



2019 GROWER SURVEY

DECEMBER 2019

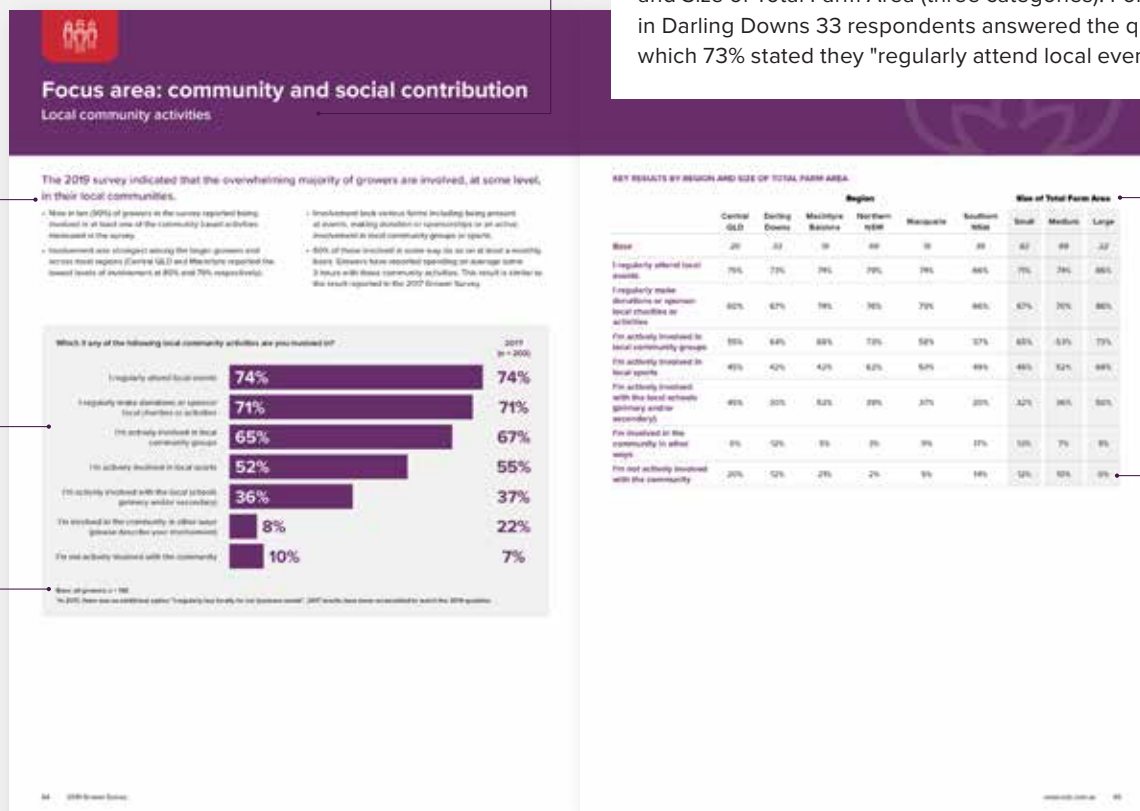
How to navigate the report

The commentary to the left provide 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 results below are results of survey measurements reported at an overall level – covering all regions and farm sizes.

The banner above each page denotes the section and sub-section currently navigated to in the report. For example, this page is within the “community and social contribution” section (denoted by the heading and the icon at the top left) and covers questions regarding “local community activities”.

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 instance, in Darling Downs 33 respondents answered the question, of which 73% stated they “regularly attend local events”.



The base represents the cohort of respondents to the question (e.g. all growers), and the number that provided an answer to the question (192). Growers did not necessarily answer each question – as a result, the base across questions may vary.

Segments were categorised as follows:

Region (based on Location in Q4)

- 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 in Q6)

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

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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 CRDC and Cotton Australia Australian Grown Cotton Sustainability Report, and the industry's best practice program, *myBMP*, and 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.

2019 Grower Survey

Background to the 2019 Grower Survey

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. This information helps inform CRDC about the benefits of the research it invests in. 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, researchers and others. The 2019 Grower Survey has been refined by the working group with reference to both the 2017 and 2018 surveys, 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 the CRDC 2018-23 Strategic RD&E Plan.

The 2019 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 were included in the survey including:
 - water;
 - energy;
 - nutrition and soil;
 - myBMP;
 - IPM and crop protection;
 - natural resource management;
 - industry research trials;
 - community and social contribution; and
 - industry sentiment.

The results from the 2019 Grower Survey now follows.

How the survey was conducted

The 2019 Grower Survey was conducted using a mixed mode data collection methodology.

This included:

- Growers where email contact details were available were invited to complete the survey online;
- Growers were also contacted by phone to firstly encourage them to complete the survey online and, where possible, complete the survey over the phone.

When the survey was conducted

Surveys have usually been conducted in winter, focusing specifically on the preceding crop. The 2016 survey was however conducted in February 2016.

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

The 2019 Grower Survey opened on 11th June 2019 and ran until 13th July 2019.





2018-19 Season Wrap-Up

A look at the 2018-19 season

The 2018-19 cotton season was impacted by the prolonged dry conditions facing most of the cotton growing regions. There was a significant decline in the total area planted to cotton this season, as a result of below average rainfall, very low levels of soil moisture, and a lack of stored irrigation water.

The Australian cotton industry in 2018-19:

- **336,000 hectares** – planted into irrigated and dryland cotton, down 30 percent on 2017-18
- **2.2 million bales** – produced by the Australian cotton industry, down from 4.5 million the previous year
- **6.4 bales per hectare (10.0 irrigated, 1.2 dryland)** – the average yield for the 2018-19 crop, compared to 9.7 bales per hectare in 2017-18 (11.8 irrigated, 2.5 dryland).

Source: ABARES Ag Commodities Report, June 2019;
Cotton Grower Yearbook, 2019

CRDC'S INVESTMENT IN 2018-19

\$24.1 million

CRDC's investment in cotton RD&E on behalf of cotton growers and the Australian Government

285 RD&E projects

116 research partners

5 key program areas

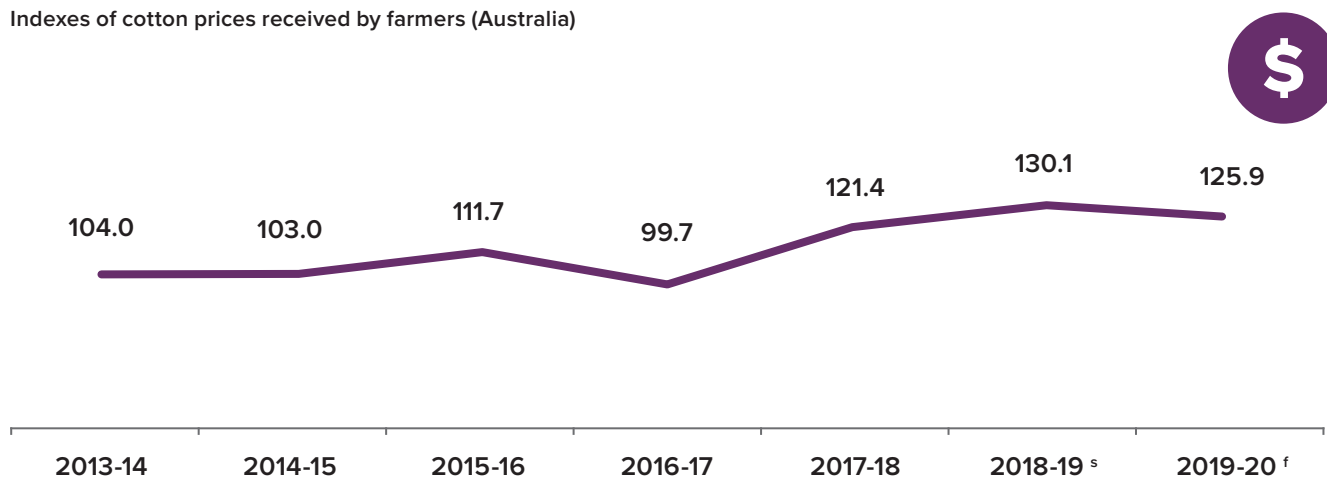
increasing productivity and profitability on Australian cotton farms; improving cotton farming sustainability and value chain competitiveness; building the adaptive capacity of the Australian cotton industry; strengthening partnerships and adoption; and driving RD&E impact.

1st year

of the CRDC 2018-23 Strategic RD&E Plan

Commodity performance indicators

Indexes of cotton prices received by farmers (Australia)

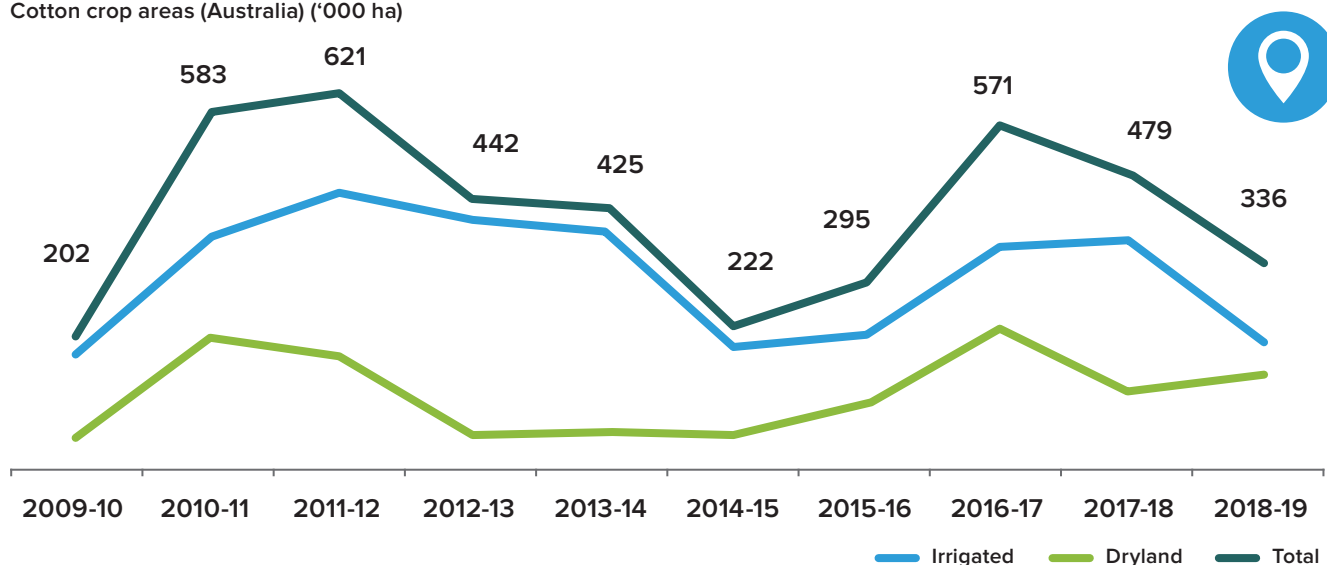


^f ABARES forecast. ^s ABARES estimate.

Note: The indexes for commodity groups are calculated on a chain weighted basis using Fisher's ideal index with a reference year of 1997-98 = 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 \$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 \$40,000 from 2015-16.

Source: ABARES; Australian Bureau of Statistics

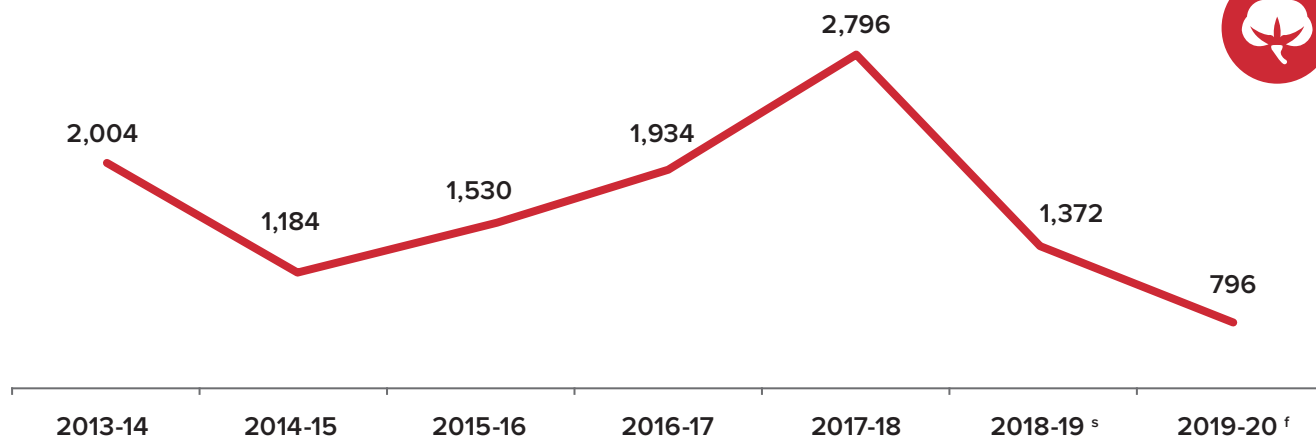
Cotton crop areas (Australia) ('000 ha)



Source: Cotton Grower Yearbooks



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

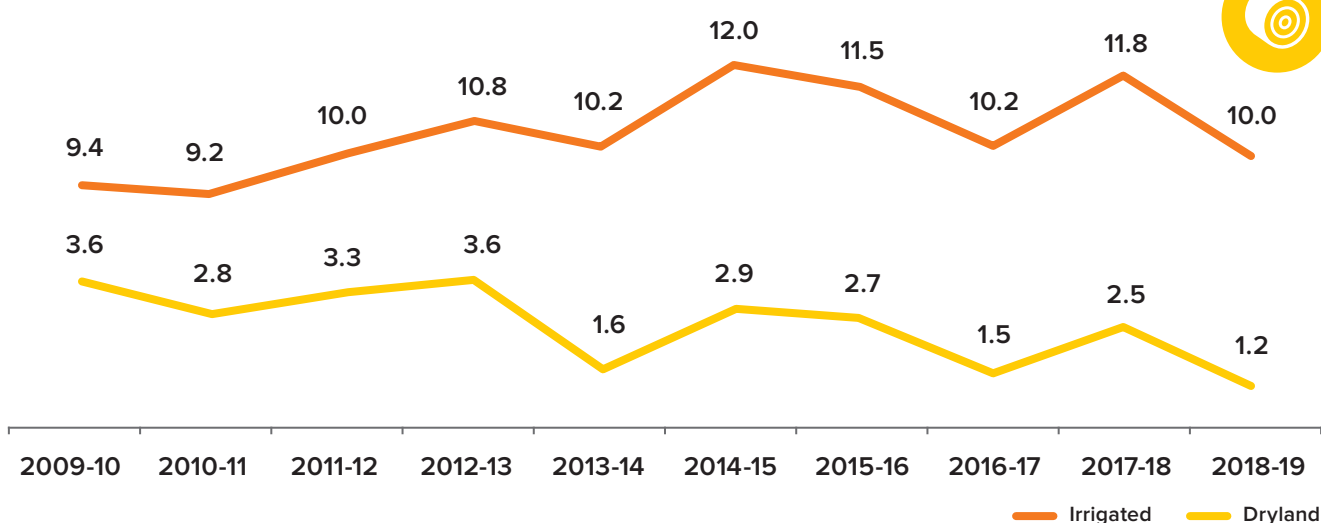


^f ABARES forecast. ^s ABARES estimate. ^{*} Value delivered to gin.

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 \$40,000 from 2015-16.

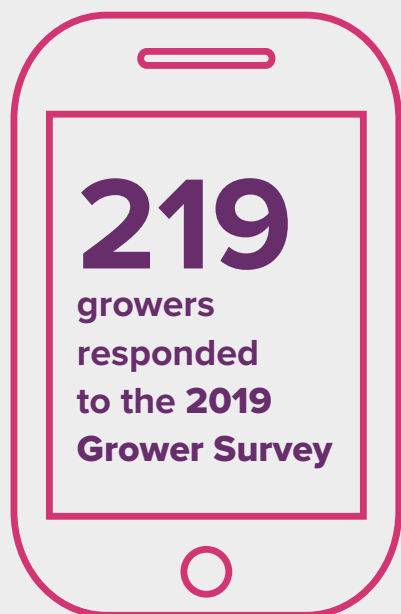
Sources: ABARES; Australian Bureau of Statistics

Average cotton yields (Australia) (bales/ha)



Source: Cotton Grower Yearbooks

Key findings



80% of growers are very positive about the future of the industry



14% of total farm area was under cotton production in 2018-19



Growers reported an average of 298 hectares under cotton



YIELDS
AVERAGE YIELDS
(BALES / HA)

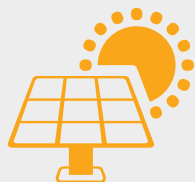
10.23 (fully irrigated)

1.47 (raingrown | dryland)



WATER USE
AVERAGE WATER
APPLIED (ML/HA)

7.71 ML / ha (fully irrigated)



27% of growers generated and used solar energy on their farm in 2018-19



73% of growers managed the limited water by planting only the cotton area there was enough water to fully irrigate



91%

of growers used **autosteer** for most machinery operations, with **64%** using **traction control systems** for most machinery operations



Growers described the season as **dry, hot, challenging** and **tough**



36% used **manures or composts** as part of their nutrition program



69% were proud to have some form of **airborne species** on their farm on in their local landscape



8% of growers used irrigation water to water **drought effected** areas of vegetation



24% of growers had **cotton industry research trials** on their farm last season



90% are actively involved in **local community activities**



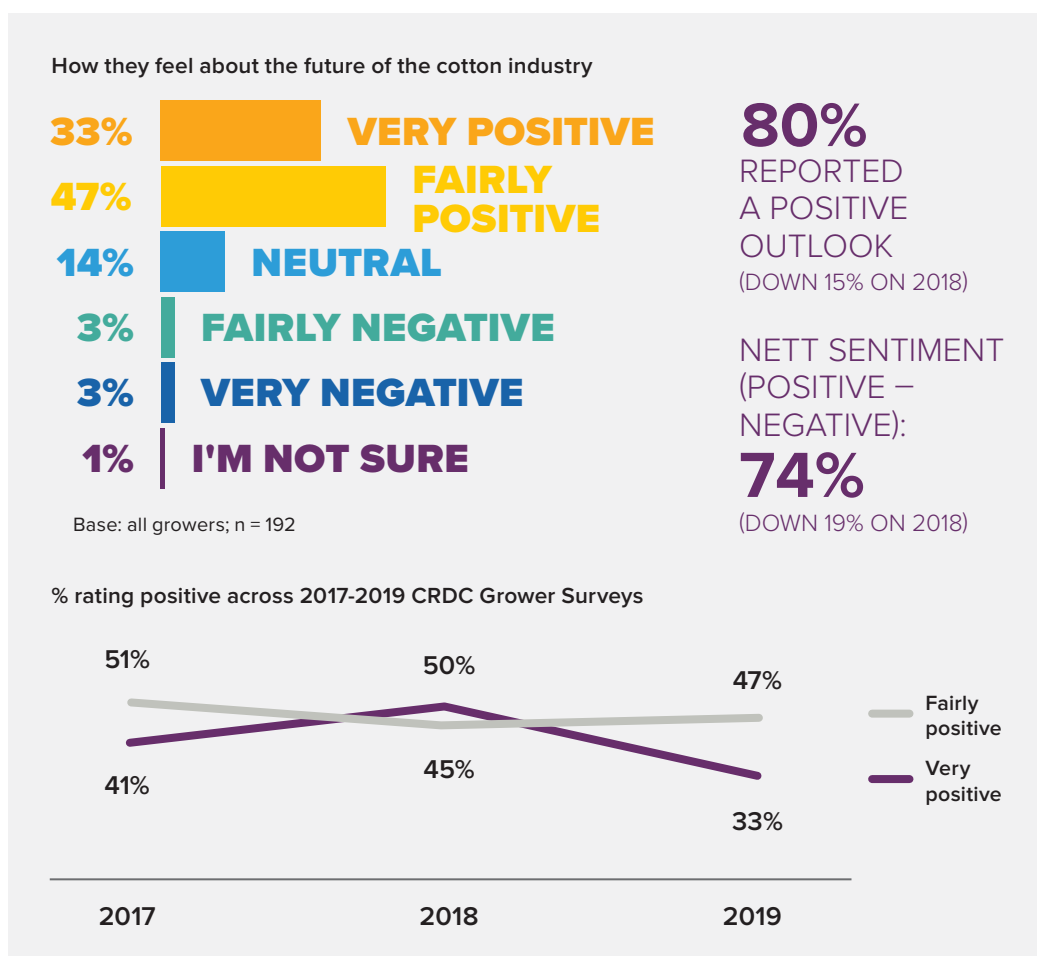
Focus area: industry sentiment

Feelings about the future of the cotton industry

The feedback from the 2019 CRDC Grower Survey indicates a positive level of confidence and optimism about the future of the industry among cotton growers. That said, the results indicate a softening in grower confidence from previous years. It's likely that the dry conditions of the season and the forecasts have contributed to this decline. We also note that:

- The overwhelming majority of growers continue to be positive about the future (80%) with just 6% holding a negative view. This was a decrease (down 15 points) on the 2018 result.
- That said, there are fewer growers reporting being very positive. The enthusiasm about the future remains strong overall, but is perhaps a little more cautious in this outlook.
- This level of optimism remains consistent across all geographies and all farm sizes. While the results vary slightly across regions, the results still indicate a positive level of optimism.

The results from this measure over the past three years are shown opposite and point to small changes in the nature of confidence among growers.

