2014
COTTON GROWING PRACTICES

Findings of CRDC's survey of cotton growers

Australian Government

Cotton Research and Development Corporation

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Summary

The Cotton Growing Practices 2014 survey of cotton growers gathered information about management of weeds, climate, carbon, riparian areas, irrigation and irrigation pumps. Information was also gathered about cotton yields and fibre quality for the season and grower perceptions of CottonInfo.

Conducted for the Cotton Research and Development Corporation (CRDC), the survey findings help the industry to understand the range of practices used on cotton farms, to inform research and extension priorities and to measure the uptake of research. The information is also valuable in policy and communication dialogue. Surveys in different years have gathered information on different aspects of the farming system.

Survey responses for the 2013-2014 season covered 101,783 ha of irrigated cotton (27% of the total irrigated crop) and 14,394 ha of dryland cotton production (38% of the total dryland crop in 2013-14). Of the 1086 farms surveyed, 415 farms (38%) replied and/or were contacted by phone. 32% of these had not harvested cotton in 2013-14 or the letters were returned to sender. Surveys were completed by 19% (177) of the farms registered with CRDC that may have grown cotton in 2013-14.

Highlights of the findings presented in this report include:

2013-14 season

- Very hot, dry summer with limited water followed by a wet harvest in many regions.
- Central Queensland achieved higher yields than previous years while other regions achieved slightly lower yields for irrigated cotton than the 2012-13 season.
- Dryland yields were down on the previous season.
- The range in yields achieved was large.
- Quality discounts in Central Queensland and Southern NSW were lower that in 2012-13 while other regions had a substantial increase in quality discounts.

Weeds

- A high proportion of farms are using weed control practices consistent with the Herbicide Resistance Management Strategy (HRMS).
- In irrigated cotton, 79% of respondents used 2 or more non-glyphosate weed management tactics in a given field over 12 months.
- In dryland cotton, 63% of respondents used 2 or more non-glyphosate weed management tactics in a field from July 2013 - June 2014.
- Cultivation/s and glyphosate were the most used tactics for summer fallow weed control.
- 73% of respondents tolerated less than 5% of survivors after the first over-the-top glyphosate application.
- Problem weeds include fleabane, feathertop rhodes, ryegrass and barnyard grass.

Irrigation

- 95% of the irrigated cotton area reported was grown under standard (92.1%) or bankless (2.5%) furrow irrigation systems in the 2013-14 season. 3% of the crop was grown under lateral move irrigators, 1.7% under centre pivots and 0.7% on drip irrigation.
- 95% of respondents had standard furrow irrigation, with 68% having only furrow irrigation. 28% irrigator respondents have a mix of irrigation system types with 11% having bankless furrow, 16% centre pivots, 19% lateral moves and 8 % drip irrigation.
- 23% had made changes to irrigation systems in the past 5 years and 32% planned or seriously considered changes within 2 years.
- Improved water use efficiency, labour savings and ease of management were key drivers of decisions to change irrigations systems. Water use efficiency and financial savings were key factors for not changing systems.
- Forums, fields days, events, on-farm trials and research were identified as important information sources in considering changes to irrigation system type.

- 79% of irrigator respondents scheduled irrigations using soil moisture monitoring by capacitance or neutron probe, which was very similar to 2011.
- A range of improvements had been made to improve efficiency of furrow and overhead irrigation.
- 76% of groundwater user respondents monitored the quality of groundwater at least every few years, a significant increase from 20% in 2006.

Pumping for irrigation

- 52% of irrigator respondents monitored and recorded the operating hours, energy consumption and how much water each pump shifts. 89% monitored and recorded at least one of these.
- 67% had replaced pumps and/or pump engines to improve the efficiency of water pumping.
- 11% had made a change in the power types used for pumping water and a number expressed concern about rising electricity costs.
- 69% of respondent irrigation farms had 1-10 pumps for water.
- 84% of respondents had at least one pump used only for relifting water.
- 97% of respondent farms had pumps with diesel engines, 52% had pumps with electric engines.
- 75% of the pumps reported had diesel engines.
- 56% of diesel pump engines and 62% of electric pump engines were more than 10 years old.
- There was regional variation in the number of pumps of each type per farm and the age and energy source of the pump engines.

Weather, climate and carbon

- El Nino southern oscillation effects and the sourcing of climate information for decision making were understood by most respondents, though a relatively small proportion indicated they thoroughly understood these.
- 67% indicated they did not understand the Southern Annular Mode and other climate processes impacting on rainfall in their area.
- Just over 40% indicated they understood the sequestering of soil carbon in the farming system or by native vegetation.
- 47% indicated they understood the carbon footprint of their farming operation.
- 85% did not understand the Carbon Farming Initiative and how to participate.

Riparian management

- 68% of respondents had a creek or river on their property.
- 91% taken steps to manage their riparian zone in the past 5 years.
- The average length of the riparian area was 7.5km (range 0.5-42km).
- 55% of respondent farms had grazing stock at least sometimes.
- 71% of farms with grazing and riparian areas had at least some of the riparian area fenced and 72% usually or always excluded stock from this area.
- 90% indicated something they valued about the riparian area.
- 60% valued their riparian area for recreation.
- The most observed changes in riparian condition were a worsening of feral pests and an improvement in the regeneration of native plants.
- There is interest in receiving more information and support on riparian area management.

CottonInfo

- 82% of respondents were aware of CottonInfo.
- 78% indicated they have sourced information from CottonInfo.
- The highest rate of use is in St George/ Dirranbandi, Gwydir and Southern NSW.
- 89% of respondents indicated CottonInfo had helped them to improve practices, at least a little with 37% indicating a significant or very significant level of assistance. The areas of most influence are the agronomy topics of crop protection, nutrition, soils and water management.

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Background

The 2014 Cotton Growing Practices survey was conducted in late Spring 2014, focusing on the 2013-14 cotton crop. In many regions the season was typified by a hot, dry summer with limited water followed by a wet harvest.

Information about farming practices and grower perspectives can help inform research and extension efforts and monitor change in the industry over time. Surveys of cotton growers have previously been conducted in 2013, 2011, 2008, 2007, 2006 and 1997. Each survey has focused on a few aspects of the farming system, with a rotating program of themes in different years including nutrition, soils, biotechnology stewardship, weed management, irrigation, energy, emissions, workforce, harvesting, riparian areas, communications. The intent is to revisit each theme in future years to monitor change.

The Grower Practices Surveys are part of a suite of projects measuring farm practice. Detailed information on crop protection and other issues are gathered by surveys of cotton consulting agronomists by Crop Consultants Australia. CRDC also invests in on-farm research to monitor performance and change over time – for example, water use efficiency benchmarking measurements, on-farm disease surveys and weed surveys.

Survey design, distribution and response

The 2014 survey was developed with CRDC to focus on the major themes of:

- **Weeds** – timed to benchmark weed management at the launch of the first Herbicide Resistance Management Strategy (HRMS).
- **Carbon and Climate** - information for CRDC's Carbon Farming Initiative project.
- **Irrigation** – key information for policy, revisiting 2011 practices and insights to water issues in a hot, dry season.
- **Irrigation pumping** – to help understand energy efficiency challenges and inform at NCEA research project.
- **Riparian management** – to inform the extension program in this area.
- **CottonInfo** – review of progress.

Where possible questions were aligned with earlier years to monitor trends over time.

The survey was distributed both by post and electronically. Surveys were printed and mailed out to cotton farms registered with CRDC. Together with the survey growers received:

- an introductory letter from CRDC;
- a snapshot of findings from the 2013 survey;
- a quick response form for people who would not be returning the survey (eg people who did not grow cotton in 2013-14, were not growers or did not want to respond) and for updating contact details; and
- a stamped, addressed return envelope.

An online survey tool (C-Vent) was prepared and emailed as a link through industry newsletters – providing growers with an alternate response option and reaching some growers who were not registered with CRDC. The electronic survey tool was also used for data entry for those responses returned by mail.

Responses were encouraged through CRDC's email communications and Cotton Australia's "Cotton Matters" newsletter. Earlier Spotlight articles and an Australian Cotton Conference presentation had promoted the findings of the previous survey. After an initial response, phone calls were made to growers to encourage additional responses.

Survey population

As the number of farms growing cotton in a given year cannot be accurately determined, the survey response is considered both in relation to the number of growers registered with CRDC and the total area of cotton grown.

Determining population size has been a challenge as not all growers registered with CRDC grew cotton in 2013-14 and not all growers were registered with CRDC. Considerable time was spent on refining the mailing list for the 2014 survey to ensure updates from the previous year were reflected and to consolidate 81 duplicate contacts per farm into a single mailing per farm.

The survey was mailed to 1,117 farms registered as cotton growers with CRDC or Cotton Australia. A further 31 were found to be additional contacts for a farm, reducing the number of farms to 1,086. Survey distribution via industry email newsletters gained eight responses from people not on the list, bringing the surveyed pool to 1,094.

Survey response

Cotton area represented

Survey responses covered approximately 27% of the 2013-14 irrigated cotton production area and 35% of the dryland cotton area. These figures, based on the survey responses that recorded crop area and the total crop area reported in the 2014 Cotton Yearbook, are shown with regional distribution in Table 1.

Table 1 Proportion of cotton grown in 2013-14 represented in the survey

	Irrigated Cotton		Dryland Cotton	
	Area in survey (ha)	% of area grown	Area in survey (ha)	% of area grown
Industry Total	**101,883**	**27 %**	**14,394**	**35 %**
Central Queensland	3,001	15 %	0	0 %
Darling Downs	10,904	31 %	3,635	26 %
Macintyre - Balonne	21,582	18 %	2,302	70 %
Northern NSW	40,189	32 %	7,897	35 %
Macquarie	8,452	33 %	560	42 %
Southern NSW	17,419	32 %	0	-

As per Cotton Yearbook field hectares are presented using a 1.5 conversion where required from green hectares

Proportion of farms responding

In total, replies were received from or phone calls made to 455 farms (41% of farms registered with CRDC). These replies included:

- 177 surveys returned (124 by mail, 53 via the online survey tool)
- 70 do not grow cotton
- 37 did not grow cotton in 2013-14
- 31 had the survey returned by another on the farm
- 4 had a failed or poor crop
- 40 declined
- 63 indicated they would return
- 24 were returned to sender.

The 177 survey respondents are 19% of the adjusted population (removing those who did not grow cotton). Of these, 154 farms had irrigated cotton and 43 had dryland cotton. Response rates varied by region with the highest rate of response being Southern NSW (Table 2). Figure 1 depicts the regional distribution of all surveys returned and shows a broad coverage of all cotton growing regions.

Twenty percent of replies provided updates to contact details.

For reporting of regional information some regions have been aggregated into similar zones:

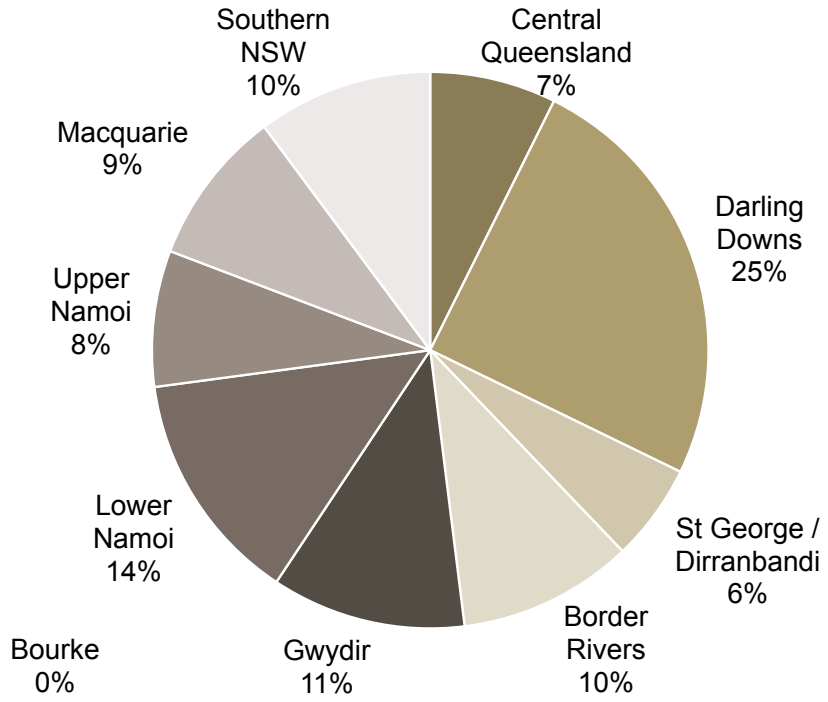
- Macintyre–Balonne comprises St George, Dirranbandi and Border Rivers.
- Northern NSW comprises Gwydir and the Lower and Upper Namoi.

Table 2 Survey response rates by region

Response Total	Number of registered growers *	Potentially active population of farms ^	Number of responses	% response within region
Central Queensland	108	90	12	13 %
Darling Downs	297	245	44	18 %
Border Rivers	115	100	19	19 %
St George / Dirranbandi	60	55	20	18 %
Gwydir	177	149	20	13 %
Lower Namoi	148	129	24	19 %
Upper Namoi	101	89	14	16 %
Macquarie	117	110	16	15 %
Bourke	11	10	0	0 %
Southern NSW	98	87	18	21 %

* Includes additional added through survey process
^ Excludes those who replied advising they didn't grow cotton 2013-14, duplicates /farm and return to sender
+ NB two respodents did not identify their region

Figure 1 Regional distribution of all surveys returned



Findings

2013-14 Season

Q. Were there any issues that substantially impacted on yield or quality of your 2013-14 cotton crop?

The 2013-14 season saw many regions experience a very hot, dry summer with limited irrigation water followed by a wet harvest. 151 respondents (85%) reported that conditions substantially impacted on yield or quality. Specific comments are listed in Table 3. The most reported issues were:

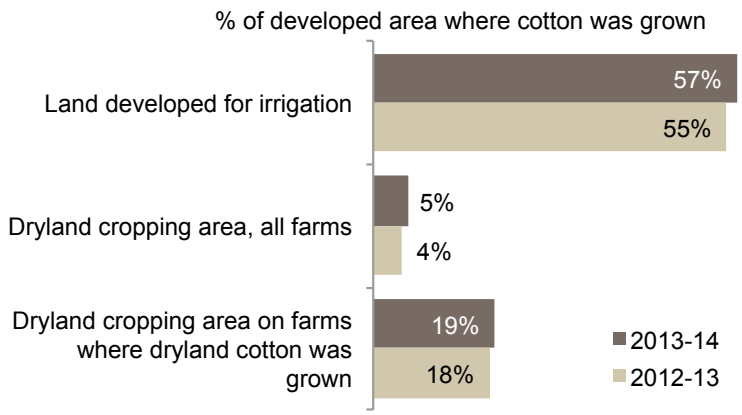
- Extreme heat (56% of respondents)
- Rain at harvest (45%)
- Ran out of water (37%)
- Cold start (17%).

