crop in the 2023 Winter, 2022-23 Summer, 2022 Winter or 2021-22 Summer	70%	56%	25%	63%	50%	80%	-	-	44%	83%	59%
'Double cropped', i.e. following crop in Winter 2023 that was harvested	5%	5%	13%	14%	0%	3%	-	-	11%	4%	5%
Following a cover crop, i.e. crop planted and terminated/not harvested (i.e. sprayed out, slashed, crimped, incorporated)	1%	5%	0%	0%	0%	1%	-	-	0%	0%	3%
New fields, i.e. never had cotton grown there previously	3%	5%	0%	0%	0%	3%	-	-	11%	0%	2%

* Multiple field histories could be reported – results may not add to 100%.

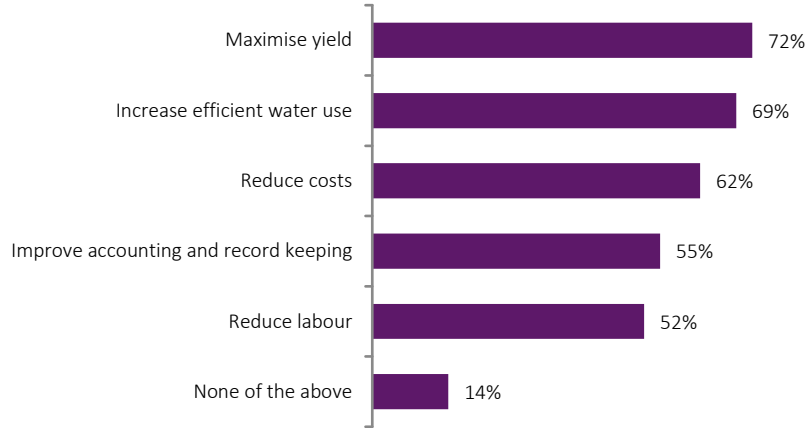
Remote sensing/earth observation (RS/EO) perceptions

Remote sensing/earth observation (RS/EO) data and technology are improving rapidly and products are becoming increasingly available to the market. From your perspective, which of the following are benefits of RS/EO products to both you and to industry? Please select all that apply for each statement.

Base: All growers; n = 132 †

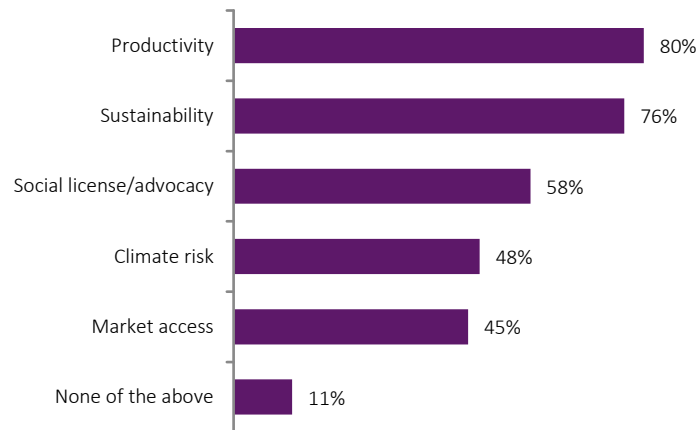
Key results by Region and Size of Total Farm Area

Remote sensing/earth observation will help me to...



	Central QLD (n=10)	Darling Downs (n=24)	Macintyre Balonne (n=16)	Northern NSW (n=38)	Macquarie (n=10)	Southern NSW (n=23)	Small (n=40)	Medium (n=68)	Large (n=24)
Maximise yield	70%	71%	88%	71%	80%	70%	63%	76%	75%
Increase efficient water use	70%	67%	100%	63%	60%	65%	58%	69%	88%
Reduce costs	70%	50%	69%	66%	50%	61%	53%	65%	71%
Improve accounting and record keeping	70%	50%	75%	50%	60%	43%	53%	56%	54%
Reduce labour	60%	42%	56%	58%	50%	52%	48%	53%	54%
None of the above	30%	13%	0%	13%	10%	22%	25%	10%	8%

Remote sensing/earth observation will help industry to manage...



	Central QLD (n=10)	Darling Downs (n=24)	Macintyre Balonne (n=16)	Northern NSW (n=38)	Macquarie (n=10)	Southern NSW (n=23)	Small (n=40)	Medium (n=68)	Large (n=24)
Productivity	90%	79%	69%	87%	50%	83%	78%	81%	79%
Sustainability	90%	79%	75%	82%	30%	74%	73%	78%	75%
Social license/advocacy	80%	67%	63%	61%	50%	39%	60%	54%	63%
Climate risk	60%	50%	44%	58%	40%	35%	45%	47%	54%
Market access	70%	58%	44%	47%	30%	26%	50%	44%	42%
None of the above	10%	13%	6%	11%	20%	13%	15%	10%	8%

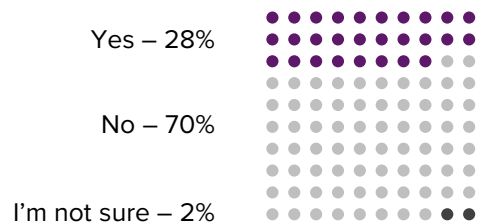
† Question was asked on rotation to roughly 50% of respondents.

R&D Impact on Farming Systems

Involvement in cotton RD&E

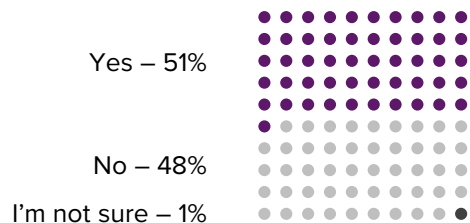
Have you been involved in a cotton RD&E program during the 2023-24 cotton growing season?

Base: All growers who grew cotton during the 2023-24 season; n = 198



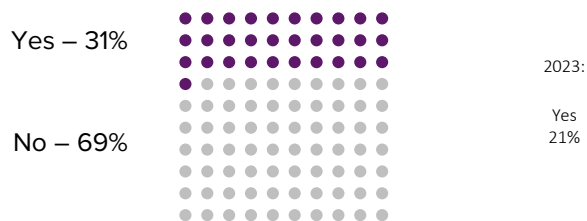
Are you contributing any data to industry R&D (such as through participation in trials or monitoring activities on farm or providing on-farm data or information to researchers or industry projects)?

Base: All growers who grew cotton during the 2023-24 season; n = 198



Did you have any cotton industry research trials on your farm during the 2023-24 cotton growing season? (e.g. CRDC, CSIRO, DPI, DAF, Universities, etc.)?