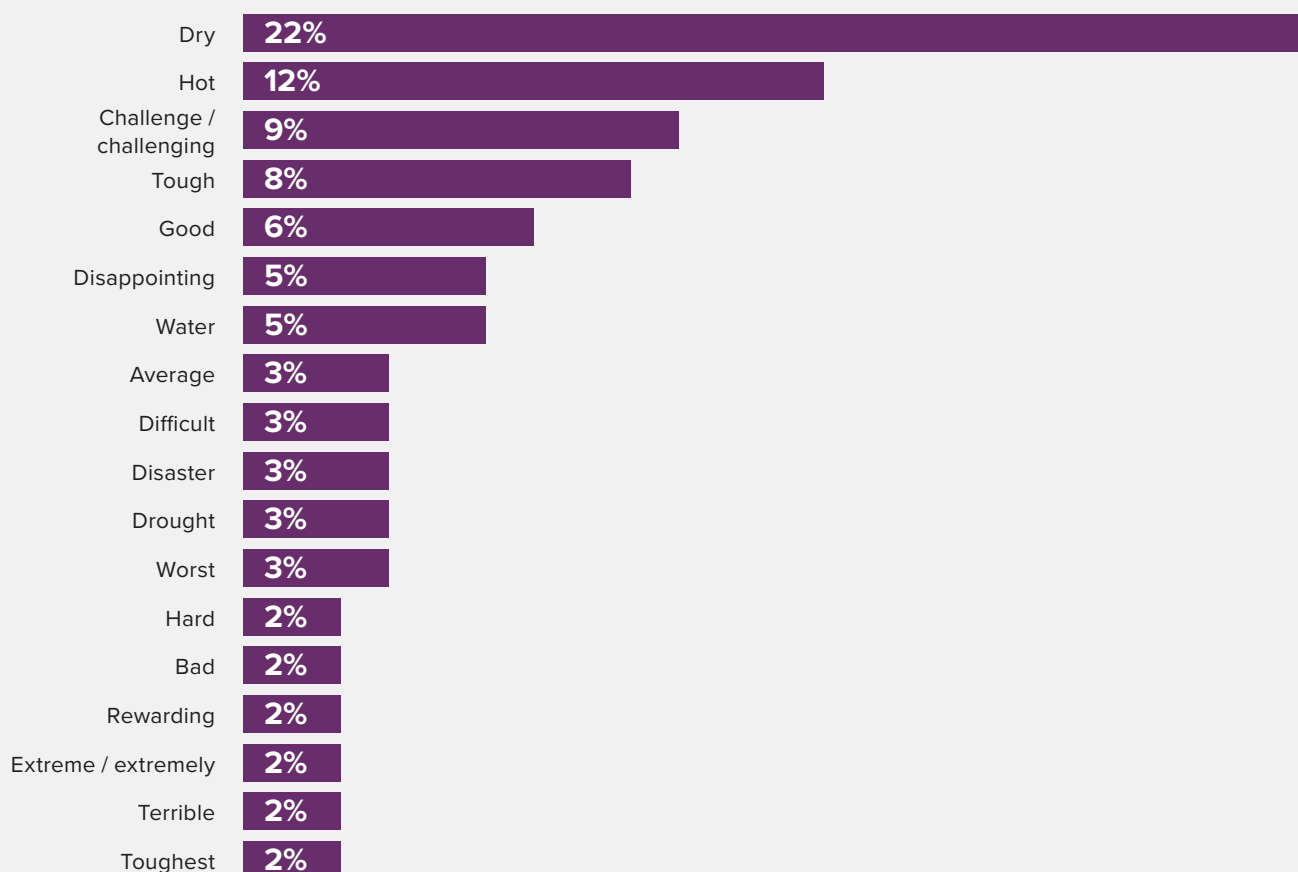


KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
Positive outlook	85%	88%	74%	83%	63%	77%	78%	77%	100%
Negative outlook	5%	9%	5%	6%	5%	3%	9%	5%	0%
Nett sentiment	80%	79%	68%	77%	58%	74%	70%	73%	100%

Describing the 2018-19 season

Describe the 2018-19 cotton season in three words or less:



Base: all growers; n = 188

Note: only relevant words mentioned by at least 2% (n = 3 or more) of growers are listed above.





Focus area: industry sentiment

Sentiment about their farming business and the cotton industry

Growers were asked specifically about the role of R&D and the profitability of cotton. The results from the 2019 survey compared with the same measures collected in the 2018 survey show that:

- Growers remaining in agreement that RD&E drives improvement in the industry (nine in ten agree although results have softened this year - down 6 points on the 2018 result); and
- The majority of growers (84%) agree that cotton is profitable and consistently their crop of choice. The result overall has remained largely unchanged since 2018 but we do note a small decline in the proportion of growers who strongly agree with this statement (down 4 points).

Overall there continues to be a strong endorsement of both these positions with very few farmers disagreeing with these statements (4% disagree).

Would you agree or disagree with the following statements about your farming business and the cotton industry: (% Agree)

Research, development & extension drive continuous improvement of the Australian cotton industry

37%

(down 9% on 2017-18)

53%

(up 3% on 2017-18)

4%

disagree

Cotton is profitable and consistently my crop of choice

37%

(up 3% on 2017-18)

47%

(down 4% on 2017-18)

8%

disagree

Base all growers; n = 192

% Agree

% Strongly Agree

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (% AGREE + STRONGLY AGREE)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
RD&E drive continuous improvement of the Aus cotton industry	85%	91%	89%	92%	89%	86%	84%	94%	91%
Cotton is profitable and consistently my crop of choice	80%	73%	89%	85%	84%	66%	74%	78%	100%





Focus area: industry sentiment

Factors that limit the bottom line of their cotton business

When asked about what things may be limiting their bottom line, growers were direct and single minded, reporting that:

- More than eight in ten identified water and climate as the factors that most impacted yield in the 2018-19 season. This was articulated from a number of different perspectives including:
 - availability of water
 - weather over the growing season
 - lower than anticipated rainfall
 - price of water
 - moisture levels

Other factors mentioned by fewer growers included input costs (fuel, water, wages, chemicals) and labour shortages.

What factors do you believe LIMITED yield last season (2018-19)?

83% - Water / climate related

- Water
- Availability of water
- Weather / Climate / Season
- Lack of water / irrigation water
- Rain / Rainfall
- Cost/price of water
- Lack of rain
- Moisture / Moisture availability
- Drought conditions
- Heat / Hot weather

18% - Input costs

- Fuel / Energy costs
- Cost/price of water
- Wages / cost of labour
- Cost of chemicals
- Input costs
- Cost of fertiliser

9% - Farm-related Issues

- Lack of suitable labour
- Soil type / Soil constraints

7% - Seed

- Monsanto / Monsanto royalties / Licensing fees
- Bollgard® 3 (not specified)
- Seed varieties

6% - Government

- Government policy/regulations
- Government (unspecified)
- Government interference

4% - Disease

- Verticillium wilt

3% - Media

- Negativity in the media

3% - Price of cotton



Base all growers; n = 191

Note: only verbatims mentioned by at least 2% (n = 3 or more) of growers are listed above.



What the growers said...

"Irrigation water and rainfall. Government regulations and social media. The cotton industry is being bashed on social media, the cotton industry is being blamed for no water in the river systems."

"Consistent rainfall. Very poor water retention in our overland flow systems, we have massive periods of runoff, followed by no rain at all and we should be storing some of that water."

"The introduction of Bollgard® 3. Resistant to a lot of grubs and insects and makes it easier to grow with less chemical."

"The way Govt has dealt with water reform. The damage they have done to the water industry will be felt for a long time."

"Weather and the difficulty of growing dryland cotton, Monsanto seeds for dryland cotton is way too expensive."

"Inexperience. Our infrastructure isn't where we need it to make cotton a big thing for us at this point."

"Shortage of water and rain. Poorly designed (overweight) machinery options dominating the market."

"Lack of water and lack of understanding of irrigators and farmers needs by Government."

"The infrastructure of water hasn't been changed for 40/50 years. Political meddling."

"Water. Soil. If you had all the water you could, you would run into other problems."

"We had 30% of our water embargoed and we had to buy water. Water availability."

"The price of coarse grain works out to be better than risking a cotton crop."

"The price of cotton and the seasons. The price to grow and sell cotton."

"Water and government. They are not doing enough to stipulate the water."

"Water and negative publicity about water, we need people to be on side."

"The general costs. Wages, chemicals, price of water, price of diesel."

"Drought and six dry seasons in a row. The cost of the technology."

"Regulations meaning Government Regulations and the environment."

"Rain. And weather, less reliable rainfall, more severe storms."

"Cost. Chemical cost and license fees. Cost of pumping water."

"Water is the biggest and most factor within our bottom line."

"Lack of water and the attitude of government and the media."

"Availability of water and input costs, fuel and labour."

"Lack of water. Availability of water. Costs of water."

"Moisture availability and disease. Verticillium wilt."

"Climate conditions and govt restrictions (red tape)."



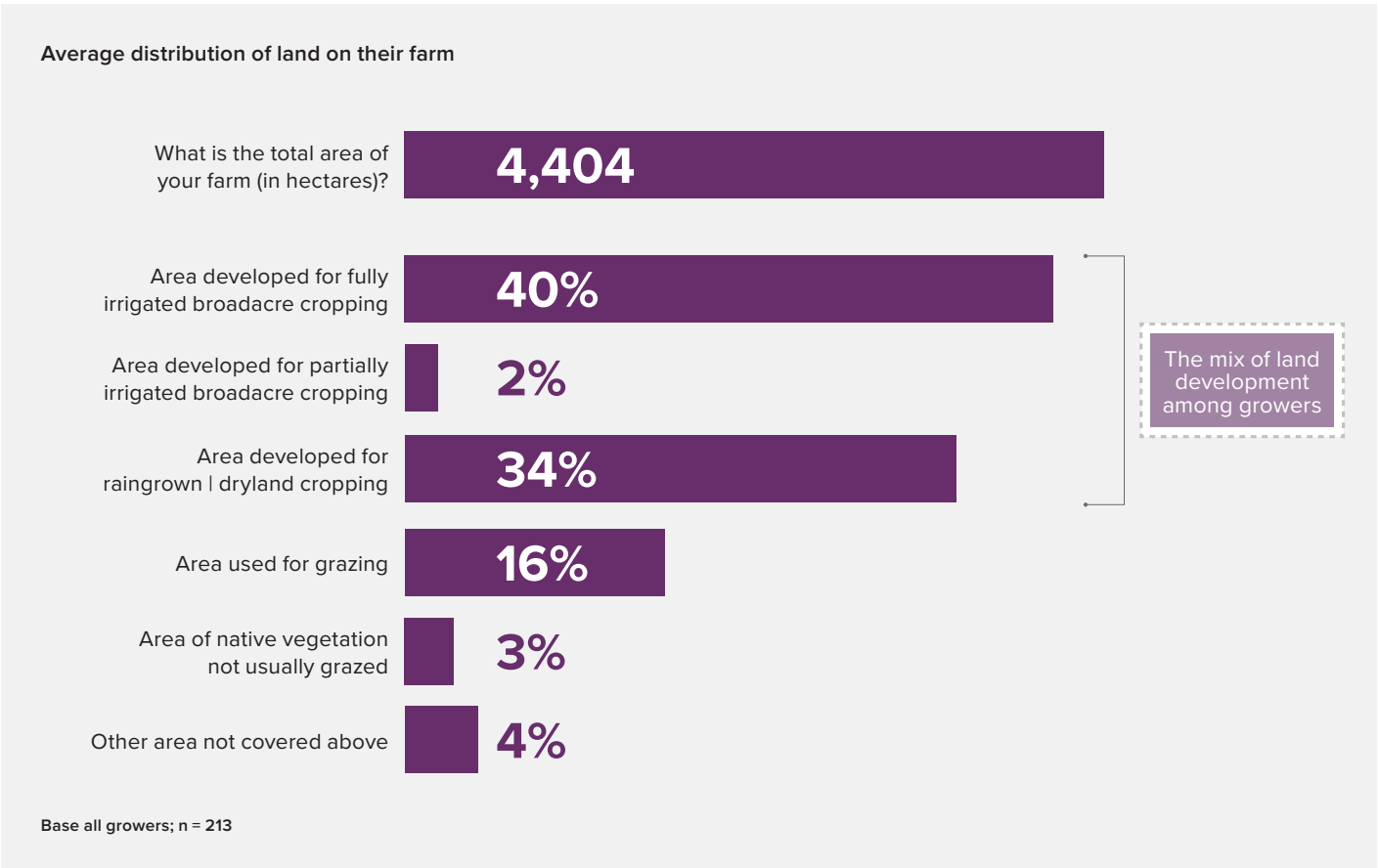
Focus area: farm profiles

Area and distribution of farm land

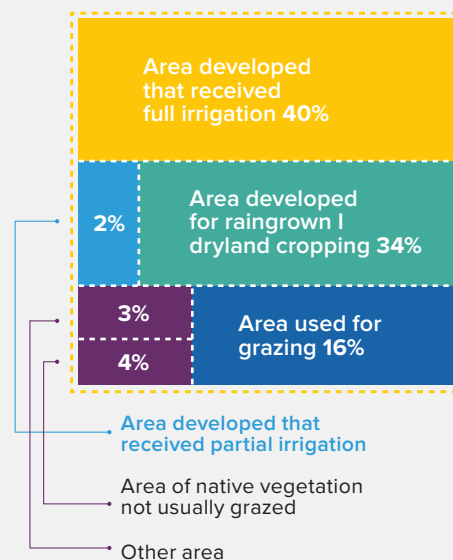
The initial enquiries of growers related to building an understanding of their farm use. The feedback from the 2019 CRDC Grower Survey indicates:

- Growers reported (on average) a farm size of some 4,404ha;
- 76% of the available land area was developed and available for cropping or other uses including cotton; with
- Growers again this year reporting that the majority of the developed area is either fully irrigated or developed for dryland farming; and with
- Some 23% 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.



Average distribution of land on their farm



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	34	22	73	33	42	88	99	26
Total area	6,715	1,692	7,657	5,235	4,431	2,337	1,175	3,834	17,503
Full irrigation	41%	36%	34%	34%	26%	67%	58%	30%	20%
Partial irrigation	1%	2%	1%	2%	1%	2%	1%	3%	1%
Raingrown Dryland	19%	49%	26%	44%	43%	14%	20%	41%	56%
Other	39%	13%	39%	21%	30%	17%	21%	25%	23%



Focus area: farm profiles

Average riparian length and width

The feedback from the 2019 CRDC Grower Survey indicates:

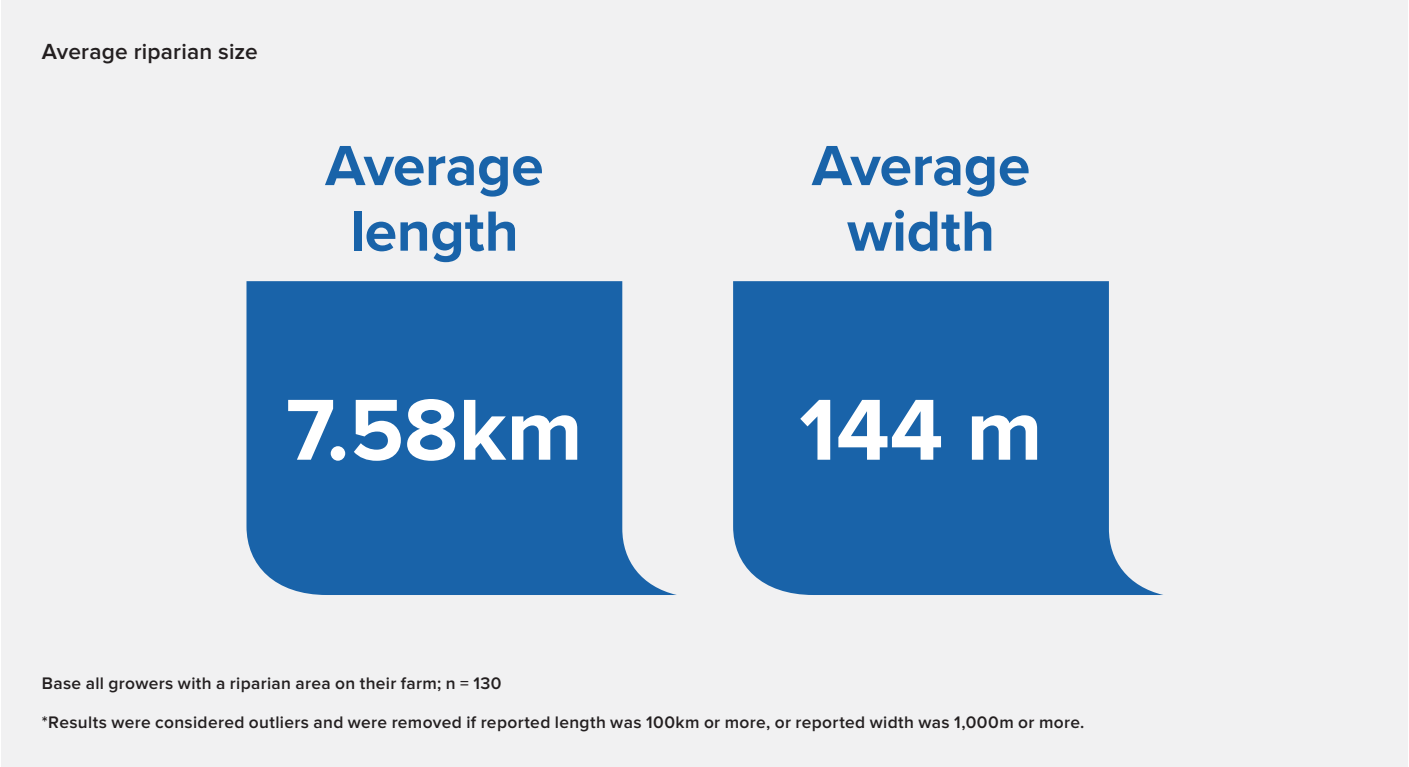
- Growers report their average riparian area is 7.58km in length; while there have been some changes over the last three years the overall size remains largely consistent.
- Growers reported an average riparian width of 144m. The results from the 2019 survey indicate a smaller riparian area width (on average down 25m from 2018). This is on top of a decline on the same measure in 2018 (down 6m on 2017).

As reported in 2018, the analysis indicates the size of these riparian areas varies considerable across the different growing regions. Not surprisingly also there is considerable variation across the different farm sizes.

This compares to a reported average area of 6.31km reported in 2018, 7.65km reported in 2017, 7.5km in the 2014 survey and 9km reported in the 2011 survey.

“Riparian land is any land which adjoins, directly influences, or is influenced by, a body of water.”

Source:https://cottoninfo.com.au/sites/default/files/Managing%20riparian%20lands_0.pdf





COMPARISON OF REPORTED RIPARIAN SIZE ACROSS GROWER SURVEYS

	2011	2014	2017	2018	2019
Base	183	110	157	142	130
Average length	9km	7.5km	7.65km	6.31km	7.58km
Average width	Not asked	Not asked	175 m	169 m	144 m

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	15	20	15	49	13	18	44	68	18
Average length	6.64km	7.03km	11.73km	8.36km	6.88km	3.92km	4.87km	7.13km	15.72km
Average width	174 m	130 m	243 m	138 m	39 m	158 m	117 m	169 m	99 m



Focus area: 2018-19 cotton crop

Distribution of area planted for cotton

Key information about the growers' area planted for the 1819 season was collected during the survey. The feedback from the 2019 CRDC Grower Survey indicates:

- Growers reported a field area planting of 36% of the developed fully irrigated areas (down 9 points on the 2018 result);
- Just 11% of the partially irrigated developed area was allocated and used for their cotton crop (down from 24% in 2018); and
- 13% of the dryland area was allocated to cotton. This compares to 12% last year and 11% reported in the 1617 survey.
- Based on the feedback provided in the 2019 Grower Survey, cotton was grown on an estimated 14% of total farm land. This compares to the 2018* estimate of 14% of the total farm area reported by Cotton Australia.
- On average, growers reported an area of 298 ha allocated to cotton. This compares to the 2018 Grower Survey estimate of

576 ha, and the 1819 season estimate of 230 ha from Cotton Australia.

- Based on the estimates provided by growers, it is estimated that the total cotton crop area for the 1819 season was 205,859 ha. This compares to the estimate of 336,000 ha from the Cotton Grower Yearbook, and 292,000 ha estimated for the 1819 season by Cotton Australia.

Source (ABARES): Agricultural Commodities: June quarter 2019 - Statistics

* 2018 figures were used as 2019 figures from Cotton Australia were not available.

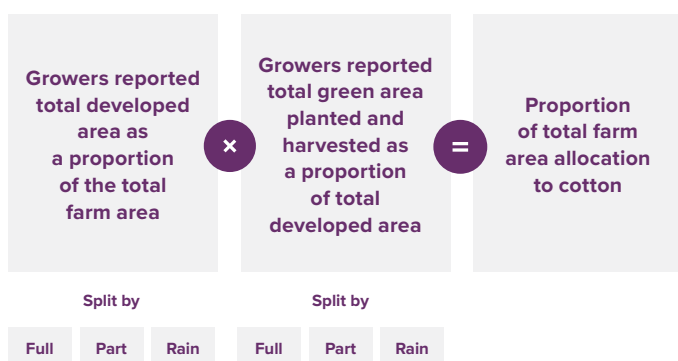
Source (Cotton Australia): http://cottonaustralia.com.au/uploads/publications/03_051801_COTTON_ANNUAL_2018_DR4.pdf

AREA PLANTED FOR COTTON WITHIN EACH DEVELOPED AREA FOR THE 2018-19 COTTON GROWING SEASON

	Fully Irrigated (proportion)	Partially Irrigated (proportion)	Raingrown Dryland (proportion)
Field area planted	37%	11%	13%
Green area planted	28%	3%	7%
Area planted but not harvested	1%	0%	1%

Base: all growers who grew cotton during 2018-19 season; n varies (Fully Irrigated, n = 144, Partially Irrigated, n = 14, Raingrown | Dryland, n = 107).