Table 3 Comments from growers on issues substantially impacting on yield

Dry conditions ■ During the heat waves our pivot was getting bogged so was very difficult to keep the water up ■ No rain during fallow to germinate volunteers ■ Lack of rain on dryland crops resulting in area being ploughed out due to a lack of germination ■ Zero rain in growing period ■ No rain to plant dryland ■ Lack of in crop rain ■ Drought ■ Severe drought ■ Abandoned some fields to ensure sufficient water on remainder ■ Dry start ■ Lack of rain.
Other weather ■ Cloudy weather at peak boll set ■ Cold finish ■ Windy start dried out top of profile.
Pests and diseases ■ Reniform nematodes ■ Poor germination at planting ■ Verticillium wilt ■ Poor plant stands.

The area of cotton grown relative to the area of land developed for cropping on respondent farms was very similar to the 2012-13 season (Figure 2). On farms where irrigated cotton was grown, it covered approximately half the irrigable area and on farms where dryland cotton was grown it accounted for 19% of the dryland cropping area.

Figure 2 Proportion of land developed for cropping where cotton was grown in 2013-14



Yields

Yield results indicate a very large variation between the highest and lowest values reported by farms in each region, depicted by the 'errors bars' in Figure 3 and detailed in Table 4. Figure 3 shows the average yield across the region and the average of each farms' highest yielding field.

The variation in irrigated yields seems to be the greatest in the regions that ran short of irrigation water. Results show that the best performing fields are well ahead of the average. The highest reported yield was 15.6 bales/ha from an irrigated field in the Gwydir. Most regions achieved slightly lower yields for irrigated cotton than they had the previous season (Figure 4). Central Queensland achieved substantially higher yields (Figure 4) and substantially lower quality discounts (Figure 6) than the previous season, likely due to the sunny days and largely dry harvest.

Figure 3 Cotton yields of irrigated and dryland cotton for the 2013-14 season

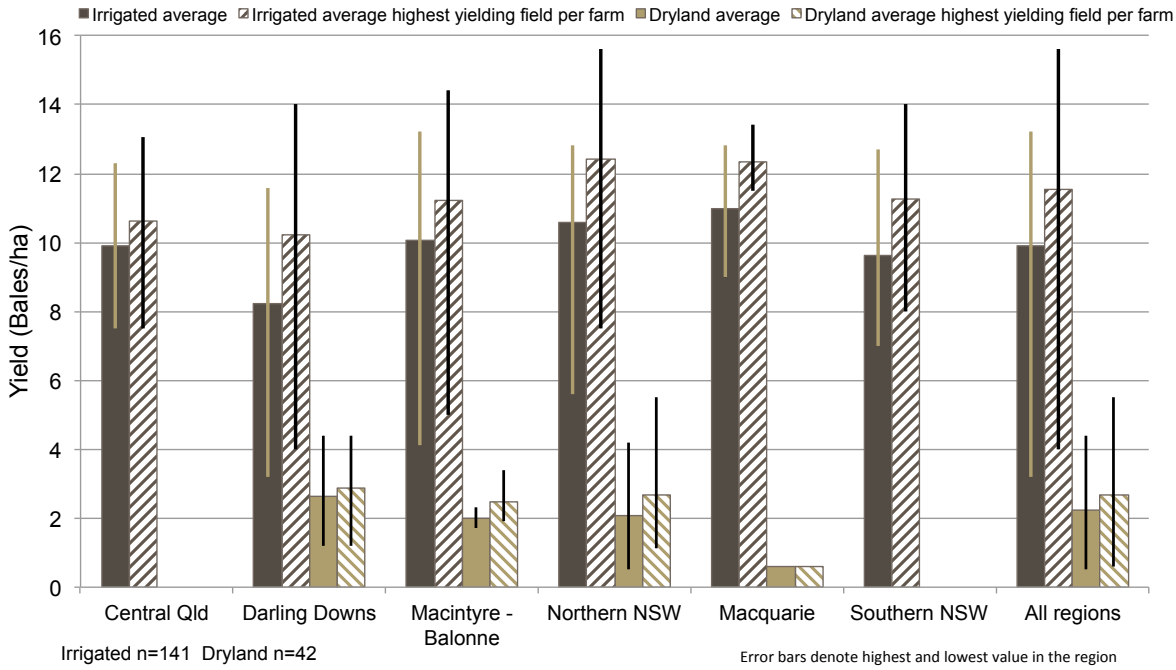


Table 4 Range in yield and quality results for irrigated and dryland cotton 2013-14, by region

	Average Yield Bales/ha	Range in farm average yield Bales/ha	Highest yielding fields average Bales/ha	Range in farms' highest yielding fields Bales/ha	Average cost of quality discounts $/Bale	Range in quality discounts $/bale
IRRIGATED COTTON						
Central Qld	10	11	7.5 – 12.3	7.5 – 13.1	$ 20	$ 0 – 58
Darling Downs	8	10	3.2 – 11.6	4 – 14	$ 36	$ 0 – 80
Macintyre - Balonne	10	11	4.1 – 13.2	5 – 14.4	$ 54	$ 0 – 150
Northern NSW	11	12	5.6 – 12.8	7.5 – 15.6	$ 33	$ 0 – 75
Macquarie	11	12	9 – 12.8	11.5 – 13.4	$ 14	$ 0 - 30
Southern NSW	10	11	7 – 12.7	8 – 14	$ 5	$ -6 – 15
All regions - Irrigated	**10**	**12**	**3.2 – 13.2**	**4 – 15.6**	**$ 35**	**$ -6 –150**
DRYLAND COTTON						
Darling Downs	3	1.2 - 4.4	3	1.2 – 4.4	$ 35	$ 0.55 - 80
Macintyre - Balonne	2	1.9 – 2.3	2	1.9 – 3.4	$ 67	$ 0 - 100
Northern NSW	2	0.5 – 4.2	3	1.1 – 5.5	$ 33	$ 0 – 120
Macquarie	0.6	0.6 – 0.6	0.6	0.6 - 0.6	$ 40	$ 40 – 40
All regions - Dryland	**2**	**0.5 – 4.4**	**3**	**0.6 – 5.5**	**$ 37**	**$ 0 – 120**

Dryland cotton crops generally suffered from the hot, dry conditions and while some strong yields were achieved, yields were on average substantially lower than 2012-13 (Figure 5). The highest reported yield from a dryland cotton field in 2013-14 was 5.5 bales/ha from a field in the Upper Namoi.

Figure 4 Average irrigated cotton yields 2013-14 compared with 2012-13, by region

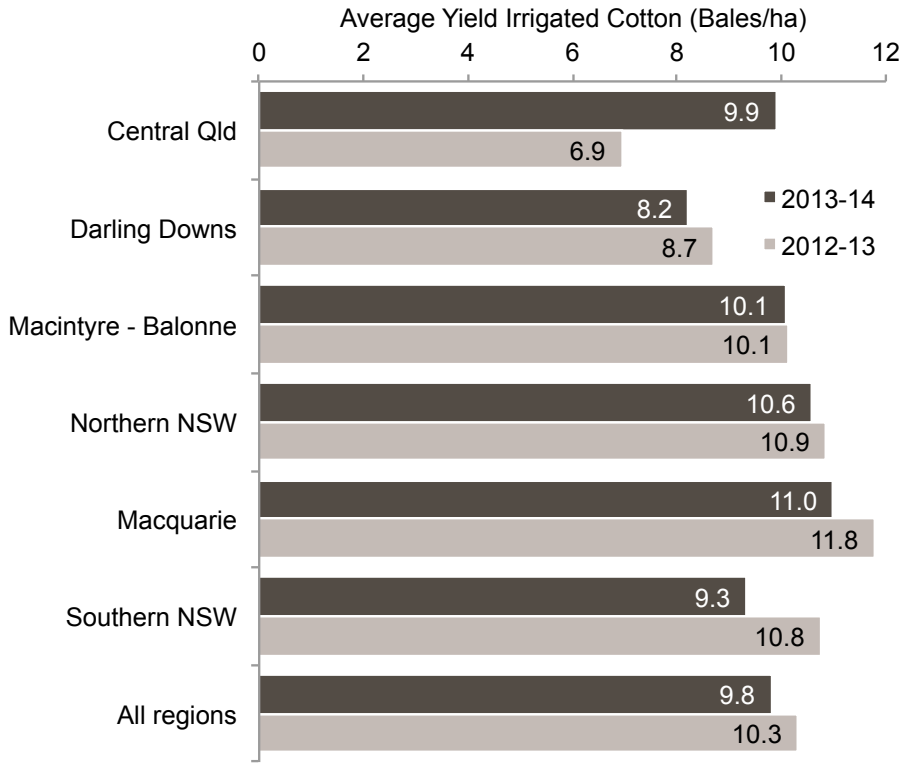
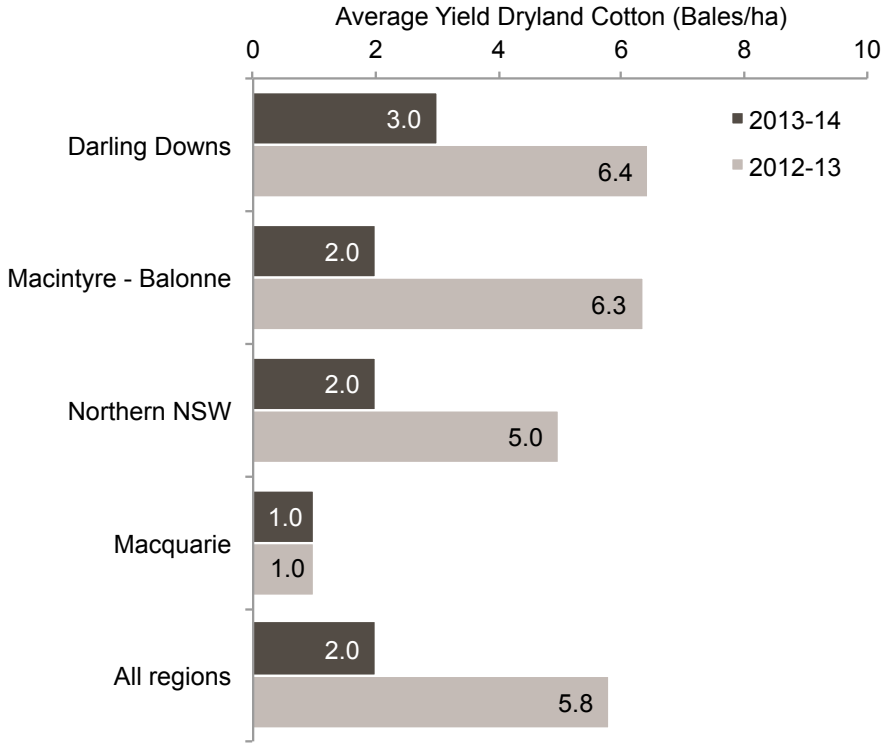


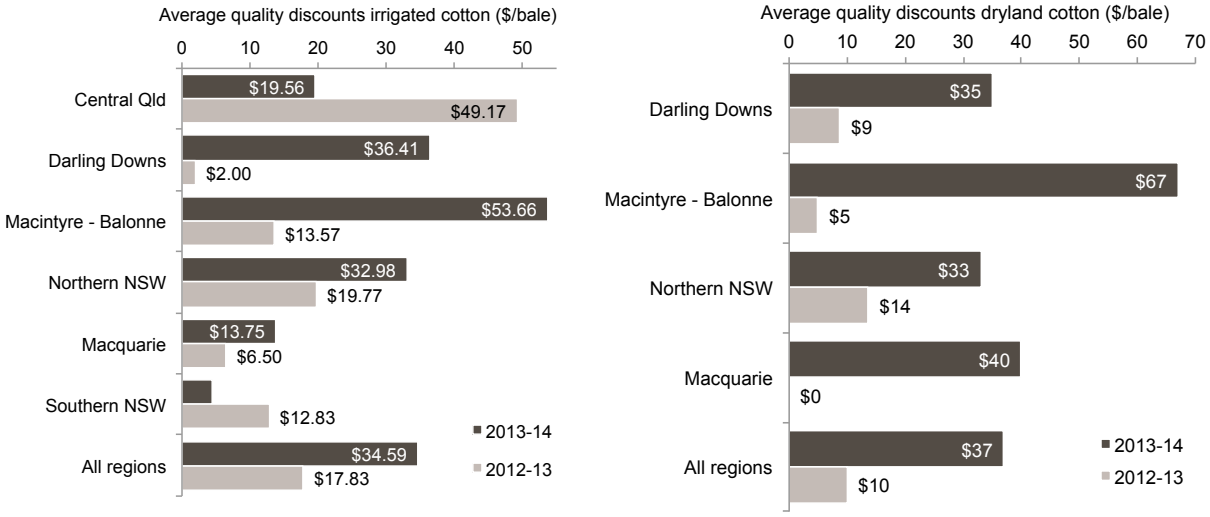
Figure 5 Average dryland cotton yields 2013-14 compared with 2012-13, by region



Quality Downgrades

For most regions, quality downgrades were more costly in 2014 than in 2013 (Figure 6). On average across all regions, the quality discounts in 2014 were almost double those in 2013 for irrigated and nearly 4 times as high in dryland crops. By contrast, Central Queensland with a largely dry harvest in 2014 saw quality discounts at less than half those of 2013 with 33% of respondents reporting no discounts. Similarly, Southern NSW had a great improvement with quality discounts being a third of those in 2013.