Base: All growers who grew cotton during the 2023-24 season; n = 198



Key results by Region and Size of Total Farm Area

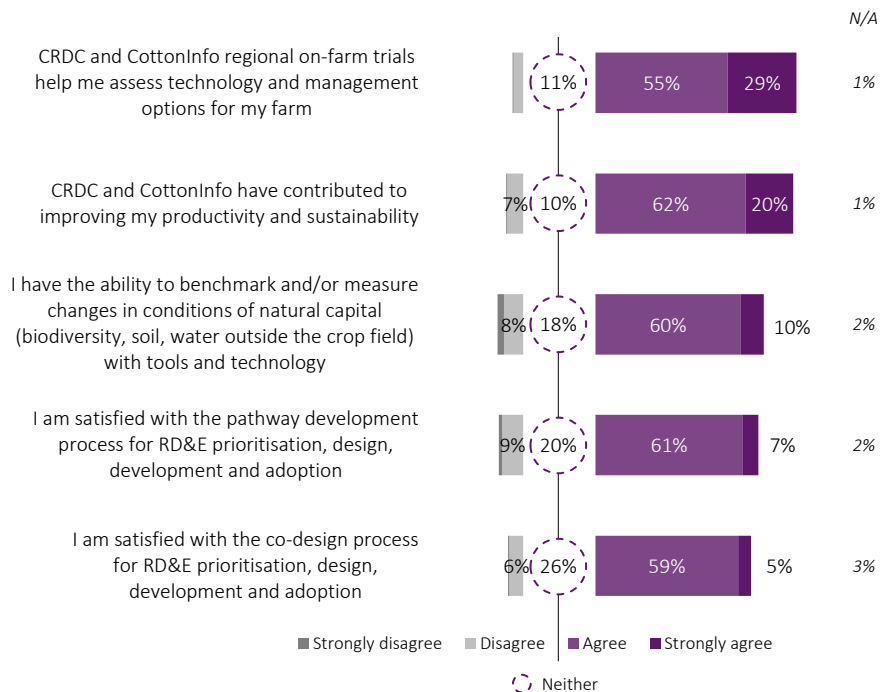
	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
Yes	35%	23%	32%	31%	20%	25%	20%	30%	37%
No	65%	73%	68%	68%	80%	72%	77%	70%	61%
I'm not sure	0%	3%	0%	1%	0%	3%	3%	0%	2%

	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
Yes	53%	50%	36%	54%	45%	59%	43%	49%	66%
No	47%	50%	64%	44%	55%	41%	55%	49%	34%
I'm not sure	0%	0%	0%	3%	0%	0%	2%	1%	0%

	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
Yes	53%	33%	14%	37%	15%	25%	35%	25%	41%
No	47%	67%	86%	63%	85%	75%	65%	75%	59%

Please tell us whether you agree or disagree with the following statements...

Base: All growers; n = 228



Key results by Region and Size of Total Farm Area (% agree + % strongly agree)

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
CRDC and CottonInfo regional on-farm trials help me assess...	72%	88%	84%	88%	90%	76%	81%	84%	86%
CRDC and CottonInfo have contributed to improving...	67%	83%	88%	87%	86%	85%	79%	82%	86%
I have the ability to benchmark and/or measure changes...	61%	67%	84%	68%	76%	71%	61%	67%	91%
I am satisfied with the pathway development...	56%	83%	72%	64%	67%	71%	67%	67%	70%
I am satisfied with the co-design process for RD&E prioritisation...	50%	71%	68%	67%	48%	76%	65%	64%	65%

FOCUS AREA

Nutrition and Soil

Nutrient products used and rate of application

Which nutrient products (both nitrogen-based and blended products) did you apply on your cotton field/s in 2023-24? Please select up to three each from the following lists.

Base: All growers who grew cotton during the 2023-24 season; n = 198

	% used product	Average application rate (in kg/ha) – fully irrigated	Average application rate (in kg/ha) – raingrown/ dryland
Nitrogen-based products			
Urea	91%	447.4	173.7
Anhydrous Ammonia	12%	232.0	21.4
Easy N	10%	103.7	0.0
Other (please specify)	3%	362.0	5.0
Blended products			
Cotton Sustain	24%	217.3	44.4
Granulock SS	2%	243.8	n/a
Granulock Zn	17%	164.2	60.0
MAP	20%	174.0	180.0
MAP (Zinc)	15%	160.2	45.0
DAP	4%	177.5	n/a
Compost	10%	5,894.1	4,750.0
Muriate of Potash	15%	107.7	20.0
Other (please specify)	20%	2,153.3	182.8
Nutrients applied *			
Nitrogen	n/a	238.25	86.56
Phosphorus	n/a	30.28	13.44
Potassium	n/a	22.56	3.16
Zinc	n/a	0.97	0.56
Sulfur	n/a	7.56	0.94

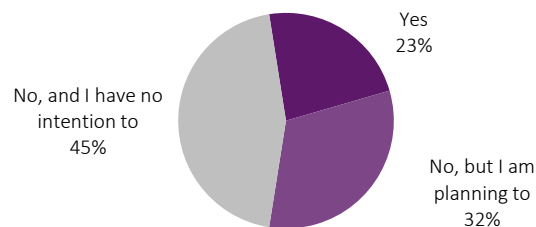
Key results by Region and Size of Total Farm Area (% used product)

	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
N-based products									
Urea	88%	90%	73%	92%	100%	100%	88%	94%	88%
Anhydrous Ammonia	6%	0%	27%	18%	0%	13%	7%	11%	22%
Easy N	12%	27%	9%	7%	10%	0%	15%	8%	5%
Other (please specify)	0%	3%	0%	3%	15%	0%	3%	4%	0%
Blended products									
Cotton Sustain	29%	13%	50%	38%	5%	0%	25%	21%	32%
Granulock SS	0%	0%	5%	0%	0%	9%	2%	2%	2%
Granulock Zn	18%	27%	18%	6%	10%	41%	20%	19%	10%
MAP	41%	3%	14%	11%	30%	41%	12%	21%	29%
MAP (Zinc)	18%	13%	9%	13%	45%	6%	8%	18%	17%
DAP	0%	0%	5%	3%	10%	0%	7%	4%	0%
Compost	12%	20%	9%	4%	0%	19%	12%	10%	5%
Muriate of Potash	35%	30%	18%	6%	10%	9%	13%	16%	12%
Other (please specify)	35%	23%	5%	23%	15%	16%	27%	18%	17%
Average application rate of nutrient across fully irrigated cotton growers (kg/ha)									
Nitrogen	280.13	158.98	276.08	248.13	316.79	207.01	206.20	241.84	286.66
Phosphorus	43.19	13.86	35.91	21.96	44.38	40.64	28.16	29.92	34.88
Potassium	37.88	25.67	43.04	26.80	7.49	3.33	21.41	21.34	27.49
Zinc	0.79	0.62	1.30	1.06	1.24	0.96	0.75	1.01	1.29
Sulfur	4.94	1.69	7.46	6.51	21.01	7.32	6.59	9.02	5.85

* "Nutrients applied" was calculated by reviewing each product and the proportion of each nutrient within each product per kg. These proportions were then multiplied by each product application rate and added together to provide an application rate of the nutrient.

Have you assessed your carbon footprint?

Base: All growers; n = 228



Key results by Region and Size of Total Farm Area

		Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
2021:	Yes 29%	22%	10%	12%	33%	29%	21%	7%	25%	44%
	No 70%	17%	33%	48%	35%	29%	21%	29%	34%	33%
	No, but I am planning to	17%	33%	48%	35%	29%	21%	29%	34%	33%
	No, and I have no intention to	61%	57%	40%	32%	43%	59%	64%	42%	23%

Of the **55%** or n = 125 who are assessing or plan to assess. . .

Why are you assessing your carbon footprint, and how ["are you achieving this" / "will you achieve this"]?

Base: All growers who are assessing or plan to assess their carbon footprint; n = 125

“Why?”

- 14% - Forced to / will be necessary/mandatory in future
- 14% - To establish a baseline / compare other inputs (e.g. organic fertilisers, less chemicals)
- 13% - Government / Bank has/will enforce this
- 11% - Marketing / Market access / Opportunities in the long-term
- 9% - For future carbon credits / financial gain / reduce costs
- 9% - Industry pressure / social license
- 8% - It's important for everyone to do for the future
- 7% - Self-interest
- 5% - Don't want to be left behind / everyone else is doing it
- 4% - For our own efficiencies
- 3% - Sustainability
- 10% - No reason provided / not sure / not specified

“How?”

- 35% - Someone else / bank / 3rd party / independent assessor
- 8% - Soil testing
- 7% - Online carbon calculator / self-assessment tools (e.g. Agripath, Green Earth, myBMP)
- 7% - Management / Record keeping of farm inputs and timing
- 3% - Benchmarking / Baselineing group
- 3% - Self-assessing (NFI)
- 30% - No method provided / not sure / not specified

Of the **45%** or n = 103 who are not assessing or planning to assess. . .