ESTIMATION METHOD TO CALCULATE PROPORTION OF TOTAL LAND AREA UNDER COTTON



AREA UNDER COTTON CROP WITHIN THE 2018-19 SEASON

Average area growers reported as area allocated to cotton crop (ha / grower)	298
Total number of growers growing cotton in 2018-19*	692
Total area under cotton crop within 2018-19 (ha)	205,859

* Total sample size: n = 964. When contacted by phone, 9.8% of contacts stated they were not in the farming business anymore.

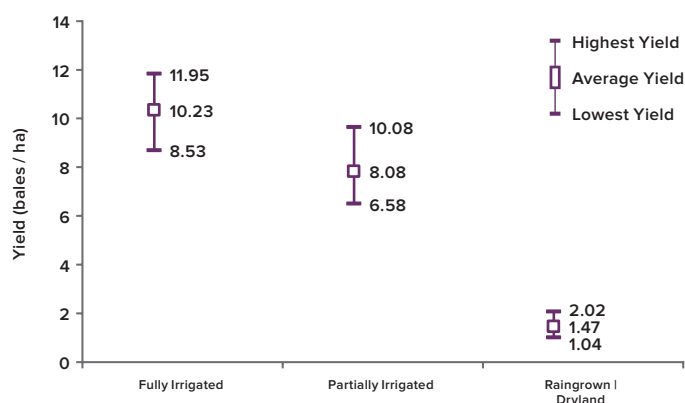
A further 20.5% when surveyed identified they were not farming cotton in 2018-19. Taking these into account, the effective number of cotton growers is n = 692.

Focus area: 2018-19 cotton crop

Yields for the 2018-19 cotton growing season

Growers reported three key indicators for the yields they achieved for the 1819 growing season.

- These were average yield across their entire crop, 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, partially and rain grown areas. A quick overview of the different yields achieved across these different areas is shown opposite.
- For fully irrigated areas, the 1819 survey reported an average yield of 10.23 bales/ha. This reported result is down on the 2018 result (11.22) but above that reported in 2017 (9.99).



YIELDS FOR THE 2018-19 COTTON GROWING SEASON (BALES PER HECTARE)

	Fully Irrigated (bales per ha)	Partially Irrigated (bales per ha)	Raingrown Dryland (bales per ha)
Average yield	10.23	8.08	1.47
Yield achieved by your highest-yielding field (average of grower-reported yield)	11.95	10.08	2.02
Yield achieved by your lowest-yielding field (average of grower-reported yield)	8.53	6.58	1.04
Range of variation from average yield	3.42	3.50	0.98

Base all growers who grew cotton during 2018-19 season; n varies (Fully Irrigated, n = 132, Partially Irrigated, n = 4, Raingrown | Dryland, n = 45).

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	15	20	13	36	16	32	59	56	17
Fully irrigated – Average yield	10.01	9.34	9.94	9.98	11.94	10.42	9.88	9.98	12.24
Fully irrigated – Highest yield from one field	11.60	10.96	11.36	12.18	13.25	12.07	11.50	11.86	13.78
Fully irrigated – Lowest yield from one field	9.14	7.58	7.98	8.10	10.35	8.64	8.12	8.27	10.74
Range of variation from average yield	2.46	3.39	3.38	4.08	2.91	3.43	3.38	3.59	3.04



Focus area: 2018-19 cotton crop

Factors limiting yield in the 2018-19 season

What factors do you believe LIMITED yield last season (2018-19)?

89% - Climate related

- Heat / Hot weather
- Lack of water
- No rain / no rainfall / lack of rain
- Water
- Rain / Rainfall
- Drought
- Availability of water
- Hail
- Dry weather
- Lack of moisture
- Weather
- Moisture

12% - Operations related

- Time of planting
- Couldn't get water around the farm quick enough
- Needed more irrigation / less time between irrigations

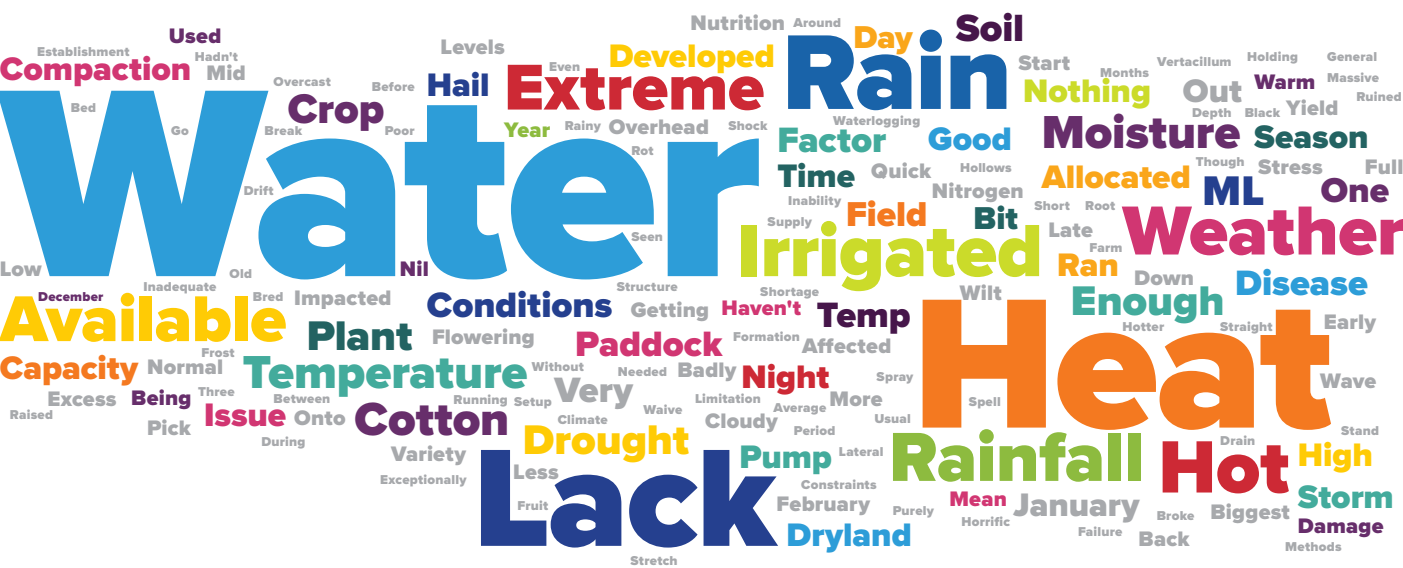
6% - Field related

- Compaction
- Soil constraints

4% - Disease and pest related

- Verticillium wilt

Base: all growers who grew cotton during 2018-19 season; n = 159
Note: only verbatims mentioned by at least 2% (n = 3 or more) of growers are listed above.







Focus area: 2018-19 cotton crop

Cotton field history of the 2018-19 cotton hectares

OF THE IRRIGATED COTTON HECTARES IN 2018-19, HOW MANY WERE...

	% of growers with at least one hectare of this history	Average proportion of cotton area with this history
Back to back cotton, i.e. cotton grown in the same field in the 2017-18 and 2018-19 seasons	50%	26%
Following Summer fallow, i.e. no crop in the 2017-18 Summer or 2018 Winter, but cropped in 2016-17 Summer or 2017 Winter	47%	34%
Following long fallow, i.e. no crop in the 2018 Winter, 2017-18 Summer, 2017 Winter or 2016-17 Summer	39%	31%
'Double cropped', i.e. following crop in Winter 2018 that was harvested	7%	4%
Following a cover crop, i.e. crop planted and sprayed out/not harvested	2%	1%
New fields, i.e. never had cotton grown there previously	12%	7%

Base: all growers who grew cotton during 2018-19 season and has irrigated cotton; n = 133

OF THE RAINGROWN | DRYLAND COTTON HECTARES IN 2018-19, HOW MANY WERE...

	% of growers with at least one hectare of this history	Average proportion of cotton area with this history
Back to back cotton, i.e. cotton grown in the same field in the 2017-18 and 2018-19 seasons	5%	3%
Following Summer fallow, i.e. no crop in the 2017-18 Summer or 2018 Winter, but cropped in 2016-17 Summer or 2017 Winter	23%	19%
Following long fallow, i.e. no crop in the 2018 Winter, 2017-18 Summer, 2017 Winter or 2016-17 Summer	72%	70%
'Double cropped', i.e. following crop in Winter 2018 that was harvested	2%	1%
Following a cover crop, i.e. crop planted and sprayed out/not harvested	14%	10%
New fields, i.e. never had cotton grown there previously	2%	<1%

Base: all growers who grew cotton during 2018-19 season and has raingrown | dryland cotton; n = 43



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (AVERAGE PROPORTION OF COTTON AREA WITH THIS HISTORY)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	16	21	11	38	15	32	59	58	16
Back-to-back cotton	78%	15%	30%	3%	40%	28%	26%	27%	25%
Following Summer fallow	3%	20%	60%	39%	36%	42%	37%	32%	31%
Following long fallow	8%	52%	9%	54%	21%	14%	27%	34%	35%
'Double cropped'	2%	3%	0%	3%	0%	9%	5%	2%	4%
Following a cover crop	0%	1%	0%	3%	0%	0%	0%	2%	0%
New fields	6%	0%	0%	0%	2%	26%	9%	6%	3%

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (AVERAGE PROPORTION OF COTTON AREA WITH THIS HISTORY)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	2	15	5	19	2	0	12	21	10
Back-to-back cotton	59%	0%	0%	0%	0%	-	4%	0%	7%
Following Summer fallow	24%	30%	40%	5%	0%	-	32%	15%	10%
Following long fallow	0%	72%	47%	78%	100%	-	58%	71%	80%
'Double cropped'	0%	4%	0%	0%	0%	-	5%	0%	0%
Following a cover crop	11%	7%	0%	16%	0%	-	17%	10%	2%
New fields	8%	0%	0%	0%	0%	-	0%	0%	2%



Focus area: water

Moisture profile, in-crop rainfall and water applied

Information about moisture profiles, rainfall, irrigation and irrigation strategies were collected in the 2019 Grower Survey. The feedback indicates that:

- Moisture profiles remained largely constant (from planting to season's end) for the fully irrigated area while dropping dramatically for partially and rain grown areas.
- There was limited rainfall across the season with growers reporting an average of 115mm.
- Growers with fully irrigated cotton area reported using 7.7ML/ha while at the same time making use of a range of different strategies to manage the largely limited water available this season. They reported using, on average, just over two of these strategies.

Could you please provide estimates on what the moisture profile was at planting (or prior to pre-watering if performed) across the following areas (for the 2018-19 cotton growing season):

	Fully Irrigated	Partially Irrigated	Raingrown Dryland
Moisture profile at planting or prior to pre-watering (mm)	94.8	200.0	211.2
Moisture profile at season's end (mm)	98.1	18.3	15.4

Base: all growers who grew cotton during 2018-19 season; n varies (Fully Irrigated, n = 105, Partially Irrigated, n = 3, Raingrown | Dryland, n = 37).

How much in-crop rainfall (in mm) did you receive in the 2018-19 cotton growing season between planting and harvesting?

In-crop
rainfall

114.6
mm

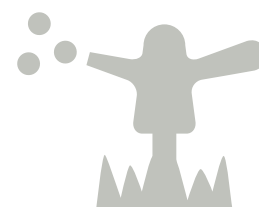
Base: all growers who grew cotton during 2018-19 season; n = 145



How much irrigation water (in megalitres) on average (per ha) was applied during the 2018-19 cotton growing season?

	Fully Irrigated	Partially Irrigated
Average megalitres used per ha	7.71 ML / ha	5.33 ML / ha

Base: all growers who grew cotton during 2018-19 season; n varies (Fully Irrigated, n = 125, Partially Irrigated, n = 3).





KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	10	16	8	32	12	27	48	44	13
Fully irrigated - At plating/prior to pre-watering (mm)	90.0	134.6	23.8	119.0	52.0	82.6	110.3	65.3	149.5
Fully irrigated - At season's end (mm)	107.8	111.3	41.3	90.8	10.8	158.0	131.4	70.3	79.2

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	15	25	12	51	14	28	57	68	20
In-crop rainfall (mm)	168.0	142.1	99.8	105.2	97.2	93.3	118.5	111.5	113.8

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	15	19	9	36	14	32	57	54	14
Fully irrigated – Megalitres used per ha (ML / ha)	6.11	5.39	8.50	6.87	9.65	9.71	7.36	7.68	9.26
Base	0	2	0	1	0	0	1	2	0
Partially irrigated – Megalitres used per ha (ML / ha)	-	4.50	-	7.00	-	-	3.00	6.50	-



Focus area: water

GPWUI: Gross Production Water Use Index

The GPWUI (Gross Production Water Use Index) is an index to benchmark water use efficiency.

This benchmark relates total production (bales) to the total amount of water used, from all sources including irrigation water, rainfall (total or effective) and soil moisture.

For the purposes of calculations for this report, results across fully irrigated land were used.

The results from the 2019 Grower Survey indicate that across all growers responding to the 2019 survey the GPWUI was at 1.32 bales/ML. The tables to the right show the variation of this index across the growing regions (ranging from 0.92 in Southern NSW to 1.60 in the Darling Downs).

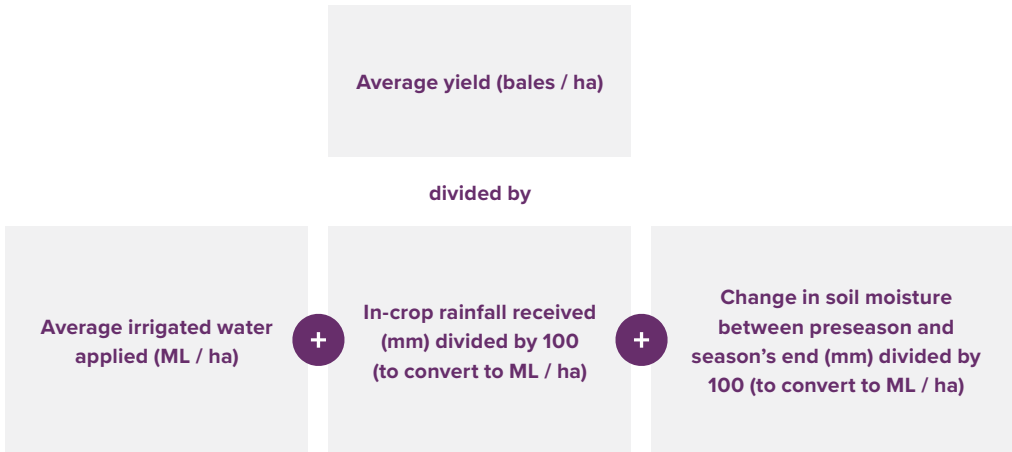
Gross Production Water Use Index (average of grower results)



Base: all growers who provided answers to all questions used within GPWUI calculations (one outlier removed); n = 85



How GPWUI is calculated (on fully irrigated land):



This is calculated for each individual grower and then averaged to provide an overall measure of GPWUI.

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

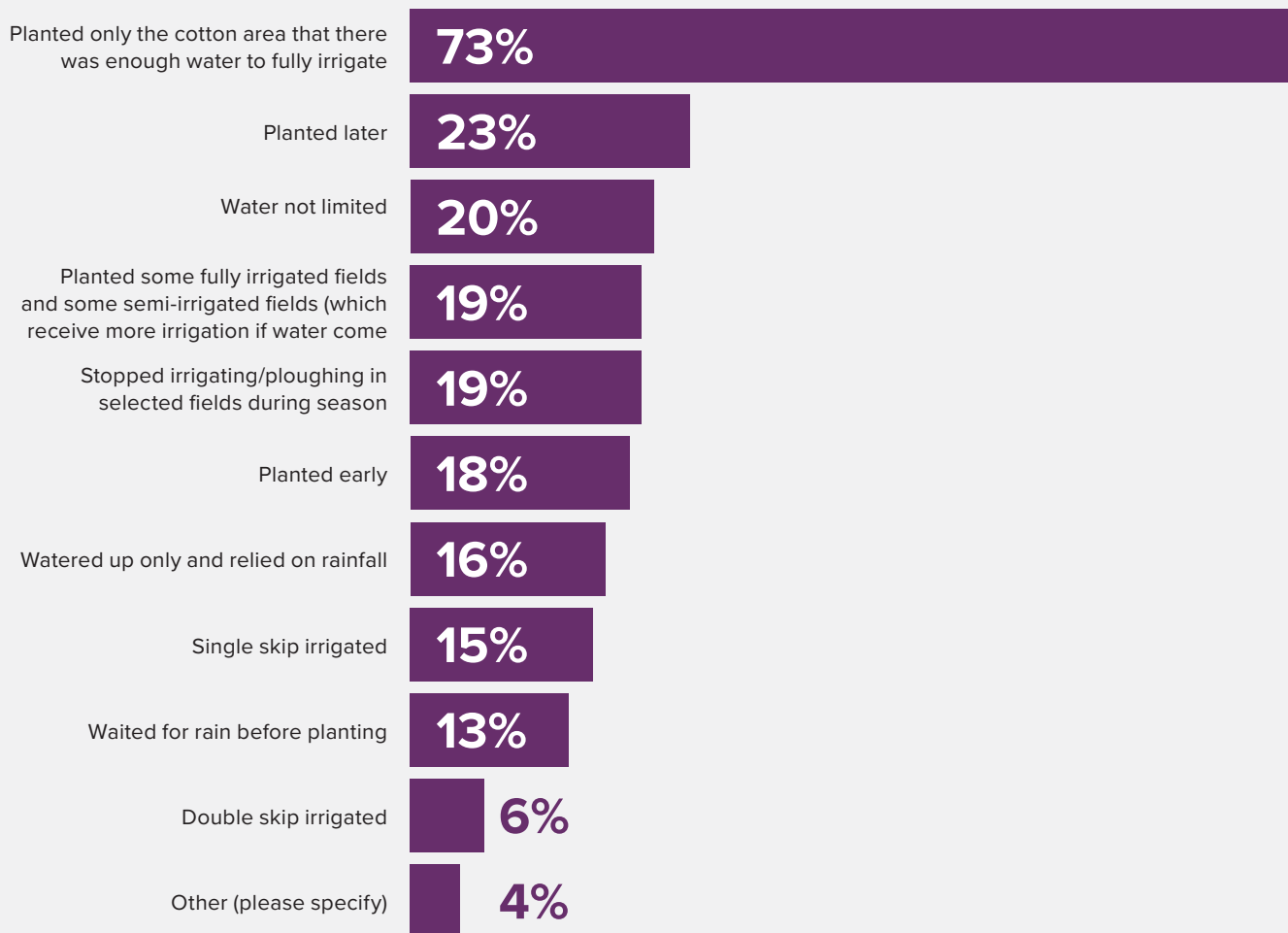
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	7	11	6	31	10	20	34	41	10
GPWUI (bales / ML)	1.36	1.60	1.15	1.53	1.22	0.92	1.35	1.32	1.19



Focus area: water

Strategies for managing limited water

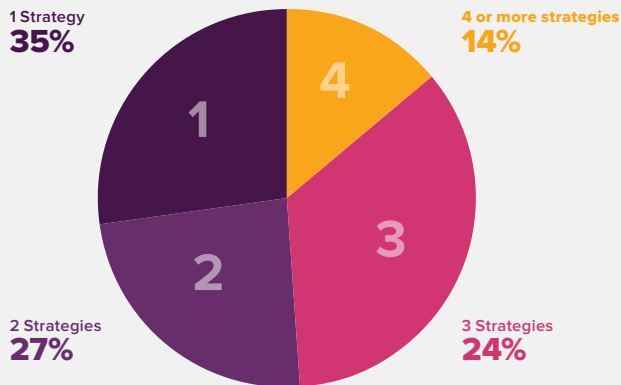
For irrigated / partially irrigated cotton this season (2018-19), what strategies have you used for managing limited water?