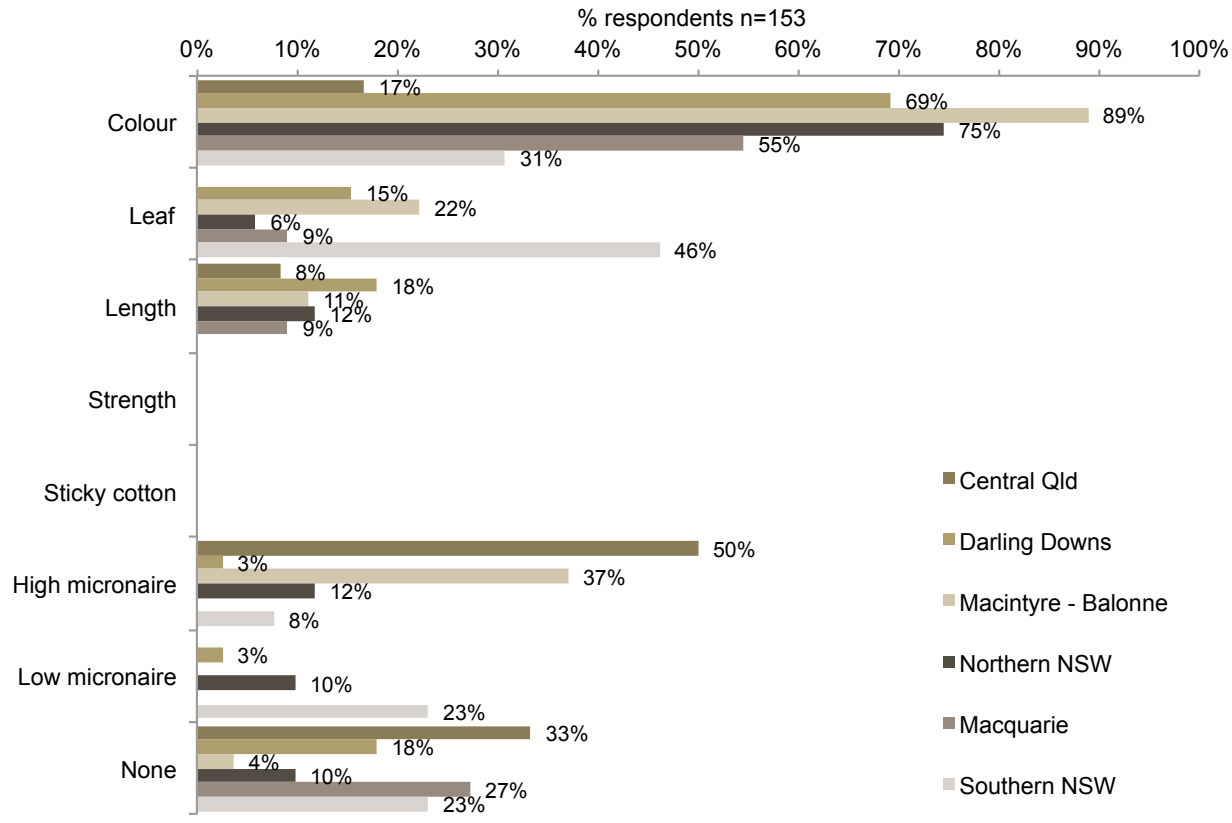
Figure 6 Quality discounts over two seasons, by region



Q. Which quality discounts (if any) were the most costly for you this year?

The most reported type of costly discounts in Southern Qld, North and Central NSW were colour and leaf, presumably a result of wet conditions at harvest. High micronaire was also evident, particularly in Central Queensland which may be linked to high temperatures in the growing season.

Figure 7 Most costly types of quality discounts received



Weed management

Mitigating the risk of weeds developing resistance to glyphosate is a key focus area for research and extension work. With the release of the industry's first Herbicide Resistance Management Strategy (HRMS) in 2014 it was timely to benchmark current weed management strategies. The survey gathered information on current practices relating to the key elements of the HRMS:

1. Using a variety of weed control tactics in-crop, including 2 non-glyphosate tactics;
2. Summer fallow tactics include two non-glyhposate tactics; and
3. Control of survivors of glyphosate applications.

Overall, a high proportion of farms used weed control practices consistent with these elements of the HRMS.

It is important to note that the dry seasonal conditions in the 2013-14 season would have resulted in relatively low weed pressure. This is likely to have influenced the number of tactics used but the variety of tactics is still relevant.

In-crop weed control

Q. For ONE IRRIGATED/DRYLAND FIELD where you grew cotton in 2013-14 please tick all the strategies that you used in that field to manage weeds between July 2013 and June 2014.

The survey asked growers to select the weed control tactics they had used in a single field for each irrigated and dryland cotton (as relevant) over a 12 month period from July 2013-2014. It was important this related to a single field so that it was possible to assess the mix of tactics used, in particular to determine the number of non-glyphosate tactics used.

Irrigated cotton

Glyphosate was the most widely used weed control tactic (Figure 8) with a variety of other herbicide and non-herbicide tactics used. Further analysis of the mix of tactics used in each field (Figure 9) reveals:

- 79% of respondents used 2 or more non-glyphosate tactics to manage weeds in an irrigated cotton field from July 2013 - June 2014
- 4% used only glyphosate.

Dryland cotton

The mix of weed control tactics used in dryland (Figure 8) cotton was similar to irrigated, with a lower use of Roundup Ready® cotton with over the top glyphosate. Further analysis (Figure 9) indicated:

- 63% of respondents used 2 or more non-glyphosate tactics to manage weeds in a dryland cotton field from July 2013 - June 2014
- 7% used only glyphosate.

A smaller proportion of dryland respondents used the recommended two or more non-glyphosate tactics for weed control in dryland as compared with irrigated cotton. It is relevant to note that dry conditions in most regions in 2013-14 would likely have resulted in low weed germination, influencing the number of weed tactics used in dryland systems.

Figure 8 Proportion of respondents using each type of weed control tactic in a given field July 2013-June 2014

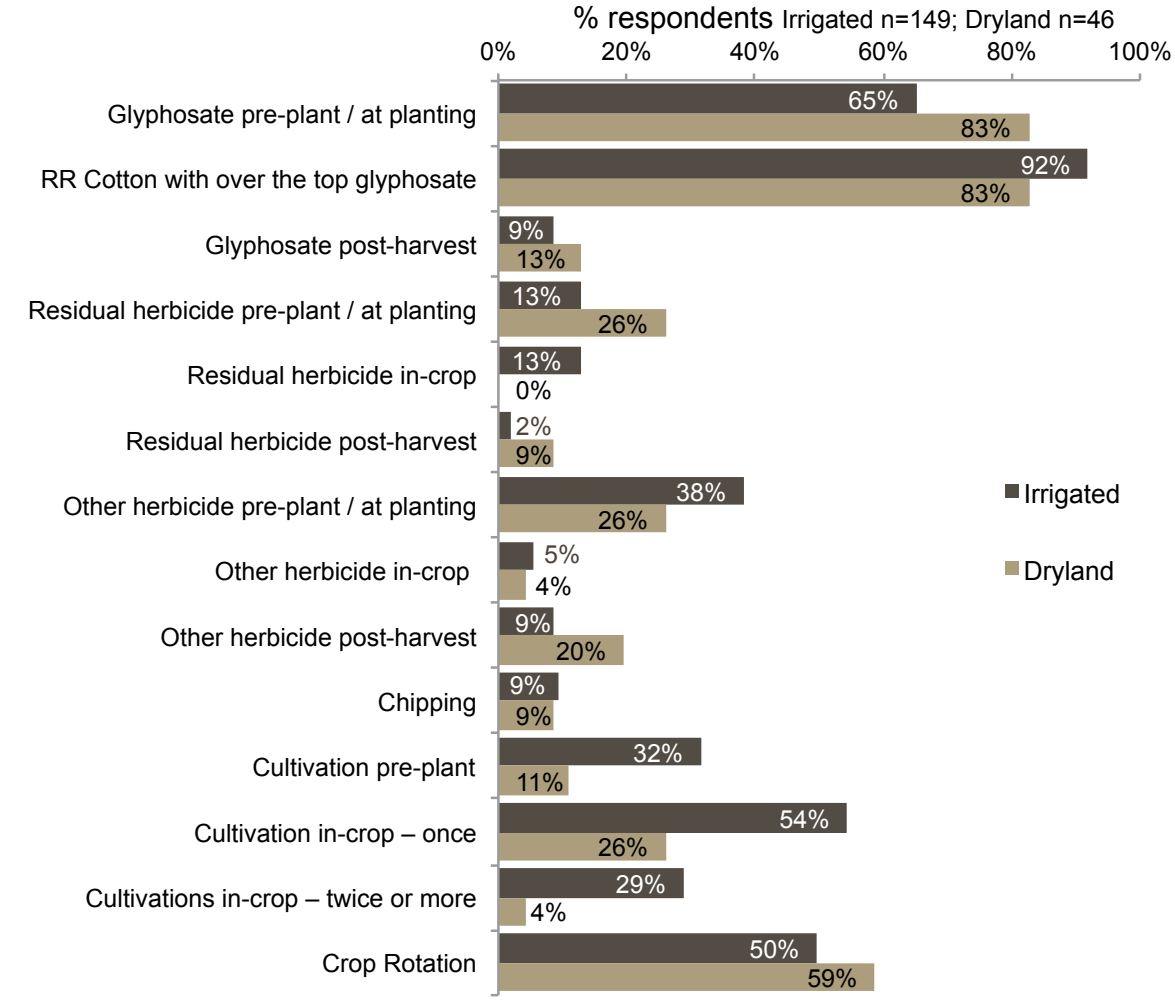
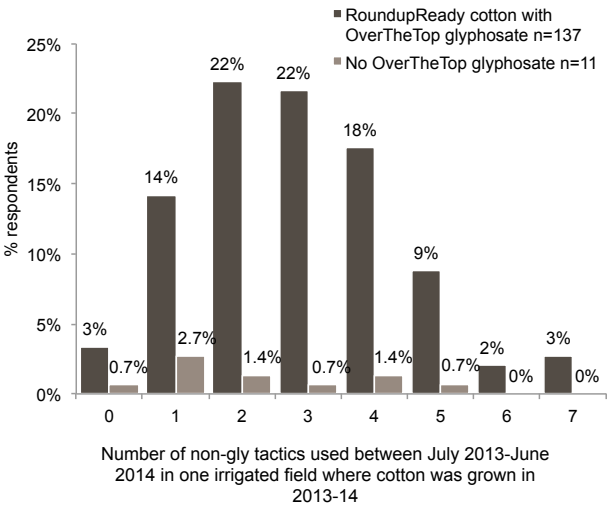
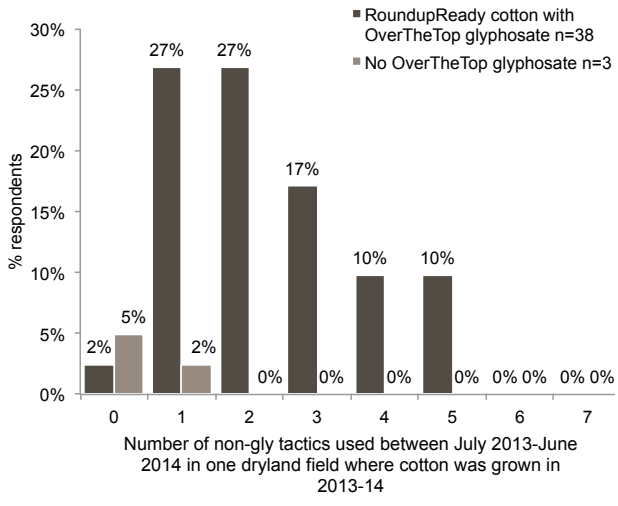


Figure 9 Number of non-glyphosate weed control tactics used in an irrigated or dryland cotton field





Hard to control and herbicide resistant weeds

The question about weed control tactics also asked respondents to identify whether the selected field had any hard to control or herbicide resistant weeds. Respondents indicated:

- Herbicide resistant weeds were thought to be present by 24% of respondents in irrigated fields and 26% dryland.
- Other hard to control weeds were present for 36% of irrigated and 48% dryland.

However, the listing of the herbicide resistant weed types (Table 5) includes several weeds such as fleabane which have not technically been classified as 'herbicide resistant'.

Table 5 Herbicide resistant and hard to control weeds listed as present in the selected fields

	Weeds listed by respondents as	
	Herbicide resistant	Other Hard to control
Irrigated	Fleabane (18 respondents) Feathertop rhodes (7) Ryegrass (6) Umbrella grass (2) Cotton (2) Barnyard grass (1) Milk thistle (1) Peach vine (1)	Feathertop rhodes grass (2) RR Canola (1) Ryegrass (2 + 1 in channels) Climbing buckwheat Fleabane
Dryland	Fleabane Barnyard grass Ryegrass Feathertop rhodes Umbrella grass Milk thistle	Fleabane Feathertop rhodes grass

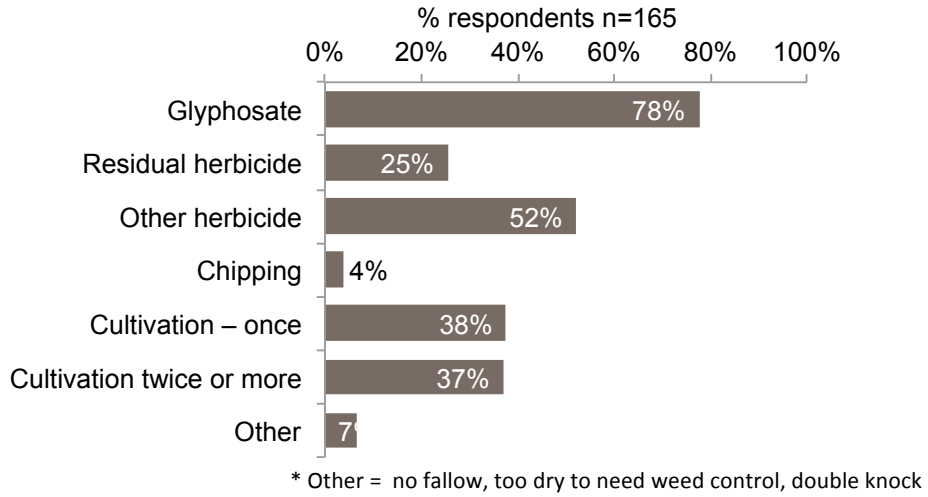
Summer fallow weed control

Q. For your most typical SUMMER FALLOW field in 2013-14, please select any of the following tactics you used for weed management in that field

To control weeds in summer fallows in 2013-14 (Figure 10):

- Cultivation/s and glyphosate were the most widely used tactics.
- Other, non-residual herbicides were used by 52% of respondents.
- 4% of respondents used only glyphosate for weed control in summer fallow.