Why aren't you assessing your carbon footprint?

Base: All growers who are not assessing or planning to assess their carbon footprint; n = 87

- 26% - I don't have time / other things to focus on / other priorities
- 14% - No benefit / financial incentive for us to do this
- 11% - It's not necessary / required / won't do it until forced to
- 10% - Just haven't got around to it / taking steps to eventually assess
- 8% - I don't believe in climate change / carbon footprint / the science
- 8% - I don't believe it contributes to climate change / global warming
- 7% - It seems difficult to do / confusing / can't efficiently do this
- 7% - Waiting for more solid evidence to do this
- 6% - No interest / don't care
- 6% - We are already doing a lot of green initiatives / already sustainable
- 5% - Not worried / concerned about it at the moment
- 5% - Don't know enough about it / how to measure it

Have you made any changes to your cotton production system in order to lower your carbon footprint?

Base: All growers; n = 114 †



34%

Have made changes to their cotton production system in order to lower their carbon footprint

66% reported they have not made changes to their cotton production system

2021:
 Yes 39%
 No, planning to 18%
 No, no plans 39%
 Not sure 4%

Key results by Region and Size of Total Farm Area

	Central QLD (n=10)	Darling Downs (n=17)	Macintyre Balonne (n=15)	Northern NSW (n=37)	Macquarie (n=9)	Southern NSW (n=22)	Small (n=33)	Medium (n=57)	Large (n=24)
Yes	20%	53%	13%	49%	22%	27%	24%	40%	33%
No	80%	47%	87%	51%	78%	73%	76%	60%	67%

Of the 34% or n = 39 who are assessing or plan to assess. . .

What changes have you made to your cotton production system?

Base: All growers who have made changes to their cotton product system; n = 39

- 31% - Reduction of nitrogen / inorganic fertiliser use / chemicals
- 31% - Investing in more carbon-neutral equipment (e.g. better fuel efficiency, bigger machines, less hours, quicker water running, solar powered)
- 23% - Zero / Minimal tillage / passes
- 21% - Adjusted timing/application/scheduling (e.g. split urea application, water efficiency)
- 21% - Using more organic fertilisers such as compost, feedlot manure
- 8% - Using different inputs e.g. coated urea, inhibitors
- 5% - Crop rotation
- 5% - Increase efficiencies of inputs
- 5% - Returning stubble to the soil

Results above are a subjective coding of verbatim answers from respondents.
 † Question was asked on rotation to roughly 50% of respondents.

Barriers to lowering carbon footprint

What's stopping you from lowering your carbon footprint? What limitations do you see?

Base: All growers; n = 132 †

- 19% - Nothing / not sure
- 15% - Don't know enough about it / how to do it / lack of knowledge
- 14% - Cost involved / financial burden
- 11% - No incentive / financial benefit to us
- 11% - We are already doing a lot of green initiatives / already sustainable / can't manage our land any better
- 11% - Availability/Cost of alternative products / energy (e.g. fertilisers, diesel, electricity)
- 7% - Productivity / reduction in yield
- 5% - Other sacrifices to the business (e.g. work involved, time involved)
- 4% - No pressure for us to do it
- 4% - We don't have a baseline yet
- 3% - Not interested in doing it / not a concern for me
- 3% - Water availability / lack of rain / weather in a given season
- 3% - Lot of red tape / hoops to jump through / Government is the limitation
- 2% - I don't believe in it / already returning everything back into the soil
- 2% - Limitations of technology (e.g. non-diesel tractors)
- 2% - It seems difficult to do



FOCUS AREA

IPM and Crop Protection

This section of results from the 2024 Grower Survey covers questions asked about IPM and crop protection.

Some of the insights provided by growers are detailed below.

Half affected by disease, with a variety of tactics used to combat this

Growers were asked whether they had any of five listed diseases (Fusarium / Reoccurring / Verticillium Wilt, Alternaria Leaf Spot, and/or Black Root Rot) on-farm during the 2023-24 cotton growing season. From this, just over one in two (52%) reported they had at least one of the five listed diseases, with the highest incidence nationally being Verticillium Wilt (32% said this). This was most prominent in Northern NSW (52%) and Macquarie (45%).

This cohort was then asked what tactics they were using to combat these diseases – growers provided a variety of tactics, including the following:

- Crop rotation including changing crops, longer rotations, etc. (49% said this);
- Fallow, or otherwise stating they don't double crop (24%);
- Variety selection (17%);
- Using the recommended tactics / industry practice (13%);
- Planting later / when it's warmer (12%); and
- Treatment or otherwise apply chemicals / products (10%).

Inoculum levels – low monitoring, but useful information when performed

Around two in five (39%) reported that they have done on-farm monitoring of disease inoculum levels in their soil. This was more prominent among larger farms (53%) compared to medium (39%) and small (29%) farms.

Of this cohort that have reported they have done on-farm monitoring of disease inoculum levels, almost all (91%) said they have used this information on their disease inoculum levels to inform management decisions.

When asked about any areas they require more research or information, there was no one standout area but a variety of topics that growers indicated they wanted to learn more about. Details of these areas are provided next.

Incidence of disease on-farm during the 2023-24 cotton grow



52%

Reported at least one of five listed diseases on-farm during the 2023-24 cotton growing season

Top tactics reported by growers used to combat disease

49% - Crop rotation (inc. changing crops, longer rotations)

24% - Fallow / we don't double crop

17% - Variety selection

Areas that growers required more research or information



Which of the following diseases did you have on-farm during the 2023-24 cotton growing season?
 If you had a disease on-farm, please provide your best estimate of the yield loss (in bales per hectare).
 Base: All growers who grew cotton during the 2023-24 season; n = 198

Key results by Region and Size of Total Farm Area (% yes, on farm)

	Yes, on farm	Mean estimate of yield loss (of those who could provide an estimate)	Not on farm	Don't know
Verticillium Wilt	32% 2021: 28%	0.87 bales/ha (n = 42)	67%	1%
Black Root Rot	24% 2021: 29%	0.98 bales/ha (n = 26)	75%	1%
Alternaria Leaf Spot	19% 2021: 23%	0.41 bales/ha (n = 23)	80%	1%
Fusarium Wilt	17% 2021: 23%	0.54 bales/ha (n = 20)	82%	1%
Reoccurring Wilt	3% 2021: 5%	1.70 bales/ha (n = 3)	97%	1%

	Central QLD (n=17)	Darling Downs (n=30)	Macintyre Balonne (n=22)	Northern NSW (n=71)	Macquarie (n=20)	Southern NSW (n=32)	Small (n=60)	Medium (n=97)	Large (n=41)
Verticillium Wilt	6%	23%	23%	52%	45%	13%	25%	31%	44%
Black Root Rot	24%	17%	23%	23%	50%	22%	17%	25%	32%
Alternaria Leaf Spot	35%	17%	18%	14%	25%	19%	17%	18%	27%
Fusarium Wilt	12%	33%	14%	18%	15%	9%	12%	20%	20%
Reoccurring Wilt	12%	0%	0%	3%	5%	0%	3%	2%	2%

Of the **52%** or n = 103 who reported at least one of the five listed diseases on-farm. . .
 2021: 55%

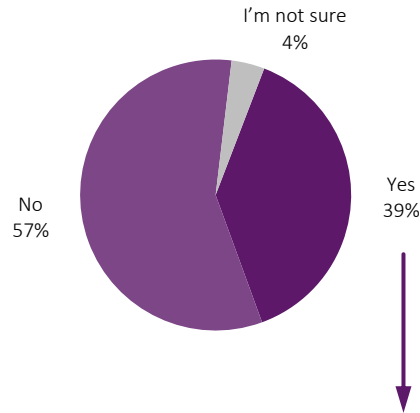
Can you describe what tactics you use to combat these diseases?
 Base: All growers who reported at least one of the five listed diseases on-farm; n = 103

- 49% - Crop rotation (inc. changing crops, longer rotations)
- 24% - Fallow / we don't double crop
- 17% - Variety selection
- 13% - Use the recommended tactics / industry practice (no further info)
- 12% - Planting later / when it's warmer
- 10% - Treatment / Apply chemicals / products
- 9% - Best practice field management (e.g. water management, try and keep it all at one end, wash machinery down, contractors)
- 3% - Pre-irrigation / irrigation / delay in crop irrigation to reduce stress
- 3% - Higher fertiliser rates for soil health

On-farm monitoring of disease inoculum levels

Have you done any on-farm monitoring of disease inoculum levels in your soil?