Base: all growers who grew cotton during 2018-19 season and has irrigated cotton; n = 131



Number of strategies used



2.25
Average number
of strategies used

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	16	21	11	37	14	32	59	57	15
Planted only the cotton area that there was enough water to fully irrigate	63%	71%	64%	68%	86%	84%	80%	67%	73%
Planted later	25%	24%	27%	43%	7%	3%	15%	28%	33%
Water not limited	19%	14%	18%	3%	29%	41%	20%	21%	13%
Planted some fully irrigated fields and some semi irrigated fields	6%	38%	18%	27%	14%	6%	14%	25%	20%
Stopped irrigating/ ploughing in selected fields during season	0%	43%	27%	24%	14%	6%	15%	21%	27%
Planted early	56%	10%	0%	11%	14%	19%	20%	12%	27%
Watered up only and relied on rainfall	13%	5%	18%	27%	14%	13%	12%	18%	27%
Single skip irrigated	0%	38%	18%	19%	7%	3%	14%	14%	20%
Waited for rain before planting	13%	33%	18%	16%	0%	0%	14%	9%	27%
Double skip irrigated	6%	10%	27%	3%	7%	0%	3%	9%	7%
Other (please specify)	0%	0%	0%	3%	7%	9%	3%	2%	13%



Focus area: energy

Total energy use and use of solar energy

Information about energy use was also collected in the 2019 Grower Survey. The feedback from growers indicates that:

- Diesel remains the primary energy source being used with an estimated average of:
 - 223 L/ha used for In-field operations; and a further
 - 140 L/ha used for pumping water.
- Just over one in four growers (27%) reported using solar energy for their farming operations during the 2018-19 season. It was

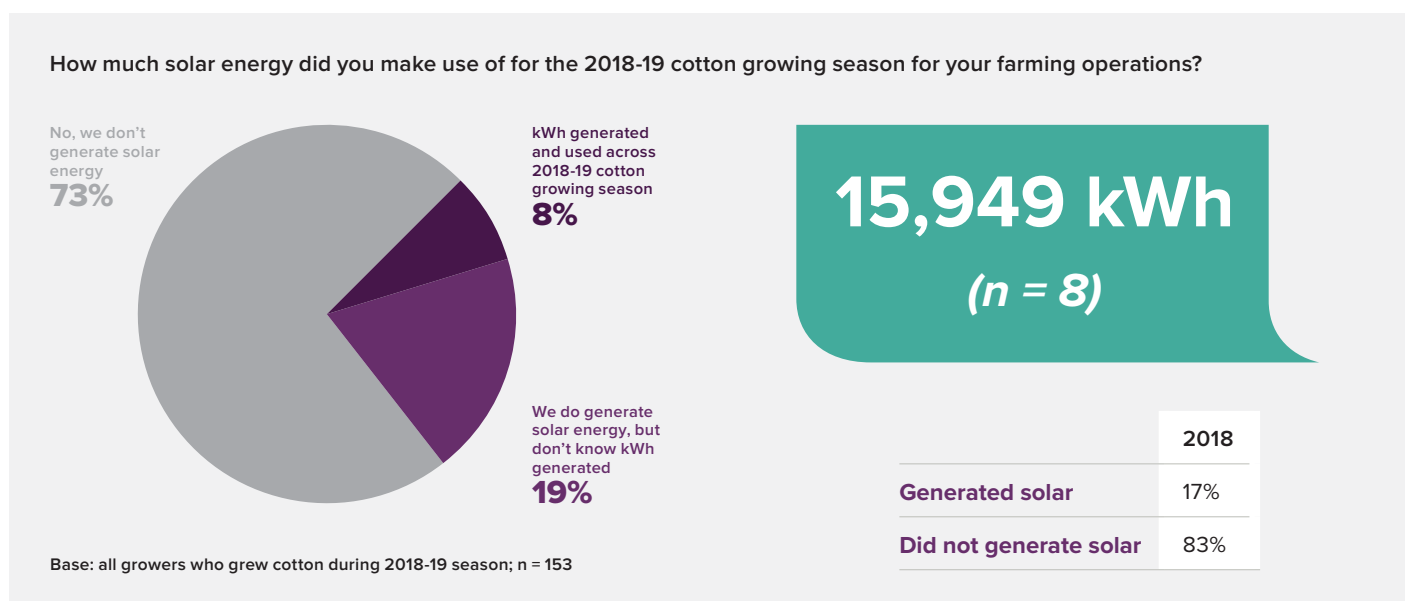
interesting to note few of these growers were aware of how much energy was generated via this source.

- The majority of growers are changing behaviours with their existing equipment (use autosteer, traction control) as their primary mechanism to reduce energy consumption.

Please provide an estimate on what your total energy use was for the 2018-19 cotton growing season across the following operations – grower average per hectares of area planted for cotton

		Diesel (L)	Bio-diesel (L) / Electricity (kWh)
Energy used for in-field operations (grower average / ha planted for cotton)		223 L / ha	< 1 L / ha
	2018:	133 L / ha	117 of 118 growers did not use Bio-diesel 0 L / ha
Energy used for pumping water (grower average / ha planted for cotton)		140 L / ha	27 kWh / ha
	2018:	111 L / ha	70 kWh / ha

Base: all growers who grew cotton during 2018-19 season AND answered the question; n = 123





KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	16	17	12	41	11	26	47	58	18
Diesel (L / ha) – Energy used for in-field operations	125	253	580	110	296	256	216	230	215
Bio-diesel (L / ha) – Energy used for in-field operations	0	0	0	<1	0	0	<1	0	0
Diesel (L / ha) – Energy used for pumping water	49	95	129	121	419	181	189	137	13
Electricity (kWh / ha) – Energy used for pumping water	13	96	0	37	0	0	8	52	5

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

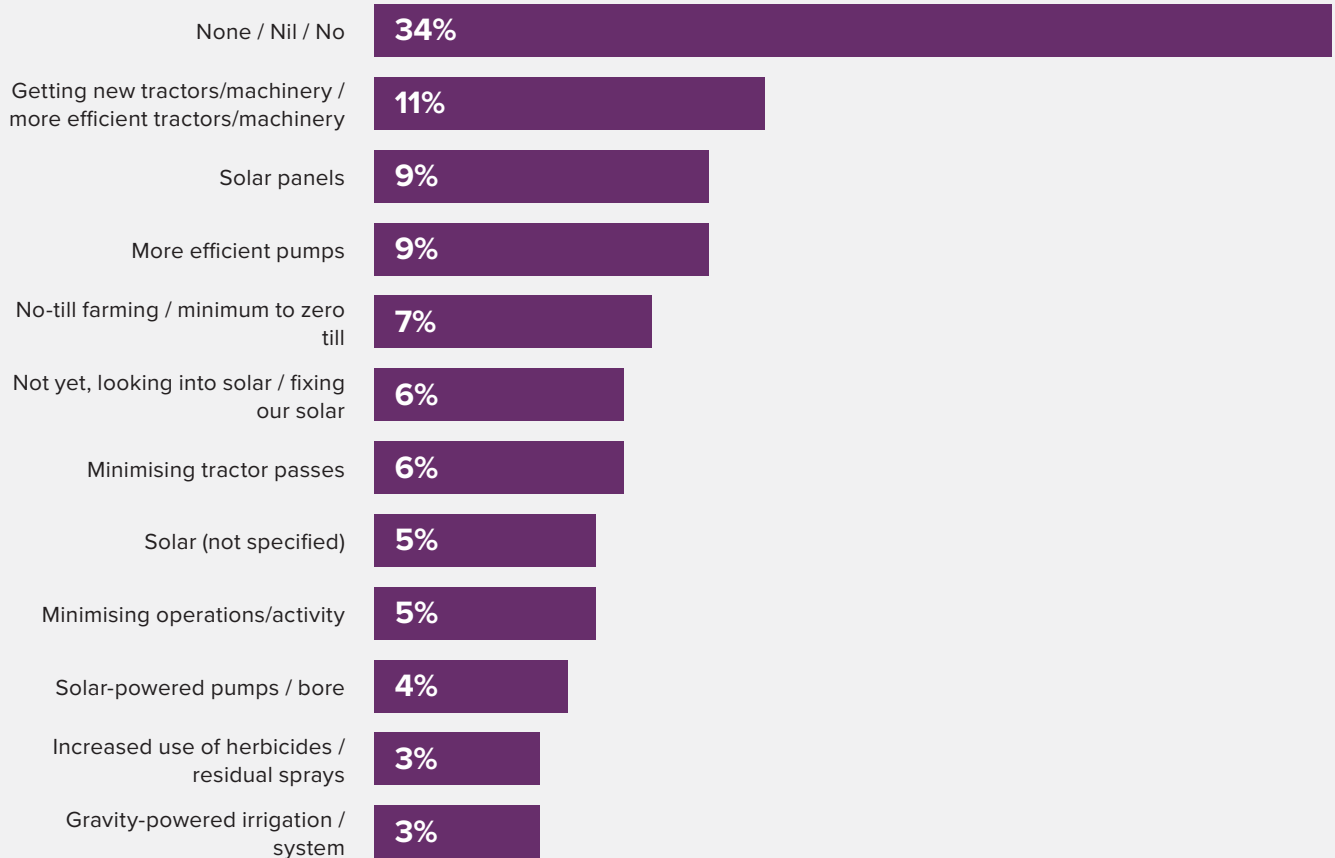
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	18	27	13	50	14	31	62	70	21
% who generate and use solar energy	0%	15%	46%	30%	50%	29%	19%	29%	43%



Focus area: energy

Measures undertaken to reduce energy use

Are you taking any measures to reduce your energy use (fuel or electricity)? If so, please provide examples of how.



Base: all growers; n = 193

Note: only words mentioned by at least 3% (n = 5 or more) of growers are listed above.



What the growers said...

"We are diesel water return pumps and they are sized correctly and when have the most efficient pump and engine usage that we can. We only do what we have to do so we don't waste energy. We look at everything thoroughly and monitor it closely."

"We are reducing the operations within the field. We try to do things early which reduces the amount of operations (passes) that we have to do. We try not to run too much tail water that reduces are pumping."

"We put in a varied speed starter on our electric pump, so we can turn it down to use the least amount of amps to the most amount of water. You can vary the speed of it and turn it right down"

"We did an audit through NSW Farmers. The manner of usage of electricity, tire pressure, new tractors, fuel efficiency, using off peak electricity, using generators."

"I've fitted a couple of new irrigation motors, which are more fuel efficient, and I've had lots of phone calls to energy providers to reduce the cost of power."

"Using as much solar as possible on sheds and house and trying to maintain off peak as we can and pumping through the day with our home irrigation systems."

"Our fuel use isn't too bad, all our systems are beds in bays, it requires very little recycling of water, no runoff, no pumping costs."

"Designing the irrigation system so we're only pumping the water once, and recycling 100% of the tail water back onto the fields."

"Yes, consider the priority of tractor passes, buying fuel efficient machinery and motors and the drought taking care of it too."

"Reducing the number of tractor passes in the field. We are generating solar energy and utilising less intensive fertilisers."

"Limited tillage as we can, we educate our drivers on high gears and low revs. Developed our fields on a gravity system."

"We limit all our energy use, nothing other than modern day equipment and engines, electricity and diesel to pump water."

"Installed solar panels for domestic use, also solar panels on another farm that puts electricity back into the grid."

"We just have installed 100 kw solar system for our bore. So we are hoping to go 60-70% efficient via using that."

"I try to do the job properly, so I don't have to do it twice. I'm a gravity fed farm, I pick up all my tailings."

"We are updating our diesel engines to more efficient ones. We have done farm infrastructure to reduce pumping."

"Solar on the farm. Change of habits, use the power when the solar is on, e.g. a lot more power during the day."

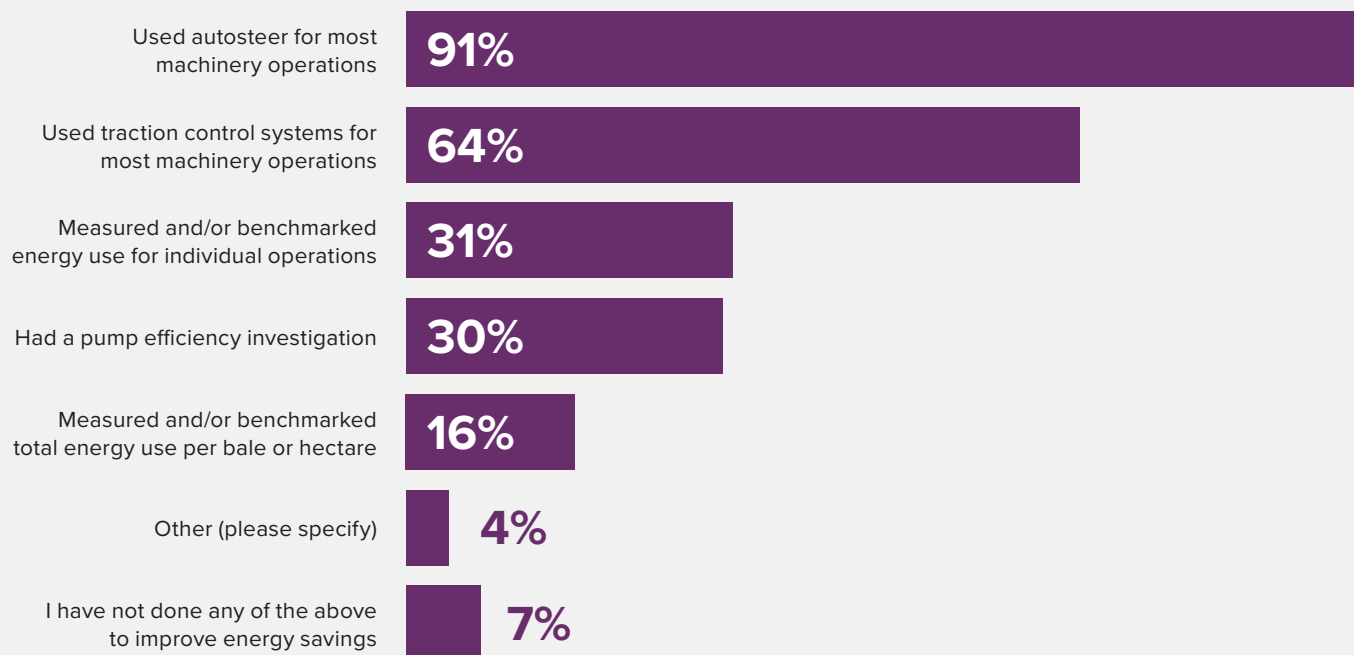
"Trying to maximise the use of solar electricity on the house. I run the sprinkler system at night-time."



Focus area: energy

Actions taken to improve energy savings

In the last five years, have you done any of the following to improve energy savings?



Base: all growers; n = 195



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	68	19	36	84	88	23
Used autosteer for most machinery operations	90%	91%	89%	90%	89%	94%	86%	93%	100%
Used traction control systems for most machinery operations	65%	67%	74%	72%	47%	50%	56%	68%	78%
Measured and/or benchmarked energy use for individual operations	40%	27%	42%	37%	16%	22%	21%	36%	48%
Had a pump efficiency investigation	50%	21%	37%	31%	37%	19%	25%	31%	48%
Measured and/or benchmarked total energy use per bale or hectare	25%	15%	21%	13%	16%	14%	13%	16%	26%
Other (please specify)	5%	6%	0%	4%	5%	0%	4%	3%	4%
I have not done any of the above to improve energy savings	10%	3%	5%	10%	5%	6%	10%	7%	0%



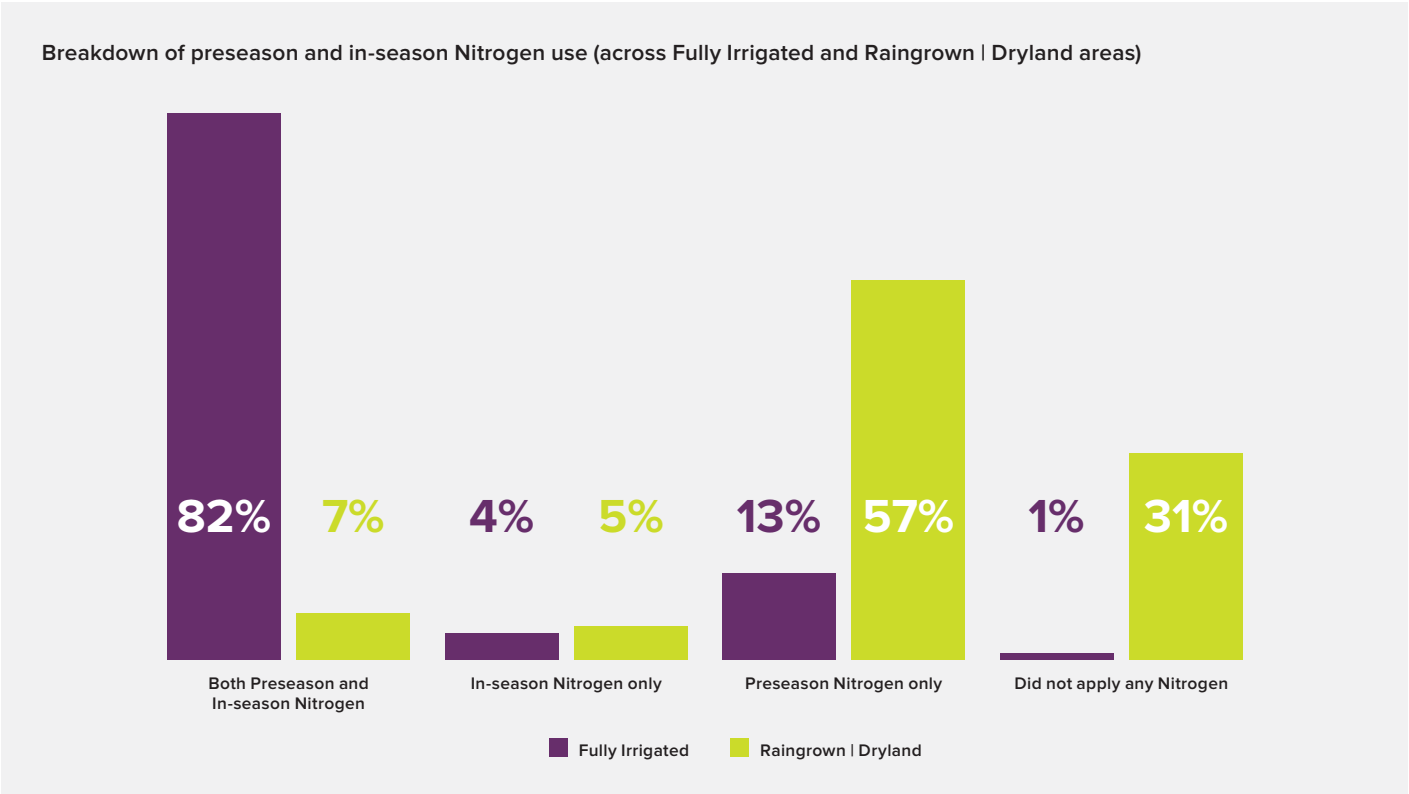
Focus area: nutrition and soil

Rate of applied nutrients in 2018-19

Please list the rate of applied nutrients for your most typical irrigated, partially irrigated and/or dryland cotton field/s in 2018-19:

	Fully Irrigated	Partially Irrigated	Raingrown Dryland
Preseason Nitrogen (kg N/ha)	182.8	133.3	80.7
In-season Nitrogen (kg N/ha)	142.3	33.3	11.8
Total Nitrogen (kg N/ha)	325.1	166.7	92.5
Nitrogen use efficiency (kg lint/kg of applied N)	8.8	13.3	7.5
Total Phosphorus (kg P/ha)	71.4	32.5	20.0
Total Potassium (kg K/ha)	30.2	47.5	12.1
Total Zinc	17.3	1.7	17.1
Total Sulfur	9.9	0.0	6.0

Base: all growers who grew cotton during 2018-19 season; n varies (Fully Irrigated, n = 122, Partially Irrigated, n = 3, Raingrown | Dryland, n = 42).





KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	14	20	9	34	14	31	55	53	14
Fully irrigated - Preseason N (kg N/ha)	258.6	151.8	209.1	147.9	129.3	223.4	201.8	165.5	173.6
Fully irrigated - In-season N (kg N/ha)	72.9	54.0	189.3	117.6	195.0	220.2	121.5	156.6	170.0
Fully irrigated - Total N (kg N/ha)	331.4	205.8	398.4	265.6	324.3	443.5	323.3	322.1	343.6
Fully irrigated - Nitrogen use efficiency (kg lint/kg of applied N)	7.9	13.1	6.5	9.5	9.1	6.4	9.5	8.3	8.6
Fully irrigated - Phosphorus (kg P/ha)	72.3	31.2	98.6	52.6	74.4	108.9	72.6	73.5	58.2
Fully irrigated - Potassium (kg K/ha)	66.7	17.9	34.2	22.2	19.2	35.7	32.3	30.5	20.6
Fully irrigated - Total Zinc	7.3	1.2	6.5	16.3	9.1	42.9	10.0	28.8	6.2
Fully irrigated - Total Sulfur	12.0	4.3	3.1	14.4	8.8	9.7	12.8	9.5	1.0



Focus area: nutrition and soil

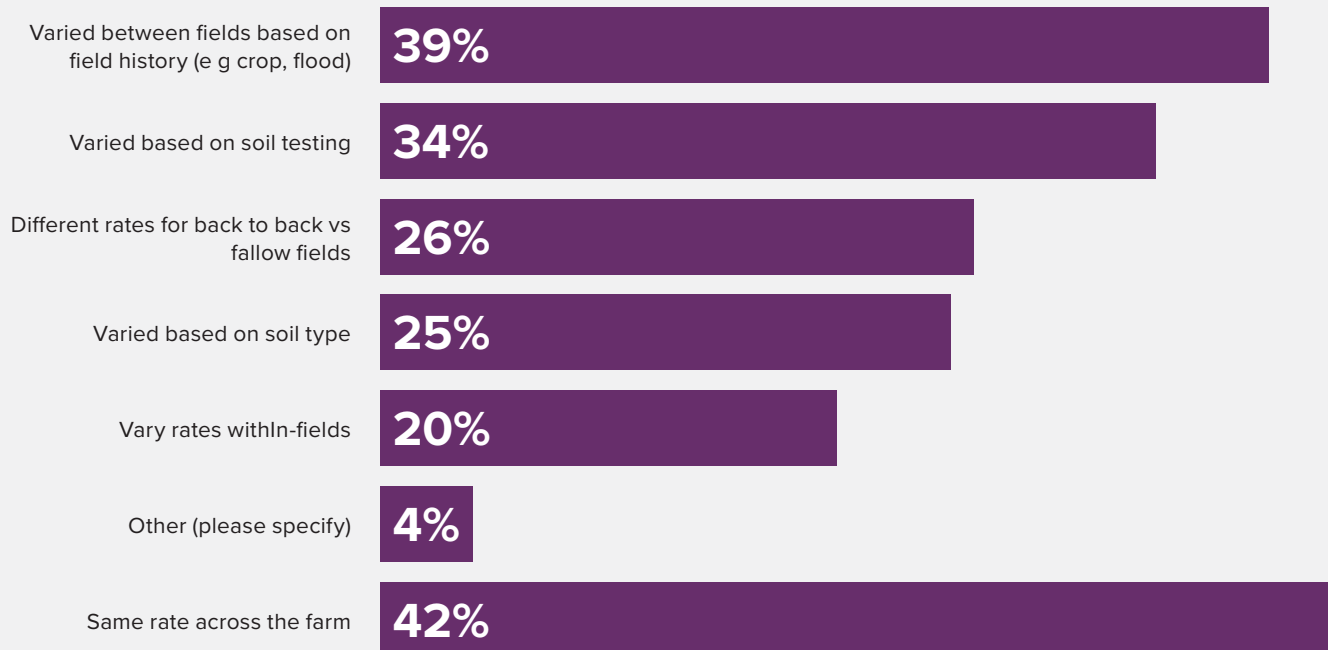
Varying fertiliser application rates

Growers were asked about the rate and type of nutrients applied during the 18-19 season. The feedback provided by growers indicates that:

- An estimated average of 325 kg/ha of nitrogen was used on fully irrigated areas. By comparison just 92.5 kg/ha was used on rain grown areas.
- The majority (82%) of growers with fully irrigated area applied nitrogen both pre-season and during the season.
- Growers with rain grown areas are more likely to use Nitrogen only (57%) or apply no nitrogen (31%).