Figure 10 Proportion of growers using each type of weed control tactic in summer fallows



* Other = no fallow, too dry to need weed control, double knock

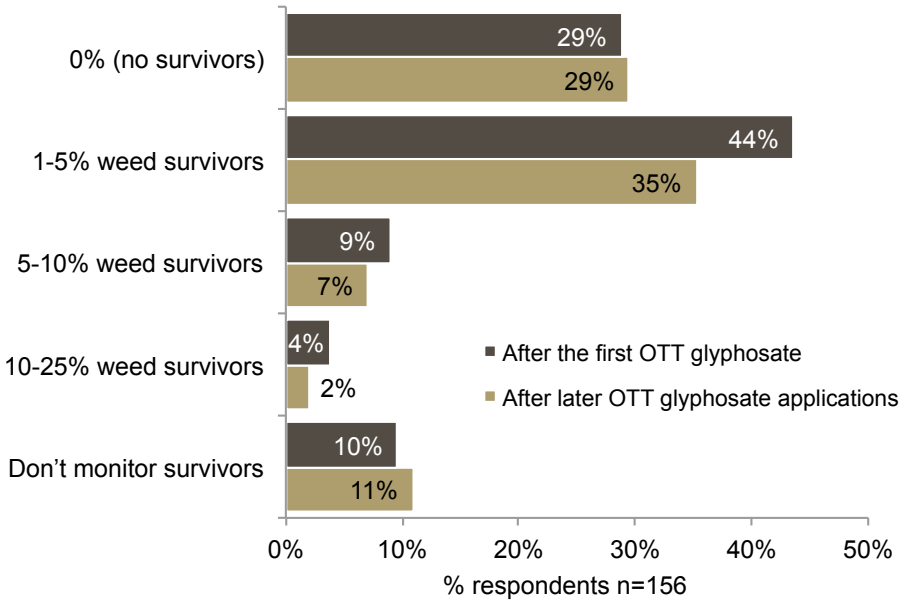
Tolerance of survivors of glyphosate applications

Q. In Roundup Ready® Flex cotton, what proportion of weeds surviving an over the top (OTT) glyphosate application do you tolerate before using another tactic to kill these survivors?

Figure 11 shows the level of tolerance respondents had for weeds surviving after over-the-top applications of glyphosate in Roundup Ready® cotton. That is, if there were higher levels of survivors these respondents would follow up with another tactic to control surviving weeds.

- 73% of respondents tolerated less than 5% of survivors after the first over-the-top glyphosate application.
- 64% of respondents to the question indicated they tolerated less than 5% of survivors after later over-the-top applications.
- As no respondents to this question selected the option "did not grow RR cotton" the 11% who do not monitor survivors can be presumed to have grown Roundup Ready® cotton.
- Of the total of 156 respondents to this question, 5% did not complete the "after the first OTT glyphosate" part of the question and 15% did not complete the "After later OTT glyphosate" part.

Figure 11 Level of survivors of Over-The-Top glyphosate applications tolerated by respondents



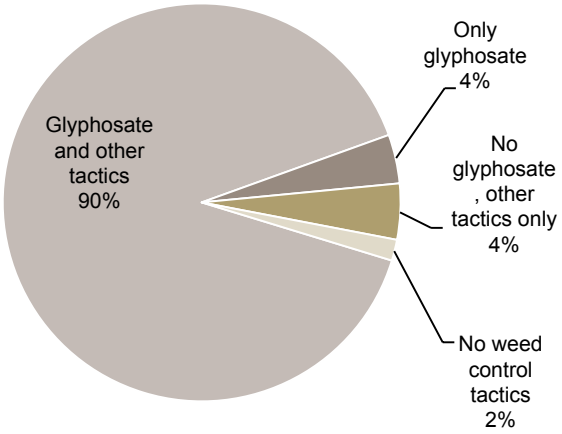
Weed control in non-crop areas

Q. To manage weeds in non-crop areas (eg roadways, irrigation channels) between July 2013 and June 2014, did you use

Using tactics others than glyphosate to control weeds in non-crop areas such as roadways and irrigation channels is important to avoid developing herbicide resistant weeds which could spread in the farming system.

94% of respondents indicated they used tactics other than glyphosate in these areas, with 90% using them in combination with glyphosate (Figure 12).

Figure 12 Proportion of growers using a mix of tactics to manage weeds in non-crop areas



Perceptions of herbicide resistance risk

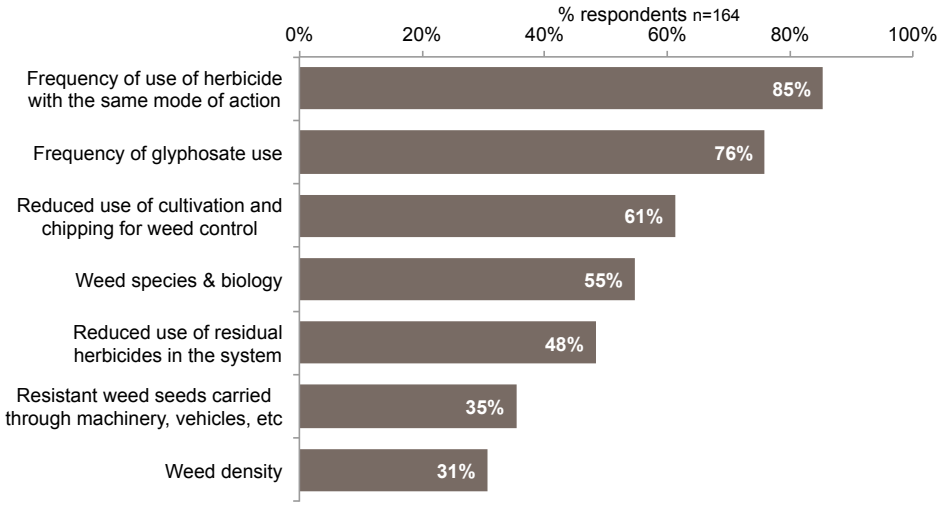
Q. Which of the following do you believe contribute substantially to the risk of herbicide resistant weeds developing or appearing?

When asked to select from a list of potential risk factors for herbicide resistance, the majority of growers identified the frequency of use of herbicides with the same mode of action, including frequent glyphosate use (Figure 13).

A few respondents made comments about the herbicide resistance risk:

- Do resistance tests.
- Extra care taken on known resistant weeds on railways and fencelines.
- Use of only one mode of action is probably the most significant contributor to glyphosate resistance.

Figure 13 Factors thought to contribute substantially to the risk of herbicide resistant weeds developing



Weed management

Q. Other comments on weeds and your approach to weed management

Individual comments recorded by respondents about weed management and their approach to weeds are listed in Table 6.

Table 6 Comments about weed management

Rotation crops and fallows

- Changing to winter cropping and alternative summer crops to cotton, therefore using different chemical applications.
- Chaff management behind the harvester in the rotation crop. Chaff concentrated into 3m tramline tracks to decay in mulch in wheel tracks. Cut crop short to take in all weed escapes.
- We use crop rotations - therefore different herbicides + timing
  Weeds are harder to control in drought because of smaller numbers and stress on weeds and farmer.
- Use of rotations certainly helping. E.g Cotton, corn, fababeans.
- Continual cultivation in fallow fields.
- The best time to control herbicide resistance on tolerant species is in the fallow with alternative strategies.
- Often double cropping, winter crop doubled falllow (short 3 weeks)
- Very tricky to control feathertop Rhodes if you want to grow certain crops
- Dryland: 5 year Rotation; Irrigation: 2 years in and 1 year out rotation.

Tactics

- Fleabane + volunteer RR cotton are the biggest problems. Use Diuron, hormone sprays when we can, cultivation and chipping.
- Chipping is useful
  Cultivation may be a tool which gets more use
- Zero till weed management is uneconomical if the paddock contains barnyard grass, milk thistle, fleabane and feathertop rhodes grass. Often weeds are still uncontrolled because there are no other suitable options left.
- Inter-row cultivation; In the irrigated area - crop rotation allowing use of chemistry other than glyphosate. Use of alternate chemistry and tillage through winter prep time. Constant hand chipping at head ditches during syphon starting in the summer.
- Locations such as channels etc that implements cannot reach to cultivate are a concern. During the cotton season control options are limited.
- Cultivation
- Use different methods rather than relying on any one method
- Mechanical cultivation where possible, always vary the mode of action
- Integrated weed control
  Using a consultant for whole farm year-round develops good strategies such as using residual herbicides in fallows and recognising difficult weeds such as feather-top Rhodes grass.
- Constantly using chipping year round on roads and banks, not relying on roundup to kill bigger weeds. Steel in the paddock.
- We don't have resistant weeds at this stage, however we have been using different modes of action and double knock on fallows along with herbicides on non crop fallows and always follow our two early in crop Roundup Ready sprays with a cultivation.
- We do light chipping in known resistant fields, agronomist does continual monitoring.
- Managing feather top Rhodes grass is our toughest weed. We are using more residuals now and double knocks prior to planting to make sure we have a very clean paddock to begin the season with. With pupae busting and ground prep we have managed the weeds in combination with the use of pre-emergents.
- Pre water, do not water up.

Weed tolerance

- We always control/eliminate hard to kill weeds.
- Zero tolerance on head ditches, channels and tail trains
- Follow a zero survivor program where possible. Survivors are chipped or eliminated. All residues + rites of way controlled so weeds don't get to seed.
- Kill it before it sets seed.
- Spray early on small weeds.

Herbicides

- Will add Verdict to glyphosate to help eliminate barnyard grass resistance
- We need a rebate from Monsanto to encourage use of residual herbicides again, rotate with RUPCT
- Put yellow herbicide out!
- Introducing residual herbicides pre-plant
- When spraying aim to kill hardest to control rate
- Using more knockdown and residuals than ever
- RR Spray not strong enough for grasses at recommended rate
- Due to increased use of double knock strategy there is a worry we may lose efficiency of Paraquat? Timing of application in fallows is more important when using glyphosate to control weeds in winter, especially when trying to grow irrigated and dryland cotton in a no till system
- Interest in using a more tactical approach of residuals
- Moving toward more residual herbicides in crop
- Shielded spray.

Technologies

- We have rotated RRF and LL technologies and found this an excellent tool for weed management.
- Use a weedseeker sprayer to apply different chemistry such as Amitrol T (group Q)
- It is getting tougher. Rates always going up. A lot more tank mixes. Use of weed seeker has been useful
- cotton industry desperately needs to get good varieties in Liberty . The strangle hold Monsanto seems to have over CSD is very unhealthy and will lead to broadscale resistance which is building very quickly. I have seen canola in Canada where the whole district plants RR one year and Liberty the next. This has been much sounder and they have reduced the speed of resistance. The Liberty is priced much the same / ha as well. This is a much better plan and is in contrast to our disaster that is already showing - as can be expected with such a unbalanced plan.
- Liberty Link in useful yielding varieties would be welcome.
- Need more $ spent on spray weed technology research to make more effective and cheaper to buy.

Irrigation

153 respondents (87%) irrigated cotton.

Irrigation System Types

Q. Please list the area under each irrigation type on your farm and the area of cotton grown in 2013-14 with each irrigation type.

Furrow irrigation systems were far the dominant form of irrigation used by respondents, both in the total area developed under each system and the area of irrigated cotton grown in the 2013-14 season (Table 7). 95% of respondents' irrigated cotton crops were grown under standard or bankless furrow irrigation systems in the 2013-14 season.

Table 7 Relative use of each type of irrigation system

	% respondents using this irrigation type *	% of irrigated area developed for this system	% of cotton area grown under system in 2013-14
Furrow (excl bankless)	95 %	91.2 % ^	92.1 %
Bankless Channels	11 %	1.8 %	2.5 %
Centre Pivot	16 %	2.6 %	1.7 %
Lateral Move	19 %	3.8 %	3 %
Drip	8 %	0.7 %	0.7 %

* total more than 100% as many farms use more than one irrigation type

^ furrow + bankless area is 13% higher than previous estimate of 80% (Roth, Harris, et al 2013)

The majority of respondent farms had one irrigation system type (Table 8). However, 28% of respondents had two or more irrigation system types, with some have three or four. Of those farms with four system types, two farms had: Furrow + bankless channels + centre pivot + lateral move; and the other had: Furrow + bankless channels + lateral move + drip.

Table 8 Variety in irrigation systems per farm

Number of irrigation system types on the farm	% of respondents n=150
1	72 % 68% have only furrow systems 3% have only centre pivots 2% have only bankless
2	23 %
3	3 %
4	2 %

Changes to irrigation systems

Q. Have you changed any of your irrigation systems recently or are you considering a change? Have changed systems; Will change systems in the next 12-24 months, seriously considering a systems change in 12-24 months. From what system to what new system?

Changes to irrigation system had been made, planned or seriously considered for the period between 2009 and 2016 by 46% of respondents:

- 23% of irrigator respondents indicated they had made a change to their irrigation system type in the past 5 years (ie 2009 – 2014);
- 10% indicated they would make a change in the next 12-24 months; and
- 21% were seriously considering a change in this period.

Regionally, the highest proportion of farms making changes to irrigation systems in the past 5 years was in Central Queensland and Southern NSW (Figure 14).

Converting from furrow to bankless or overhead irrigators were the most common changes made or planned (Table 9). Interestingly one respondent had developed drip, lateral move and centre pivot irrigation but was not using these for growing cotton.