Base: All growers; n = 228

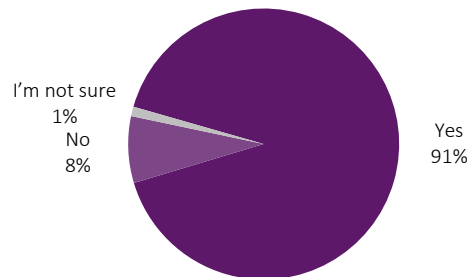


Key results by Region and Size of Total Farm Area

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
Yes	28%	33%	36%	44%	33%	47%	29%	39%	53%
No	72%	64%	56%	51%	67%	50%	69%	57%	40%
I'm not sure	0%	2%	8%	5%	0%	3%	1%	4%	7%

Has this information about the disease inoculum levels in your soil been used to inform management decisions?

Base: All growers who have done on-farm monitoring of disease inoculum levels; n = 88



Key results by Region and Size of Total Farm Area

	Central QLD (n=5)	Darling Downs (n=14)	Macintyre Balonne (n=9)	Northern NSW (n=33)	Macquarie (n=7)	Southern NSW (n=16)	Small (n=21)	Medium (n=44)	Large (n=23)
Yes	100%	93%	100%	82%	86%	100%	90%	86%	100%
No	0%	7%	0%	18%	0%	0%	10%	11%	0%
I'm not sure	0%	0%	0%	0%	14%	0%	0%	2%	0%

What areas do you require more research or information?

Base: All growers; n = 205 (question was amended during fieldwork)

28% - None / No / N/A / Not sure

19% - Info for a specific weed/disease, how to manage it, etc.

15% - Variety selection / dryland varieties / tropic varieties / varieties for a shortened growing season

6% - Disease / soil disease (NFI)

5% - Crop rotation / best choice of crop / how rotations affect inoculum levels

5% - Nitrogen / Fertiliser efficiency / management

4% - Soil nutrition / micronutrient management

4% - Water usage / efficiency / effects of certain irrigation systems

3% - Seed vigor

3% - Disease management

3% - Carbon / carbon sequestration / carbon improving yields / building soil carbon

3% - Soil health / ground preparation best practice

3% - Increasing yields (e.g. generally, on back-to-back cotton)

2% - Seed germination



Do you actively use a variety of tools, tactics and systems to enhance on-farm biosecurity?

Base: All growers; n = 228



69%

Reported actively using tools, tactics and systems to enhance on-farm biosecurity

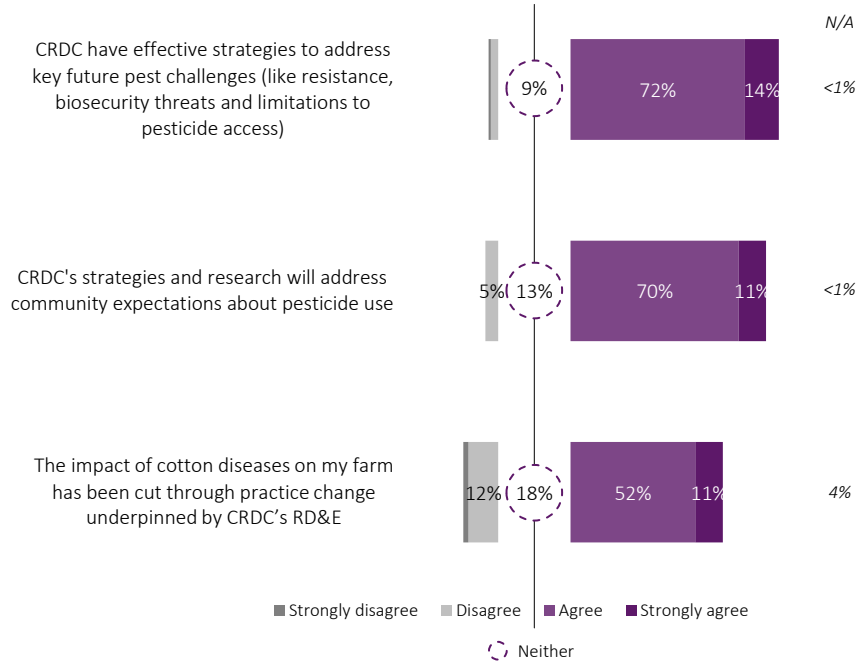
29% reported they have not done this, while 3% were not sure

Key results by Region and Size of Total Farm Area

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
Yes	67%	62%	68%	67%	67%	79%	60%	75%	67%
No	22%	36%	28%	32%	29%	21%	38%	24%	26%
I'm not sure	11%	2%	4%	1%	5%	0%	3%	1%	7%

Please tell us whether you agree or disagree with the following statements...
 Base: All growers; n = 228

Key results by Region and Size of Total Farm Area (% agree + % strongly agree)



	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
CRDC have effective strategies to address key future pest challenges (like resistance, biosecurity threats and limitations to pesticide access)	83%	93%	84%	84%	90%	100%	85%	88%	84%
CRDC's strategies and research will address community expectations about pesticide use	94%	88%	64%	76%	76%	97%	79%	82%	81%
The impact of cotton diseases on my farm has been cut through practice change underpinned by CRDC's RD&E	44%	64%	76%	65%	86%	56%	56%	65%	70%

FOCUS AREA

Workforce and Training

This section of results from the 2024 Grower Survey covers questions asked about their workforce and training.

Some of the insights provided by growers are detailed below.

The value of workers on-farm

Growers were asked to provide their agreement on statements regarding the value of workers:

- It is important to me that workers feel like a valued part of my farm business;
- Getting the right employees on farm is critical to my business success; and
- I do not really care who I have employed on farm as long as the job gets done.

It's clear that growers do value their workers, with 98% agreeing that it's important to them that workers feel valued, and 96% agreeing that getting the right employees on-farm is critical. Conversely, only 7% of growers agreed that they do not really care who they have employed on-farm, with the overwhelming majority (87%) disagreeing with this statement. The results are consistent with the 2018 survey results, the last time this question was included in the Grower Survey.

Agreement on statements regarding the value of workers



Almost all businesses undertake WHS activities on-farm

Growers were asked about how often the following Work Health Safety (WHS) activities have occurred over the last 12 months, with almost all (93%) growers reporting having at least one of seven listed activities occur at least once every two to three months. The top three WHS activities reported by businesses being undertaken at least once every two to three months were:

- Consultation with workers on WHS issues (83%);
- Train, coaching and mentoring staff (78%); and
- Reviewing workplace hazards (76%).