Did you vary fertiliser application rates between different fields / management units last season?



Base: all growers who grew cotton during 2018-19 season ; n = 152



In relation to fertiliser use and application the feedback indicates that:

- Most growers (42%) use the same fertiliser application rate across the farm. This is more likely to be evident among smaller growers (52%) than the larger growers (24%).
- Where this is not the case growers typically apply based on either field history or soil testing. The feedback suggests that larger growers are more likely to adopt these practices than other growers.

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

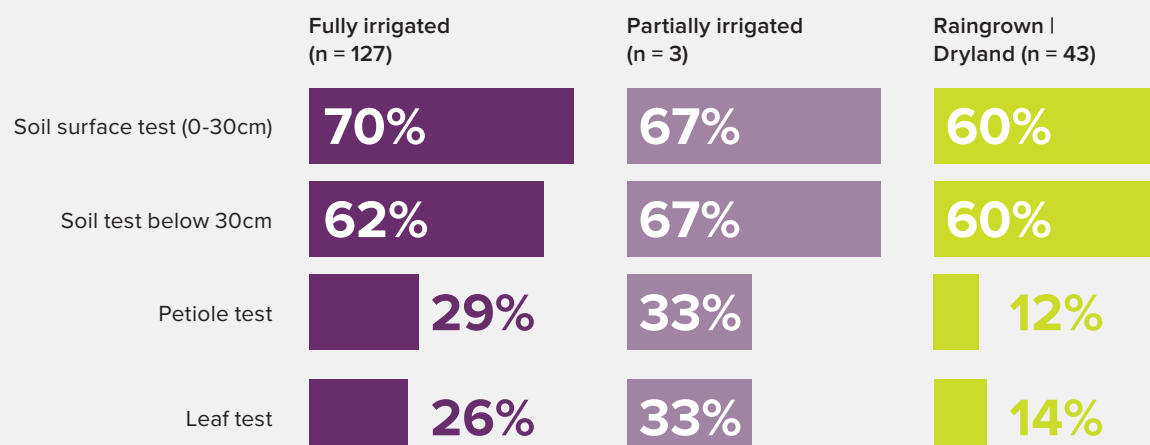
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	18	27	13	49	14	31	61	70	21
Varied between fields based on field history (e.g. crop, flood)	39%	44%	54%	29%	43%	42%	33%	41%	48%
Varied based on soil testing	22%	44%	46%	35%	21%	29%	28%	36%	43%
Different rates for back to back vs fallow fields	22%	30%	46%	10%	36%	39%	23%	27%	33%
Varied based on soil type	39%	22%	31%	16%	14%	35%	23%	26%	29%
Vary rates within-fields	33%	0%	38%	14%	21%	32%	20%	19%	29%
Other (please specify)	11%	4%	0%	6%	0%	0%	3%	3%	10%
Same rate across the farm	44%	41%	31%	47%	29%	45%	52%	39%	24%



Focus area: nutrition and soil

Analyses undertaken before deciding on fertiliser rates

When deciding on fertiliser rates for your 2018-19 cotton crops, which of the following analyses did you refer to, if any, for each cotton system?



Base: all growers who grew cotton during 2018-19 season ; n = 151

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Fully irrigated									
Base	16	20	11	35	14	31	57	54	16
Soil surface test (0-30cm)	56%	75%	73%	77%	64%	68%	68%	67%	88%
Soil test below 30cm	56%	75%	64%	66%	64%	52%	56%	61%	88%
Petiole test	6%	10%	27%	34%	36%	45%	32%	19%	56%
Leaf test	13%	5%	36%	31%	43%	29%	16%	28%	56%
Raingrown / Dryland									
Base	2	15	5	19	2	0	12	21	10
Soil surface test (0-30cm)	100%	73%	20%	58%	50%	0%	58%	62%	60%
Soil test below 30cm	100%	67%	20%	63%	50%	0%	50%	67%	60%
Petiole test	0%	13%	0%	16%	0%	0%	17%	5%	20%
Leaf test	0%	7%	0%	26%	0%	0%	8%	5%	40%





Focus area: nutrition and soil

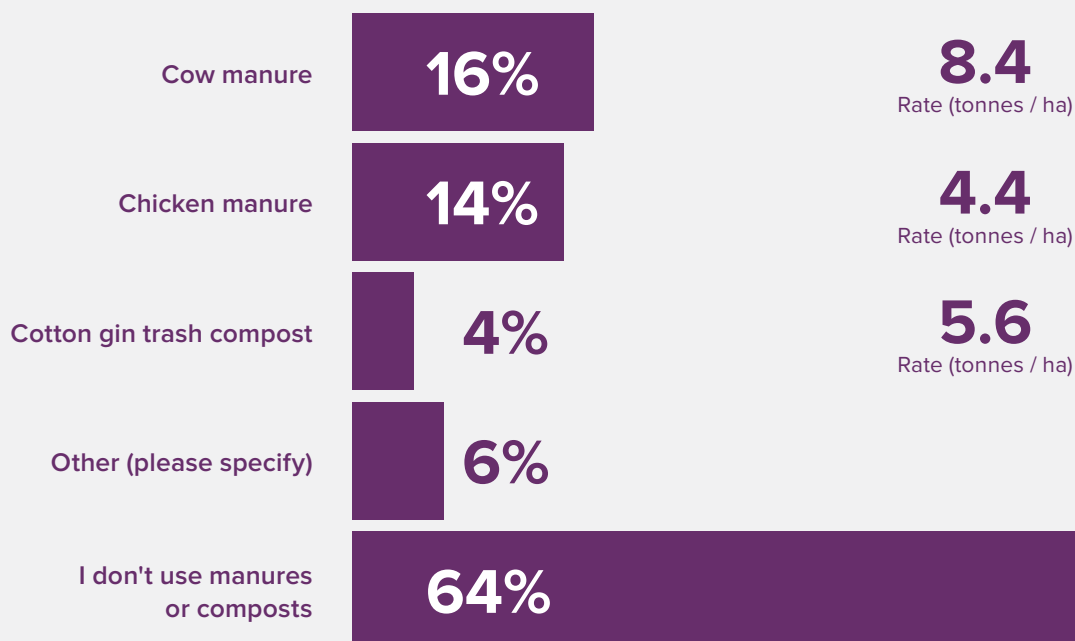
Manures/composts used as part of nutrition program

Growers were asked about the use of manures or composts as part of a nutrition plan. The feedback provided by growers indicates that:

- Based on the feedback provided, the majority of growers (almost two in three, 64%) have indicated they do not use manures or composts. Proximity to a economic source of manure (e.g. cattle feed lots, poultry sheds) is a major determinant of use.
- Among growers that do, the feedback suggests an even split between the use of cow and chicken manure.
- Where cow manure was used, the application rate was higher (8.4 tonnes/ha) compared to growers using chicken manure (4.4 tonnes/ha)



Which of the following manures or composts do you use as part of your nutrition program, and at what typical rate of tonnes per hectare?



Base: all growers who grew cotton during 2018-19 season ; n = 152

Other specified manures/composts that growers reported (n = 9):

"Beef Feedlot"

"Bio Solids"

"compost from food waste"

"doilicus lablab"

"Feedlot"

"Folia sprays"

"Pig Manure"

"Trash that grows in our paddock we put in the ground we don't burn it"

"urea"



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (% USE)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	18	27	13	49	14	31	61	70	21
Cow manure	11%	41%	8%	18%	0%	6%	13%	17%	24%
Chicken manure	0%	0%	0%	18%	0%	39%	18%	11%	10%
Cotton gin trash compost	0%	11%	8%	2%	0%	3%	7%	3%	0%
Other (please specify)	11%	15%	8%	4%	0%	0%	8%	6%	0%
I don't use manures or composts	78%	41%	85%	61%	100%	58%	59%	66%	76%



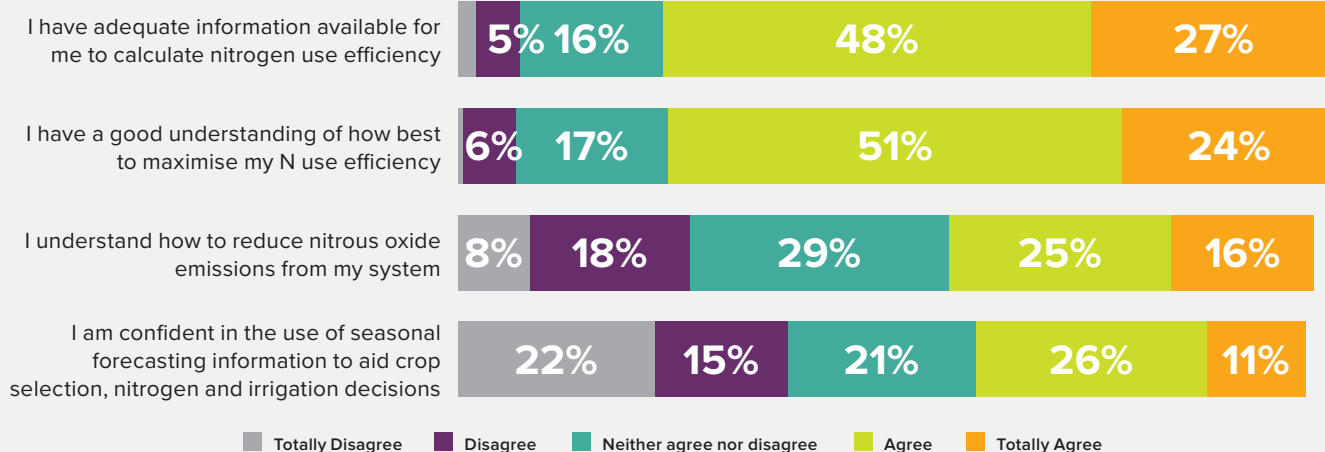
Focus area: nutrition and soil

Understanding and confidence in utilising nutrition and soil

Growers attitudes towards various aspects of soil and nutrition were measured in the 2019 survey with the results showing that:

- Growers more likely to agree that:
 - they have adequate information to calculate nitrogen use efficiency (75% agree); and
 - have a good understanding of how best to maximise this efficiency (75% agree).
- By contrast however growers were less likely to agree that:
 - they understand how to reduce nitrous oxide from their system (41% agree); and
 - are confident in the use of seasonal forecasting information to help make good decisions (37% agree).

Please indicate your agreement with each of these statements:



Base: all growers; n = 194

Note: "Don't know" answers are not displayed above.



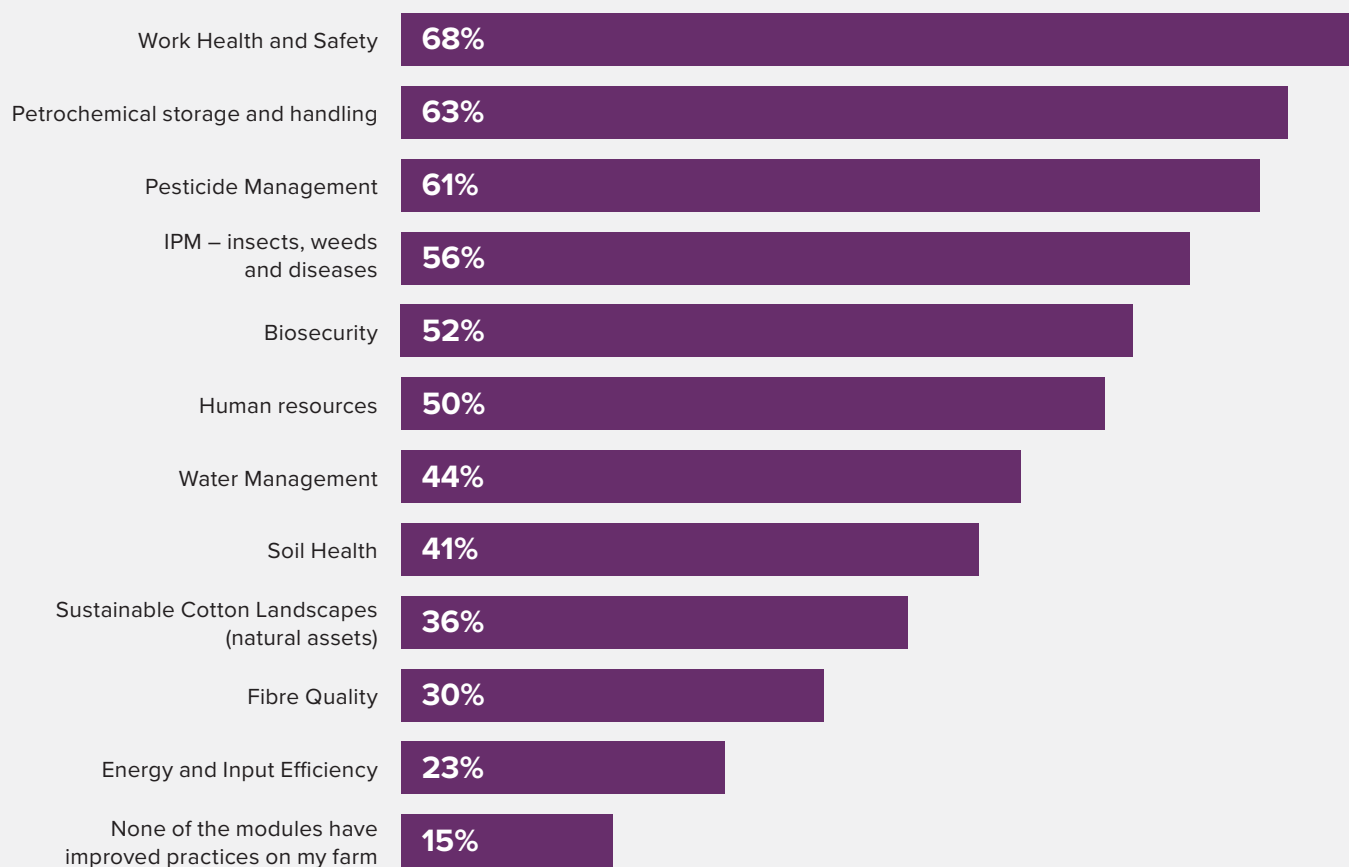
KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (% AGREE)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	67	19	36	83	88	23
I have adequate information available for me to calculate nitrogen use efficiency	85%	76%	84%	78%	84%	58%	69%	81%	83%
I have a good understanding of how best to maximise my N use efficiency	80%	79%	84%	76%	79%	61%	69%	81%	78%
I understand how to reduce nitrous oxide emissions from my system	60%	33%	42%	39%	42%	39%	37%	44%	39%
I am confident in the use of seasonal forecasting information to aid crop selection, nitrogen and irrigation decisions	55%	33%	26%	25%	42%	56%	39%	34%	43%

Focus area: *myBMP*

myBMP modules that have improved farm practices

Which of the following *myBMP* modules have improved practices on your farm?



Base: all growers who have participated in *myBMP* ; n = 94



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	15	15	13	29	11	11	36	41	17
Work Health and Safety	60%	60%	69%	83%	55%	64%	58%	73%	76%
Petrochemical storage and handling	73%	67%	69%	62%	36%	64%	58%	61%	76%
Pesticide Management	60%	53%	69%	69%	27%	73%	50%	66%	71%
IPM – insects, weeds and diseases	60%	47%	54%	72%	18%	64%	47%	59%	71%
Biosecurity	40%	33%	54%	72%	18%	73%	42%	51%	76%
Human resources	40%	40%	46%	62%	55%	45%	33%	54%	76%
Water Management	47%	27%	62%	55%	18%	36%	31%	44%	71%
Soil Health	40%	33%	54%	45%	18%	55%	31%	46%	53%
Sustainable Cotton Landscapes (natural assets)	40%	20%	38%	45%	18%	45%	17%	49%	47%
Fibre Quality	20%	13%	31%	38%	18%	55%	19%	32%	47%
Energy and Input Efficiency	33%	7%	38%	28%	9%	18%	14%	27%	35%
None of the modules have improved practices on my farm	20%	13%	8%	3%	45%	18%	19%	12%	12%

Focus area: *myBMP*

Barriers to cotton growers not registering in the *myBMP* program

What do you think are the barriers to cotton growers not registering in the *myBMP* program?

26% - Time

- Time (not specified)
- Time consuming / admin takes too much time
- Lot of time involved for no obvious benefit
- No time / lack of time
- Time poor

14% - Cost

- Cost / Money (not specified)
- Cost of getting everything up to standard / accreditation
- Can be costly / too expensive
- Cost to benefit

9% - Never heard of *myBMP* / Don't know enough about it

23% - Extra work involved

- It's more work / more paperwork
- Workload / Too busy doing other stuff
- Too hard / difficult
- Don't have enough workforce to help
- Effort (not specified)

13% - No benefits

- Lack of financial incentive / no financial gain
- Lot of time involved for no obvious benefit
- Benefits are not obvious
- No advantage in using it / not sure if it is worthwhile
- Cost to benefit

8% - Nothing - no barriers

Base: all growers; n = 192

Note: only verbatims mentioned by at least 2% (n = 3 or more) of growers are listed above.



What the growers said...

"I think a lot of growers have little things to improve on their farms but due to the drought don't want to spend the money and won't register because they realise they are not ready for audit any way."

"Time and the effort you have to put in and there is not much reward for it. And cost and the extra level of compliance and ongoing monitoring, there is a significant amount of office work."

"We cotton growers, grain growers, cattle men, every single crop has a BMP, we are just a family farm, we don't have time for the paperwork, we would never be able to run the farm."

"The time commitment in the admin side of it, also capital costs of changing things to meet the *myBMP* standard, especially for smaller family businesses."

"There is a bit of work with it, they are doing a lot of the stuff anyway. I don't know if there is any economic benefit."

"We're a small family farm and it's another level of administration and paperwork, we don't have the capacity to do it."

"No barriers, they should jump on board, just lazy or don't like change. They think it incurs a huge cost."

"The time in bales to the accreditation is the biggest issue. And the money to rectify any problems."

"Complacency, laziness, not up to the industry standards to comply, too much hard work to comply."

"Looked at it a dozen times and just haven't got around to it. I will probably have my son do it."

"My business model is to have a good handle on my costs and I think *myBMP* will cost me money."

"They might have other things to do, e.g. improving pumps and water storage, might take priority."

"It's quite daunting from the outside. Getting everything in order, it looks like a big task."

"It's time. For family farms and for corporate, they get someone in to do the work for them."

"Not knowing the program. The old program has left a bad taste in a lot of peoples' mouths."

"It is more of a corporate mentality thing for me. Too much money for not a lot of gain."

"The time involved, for a long time there was no factual proof it would be of benefit."

"Time poor, new crop for most, still developing a program, cotton season is very long."

"The cost of accreditation and very little benefit for accreditation to the farmer."

"We don't grow cotton enough to get involved in it. We don't have water every year."

"The complication of it all. It's so much mucking around to get it signed off on."

"Maybe they are concerned that they may need to change old habit die hard."

"I've never looked into it, I don't know if there is any gain in doing it."

"The time and cost of getting everything into place to meet the standards."

"I don't think so. There are advantages but no barriers for not doing it."



Focus area: IPM and crop protection

IPM and crop protection practices undertaken

Growers were asked about IPM and crop protection. The feedback provided by growers suggests that:

- The majority of growers are using most of the practices measured in the research. When compared to the results reported in the 2016-17 Grower Survey we note:
 - An increase in growers adopting industry recommended thresholds (97% this year compared to 90% in 2016-17)
 - More growers reporting that their rotation cropping decisions consider disease risks (88% v 77%) and rotation cropping decisions consider cotton pest risks (87% v 77%).
- Where the practices are being used, growers are reporting that these practices are being used on almost all of their cotton crop.