Figure 14 Regional variation in changes made or planned in irrigation systems

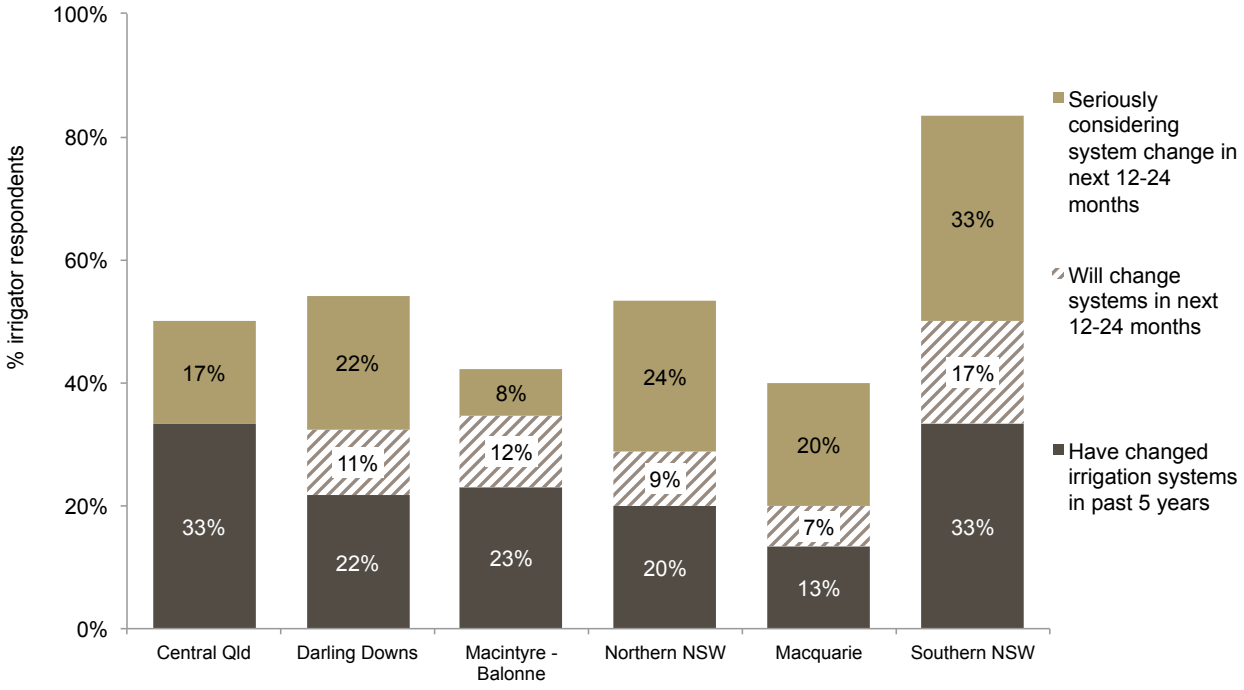


Table 9 Description of changes to irrigation system types made, planned or seriously considered

	Have Changed	Will change in 12-24 months	Seriously considering change in 12-24 months
Central Queensland	Nothing to centre pivot Added a new pivot. 40ha. Course drop sprinklers		From Drip to Furrow Possibly a new pivot. 80-100ha.
Darling Downs	Channels to pipeline Flood to lateral Furrow to lateral (X4) Furrow to pivot Removed Drip from 2 fields - at present dryland	Furrow to bankless (X2) Furrow to lateral move (X2)	Add another pivot Dryland to lateral Furrow to lateral move Furrow to pivot Lateral, Pipe through bank Lateral
Macintyre - Balonne	Furrow to Pivot or Lateral Lateral / Bankless Rooftop to bankless head ditch Siphon to through bank pipes Have developed trickle, lateral move and centre pivot but not growing cotton with it	Adding bankless and laterals from dryland Siphon to bankless	Furrow to bankless
Northern NSW	Burn siphons Centre pivot From 1m rows to 1.5m rows with 3m centres on all machines From flood to pivot Furrow to lateral (X3) Lateral to bankless P T B's (pipes through the bank)	Bankless Furrow to bankless Furrow to lateral (X2)	Combination of lateral move, bankless and pipes through bank. Flood to lateral. Furrow to bankless furrow to pivot Looking at lateral Move Nothing to pivot Old furrow irrigation from dryland to bankless To bankless
Macquarie	New reservoir Converted 105ha from furrow surface to bankless	New development to bankless channel - no change to existing development - just regrading	Furrow to Bankless Furrow to spray --> bankless
Southern NSW	Converted 100ha to GL bankless from syphon furrow to bankless Furrow to centre pivot Furrow to pivots & bankless Rice to furrow Siphon to Bankless	Centre pivots Furrow to bankless (X2)	Bankless channels Beds in bays Furrow to bankless Furrow to bankless or lateral Furrow to bankless, dry land to lateral (move) Rice to furrow

Q. Please select UP TO THREE of the most important factors driving your decision to change or not change your irrigation systems

Improved water use efficiency, labour savings and ease of management were the factors most commonly influencing the decision to make, plan or seriously consider a change to irrigation system type (Table 10).

For those who didn't make, plan or seriously consider a system change, 'Financial savings/cost' and "Improved water use efficiency" were the most commonly selected reasons.

Other factors mentioned in regards to changing irrigation system types included:

- Experience:
  - Experience of first pivot - now have two
  - Too hot and dry for centre pivot or lateral in our area. Couldn't get enough water on in heat wave.
- We are looking at more product per meg with less labour. Simpler
- Have re-lasered fields but keeping siphons/furrow irrigation.
- The cost of replacing old tape.

Table 10 Factors most influencing decisions around changing irrigation system type

Factors driving decision to change or not change irrigation system (Top 3)	% of respondents n=132	% of those who HAD made, planned or seriously considered a change n=68	% of those who had NOT made, planned or seriously considered a change n=63
Improved water use efficiency	54 %	68 %	40 %
Labour savings	47 %	66 %	27 %
Ease of management	39 %	53 %	25 %
Improved yield	27 %	31 %	24 %
Financial savings /cost	27 %	12 %	44 %
Energy savings	19 %	16 %	22 %
Increase area of irrigation	17 %	24 %	10 %
I like the new system better	4 %	7 %	0 %
Sell water/ water buyback	2 %	3 %	2 %
Other	5 %	4 %	6 %

"Other" reasons given by those who had, planned or considered change were: "Make more money with irrigation than dryland"; "Improved profitability"; "Lack of water – removed drip from two fields, changed to dryland".
"Other" reasons given by those who had, planned or considered change were: "Changed 10 years ago"; "Would have to redesign whole farm"; "Farm shape unsuitable to overhead"; "Need to get water on quick".

Q If you have changed or seriously considered changing your irrigation system, what information significantly influenced your decision?

Forums, field days, events, on-farm trials and research were the most mentioned sources of information that influenced decisions on irrigation system change (Figure 15). 12% indicated that the government irrigation modernization schemes had been an influence. Specific information sources referred to are listed in Table 11 with neighbours and other farms being often mentioned.

Figure 15 Information influencing irrigation system change

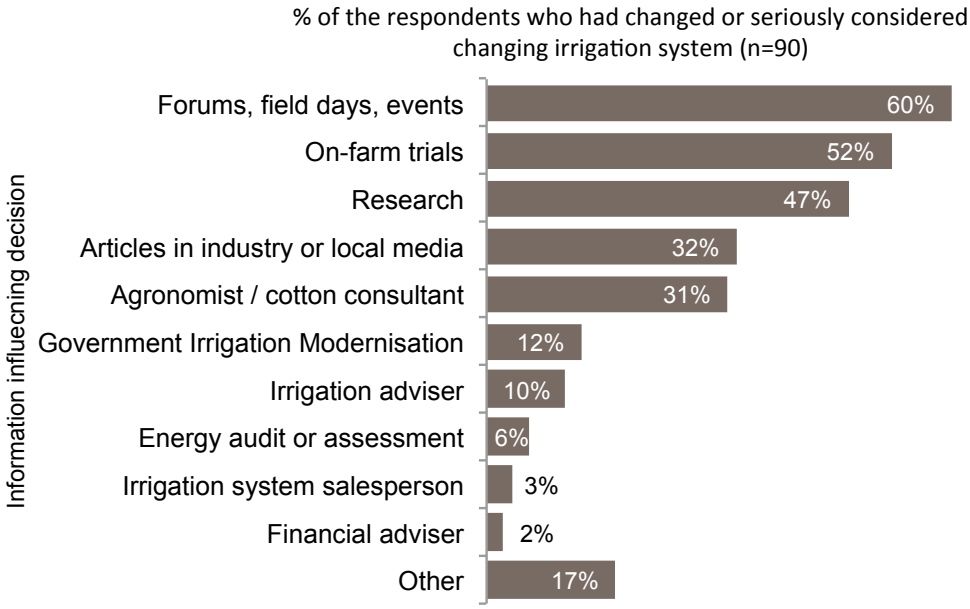


Table 11 Comments on information sources influencing decisions on irrigation system change

On-farm trials	Bullamon Plains / Turkey Lagoon Cotton mag Doing our own trials Industry adoption Keetah Own lateral Saw potential in overhead irrigation years and went from there.
Research	Google Key learning site Simply on line and talking to people in the rice industry
Forums, field days, events	Cotton Conference Visiting other farms Grower of the year Auscott Warren experience/trial Cotton Conference DPI tour to QLD bankless schemes Farm group Agvance traveling to other farms etc. Looking at their system. Field days Keytah / Gwydir / Mac Valley field days offer former water savings Southern bankless field day
Articles in industry or local media	Spotlight map Followed the Willis family from Bullamon Plains Cottongrower magazine, Newspaper
Irrigation adviser	Our land designer has had a lot of experience designing bankless channel system in the rice industry
Government Irrigation Modernisation Program	HEWIE Modernised a couple of old pivots through RWUEI with new outlets and sprinkler packages. Healthy headwalers program
Other	Neighbour Farmers using the system Individual visits to other growers. Common sense Experience of first pivot- now have two Farmers Have relazered fields but keeping siphons/furrow irrigation Own experience. Personal research Talk to neighbour Talking to other producers The cost of replacing old tape Too hot and dry for centre pivot or lateral in our area. Couldn't get enough water on in heat wave. Water efficiency We are looking at more product per meg with less labour. Simpler WUE Program

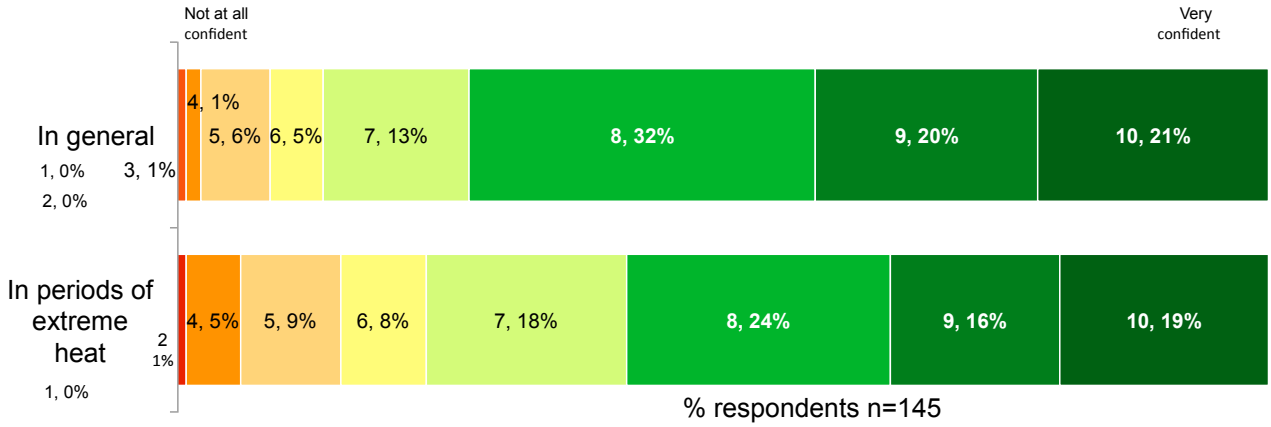
Managing irrigations

Confidence in managing limited water

In light of the extreme heat events in 2013-14 and limited water, the survey asked about growers' confidence in managing available water. Figure 16 illustrates that most growers were confident in their water management decisions, with approximately 1 in 5 respondents selecting the 10 out of a scale of 1 (Not at all confident) to 10 (Very confident). However, when considering periods of extreme heat close to one quarter (23%) indicated a confidence level of 6 or below in their water management decisions.

Q. On a scale of 1-10, how confident were you in your decisions about making the best use of available water last season? 1 = Not at al confident; 10 = Very confident

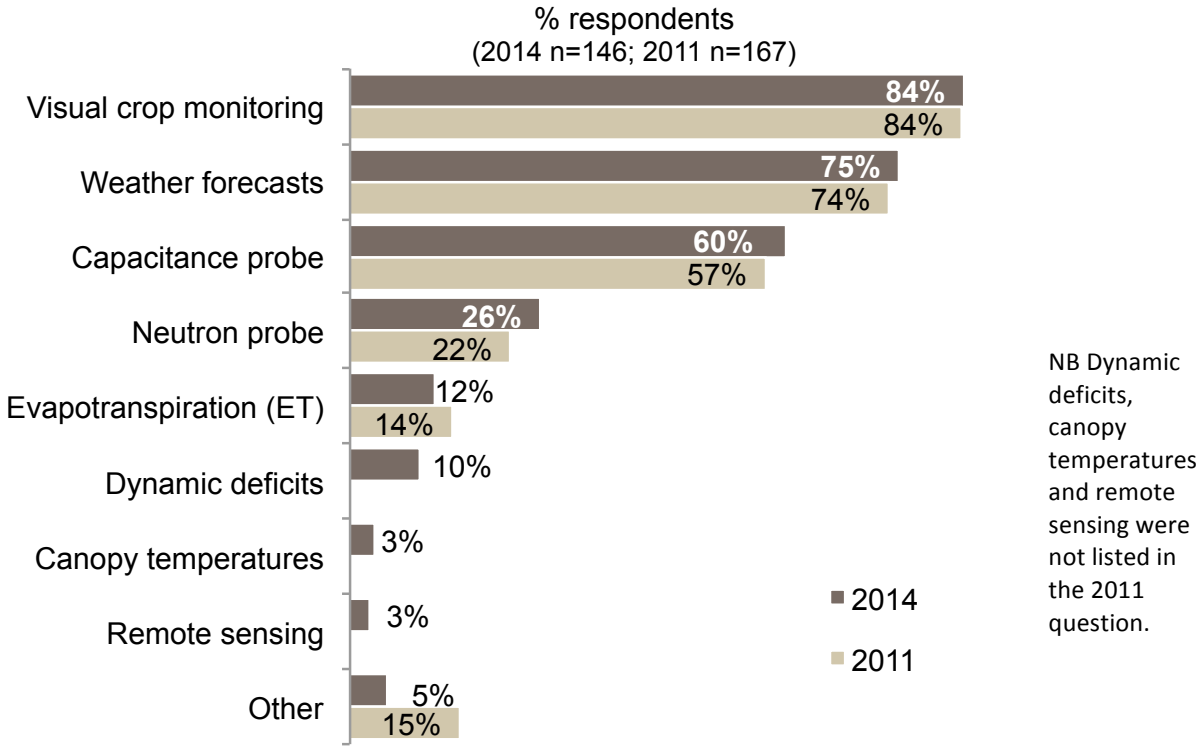
Figure 16 Confidence in making best use of available water



Irrigation scheduling

There has been relatively little change from 2011 to 2014 in the use of irrigation scheduling tools (Figure 17). 79% of irrigator respondents used soil moisture monitoring by neutron and/or capacitance probe to schedule irrigations. 8% used both of these tools.