76%

Over the last 12 months, reported reviewing workplace hazards at least once every two to three months (e.g. hazard identification and action planning)

Most businesses have farm workplace policies (written plan or not written)

Growers were asked about their farm workplace policies – specifically documented policies that will contribute to cotton farms being safer and a workplace where people want to work and stay. Just over three in four (78%) of growers reported currently having at least one of five listed farm workplace policies (written plan or not written) relating to mental health support (64%), workplace bullying (63%), harassment (63%), discrimination (61%) and/or performance and career development reviews (57%).



78%

Reported having at least one of five listed farm workplace policies (written plan or not written)

Automation increasing on cotton farms

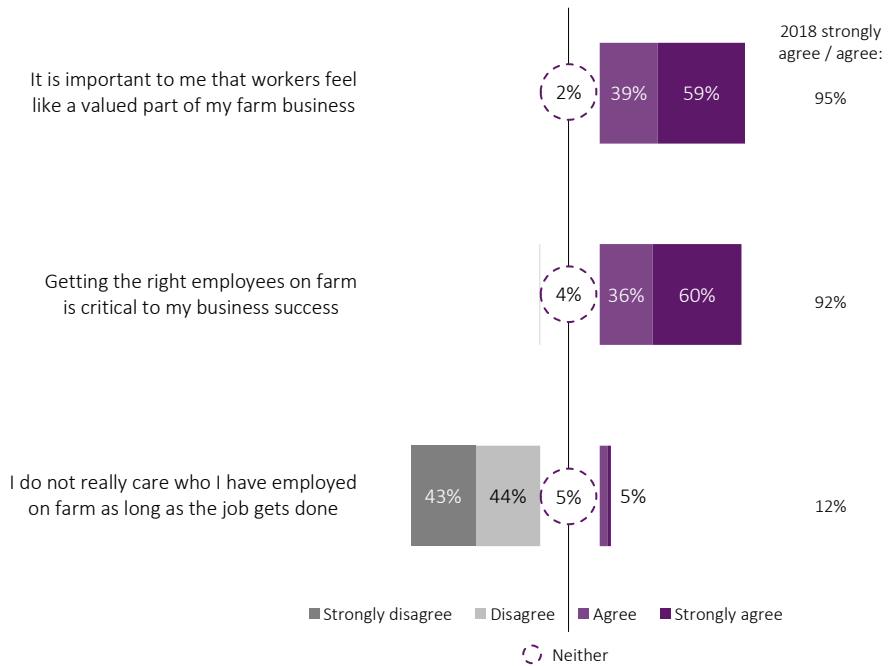
Growers were asked if they were currently using any automation (including automation for irrigation) on-farm – 46% said they were, an increase from 28% when asked in 2021 and 35% when asked in 2018. 31% reported that they were not currently, but are considering options for future (38% in 2021, 40% in 2018), whilst 22% said they have no plans to use automation (34% in 2021, 25% in 2018).



46%

Currently use automation on-farm (including automation for irrigation)

Please rate the following statements about the value of workers in your business:
Base: All growers; n = 228



Key results by Region and Size of Total Farm Area (% agree + % strongly agree)

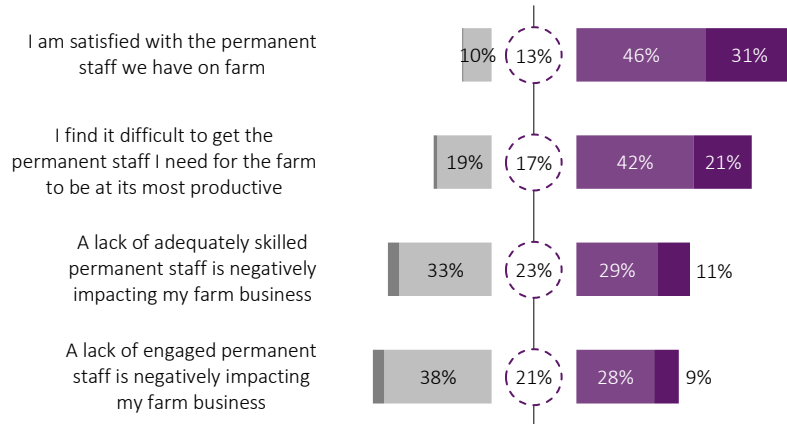
	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
It is important to me that workers feel like a valued part of my farm business	100%	95%	100%	96%	100%	100%	94%	100%	98%
Getting the right employees on farm is critical to my business success	100%	88%	100%	93%	100%	100%	90%	99%	95%
I do not really care who I have employed on farm as long as the job gets done	11%	2%	4%	7%	10%	12%	8%	6%	9%

Please provide feedback on whether your current staffing arrangements are meeting your business needs. Please provide feedback across both permanent staff and casual or contract staff.

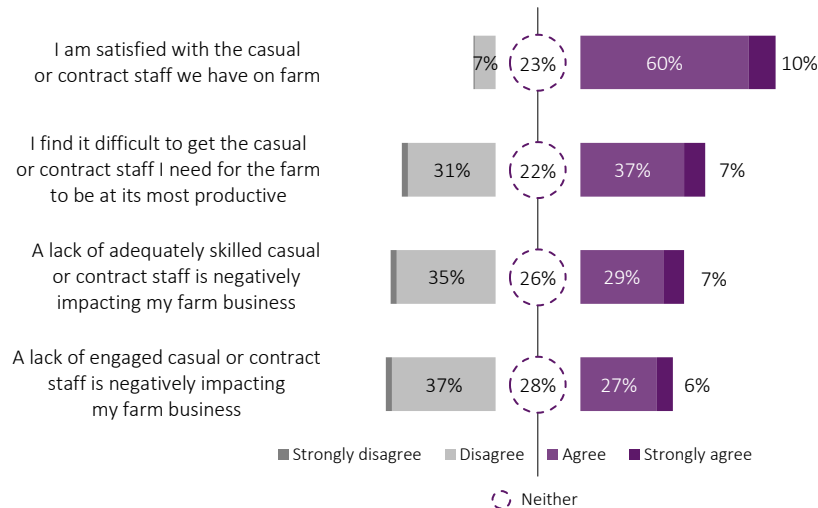
Base: All growers; n = 228

Key results by Region and Size of Total Farm Area (% agree + % strongly agree)

Permanent staff



Casual or contract staff

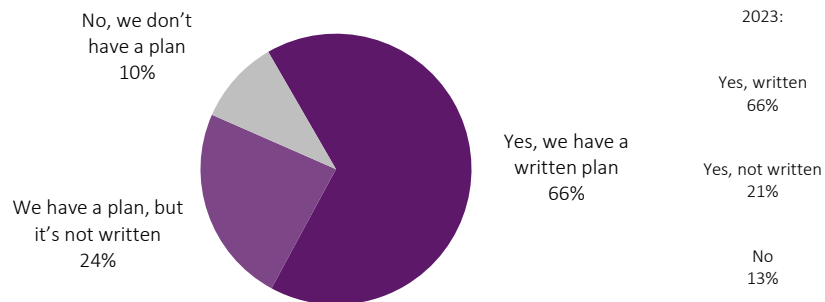


Strongly disagree
 Disagree
 Neither
 Agree
 Strongly agree

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
I am satisfied with the permanent staff we have on farm	72%	81%	80%	80%	67%	76%	75%	81%	67%
I find it difficult to get the permanent staff I need...	61%	40%	60%	72%	81%	59%	46%	70%	70%
A lack of adequately skilled permanent staff is...	33%	19%	44%	43%	67%	38%	22%	48%	51%
A lack of engaged permanent staff is...	39%	21%	32%	37%	57%	38%	24%	42%	42%
	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
I am satisfied with the casual or contract staff we have on farm	67%	69%	56%	67%	81%	76%	67%	70%	72%
I find it difficult to get the casual or contract staff I need...	44%	26%	40%	49%	67%	47%	35%	50%	44%
A lack of adequately skilled casual or contract staff is...	39%	14%	32%	44%	52%	35%	26%	42%	40%
A lack of engaged casual or contract staff is...	39%	12%	40%	36%	48%	26%	19%	42%	33%

Do you have a Work Health Safety Plan for your cotton-growing business?