HOW WIDELY USED ARE THE PRACTICES LISTED BELOW:

	Proportion of growers who have used practice in 2018-19 cotton fields	% of Total Cotton Ha (where practice is used)
The industry's recommended thresholds are used when making pest control decisions	97%	95%
Pesticides selection aims to conserve beneficial insects whenever possible	96%	99%
Weed hosts are controlled to prevent pest build up	95%	97%
Rotations are used as part of integrated weed management strategy	90%	96%
The industry's recommended sampling strategies are used to monitor pest abundance and plant damage	90%	96%
The IRMS is followed when selecting insecticides/miticides	89%	97%
Rotations cropping decisions consider cotton disease risks	88%	96%
Rotations cropping decisions consider cotton pest risks	87%	95%

Base: all growers who grew cotton during 2018-19 season; n = 150



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA (% OF GROWERS USED PRACTICE IN 2018-19 COTTON FIELDS)

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	18	27	13	47	14	31	61	69	20
The industry's recommended thresholds are used when making pest control decisions	94%	96%	100%	96%	100%	97%	95%	99%	95%
Pesticides selection aims to conserve beneficial insects whenever possible	94%	96%	100%	94%	100%	97%	93%	99%	95%
Weed hosts are controlled to prevent pest build up	89%	96%	100%	96%	100%	94%	95%	97%	90%
Rotations are used as part of integrated weed management strategy	67%	93%	92%	94%	93%	94%	92%	90%	85%
The industry's recommended sampling strategies are used to monitor pest abundance and plant damage	89%	89%	100%	89%	93%	87%	87%	91%	95%
The IRMS is followed when selecting insecticides/miticides	94%	89%	85%	91%	93%	84%	87%	91%	90%
Rotations cropping decisions consider cotton disease risks	67%	89%	85%	91%	100%	90%	85%	91%	85%
Rotations cropping decisions consider cotton pest risks	72%	93%	85%	87%	100%	87%	85%	91%	80%



Focus area: IPM and crop protection

Impact of spray drift on cotton crop

Growers were asked about the impact of spray drift on their cotton crop. These questions were also measured in the 2018 Grower Survey and so provide a comparison point for the 2019 results.

Given the small sample sizes here, it is recommended some caution over comparing these results is exercised. The feedback provided by growers suggests that:

- Somewhat fewer growers in 2019 reported being affected by spray drift (19% down 10 points). The smaller growers were less likely to report being impacted this year.

- Growers who were affected reported that, on average, 24% of their cotton crop area had been impacted.
- There was, as reported by these growers, an estimated average financial cost of approximately \$7K.

For the 2018-19 cotton growing season, what area of your cotton crop was impacted by spray drift, and what do you estimate to be the yield cost and financial cost of this damage?

% of cotton growers affected

19%
(down 10% on 2018)

OF THE 19% OF COTTON GROWERS AFFECTED...

Average % of cotton crop area impacted

24%

Average yield cost (in bales / ha)

0.7
(down 0.2 on 2018)

Average financial cost (in \$)

\$7,000

Base: all growers who grew cotton during 2018-19 season; n = 151. 19% of cotton growers affected; n = 29.



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

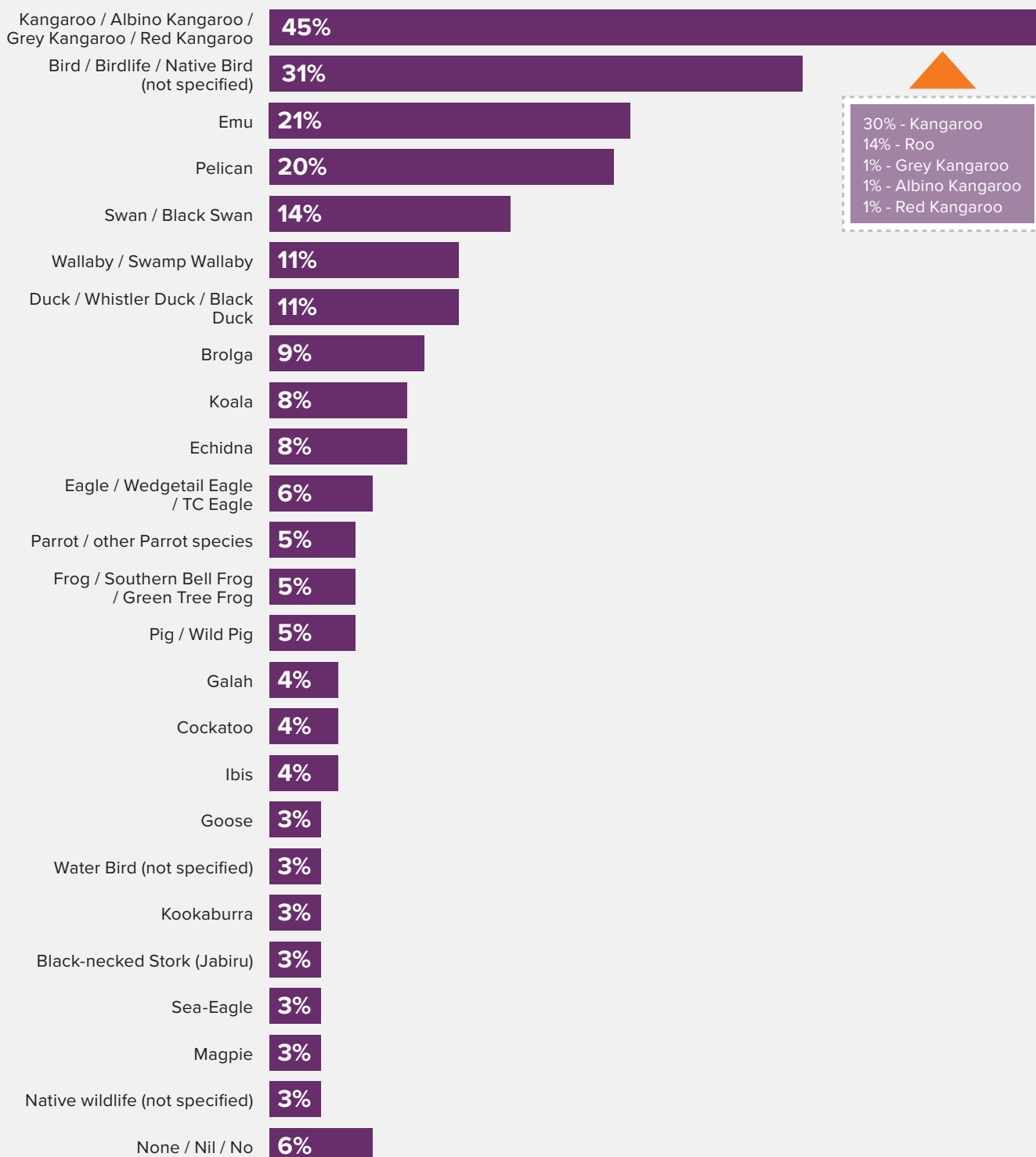
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	18	27	13	48	14	31	61	70	20
% of cotton growers affected	11%	11%	23%	25%	14%	23%	8%	29%	20%
Average % of cotton crop area impacted	75%	2%	21%	30%	2%	14%	14%	27%	17%
Average yield cost (in bales / ha)	0.0	0.1	0.0	0.4	0.0	2.0	1.3	0.6	0.4
Average financial cost (in \$)	\$0	\$833	\$0	\$7,038	\$500	\$16,440	\$976	\$6,690	\$16,000



Focus area: natural resource management

Species of wildlife growers are proud to have on-farm

What species of wildlife (land or water-based) are you proud to have occur on your farm or in your local landscape?



Base: all growers; n = 192 Note: only words mentioned by at least 3% (n = 5 or more) of growers are listed above.



Focus area: natural resource management

Species of wildlife growers are proud to have on-farm

Summary of species by land, air, water



59%

Land Species



69%

Air Species



9%

Water Species

SOME OF THE EXAMPLES OF THESE SPECIES MENTIONED BY GROWERS...

Land Species	Air Species	Water Species
Kangaroo / Albino Kangaroo / Grey Kangaroo / Red Kangaroo	Bird / Birdlife / Native Bird (not specified)	Frog / Southern Bell Frog / Green Tree Frog
Emu	Pelican	Fish (not specified)
Wallaby / Swamp Wallaby	Swan / Black Swan	Cod / Murray Cod
Koala	Duck / Whistler Duck / Black Duck	Golden Perch (Yellowbelly)
Echidna	Brolga	Yabby
Pig / Wild Pig	Eagle / Wedgetail Eagle / TC Eagle	Herring
Fox	Parrot / Superb Parrot / Red Wing Parrot / Green Mountain Parrot	Crocodile
Goanna	Galah	Platypus
Spider / Golden Orb Spider	Cockatoo	
Lizard (not specified)	Ibis	
Possum	Goose	

Base: all growers; n = 192



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

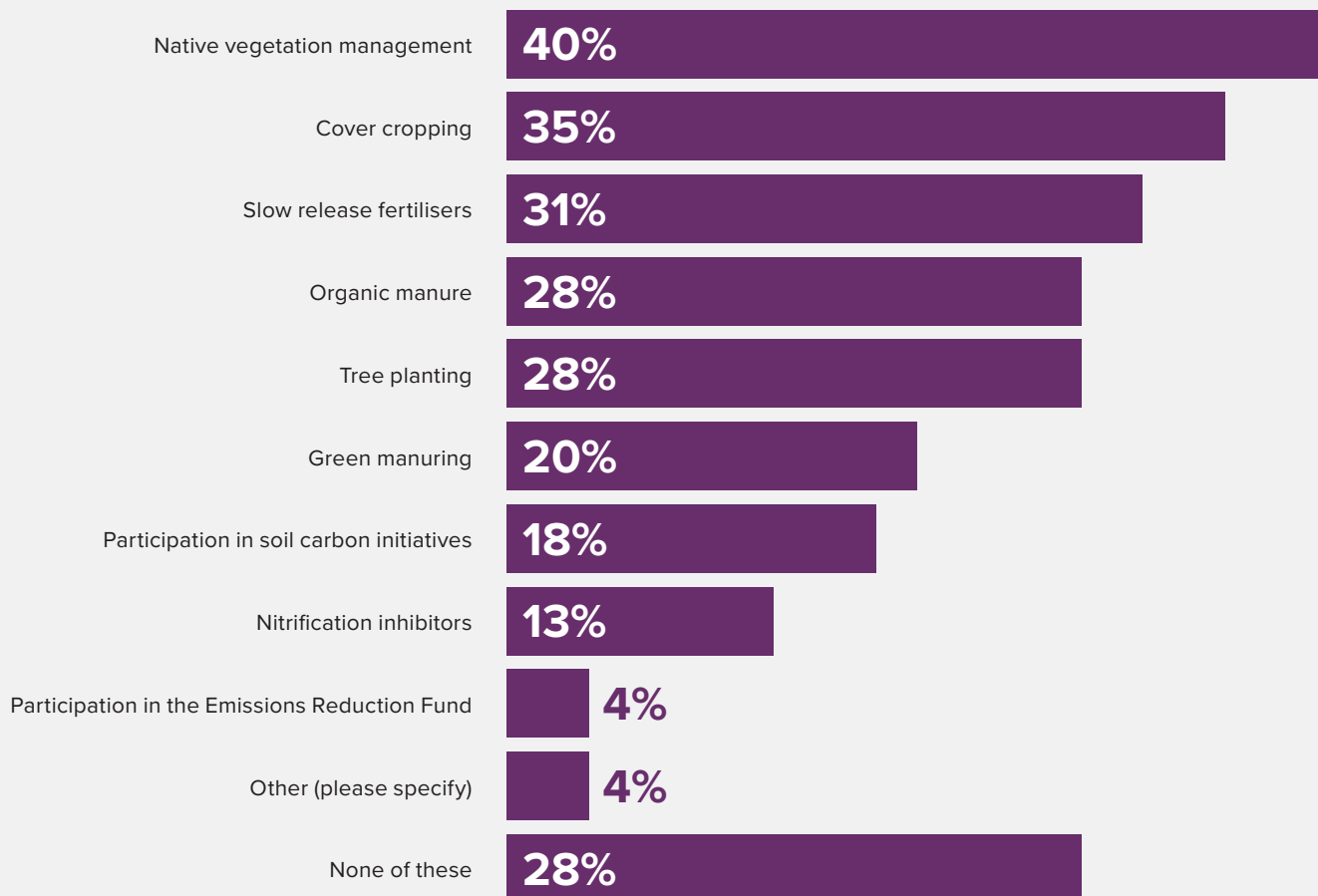
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
Land Species	60%	52%	63%	62%	68%	51%	59%	58%	64%
Air Species	80%	58%	74%	68%	58%	80%	65%	73%	73%
Water Species	15%	3%	16%	8%	5%	14%	7%	11%	9%
Kangaroo / Kangaroo species	35%	42%	58%	48%	32%	46%	45%	42%	55%
Bird / Birdlife / Native Bird	40%	24%	21%	30%	21%	43%	32%	27%	41%
Emu	25%	12%	32%	24%	42%	6%	15%	27%	23%
Pelican	20%	18%	26%	24%	26%	9%	20%	20%	23%
Swan / Black Swan	15%	12%	16%	18%	11%	6%	7%	20%	9%
Wallaby / Swamp Wallaby	25%	3%	0%	12%	21%	11%	9%	14%	14%
Duck / Whistler Duck / Black Duck	20%	9%	11%	8%	11%	14%	15%	10%	0%
Brolga	10%	3%	11%	11%	16%	9%	6%	10%	18%
Koala	0%	6%	5%	18%	0%	0%	5%	10%	9%
Echidna	5%	9%	11%	8%	11%	6%	5%	10%	9%



Focus area: natural resource management

Landscape management activities around reducing emissions / sequestering carbon

Are you undertaking/involved in any landscape management activities specifically designed to reduce emissions or sequester carbon in the landscape?



Base: all growers; n = 192



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

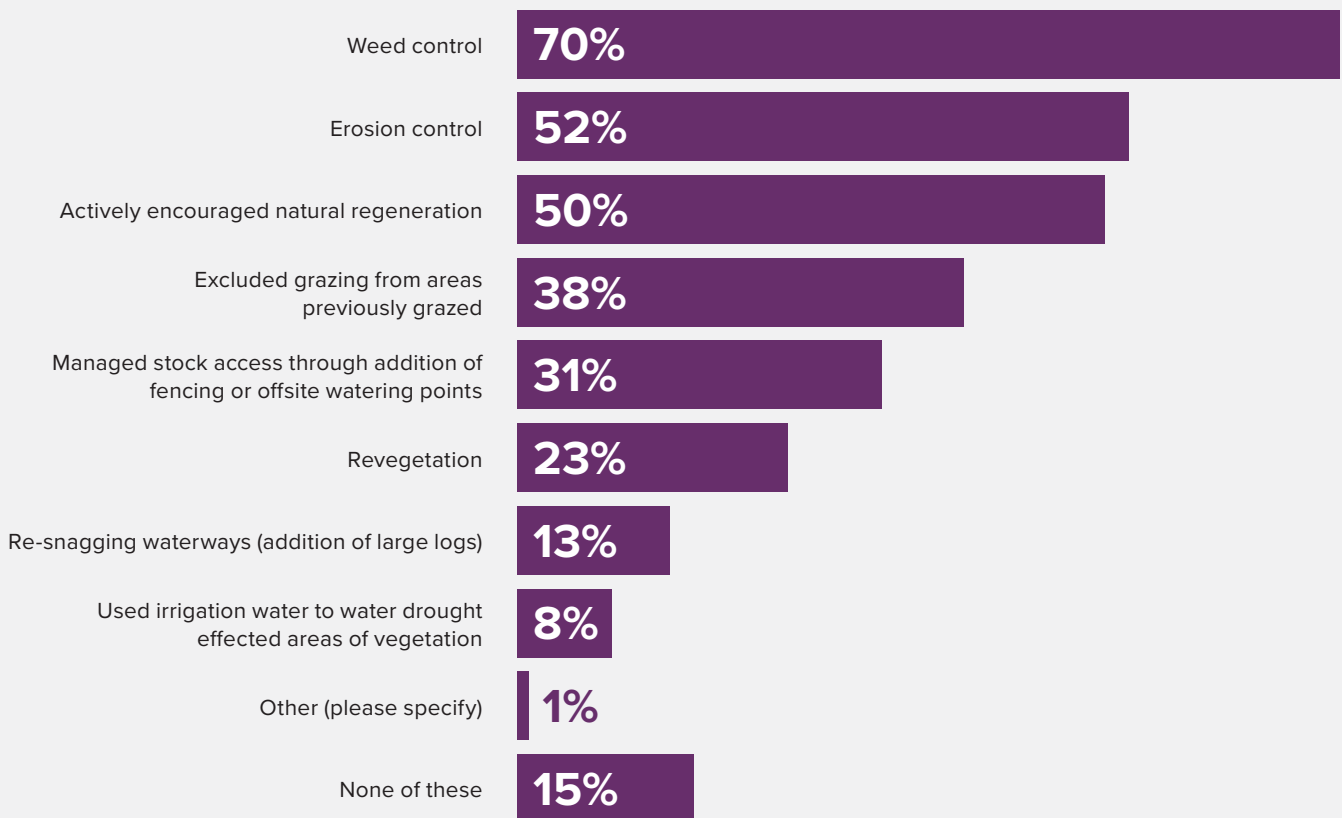
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
Native vegetation management	50%	30%	37%	44%	32%	40%	40%	35%	55%
Cover cropping	25%	48%	26%	41%	37%	23%	37%	30%	55%
Slow release fertilisers	45%	30%	32%	36%	16%	23%	37%	23%	45%
Organic manure	15%	42%	11%	29%	26%	31%	32%	26%	23%
Tree planting	20%	21%	5%	26%	37%	49%	28%	28%	23%
Green manuring	30%	9%	21%	20%	26%	23%	24%	14%	32%
Participation in soil carbon initiatives	15%	24%	0%	20%	26%	14%	17%	17%	23%
Nitrification inhibitors	20%	6%	5%	17%	16%	9%	10%	8%	41%
Participation in the Emissions Reduction Fund	10%	0%	0%	2%	11%	9%	5%	3%	5%
Other (please specify)	5%	9%	0%	3%	0%	3%	2%	5%	5%
None of these	25%	21%	42%	23%	37%	34%	26%	34%	14%



Focus area: natural resource management

Management activities undertaken in the past 12 months

In natural areas on farm, what management activities have you undertaken in the past 12 months?



Base: all growers; n = 192



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
Weed control	75%	73%	74%	73%	68%	57%	66%	69%	86%
Erosion control	85%	61%	37%	58%	32%	34%	52%	47%	73%
Actively encouraged natural regeneration	55%	39%	37%	62%	26%	54%	50%	50%	50%
Excluded grazing from areas previously grazed	40%	33%	26%	44%	42%	34%	32%	39%	59%
Managed stock access through addition of fencing or offsite watering points	35%	12%	32%	39%	37%	29%	21%	35%	55%
Revegetation	25%	15%	11%	24%	16%	37%	23%	25%	14%
Re-snagging waterways (addition of large logs)	40%	15%	5%	14%	0%	6%	15%	9%	23%
Used irrigation water to water drought effected areas of vegetation	15%	0%	5%	5%	16%	14%	10%	6%	9%
Other (please specify)	0%	0%	0%	2%	0%	3%	1%	1%	0%
None of these	10%	15%	21%	11%	16%	20%	20%	14%	0%



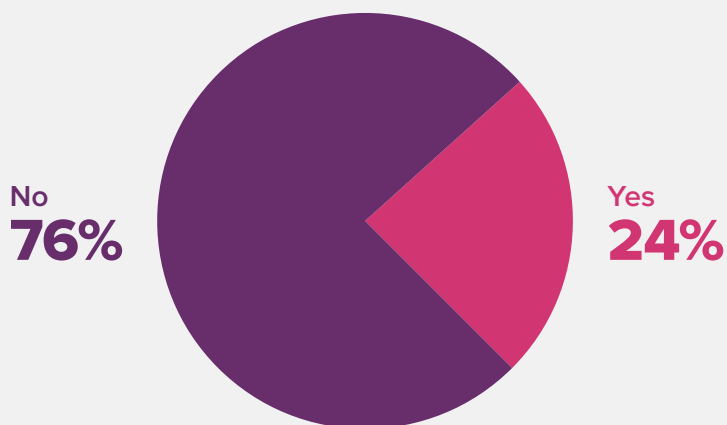
Focus area: industry research trials

The incidence of growers involved in cotton industry research was a new topic area covered in the 2019 Grower Survey. The results provided in the Grower Survey suggests that:

- About one in four (24%) of growers indicated they were involved in cotton industry research trials on their farm last season. This was more prevalent among the larger growers (64% reporting an involvement) with clear variations also reported across the regions.
- Growers who were involved reported contributing an average of just over 32 hours of their time in these trials. That said the level of reported involvement varied considerably (0-180 hours).
- Growers involved in these trials reported an estimated average cost with being involved of just under \$5,000.



Did you have any cotton industry research trials on your farm last season? (e.g. CRDC , CSIRO, DPI, DAF, Universities, etc.)?



OF THE 24% OF GROWERS WHO
HELD TRIALS ON FARM...