Figure 17 Use of irrigation scheduling tools in 2014 and 2011

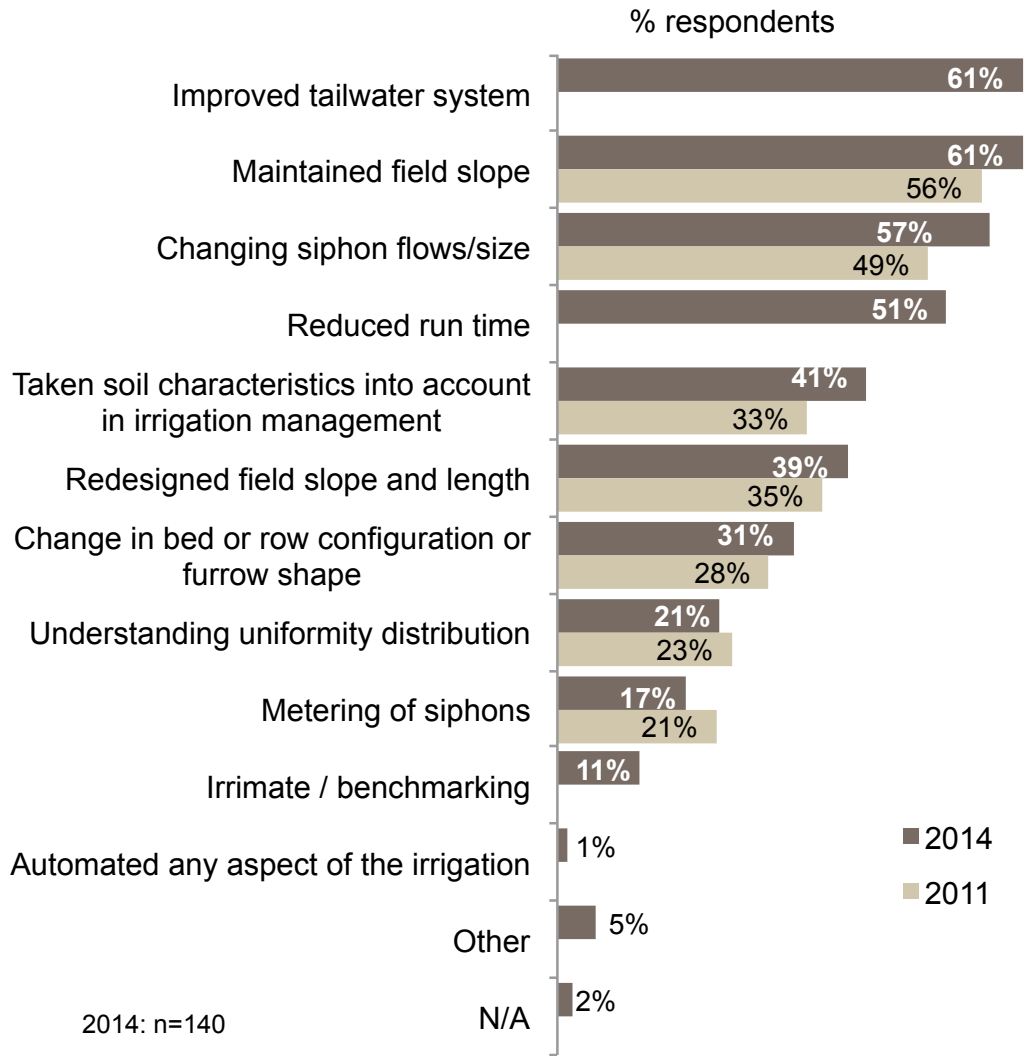


Optimising irrigation systems

Q. If you have furrow irrigation systems, please tick any of the following that you have done in the last 5 years to optimise furrow irrigation

The most commonly implemented improvements to furrow irrigation systems were improved tailwater systems, maintenance of field slope and changes to siphons and run time (Figure 18). These are largely similar strategies to those reported in 2011.

Figure 18 Strategies for optimising furrow irrigation used in the past 5 years, 2014 and 2011 responses



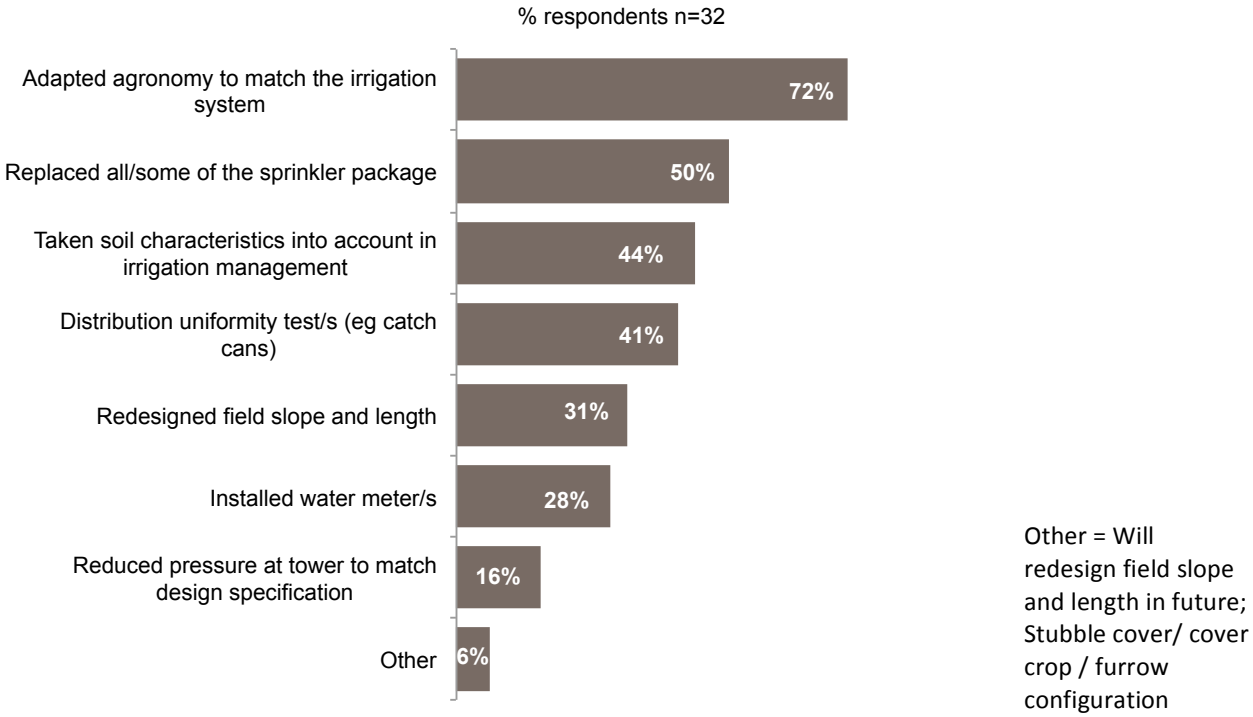
"Other" 2014 = Moisture probe, Installed channel meters, Installed concrete structures for improved water control, Increased head height in head ditches, Efficiency studies, storage loggers and survey, Installed C-probe, Dams.

Note: Blanks for 2011 had not been asked in that year

Q. If you have centre pivot or lateral move irrigation systems, please tick any of the following that you have done in the last 5 years to optimise this

The majority of centre pivot and lateral move users had adapted their agronomy to match the irrigation system and half of these respondents had replaced at leat some of the sprinkler package in the past 5 years (Figure 19). Soil characteristics were considered by a similar proportion of respondents in furrow (41%) and overhead (44%) systems.

Figure 19 Strategies used for optimising centre pivot and lateral move systems in the past 5 years



Monitoring Groundwater Quality

There has been an increase in the proportion of groundwater user respondents monitoring the quality of groundwater (Figure 20), with a large increase since 2006 :

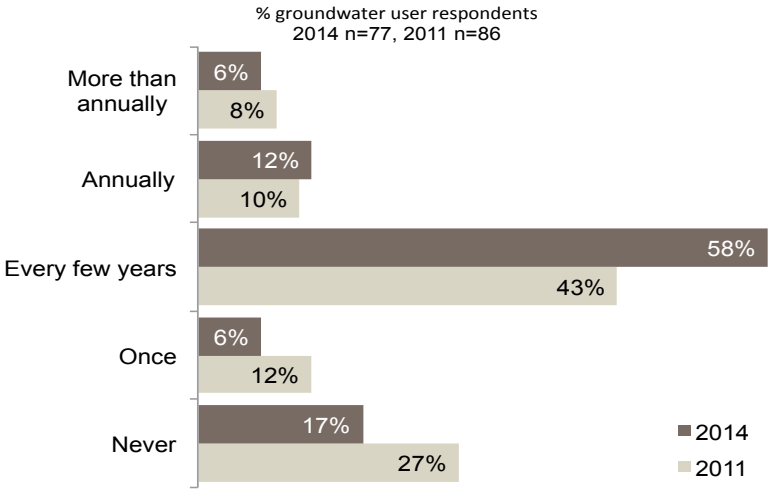
2006: 20% of irrigators monitored groundwater quality.

2011: 61% monitored at least every few years.

2014: 76% monitored at least every few years.

Groundwater attributes monitored in 2014 included pH (82%of respondents); Electrical Conductivity, EC (78%); Chloride (73%) and Sodium absorption ratio, SAR (47%).

Figure 20 Proportion of groundwater users monitoring groundwater quality in 2014 and 2011



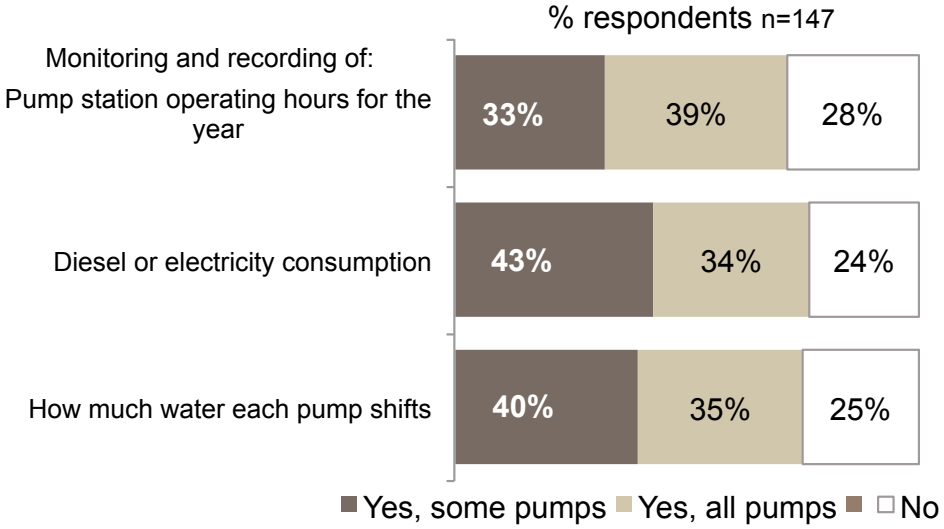
Irrigation Pumping

This section of the survey was conducted for an energy efficiency project led by Philip Szabo of the National Centre for Engineering in Agriculture, USQ. Research has found that pumping of irrigation water is a major user of energy on cotton farms[1].

Q. For your irrigation pumps, did you measure and record …

52% of irrigator respondents monitored and recorded the operating hours, energy consumption and how much water each pump shifts. 89% monitored and recorded at least one of these features (Figure 21).

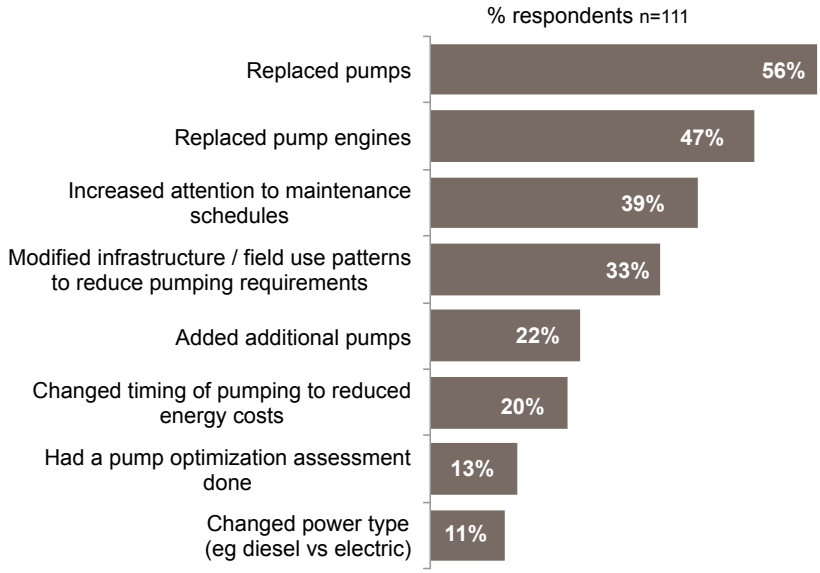
Figure 21 Monitoring and recording of pump operations



Q. Have you made any changes to improve the efficiency of water pumping?

67% of respondents had replaced pumps and/or pump engines to improve the efficiency of water pumping (Figure 22).

Figure 22 Changes made to improve pump efficiency



[1] Foley JP, Sandell GR, Szabo PM, Scobie M, and Baillie CP (2015) Improving energy efficiency on irrigated Australian cotton farms: Benchmarking report. National Centre for Engineering in Agriculture USQ

Number of pumps for each use

Q Please indicate how many pumps you have for…

There is a wide range in the number of pumps on each farm (Figure 23) and for each use. The most dominant use of pumps is for relifting water (Figure 24 and Figure 25).