Base: All growers; n = 228



Key results by Region and Size of Total Farm Area

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
2023:									
Yes, we have a written plan	61%	55%	84%	71%	76%	53%	46%	72%	86%
We have a plan, but it's not written	17%	36%	12%	25%	14%	24%	39%	19%	9%
No, we don't have a plan	22%	10%	4%	4%	10%	24%	15%	9%	5%

Does your business have a plan for the following?

Base: All growers; n = 228

	Yes, we have a written plan	We have a plan, but it's not written	No, we don't have a plan	N/A – no employees	% have a plan (written or not)
Mental health support	29%	35%	36%	n/a	64%
Workplace bullying (e.g. conflicts, disagreements)	42%	21%	37%	n/a	63%
Harassment (e.g. sexual, other harassment)	42%	21%	37%	n/a	63%
Discrimination (e.g. age, gender, cultural identity)	40%	21%	39%	n/a	61%
Performance and career development reviews (for employees)	29%	27%	36%	7%	57%



78%

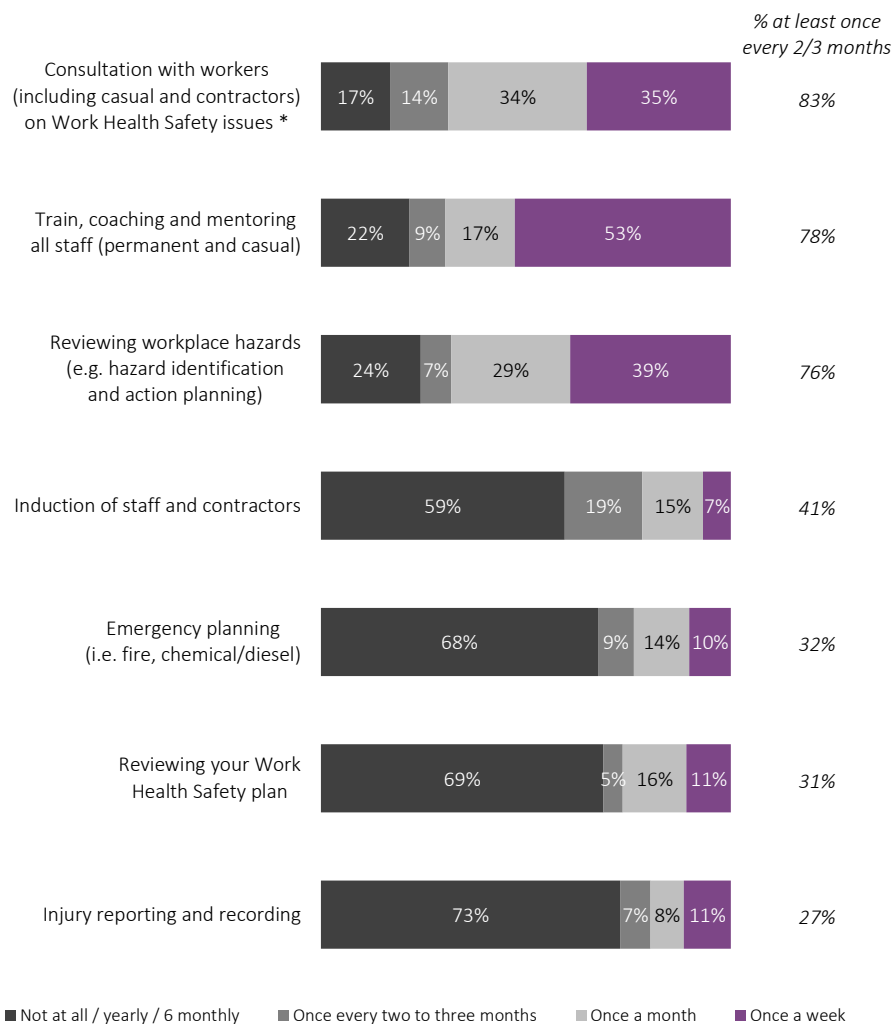
Reported having at least one of five listed farm workplace policies (written plan or not written)

Workforce and Training

WH&S activities on-farm

How often have the following activities occurred over the last 12 months? Please select the answers that best represents how often these activities occur.

Base: All growers; n = 148 (question was amended during fieldwork)



Key results by Region and Size of Total Farm Area (% at least once every 2/3 months)

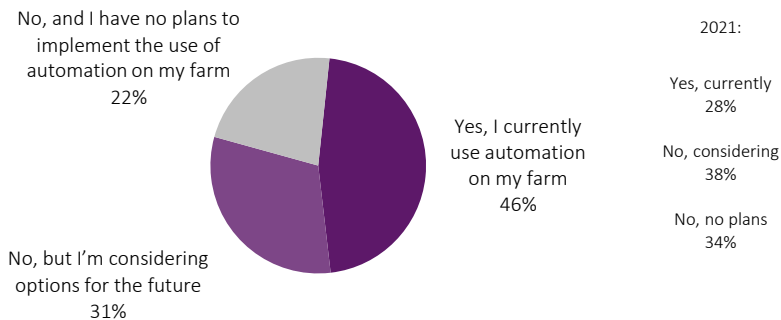
	Central QLD (n=8)	Darling Downs (n=27)	Macintyre Balonne (n=14)	Northern NSW (n=55)	Macquarie (n=15)	Southern NSW (n=19)	Small (n=46)	Medium (n=73)	Large (n=29)
Consultation with workers (including casual and contractors) on WHS issues	75%	70%	93%	84%	93%	79%	72%	85%	97%
Train, coaching and mentoring all staff (permanent and casual)	75%	63%	86%	78%	100%	68%	67%	81%	90%
Reviewing workplace hazards (e.g. hazard identification and action planning)	75%	74%	71%	80%	73%	68%	74%	73%	86%
Induction of staff and contractors	38%	22%	43%	47%	40%	21%	28%	37%	69%
Emergency planning (i.e. fire, chemical / diesel)	13%	41%	29%	44%	13%	16%	28%	29%	48%
Reviewing your Work Health Safety plan	25%	30%	29%	36%	33%	21%	35%	29%	31%
Injury reporting and recording	13%	26%	29%	27%	40%	26%	9%	29%	52%

Result labels shown if 5% or greater.

* Examples presented to the respondent were "(e.g. toolbox talks, new machinery, safety review, preseason or end of season meeting)"

Are you currently using any automation (including automation for irrigation) on your farm?

Base: All growers; n = 228



Key results by Region and Size of Total Farm Area

	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
Yes, currently	39%	50%	48%	51%	43%	32%	38%	51%	49%
No, considering	44%	31%	20%	27%	43%	38%	31%	29%	37%
No, no plans	17%	19%	32%	23%	14%	29%	32%	19%	14%

The Federal Government are reviewing the need for an agricultural apprenticeship for farms. Would you consider the following options for an agricultural apprenticeship?