Average time
contributed (in hours) **32.2**

Average cost
contributed (\$) **\$4,972**

Base: all growers; n = 192; growers who held trials on farm; n = 46;



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
Yes	15%	18%	16%	33%	26%	23%	16%	23%	64%
Base	3	6	2	22	5	8	13	19	14
Average time contributed (in hours)	30.0	26.7	30.0	36.1	11.8	40.0	30.4	30.3	36.6
Average cost contributed (\$)	\$3,667	\$4,383	\$2,000	\$8,056	\$17	\$1,951	\$2,284	\$4,934	\$7,959

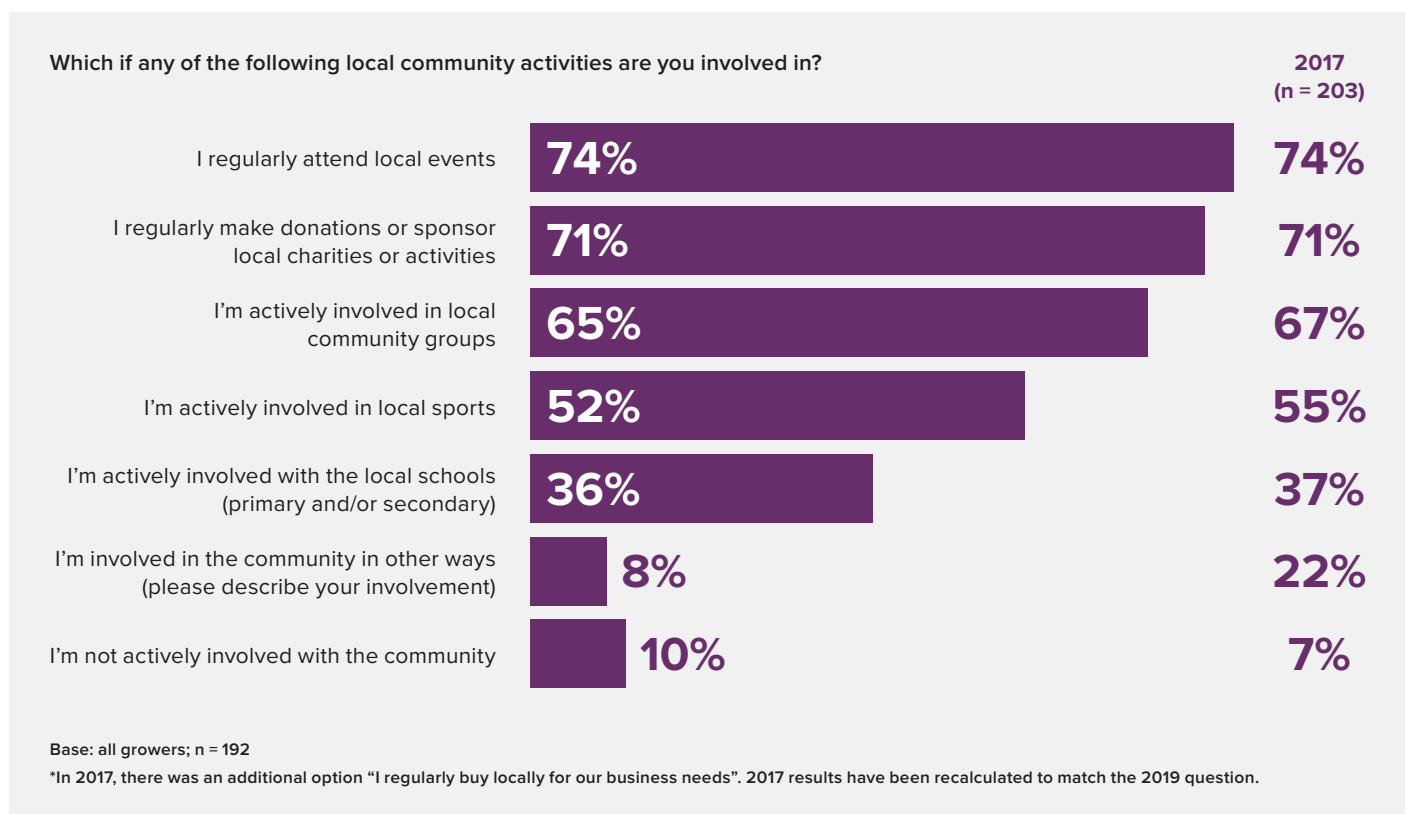


Focus area: community and social contribution

Local community activities

The 2019 survey indicated that the overwhelming majority of growers are involved, at some level, in their local communities.

- Nine in ten (90%) of growers in the survey reported being involved in at least one of the community based activities measured in the survey.
- Involvement was strongest among the larger growers and across most regions (Central QLD and Macintyre reported the lowest levels of involvement at 80% and 79% respectively).
- Involvement took various forms including being present at events, making donation or sponsorships or an active involvement in local community groups or sports.
- 60% of those involved in some way do so on at least a monthly basis. Growers have reported spending on average some 3 hours with these community activities. This result is similar to the result reported in the 2017 Grower Survey.





KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

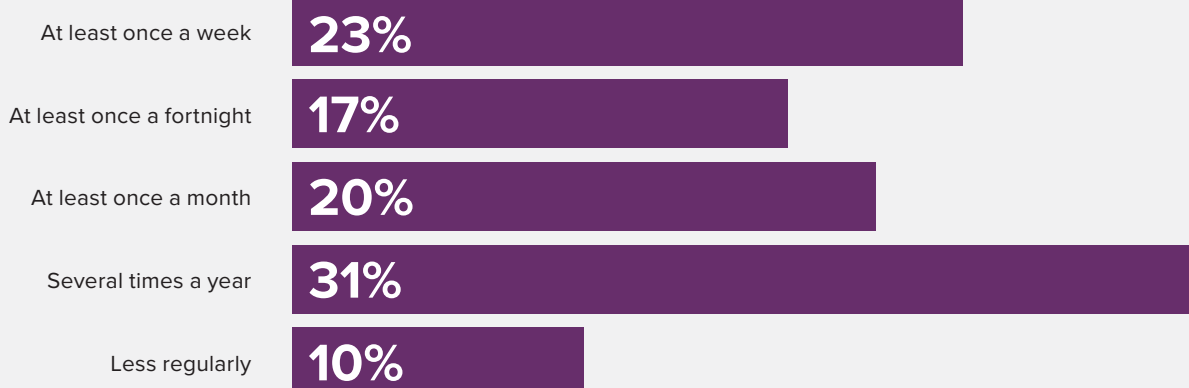
	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
I regularly attend local events	75%	73%	74%	79%	74%	66%	71%	74%	86%
I regularly make donations or sponsor local charities or activities	60%	67%	74%	76%	79%	66%	67%	70%	86%
I'm actively involved in local community groups	55%	64%	68%	73%	58%	57%	65%	63%	73%
I'm actively involved in local sports	45%	42%	42%	62%	53%	49%	46%	52%	68%
I'm actively involved with the local schools (primary and/or secondary)	45%	30%	53%	39%	37%	20%	32%	36%	50%
I'm involved in the community in other ways	0%	12%	5%	3%	11%	17%	10%	7%	5%
I'm not actively involved with the community	20%	12%	21%	2%	5%	14%	12%	10%	0%



Focus area: community and social contribution

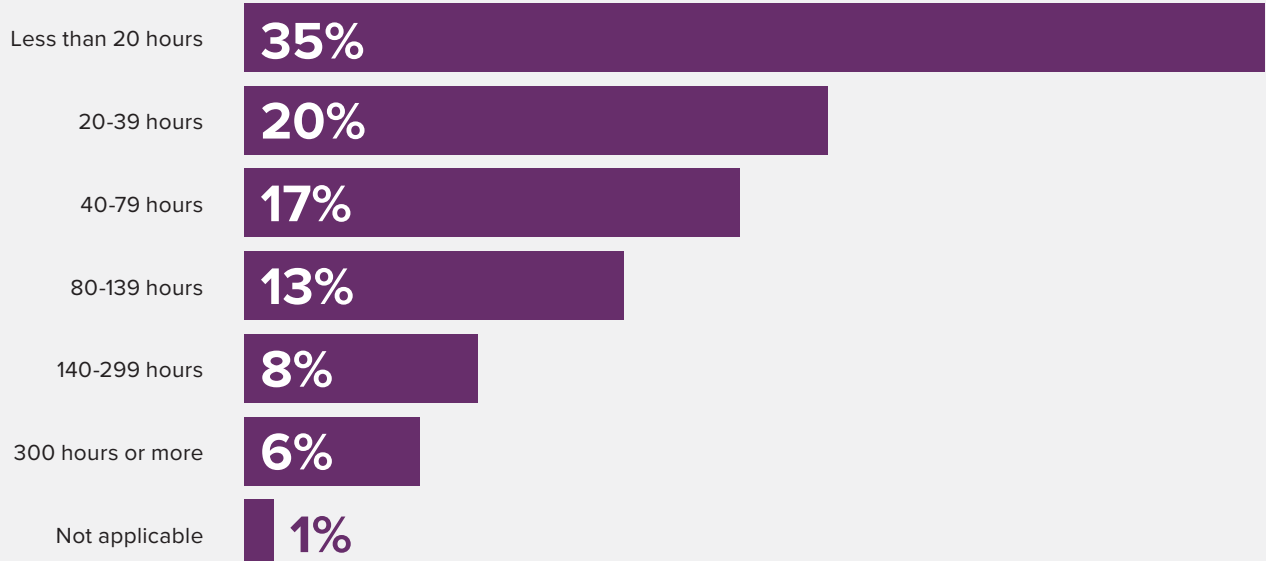
Frequency of participation in activities

Considering these, over the last 12 months how often would you usually volunteer or participate in activities in your local community?



Base: all growers who are actively involved in the community; n = 173

On average, how many hours would you estimate you have spent on community commitments and volunteering over the last 12 months:



Base: all growers who are actively involved in the community; n = 173



KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	16	29	15	65	18	30	72	79	22
At least once a week	13%	21%	40%	23%	17%	23%	19%	27%	18%
At least once a fortnight	6%	17%	20%	18%	17%	17%	21%	10%	27%
At least once a month	31%	17%	20%	18%	17%	20%	22%	15%	27%
Several times a year	44%	28%	7%	34%	33%	30%	28%	35%	23%
Less regularly	6%	17%	13%	6%	17%	10%	10%	13%	5%

KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	16	29	15	65	18	30	72	79	22
Less than 20 hours	25%	34%	33%	35%	44%	33%	32%	39%	27%
20-39 hours	31%	7%	20%	22%	22%	23%	17%	19%	36%
40-79 hours	19%	21%	20%	18%	6%	13%	18%	15%	18%
80-139 hours	13%	17%	7%	12%	11%	17%	17%	11%	9%
140-299 hours	13%	14%	0%	6%	6%	7%	10%	5%	9%
300 hours or more	0%	7%	20%	5%	6%	7%	7%	8%	0%
Not applicable	0%	0%	0%	2%	6%	0%	0%	3%	0%



Focus area: community and social contribution

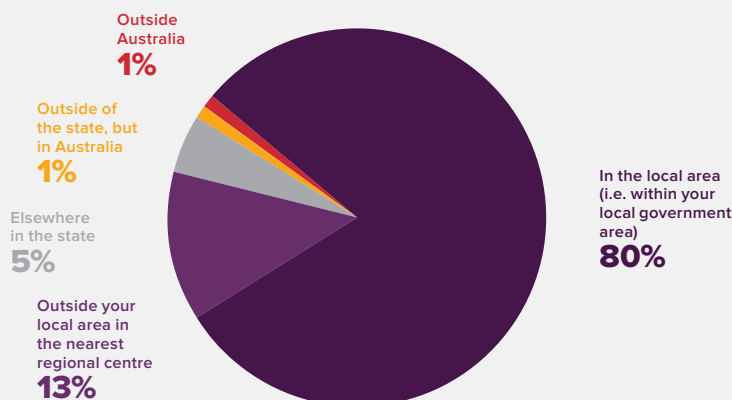
Location of business expenses for the 2018-19 season

Growers were asked about the location/area where their business expenses are spent. This measure was also collected in the 2017 Grower Survey. The feedback provided by growers suggests that:

- As reported in the survey, the majority of business expenses are reportedly spent within the immediate local areas of the farm businesses. Growers reported on average 80% of their business expenses are spent locally. This result is consistent with the result reported in the 2017 Grower Survey (79%). Smaller growers are more likely to spend more of their business expenses in this area (84% of total business expenses).
- A further 13% of total business expenses are spent in adjacent regional centres.



Thinking of your total business expenses for the 2018-19 growing season, can you estimate what proportion would be spent...?



Base: all growers; n = 192



	2017	2019
Base	203	192
In the local area (i.e. within your local government area)	79%	80%
Outside your local area in the nearest regional centre	14%*	13%
Elsewhere in the state		5%
Outside of the state, but in Australia	5%	1%
Outside Australia	2%	1%

*In 2017, respondents were asked the option "Outside the local area but in the state" instead of the two separate options seen here.

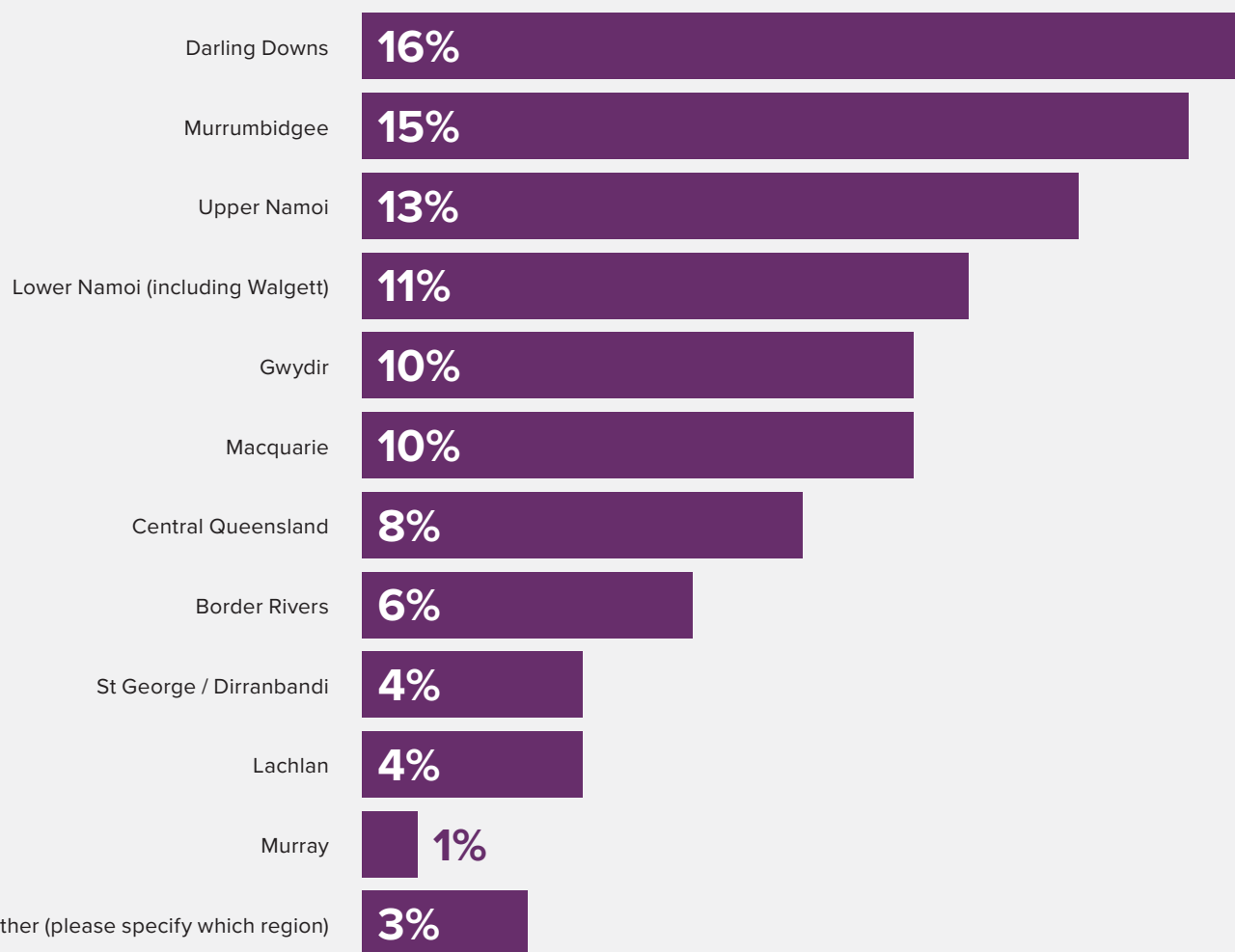
KEY RESULTS BY REGION AND SIZE OF TOTAL FARM AREA

	Region						Size of Total Farm Area		
	Central QLD	Darling Downs	Macintyre Balonne	Northern NSW	Macquarie	Southern NSW	Small	Medium	Large
Base	20	33	19	66	19	35	82	88	22
In the local area (i.e. within your local government area)	88%	82%	73%	79%	77%	81%	84%	79%	70%
Outside your local area in the nearest regional centre	7%	12%	17%	15%	16%	12%	11%	14%	20%
Elsewhere in the state	4%	5%	8%	3%	6%	5%	4%	5%	8%
Outside of the state, but in Australia	1%	1%	2%	2%	1%	1%	1%	2%	2%
Outside Australia	1%	1%	0%	1%	0%	1%	1%	1%	0%

Appendices

Farm region and grower age

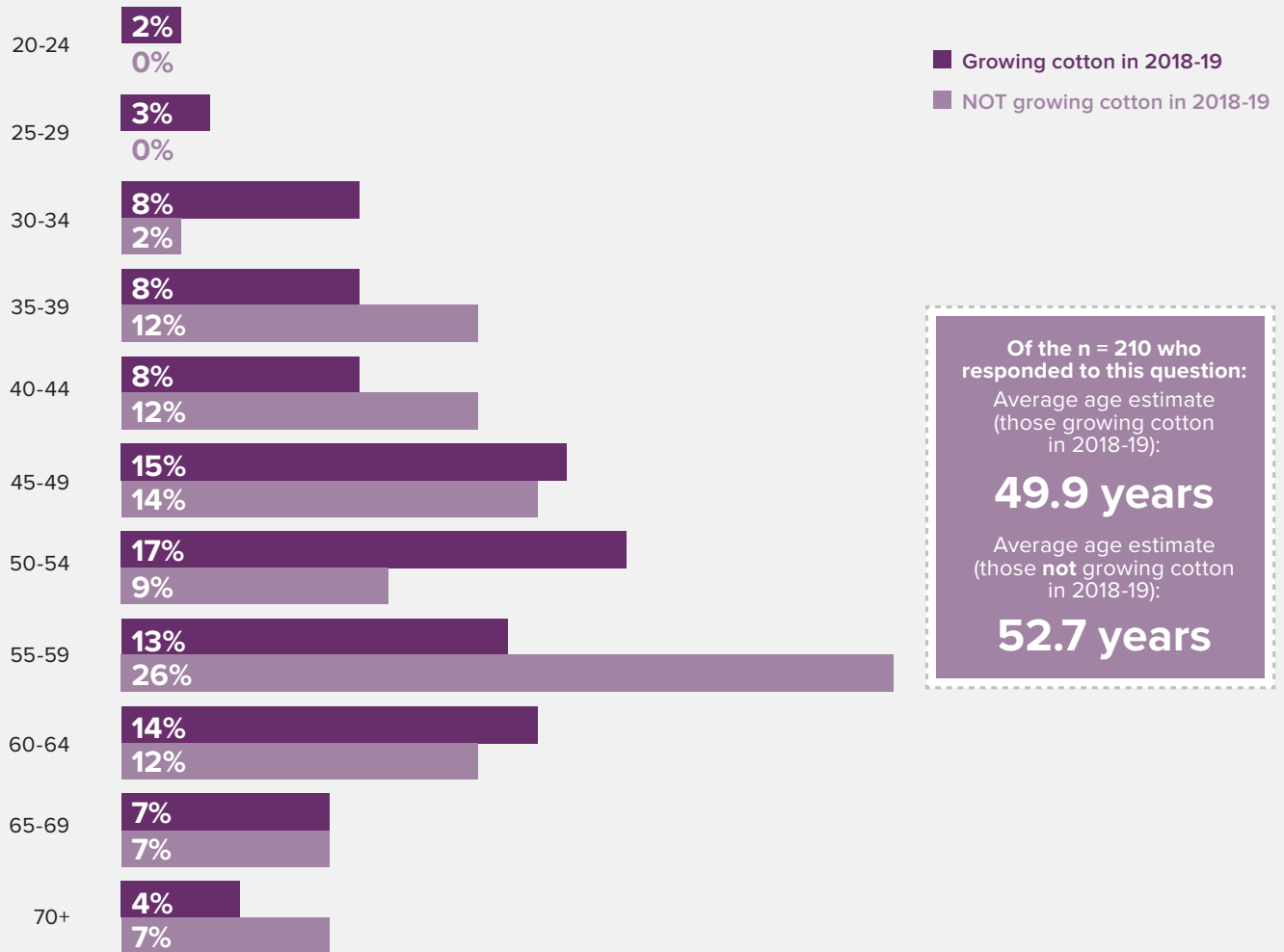
In which region are you located?



Base: all growers; n = 192



Which age category do you belong to?



Base: all growers; growing cotton in 2018-19 n = 167, NOT growing cotton in 2018-19: n = 43

Appendices

Role and description of farming business

What is your role on your farm?

Family member or farm
business owner (operational)

84%

Farm manager

12%

Farm business investor
(non-operational)

1%

Other (please specify)

2%

Base: all growers; n = 219

How would you describe your farming business?

Family farm

93%

Australian-owned corporate

4%

Mixed family/corporate

2%

Foreign-owned corporate

1%

Base: all growers; n = 219



Appendices

Technical notes

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	192 (# surveys completed)	200	219 (# surveys started)	300	500	1,000	1,500	2,000
10%	n/a	n/a	n/a	± 5.88%	± 4.80%	± 4.24%	± 4.16%	± 3.97%	± 3.39%	± 2.63%	± 1.86%	± 1.52%	± 1.31%
20%	n/a	± 11.09%	± 9.05%	± 7.84%	± 6.40%	± 5.66%	± 5.54%	± 5.30%	± 4.53%	± 3.51%	± 2.48%	± 2.02%	± 1.75%
30%	n/a	± 12.70%	± 10.37%	± 8.98%	± 7.33%	± 6.48%	± 6.35%	± 6.07%	± 5.19%	± 4.02%	± 2.84%	± 2.32%	± 2.01%
40%	± 17.53%	± 13.58%	± 11.09%	± 9.60%	± 7.84%	± 6.93%	± 6.79%	± 6.49%	± 5.54%	± 4.29%	± 3.04%	± 2.48%	± 2.15%
50%	± 17.89%	± 13.86%	± 11.32%	± 9.80%	± 8.00%	± 7.07%	± 6.93%	± 6.62%	± 5.66%	± 4.38%	± 3.10%	± 2.53%	± 2.19%
60%	± 17.53%	± 13.58%	± 11.09%	± 9.60%	± 7.84%	± 6.93%	± 6.79%	± 6.49%	± 5.54%	± 4.29%	± 3.04%	± 2.48%	± 2.15%
70%	n/a	± 12.70%	± 10.37%	± 8.98%	± 7.33%	± 6.48%	± 6.35%	± 6.07%	± 5.19%	± 4.02%	± 2.84%	± 2.32%	± 2.01%
80%	n/a	± 11.09%	± 9.05%	± 7.84%	± 6.40%	± 5.66%	± 5.54%	± 5.30%	± 4.53%	± 3.51%	± 2.48%	± 2.02%	± 1.75%
90%	n/a	n/a	n/a	± 5.88%	± 4.80%	± 4.24%	± 4.16%	± 3.97%	± 3.39%	± 2.63%	± 1.86%	± 1.52%	± 1.31%

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 ($np < 10$ or $n(1-p) < 10$).