Figure 23 Total number of pumps per farm - proportion of respondents with each number of pumps

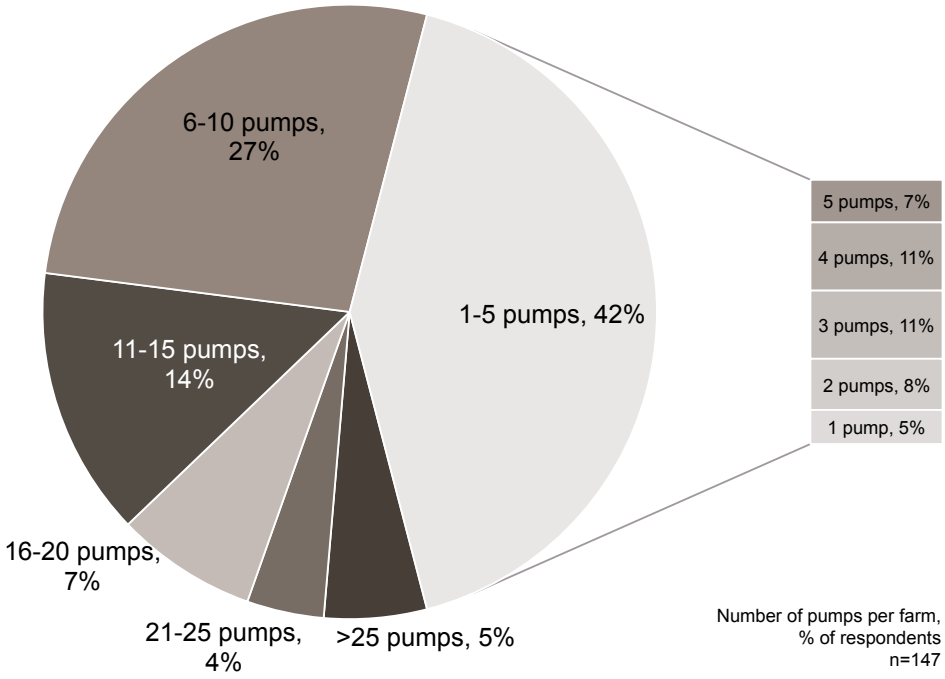


Figure 24 Proportion of respondents having at least one pump for each use

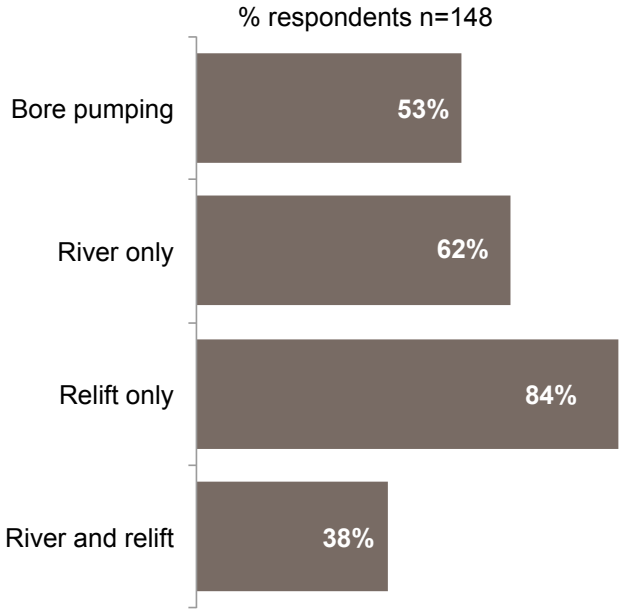


Figure 25 Number of pumps for each use, all respondents

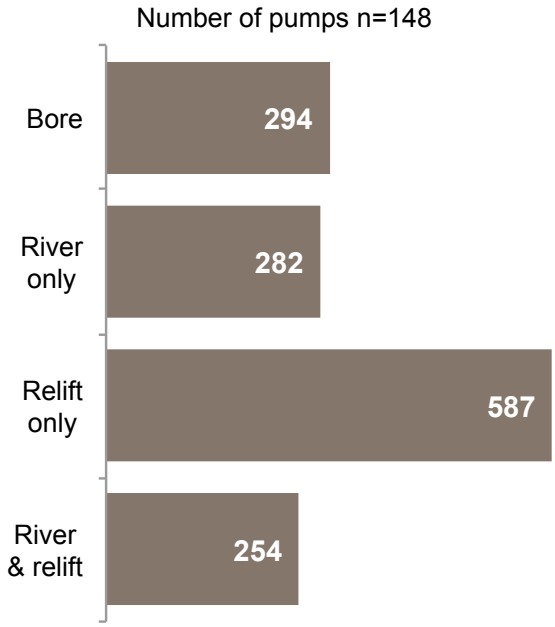
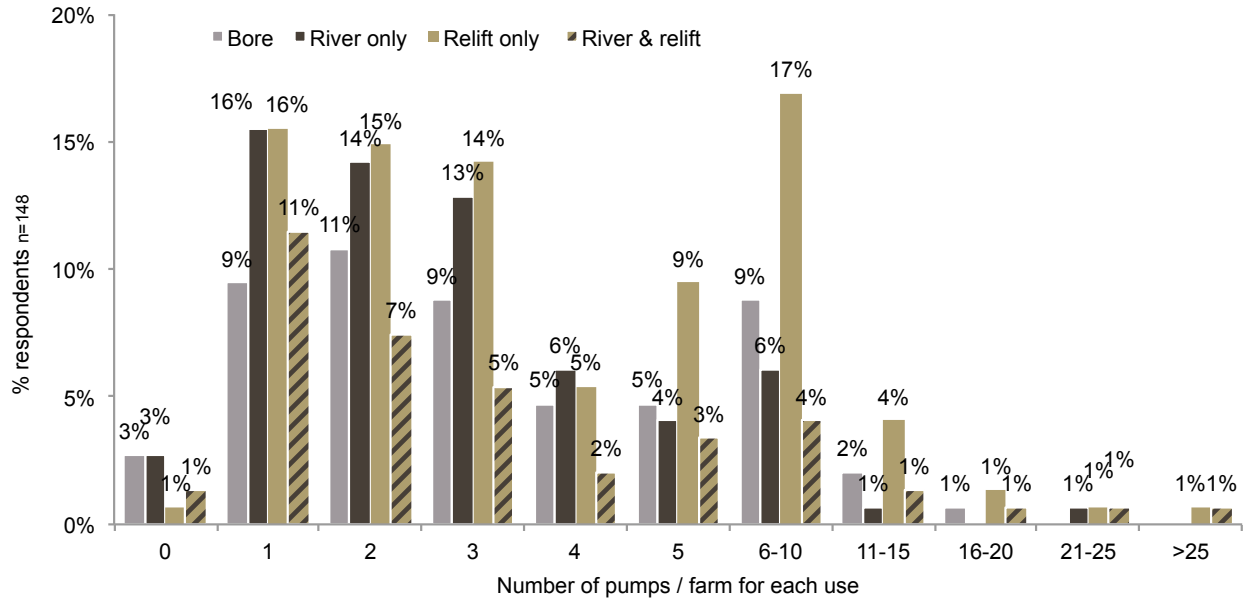


Figure 26 Proportion of respondents having each number of pump for each use



The scatter in Figure 27 illustrates that factors other than the area of irrigation influence the numbers of pumps. The regional variation in the number of pumps per farm (Figure 28) and the proportion of pumps for each use (Figure 29) may possibly be linked to the type of water source and water delivery system to the farm.

Figure 27 Number of pumps on each farm vs area of irrigation developed

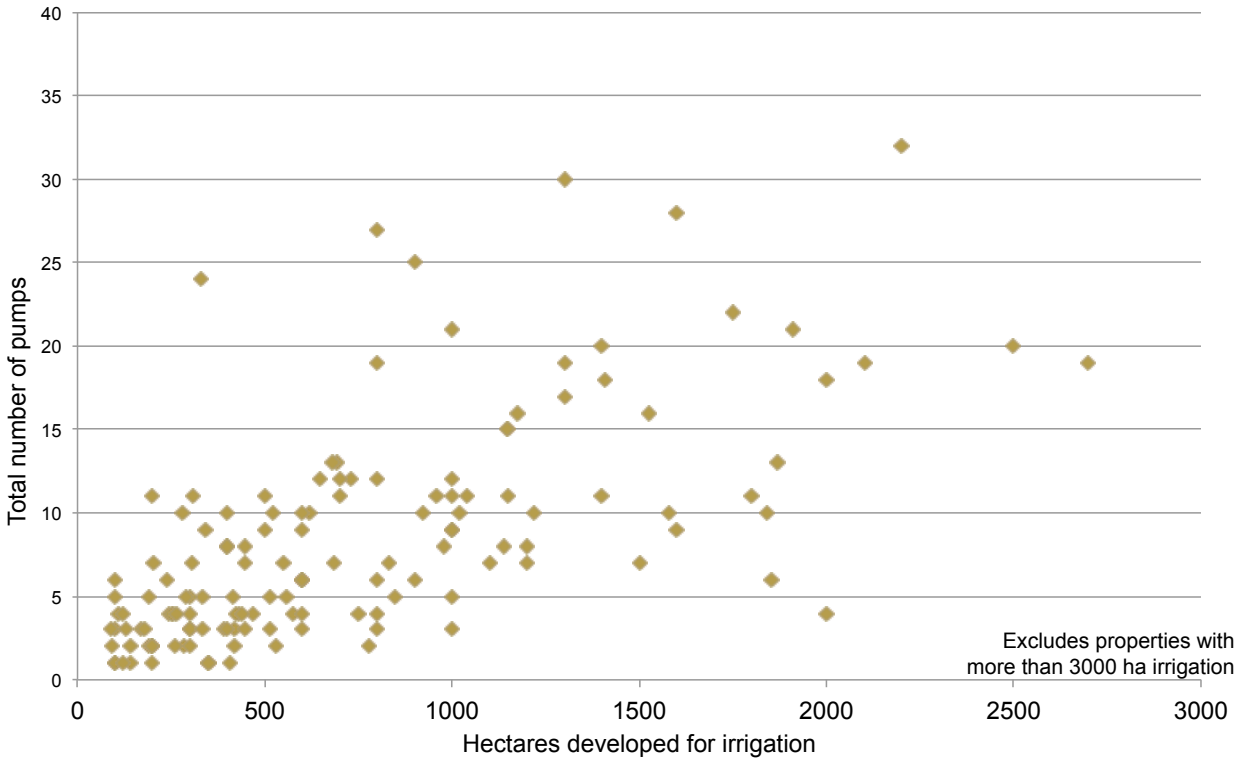


Figure 28 Average number of irrigation pumps per farm for each use by region

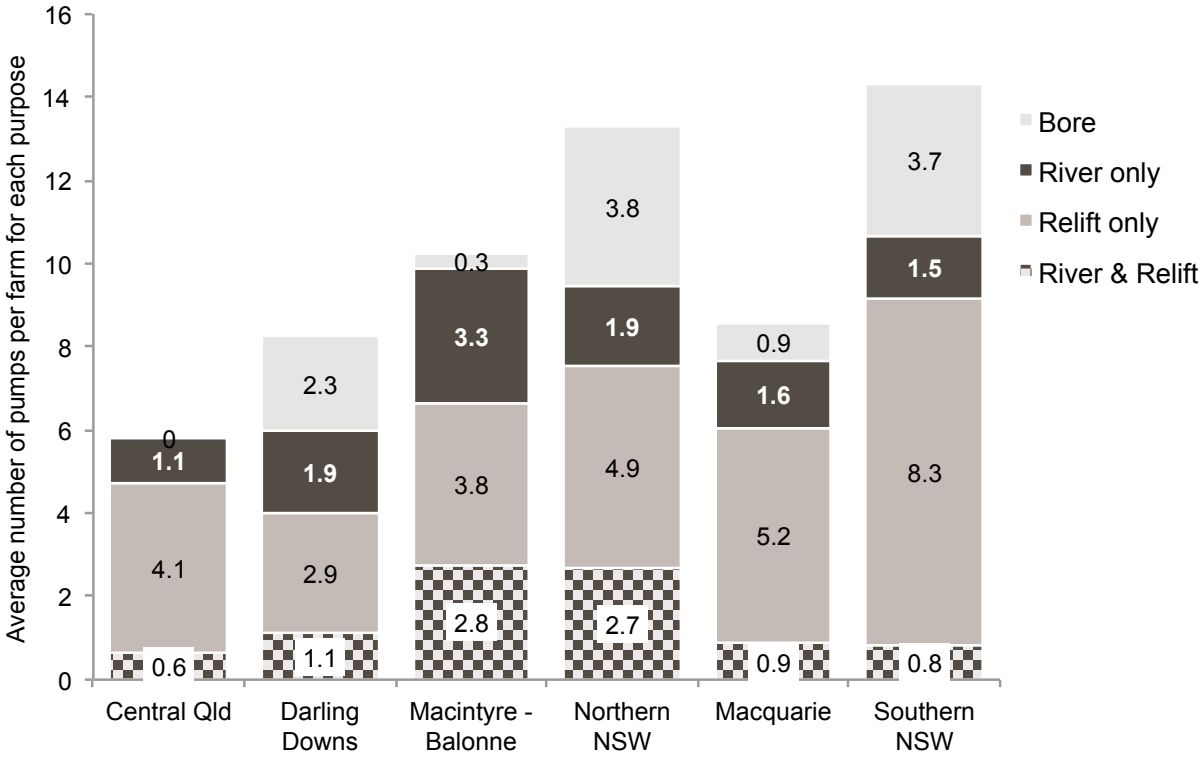
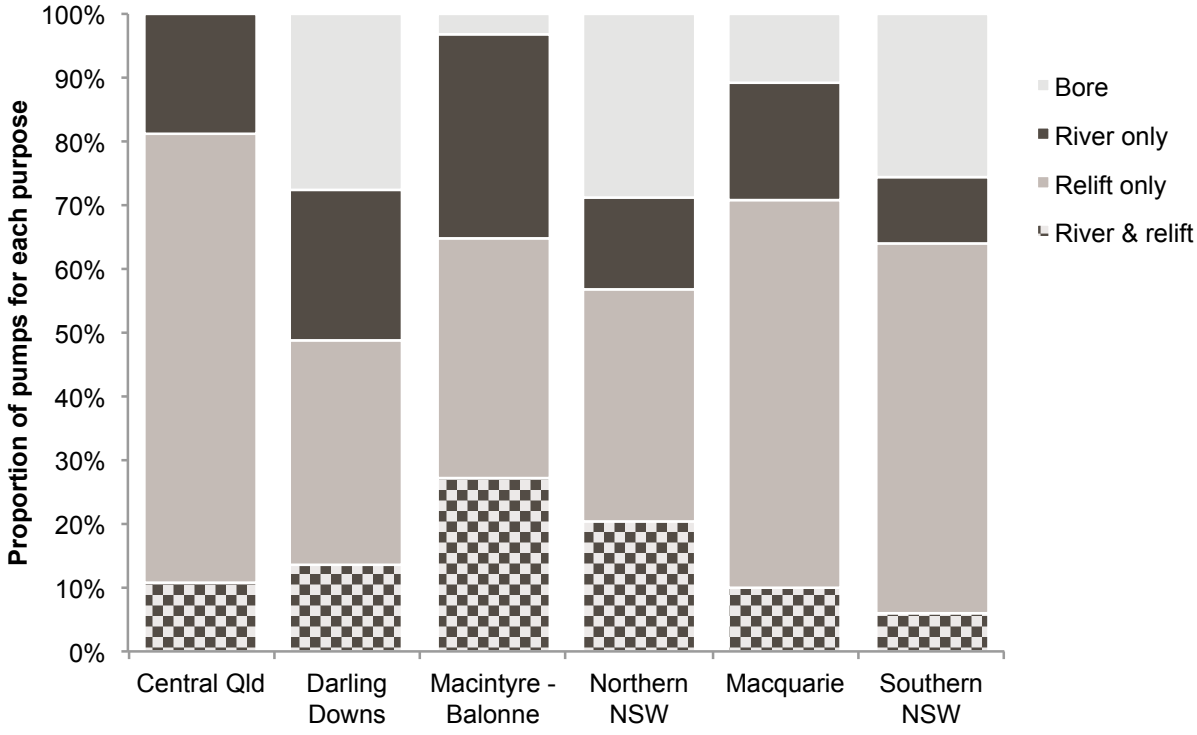