Base: All growers; n = 228



84%

Would consider recruiting a new person to complete an apprenticeship



68%

Would consider enrolling an existing staff member to complete an apprenticeship

Key results by Region and Size of Total Farm Area

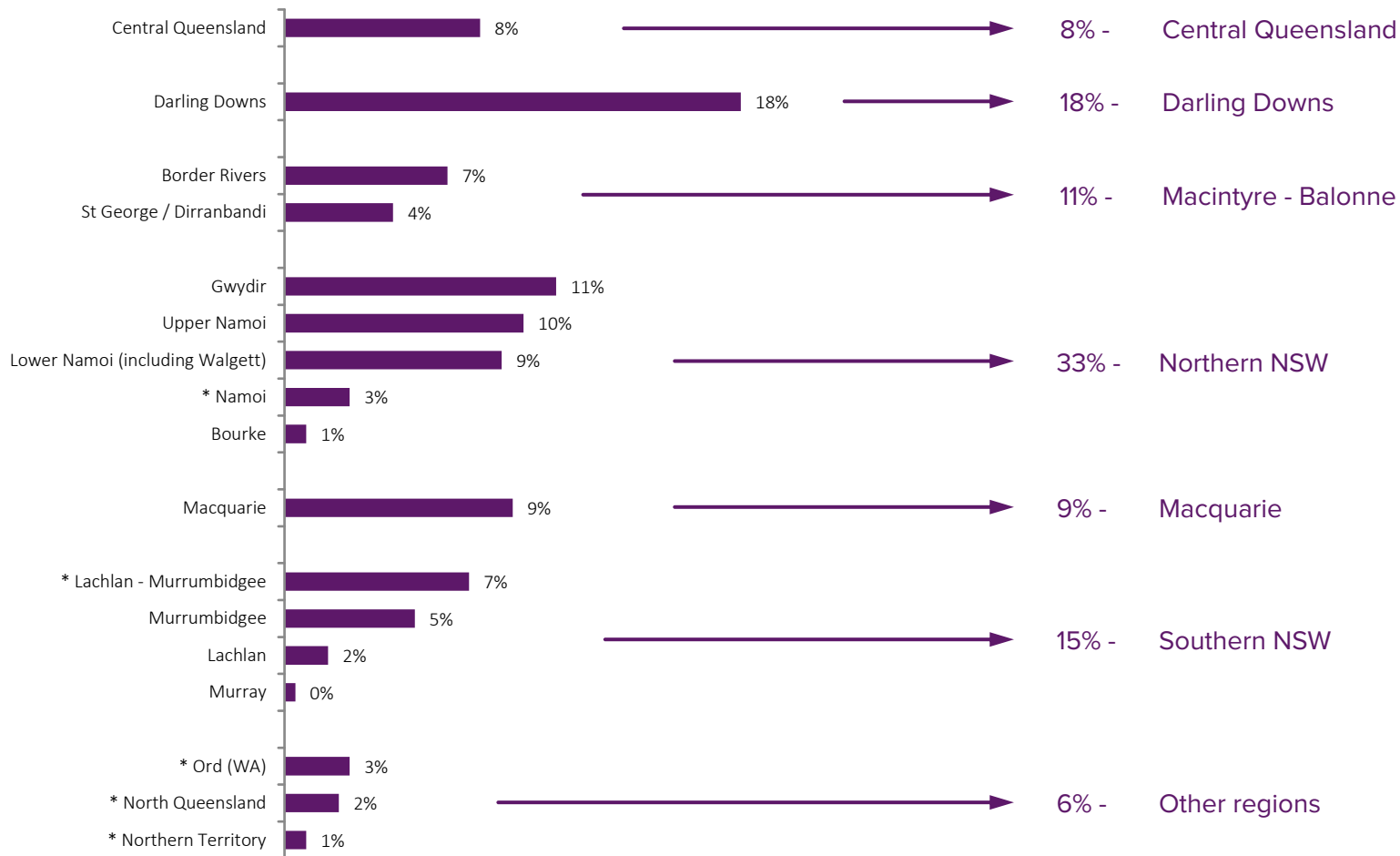
	Central QLD (n=18)	Darling Downs (n=42)	Macintyre Balonne (n=25)	Northern NSW (n=75)	Macquarie (n=21)	Southern NSW (n=34)	Small (n=72)	Medium (n=113)	Large (n=43)
Recruiting a new person	89%	79%	84%	84%	86%	82%	69%	90%	93%
Enrolling an existing staff member	78%	50%	60%	77%	81%	62%	53%	70%	91%



Appendices

Region of respondent

In which region are you located?
 Base: All growers; n = 228

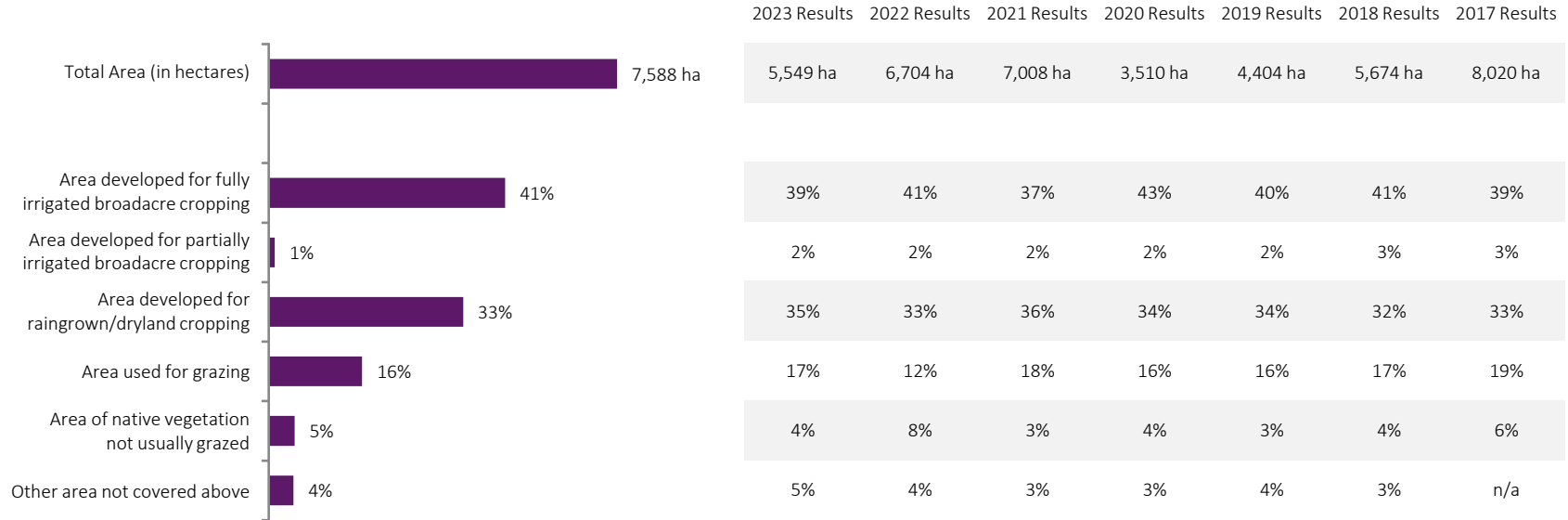


† Coded from Other (please provide postcode) answers.

Historical data of land area/distribution

What is the total area of your farm (in hectares), and of the total area of your farm, what is the area attributed to the following?

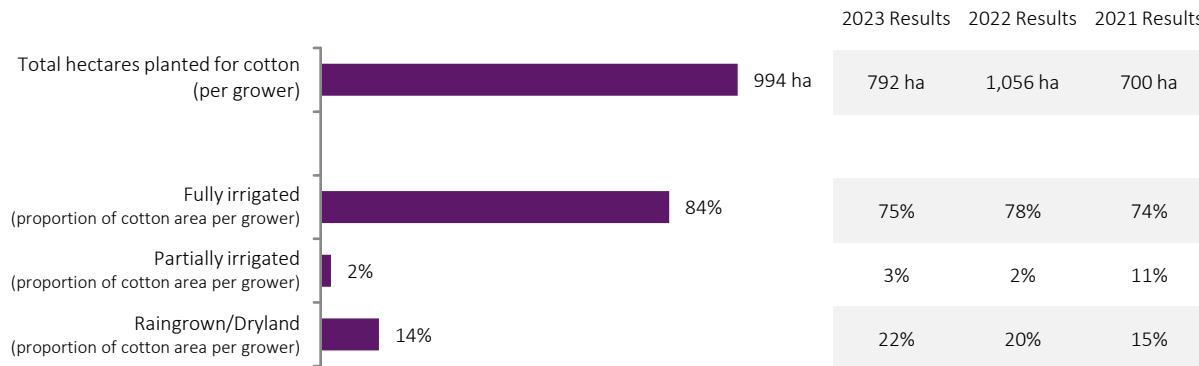
Base: All growers; n = 228



Historical data of cotton area and fully irrigated yield

What was the total number of hectares planted for cotton during the 2023-24 cotton growing season?
 And of these hectares, how many hectares were fully irrigated, partially irrigated or raingrown/dryland?