Appendices

Research design

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 survey was initially conducted via an online survey using contact lists provided by CRDC. Midway through the research period, the methodology shifted to a phone call encouraging growers to complete the survey online, or were given the option to complete the survey over the phone at a time that suited them.

Sample

In total, a sample of n = 964 growers was provided by CRDC, with n = 219 starting the survey and n = 192 surveys completed (completion rate of 19.9%). A breakdown of the number of surveys completed by Region is located below.

Questionnaire

Growers were asked to complete a 20 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
- 2018-19 Cotton Crop
- Water
- Energy
- Nutrition and Soil
- myBMP
- IPM and Crop Protection
- Natural Resource Management
- Industry Research Trials
- Community and Social Contribution
- Industry Sentiment
- Voice of the Grower

Timing

The online survey was launched on the 11th June 2019 and remained open until the 13th July 2019.

Region	Number of Started Surveys	Number of Completed Surveys
Overall	219	192
Central Queensland	20	20
Darling Downs	35	35
Macintyre – Balonne	22	19
Northern NSW	76	66
Macquarie	22	19
Southern NSW	43	35
Other	1	0

2019 Grower Survey

Survey questions

Thank you for agreeing to complete the 2019 Grower Survey.

This survey is being conducted by Intuitive Solutions on behalf of the Cotton Research and Development Corporation (CRDC).

Questions denoted with a red asterisk * are required questions and will need to be answered before moving forward in the survey.

Please continue to the next page to begin the survey.

Module 1

Farm profiles

[SECTION ASKED TO ALL GROWERS]

First, we have a few questions about you and your farm. Please be assured that this information is only being used to compare your answers to other growers at an aggregate level. This information is NOT being collected to identify you in any way.

Q1. Which age category do you belong to?

Under 20	1
20-24	2
25-29	3
30-34	4
35-39	5
40-44	6
45-49	7
50-54	8
55-59	9
60-64	10
65-69	11
70+	12

Q2. What is your role on your farm?

Farm business investor (non-operational)	1
Family member or farm business owner (operational)	2
Farm manager	3
Other (please specify)	90

Q3. How would you describe your farming business?

Family farm	1
Australian-owned corporate	2
Foreign-owned corporate	3
Mixed family/corporate	4

Q4. In which region are you located?

Central Queensland	1
Darling Downs	2
Border Rivers	3
St George / Dirranbandi	4
Gwydir	5
Lower Namoi (including Walgett)	6
Upper Namoi	7
Macquarie	8
Bourke	9
Lachlan	10
Murrumbidgee	11
Murray	12
Other (please specify which region)	90



Q5. What is the total area of your farm (in hectares)? That is the area developed for irrigated cropping, dryland cropping, grazing, native vegetation not usually grazed, and any other area not covered above.

	Number of ha
Total farm size (ha)	###

Q6. And, of the total area of your farm [ANSWER FROM Q5] hectares), what is the area attributed to the following?

Please ensure you answer each box available, even if it is 0.

	Number of ha
Area developed for fully irrigated broadacre cropping (ha)	###
Area developed for partially irrigated broadacre cropping (ha)	###
Area developed for raingrown dryland cropping (ha)	###
Area used for grazing (ha)	###
Area of native vegetation not usually grazed (ha)	###
Other area not covered above (ha)	###
TOTAL	[Q5 ANSWER] ha

Q7. Approximately how long and wide is the riparian area on your property?

Please ensure you answer each box available. You can provide your estimate in a decimal format (e.g. 0.2, 1.5, 2.75).

If you do not have a riparian area, please enter "0" in each box and continue.

Riparian length (best estimate in kilometres)	### km
Average width (best estimate in metres)	### m

Q8. During the 2018-19 cotton growing season, what was the total area planted for cotton?

Please ensure the area answered below does not exceed your area answered earlier across irrigated and raingrown/dryland cropping: [ANSWER FROM Q6] hectares.

Area (in hectares)	### ha
None, I didn't grow cotton during the 2018-19 season	99

Module 2

Your 2018-19 cotton crop

[SECTION ASKED ONLY TO THOSE WHO GREW COTTON DURING 2018-19 SEASON]

The next questions relate to your 2018-19 cotton crop.

Q9. What area was **planted for cotton for the 2018-19 cotton growing season?**

Please ensure you answer each box available, even if it is 0.

Please ensure the areas answered below do not exceed your areas answered earlier, if applicable (listed below):

Total area planted for cotton: [ANSWER FROM Q8] hectares

Area developed for fully irrigated broadacre cropping: [ANSWER FROM Q6] hectares

Area developed for partially irrigated broadacre cropping: [ANSWER FROM Q6] hectares

Area developed for raingrown | dryland cropping: [ANSWER FROM Q6] hectares

[DISPLAY FULL/PART/RAIN COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q6]

	Fully irrigated (ha)	Partially irrigated (ha)	Raingrown Dryland (ha)
Field area planted	###	###	###
Green area planted	###	###	###
Area planted but not harvested	###	###	###

Q10. What were your yields for the 2018-19 cotton growing season?

Please ensure you answer each box available, even if it is 0.

[DISPLAY FULL/PART/RAIN COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q9]

	Fully irrigated (bales/ha)	Partially irrigated (bales/ha)	Raingrown Dryland (bales/ha)
Average yield	###	###	###
The yield achieved by your highest-yielding field	###	###	###
The yield achieved by your lowest-yielding field	###	###	###

2019 Grower Survey

Survey questions

Q11. What factors do you believe LIMITED yield last season (2018-19)?

[DISPLAY Q12/Q13 BASED UPON NON-ZERO ANSWERS FOR IRRIGATED AND DRYLAND COTTON AT Q9]

Q12. Thinking about your cotton field history, of the IRRIGATED cotton hectares in 2018-19, how many were...

Please ensure you answer each box available, even if it is 0.

Please ensure each individual area answered below does not exceed your area answered earlier of irrigated cotton cropping: [ANSWER FROM Q9] hectares.

Back-to-back cotton, i.e. cotton grown in the same field in the 2017-18 and 2018-19 seasons	### ha
Following Summer fallow, i.e. no crop in the 2017-18 Summer or 2018 Winter, but cropped in 2016-17 Summer or 2017 Winter	### ha
Following long fallow, i.e. no crop in the 2018 Winter, 2017-18 Summer, 2017 Winter or 2016-17 Summer	### ha
'Double cropped', i.e. following crop in Winter 2018 that was harvested	### ha
Following a cover crop, i.e. crop planted and sprayed out/not harvested	### ha
New fields, i.e. never had cotton grown there previously	### ha

Q13. Thinking about your cotton field history, of the RAINGROWN | DRYLAND cotton hectares in 2018-19, how many were...

Please ensure you answer each box available, even if it is 0.

Please ensure each individual area answered below does not exceed your area answered earlier of raingrown | dryland cotton cropping: [ANSWER FROM Q9] hectares.

Back-to-back cotton, i.e. cotton grown in the same field in the 2017-18 and 2018-19 seasons	### ha
Following Summer fallow, i.e. no crop in the 2017-18 Summer or 2018 Winter, but cropped in 2016-17 Summer or 2017 Winter	### ha
Following long fallow, i.e. no crop in the 2018 Winter, 2017-18 Summer, 2017 Winter or 2016-17 Summer	### ha
'Double cropped', i.e. following crop in Winter 2018 that was harvested	### ha
Following a cover crop, i.e. crop planted and sprayed out/not harvested	### ha
New fields, i.e. never had cotton grown there previously	### ha

Module 3

Water

[SECTION ASKED ONLY TO THOSE WHO GREW COTTON DURING 2018-19 SEASON]

Q14. Could you please provide estimates of the moisture profile at planting (or prior to pre-watering if performed), and then again at the end of the season, across the following areas (for the 2018-19 cotton growing season):

Please ensure you answer each box available, even if it is 0.

Please estimate in millimetres.

[DISPLAY FULL/PART/RAIN COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q9]

	Fully irrigated	Partially irrigated	Raingrown Dryland
Moisture profile at planting or prior to pre-watering (mm)	###	###	###
Moisture profile at season's end (mm)	###	###	###

Q15. How much in-crop rainfall (in mm) did you receive in the 2018-19 cotton growing season between planting and harvesting?

In-crop rainfall (mm)	###
-----------------------	-----

[IF NO IRRIGATED COTTON AT Q9, GO TO Q18]

Q16. How much irrigation water (in mega litres per hectare) was applied to cotton during the 2018-19 cotton growing season?

Please ensure you answer each box available, even if it is 0.

[DISPLAY FULL/PART COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q9]

	Fully irrigated	Partially irrigated
Mega litres used per ha	###	###



Q17. For irrigated / partially irrigated cotton this season (2018-19), what strategies have you used for managing limited water? Please select all that apply.

[MULTIPLE CHOICE]

Planted some fully irrigated fields and some semi-irrigated fields (which receive more irrigation if water comes available)	1
Watered up only and relied on rainfall	2
Planted only the cotton area that there was enough water to fully irrigate	3
Single skip irrigated	4
Double skip irrigated	5
Planted early	6
Planted later	7
Waited for rain before planting	8
Water not limited	9
Stopped irrigating/ploughing in selected fields during season	10
Other (please specify)	90

Module 4 Energy

[Q18-Q19 ONLY ASKED TO THOSE WHO GREW COTTON DURING 2018-19 SEASON. Q20-Q21 ASKED TO ALL RESPONDENTS.]

Q18. Please provide an estimate on what your total energy use was for the 2018-19 cotton growing season across the following operations:

Energy used for in-field operations (ground preparation, in-season operations, harvesting and post-harvest operations excluding transport to gin). Please provide your best estimate:

Please ensure you answer each box available, even if it is 0.

Diesel (L)	###
Bio-diesel (L)	###

Energy used for pumping water. Please provide your best estimate:

Please ensure you answer each box available, even if it is 0.

Diesel (L)	###
Electricity use (kWh)	###

Q19. How much solar energy did you make use of for the 2018-19 cotton growing season for your farming operations? Please indicate an estimate of how many kilowatt hours (kWh) were generated and used across the cotton growing season.

kWh generated and used across 2018-19 cotton growing season	###
We do generate solar energy, but don't know kWh generated	2
No, we don't generate solar energy	3

[ASKED TO ALL RESPONDENTS]

Q20. Are you taking any measures to reduce your energy use (fuel or electricity)? If so, please provide examples of how.

Q21. In the last five years, have you done any of the following to improve energy savings? Please select all that apply.

[MULTIPLE CHOICE]

Measured and/or benchmarked total energy use per bale or hectare	1
Measured and/or benchmarked energy use for individual operations	2
Had a pump efficiency investigation	3
Used autosteer for most machinery operations	4
Used traction control systems for most machinery operations	5
Other (please specify)	90
[EXCLUSIVE] I have not done any of the above to improve energy savings	99

2019 Grower Survey

Survey questions

Module 5

Nutrition and soil

[Q22-Q25 ONLY ASKED TO THOSE WHO GREW COTTON DURING 2018-19 SEASON. Q26 ASKED TO ALL RESPONDENTS.]

Q22. Please list the rate of applied nutrients for your most typical irrigated, partially irrigated and/or dryland cotton field/s in 2018-19:

Please ensure you answer each box available, even if it is 0.

[DISPLAY FULL/PART/RAIN COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q9]

	Fully irrigated	Partially irrigated	Raingrown / Dryland
Preseason Nitrogen (kg N/ha)	###	###	###
In-season Nitrogen (kg N/ha)	###	###	###
Total Phosphorus (kg P/ha)	###	###	###
Total Potassium (kg K/ha)	###	###	###
Total Zinc	###	###	###
Total Sulfur	###	###	###

Q23. Did you vary fertiliser application rates between different fields / management units last season? Please select all that apply.

Vary rates within fields	1
Different rates for back to back vs fallow fields	2
Varied between fields based on field history (e.g. crop, flood)	3
Varied based on soil testing	4
Varied based on soil type	5
Other (please specify)	90
[EXCLUSIVE] Same rate across the farm	99

Q24. When deciding on fertiliser rates for your 2018-19 cotton crops, which of the following analyses did you refer to, if any, for each cotton system? Please select all that apply.

[MULTIPLE CHOICE]

[DISPLAY FULL/PART/RAIN COLUMNS DEPENDENT UPON NON-ZERO ANSWERS TO Q9]

	Fully irrigated	Partially irrigated	Raingrown / Dryland	[EXCLUSIVE] None of these
Soil surface test (0-30cm)	1	2	3	99
Soil test below 30cm	1	2	3	99
Leaf test	1	2	3	99
Petiole test	1	2	3	99

Q25. Which of the following manures or composts do you use as part of your nutrition program, and at what typical rate of tonnes per hectare?

Please ensure you answer each box available, even if it is 0.

Type of manure/compost	Use	Rate (tonnes/ha)
Cow manure	Yes / No	###
Chicken manure	Yes / No	###
Cotton gin trash compost	Yes / No	###
Other (please specify) #1	Yes / No	###
Other (please specify) #2	Yes / No	###
Other (please specify) #3	Yes / No	###
[EXCLUSIVE] I don't use manures or composts	Yes / No	

[ASKED TO ALL RESPONDENTS]

Q26. Please indicate your agreement with each of these statements.

I have adequate information available for me to calculate nitrogen use efficiency

Totally disagree	Disagree	Neither	Agree	Totally agree	Don't know
1	2	3	4	5	99

I have a good understanding of how best to maximise my N use efficiency

Totally disagree	Disagree	Neither	Agree	Totally agree	Don't know
1	2	3	4	5	99

I understand how to reduce nitrous oxide emissions from my system

Totally disagree	Disagree	Neither	Agree	Totally agree	Don't know
1	2	3	4	5	99

I am confident in the use of seasonal forecasting information to aid crop selection, nitrogen and irrigation decisions

Totally disagree	Disagree	Neither	Agree	Totally agree	Don't know
1	2	3	4	5	99



Module 6

myBMP

[SECTION ASKED TO ALL GROWERS]

Q27. Are you currently participating in myBMP?

Yes, I have been audited	1
Yes, I have registered	2
I have participated previously but not currently	3
No, have not participated ever	4

Q28. What do you think are the barriers to cotton growers not registering in the myBMP program?

[IF Q27 = 4, SKIP Q29 AND GO TO Q30]

Q29. Which of the following myBMP modules have improved practices on your farm? Please select all that apply.

Biosecurity	1
Energy and Input Efficiency	2
Fibre Quality	3
Human resources	4
Work Health and Safety	5
IPM – insects, weeds and diseases	6
Pesticide Management	7
Petrochemical storage and handling	8
Soil Health	9
Sustainable Cotton Landscapes (natural assets)	10
Water Management	11
[EXCLUSIVE] None of the modules have improved practices on my farm	99

Module 7

IPM and crop protection

[SECTION ASKED ONLY TO THOSE WHO GREW COTTON DURING 2018-19 SEASON]

Q30. With regards to insect pests, disease and weed management in 2018-19 cotton fields, how widely used (in terms of percentage of total cotton area) are the practices listed below:

Please ensure you answer each box available, even if it is 0.

	% of Total Cotton Area (on which the practice is used) (%)
The industry's recommended sampling strategies are used to monitor pest abundance and plant damage	### %
The industry's recommended thresholds are used when making pest control decisions	### %
The IRMS is followed when selecting insecticides/miticides	### %
Pesticides selection aims to conserve beneficial insects whenever possible	### %
Weed hosts are controlled to prevent pest build up	### %
Rotations cropping decisions consider cotton pest risks	### %
Rotations cropping decisions consider cotton disease risks	### %
Rotations are used as part of integrated weed management strategy	### %

Q31. For the 2018-19 cotton growing season, what area of your cotton crop was impacted by spray drift, and what do you estimate to be the yield cost and financial cost of this damage?

Please ensure the area answered below does not exceed your total cotton crop area: [ANSWER FROM Q8] hectares

Area of cotton crop impacted by spray drift (in ha)	###
Estimate of yield cost of spray drift (in bales / ha)	###
Estimate of financial cost of spray drift (in \$)	###

2019 Grower Survey

Survey questions

Q32. CRDC and GRDC have partnered with the University of New England to conduct a study to understand the drivers of and barriers to best practice for spray drift and its impacts. Would you be willing to participate in a separate survey to support this research?

Please note that your email address will only be used for the second study and will not be linked to your responses today.

Yes (please provide your email address)	*specified answer*
No	2

Module 8

Natural resource management

[SECTION ASKED TO ALL GROWERS]

Q33. What species of wildlife (land or water-based) are you proud to have occur on your farm or in your local landscape?

Species of wildlife	*specified answer*
---------------------	--------------------

Q34. Are you undertaking/involved in any landscape management activities specifically designed to reduce emissions or sequester carbon in the landscape? Please select all that apply.

Native vegetation management	1
Participation in soil carbon initiatives	2
Participation in the Emissions Reduction Fund	3
Tree planting	4
Cover cropping	5
Organic manure	6
Green manuring	7
Slow release fertilisers	8
Nitrification inhibitors	9
Other (please specify)	90 *specified answer*
[EXCLUSIVE] None of these	99

Q35. In natural areas on farm, what management activities have you undertaken in the past 12 months? Please select all that apply.

Used irrigation water to water drought effected areas of vegetation	1
Excluded grazing from areas previously grazed	2
Managed stock access through addition of fencing or offsite watering points	3
Weed control	4
Pest control	5
Revegetation	6
Actively encouraged natural regeneration	7
Erosion control	8
Re-snagging waterways (addition of large logs)	9
Other (please specify)	90 *specified answer*
[EXCLUSIVE] None of these	99

Module 9

Industry research trials

[SECTION ASKED TO ALL GROWERS]

Q36. Did you have any cotton industry research trials on your farm last season? (e.g. CRDC, CSIRO, DPI, DAF, Universities, etc.)?

Yes	1
No	2

[IF Q36 = 2 (NO), SKIP Q37]

Q37. Please indicate approximately the time and cost that you contributed to industry research trials last season.

Please ensure you answer each box available, even if it is 0.

Time contributed (in hours)	### hours
Cost contributed (\$)	\$###



Module 10

Community and social contribution

[SECTION ASKED TO ALL GROWERS]

Q38. Which if any of the following local community activities are you involved in?

Please select all that apply.

I'm actively involved in local community groups	1
I'm actively involved in local sports	2
I regularly attend local events	3
I'm actively involved with the local schools (primary and/or secondary)	4
I regularly make donations or sponsor local charities or activities	5
I'm involved in the community in other ways (please describe your involvement)	90
[EXCLUSIVE] I'm not actively involved with the community	99

[IF Q38 = 99, SKIP Q39-Q40 AND GO TO Q41]

Q39. The following questions seek to understand a bit more about your community commitments and volunteering (e.g. for groups like fire brigades, sports clubs, school canteen, meals on wheels, festivals, CWA, Landcare, local government). Considering these, over the last 12 months how often would you usually volunteer or participate in activities in your local community?

At least once a week	1
At least once a fortnight	2
At least once a month	3
Several times a year	4
Less regularly	5

Q40. On average, how many hours would you estimate you have spent on community commitments and volunteering over the last 12 months:

Not applicable	1
Less than 20 hours	2
20-39 hours	3
40-79 hours	4
80-139 hours	5
140-299 hours	6
300 hours or more	7

Q41. Thinking of your total business expenses for the 2018-19 growing season, can you estimate what proportion would be spent...?

In the local area (i.e. within your local government area)	%
Outside your local area in the nearest regional centre	%
Elsewhere in the state	%
Outside of the state, but in Australia	%
Outside Australia	%
TOTAL (check % adds to 100%)	100%

Module 11

Industry sentiment

[SECTION ASKED TO ALL GROWERS]

This last set of questions asks about your views on your farming business and the cotton industry in Australia.

Q42. Overall, how do you feel about the future of the cotton industry. Would you say you feel...?

Very positive	1
Fairly positive	2
Neutral (neither positive or negative)	3
Fairly negative	4
Very negative	5
I'm not sure	99

Q43. Describe the 2018-19 cotton season in three words or less:

[LIMITED TO 3 WORDS MAX]

Describing the season:	*specified answer*
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Q44. Would you agree or disagree with the following statements about your farming business and the cotton industry?

Cotton is profitable and consistently my crop of choice

Strongly disagree	Disagree	Neither	Agree	Strongly agree
1	2	3	4	5

Research, development & extension drive continuous improvement of the Australian cotton industry

Strongly disagree	Disagree	Neither	Agree	Strongly agree
1	2	3	4	5

Q45. What one or two factors are most limiting the bottom line for your cotton business?

Module 12

Voice of the grower

[SECTION ASKED TO ALL GROWERS]

Q46. Finally, is there any other feedback or any other issues that you would like to provide back to CRDC at this time?

SURVEY CLOSE

MORE INFORMATION



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