Base: All growers who grew cotton during the 2023-24 season; n = 198



What were your yields for the 2023-24 cotton growing season across the cotton areas?

Base: All growers who grew cotton during the 2023-24 season; n varies

(Fully Irrigated, n = 176, Raingrown/Dryland, n = 45)

Part irrigation not reported due to low sample size.

	Fully Irrigated (bales per ha)	2023 Results	2022 Results	2021 Results	2020 Results	2019 Results	2018 Results	2017 Results
Average yield	11.93	10.19	11.31	11.88	10.45	10.23	11.22	9.88
Yield achieved by your highest-yielding field (average of grower-reported yield)	13.57	11.96	13.03	13.13	11.55	11.95	12.61	11.07
Yield achieved by your lowest-yielding field (average of grower-reported yield)	10.13	8.19	9.09	10.38	9.24	8.53	9.46	8.22
Range of variation from average yield	3.44	3.77	3.94	2.74	2.31	3.42	3.15	2.85

Reliability of the Estimates

The estimates in this report are based on information obtained from a sample survey. Any data collection may encounter factors, known as non-sampling error, which can impact on the reliability of the resulting statistics. In addition, the reliability of estimates based on sample surveys are also subject to sampling variability. That is, the estimates may differ from those that would have been produced had all persons in the population been included in the survey.

Non-sampling error

Non-sampling error may occur in any collection, whether it is based on a sample or a full count such as a census. Sources of non-sampling error include non-response, errors in reporting by respondents or recording of answers by interviewers and errors in coding and processing data. Every effort is made to reduce non-sampling error by careful design of survey questionnaires and quality control procedures at all stages of data processing.

Sampling error

One measure of the likely difference is given by the standard error (SE), which indicates the extent to which an estimate might have varied by chance because only a sample of persons was included. There are about two chances in three (67%) that a sample estimate will differ by less than one SE from the number that would have been obtained if all persons had been surveyed, and about 19 chances in 20 (95%) that the difference will be less than two SEs.

Calculation of Confidence Interval

If 50% of all the people in a population of 20,000 people drink coffee in the morning, and if you were repeat the survey of 377 people ("Did you drink coffee this morning?") many times, then 95% of the time, your survey would find that between 45% and 55% of the people in your sample answered "Yes".

The remaining 5% of the time, or for 1 in 20 survey questions, you would expect the survey response to more than the margin of error away from the true answer.

When you survey a sample of the population, you don't know that you've found the correct answer, but you do know that there's a 95% chance that you're within the margin of error of the correct answer.

In terms of the numbers selected above, the margin of error *MoE* is given by:

$$MoE = z * \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

where *n* is the sample size, \hat{p} is the fraction of responses that you are interested in, and *z* is the [critical value](#) for the 95% confidence level (in this case, 1.96).

This calculation is based on the [Normal distribution](#) and assumes you have more than about 30 samples.

Margin of Error for a given sample size and survey estimate	Sample Size											
	30	50	75	100	150	198 (# growers completed)	228 (# surveys completed)	250	300	500	1,000	1,500
10%	n/a	n/a	n/a	± 5.88%	± 4.80%	± 4.18%	± 3.89%	± 3.72%	± 3.39%	± 2.63%	± 1.86%	± 1.52%
20%	n/a	± 11.09%	± 9.05%	± 7.84%	± 6.40%	± 5.57%	± 5.19%	± 4.96%	± 4.53%	± 3.51%	± 2.48%	± 2.02%
30%	n/a	± 12.70%	± 10.37%	± 8.98%	± 7.33%	± 6.38%	± 5.95%	± 5.68%	± 5.19%	± 4.02%	± 2.84%	± 2.32%
40%	± 17.53%	± 13.58%	± 11.09%	± 9.60%	± 7.84%	± 6.82%	± 6.36%	± 6.07%	± 5.54%	± 4.29%	± 3.04%	± 2.48%
50%	± 17.89%	± 13.86%	± 11.32%	± 9.80%	± 8.00%	± 6.96%	± 6.49%	± 6.20%	± 5.66%	± 4.38%	± 3.10%	± 2.53%
60%	± 17.53%	± 13.58%	± 11.09%	± 9.60%	± 7.84%	± 6.82%	± 6.36%	± 6.07%	± 5.54%	± 4.29%	± 3.04%	± 2.48%
70%	n/a	± 12.70%	± 10.37%	± 8.98%	± 7.33%	± 6.38%	± 5.95%	± 5.68%	± 5.19%	± 4.02%	± 2.84%	± 2.32%
80%	n/a	± 11.09%	± 9.05%	± 7.84%	± 6.40%	± 5.57%	± 5.19%	± 4.96%	± 4.53%	± 3.51%	± 2.48%	± 2.02%
90%	n/a	n/a	n/a	± 5.88%	± 4.80%	± 4.18%	± 3.89%	± 3.72%	± 3.39%	± 2.63%	± 1.86%	± 1.52%

Note. Margin of Errors are provided at the 95% confidence level on the assumption of a large population size (non-finite) and normally distributed. Results labelled "n/a" are due to the assumption of the normal distribution not being upheld ($n\hat{p} < 10$ or $n(1-\hat{p}) < 10$).

Objective

The purpose of the CRDC Cotton Grower Survey is to capture valuable information about cotton farming practices to give a greater understanding of the industry’s current practices and performance – so that trends can be monitored over time, practice change can be accurately measured, and areas for improvement and further RD&E investment identified. The annual Survey also aims to capture important information about growers’ understanding and perception of cotton RD&E, led by CRDC.

Methodology

The 2024 Grower Survey was conducted using a CATI (Computer Assisted Telephone Interviewing) data collection methodology. This included:

- o Growers being contacted and invited to complete the survey over the phone;
- o Where this was not possible immediately, an interview appointment time was agreed and the interview completed at the agreed time.

Sample

In total, a sample of n = 963 businesses was provided by CRDC, with n = 228 surveys completed (completion rate of 23.7%). A breakdown of the number of surveys completed by Region is located below.

Region	Sample Size	Completed Surveys	Region	Sample Size	Completed Surveys
Overall	963	228	Northern NSW	319	75
Central Queensland	73	18	Macquarie	92	21
Darling Downs	166	42	Southern NSW	146	34
Macintyre – Balonne	104	25	Other	63	13

Questionnaire

Growers were asked to complete a 24-minute survey which covered a range of topics related to their cotton growing experience both on and off-farm. Key areas of interest included:

- Farm profiles
- 2023-24 cotton crop
- Irrigation
- R&D impact on farming systems
- Nutrition and soil
- IPM and crop protection
- Workforce and training
- Voice of the grower

Please note that due to the length of the survey (in excess of 45 minutes) after n = 32 completes, questions were either removed or presented on rotation to respondents to reduce the length of the survey down to 24 minutes.

Timing

The survey was launched on 5 June 2024 and remained open until 28 June 2024.



Want more information?

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