Figure 29 Proportion of pumps for each use, by region



Pump engines

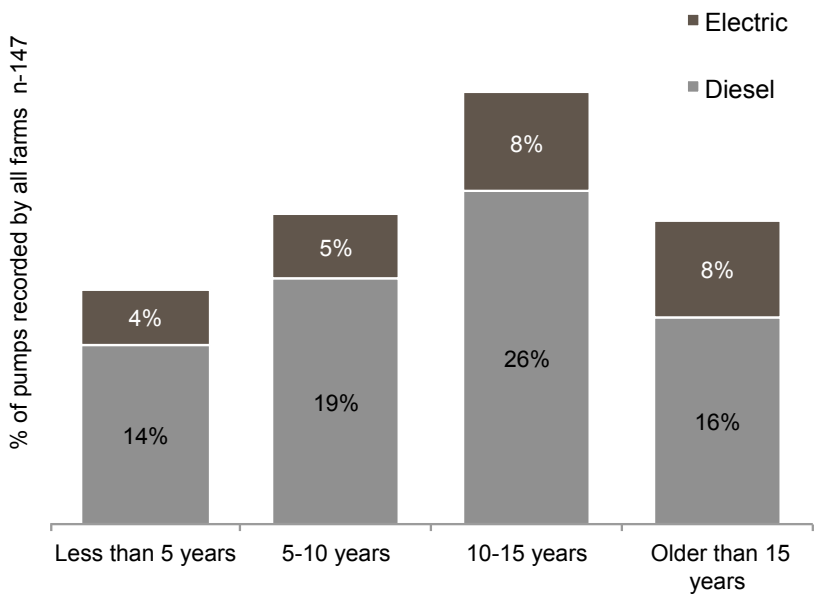
Of the 147 respondents who completed this question:

- 97% had pumps with diesel engines
- 52% had pumps with electric engines.

Of the 1240 pump engines reported:

- 75% were diesel and 25% electric.
- 56% of diesel pump engines and 62% of electric pump engines were more than 10 years old.

Figure 30 Proportion of pumps with diesel or electric engines and by age

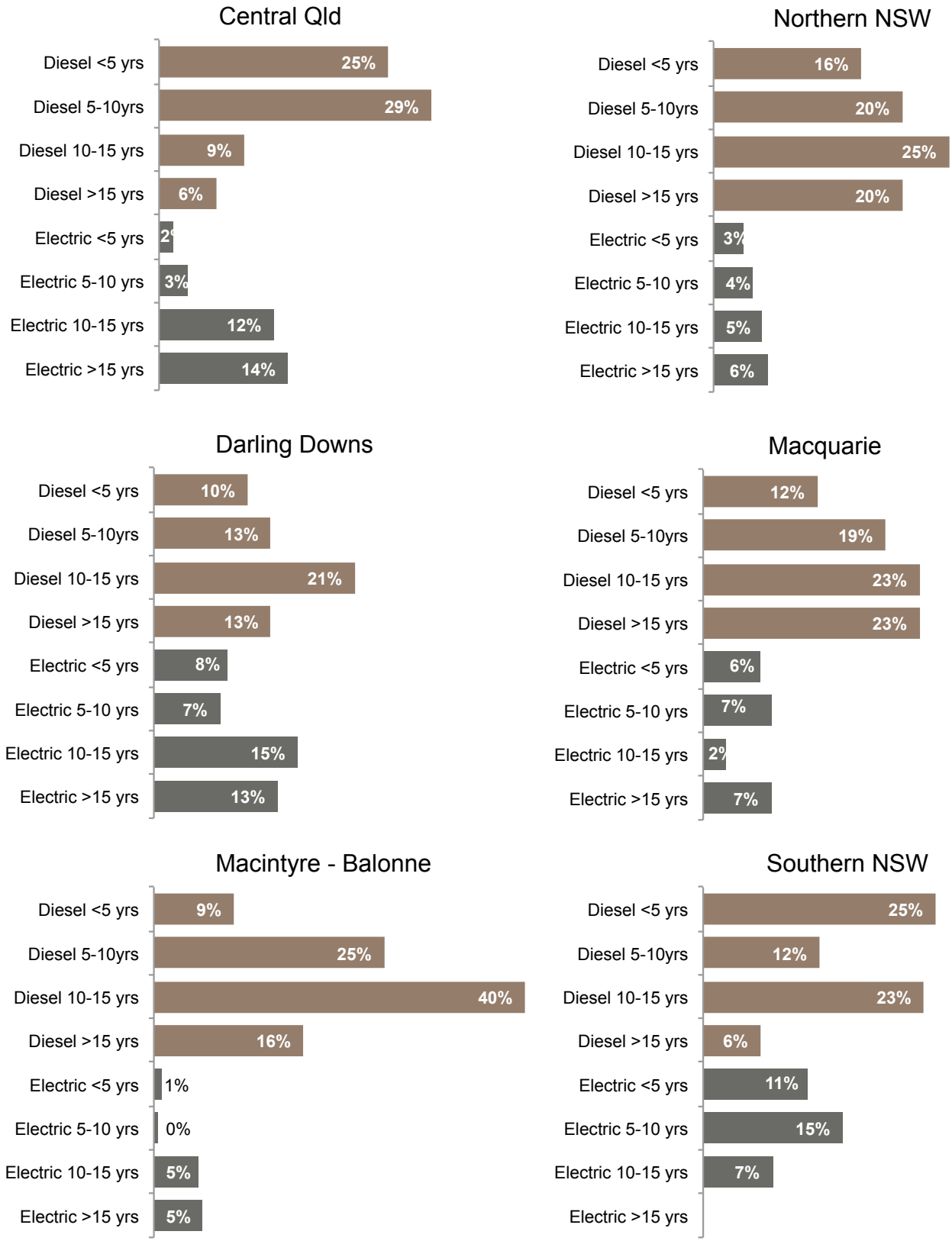


Q. Do you have any particular concerns or comments in regards to irrigation and your pump stations?

Table 12 Comments about irrigation and pump stations

Energy Costs ■ Energy costs -electricity are out of control ■ We need to get reduce cost of energy, diesel & electricity ■ Concerns over rising electricity costs as our bores are electric. ■ Demand charges on electricity ■ Cost of electricity and optimisation of pumping ■ Present pumping costs - both diesel and electric are not sustainable ■ Age and increased cost of electricity ■ Energy costs ■ Electricity has become to expensive ■ Electricity prices are ridiculous for a country with abundant coal and gas . ■ Electricity prices prohibit any changing to electric, in fact may remove electric bores next year, convert to diesel. What a backward step!
Maintenance ■ All pumps are maintained to a high degree of reliability. Diesel engines are rebuilt when needed as are electric motors. New pump bags are installed when needed. ■ Trash removal
Reliability ■ Electric river and relift to diesel due to constant power outage problems ■ We have additional spare diesel engines to allow us to change out motors quickly in breakdowns. ■ Water
Fuel Storage ■ Bunding of fuel tanks - is it required?

Figure 31 Proportion of pump engines of each age and type by region



Carbon and climate issues

CRDC is currently undertaking a project funded by the Australian Government to assist growers in understanding climate and carbon management in the farming system. The survey sought to measure growers' perception of their level of understanding of climate and carbon issues.

Figure 32 and its summary in Table 13 illustrate that the majority of respondents understand the sourcing of climate information for decision making and the El-Nino and southern oscillation effects. Slightly below half of respondents understand aspects of carbon in the farming system. Very few understand the Australian Government's Carbon Farming Initiative and how to participate.

Figure 32 Level of understanding of climate and carbon issues

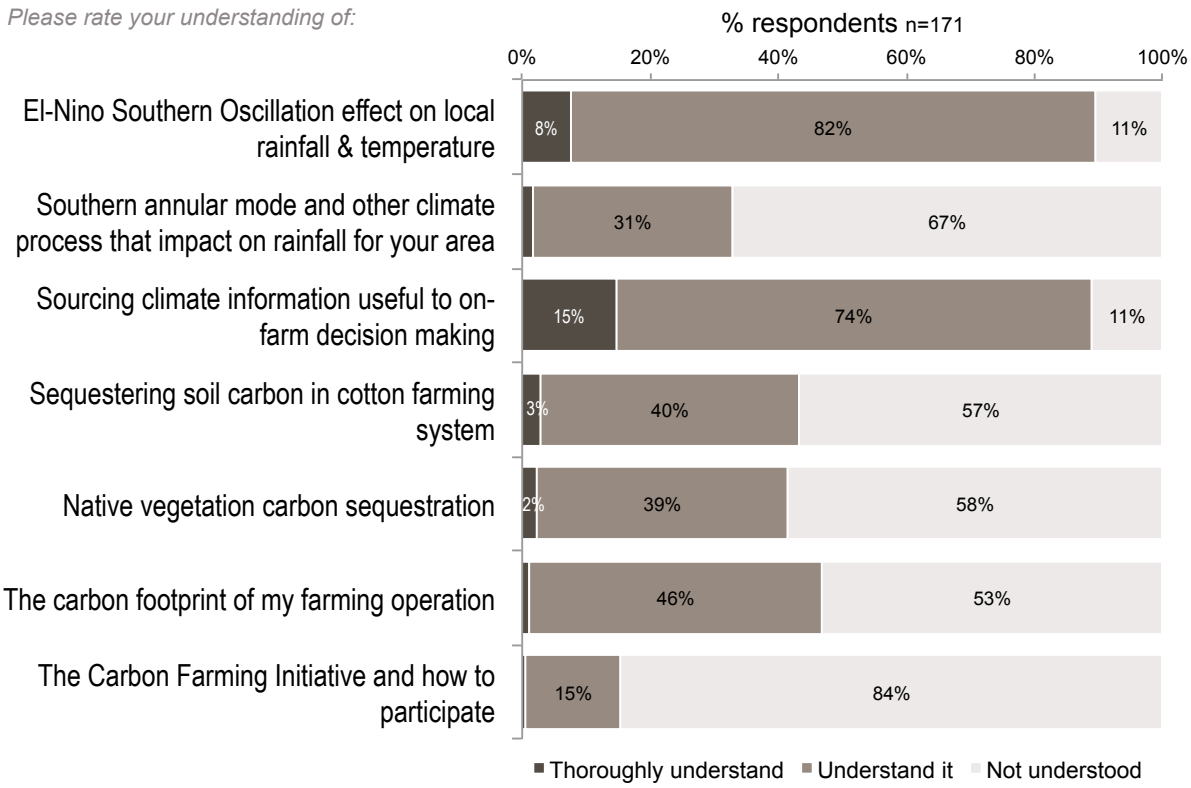


Table 13 Net understanding of climate, weather and carbon issues

El-Nino Southern Oscillation effect on local rainfall & temperature	90%
Southern annular mode and other climate process that impact on rainfall	33%
Sourcing climate information useful to on-farm decision making	89%
Sequestering soil carbon in cotton farming system	43%
Native vegetation carbon sequestration	41%
The carbon footprint of my farming operation	47%
The Carbon Farming Initiative and how to participate	15%

Riparian areas

68% of respondents had a creek or river on their property. There is considerable regional variation, with farms in the Gwydir and St George/Dirranbandi regions being the most likely to have a creek or river (Table 14). This variation is likely influenced by the irrigation system infrastructure in different regions. For example, many farms in Central Queensland, the Macquarie and Southern NSW access irrigation water from irrigation schemes and thus proximity to a waterway is less critical than it is in the regions where water is accessed directly from rivers or bores. Similar information was collected from grower surveys in 2011 and 2006. The overall trends are similar over that time, with some slightly different regional results likely influenced by the population respondent pool.

Q. Approximately how long is the riparian area on your property? (km)

110 respondents recorded the length of riparian zone on their farm. This indicated for respondent farms:

- Average 7.5km of riparian zone (similar to the average 9 km reported in 2011)
- Range 0.5 – 42 km
- 46% of respondent farms had less than 5km of riparian
- 85% of respondent farms had less than 10km of riparian
- 2% have more than 40 km of riparian.

Table 14 Regional variation in presence of creek or river or grazing stock on farms

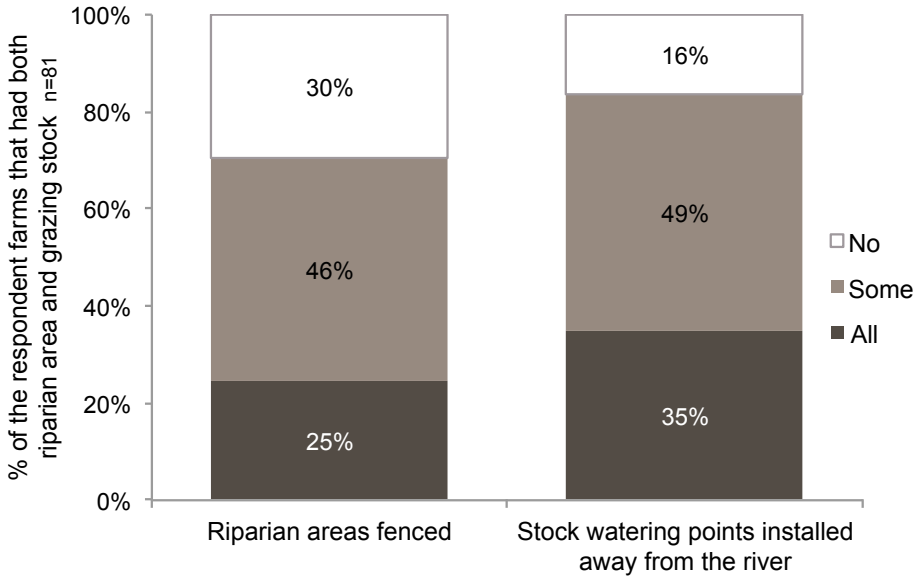
	Proportion of respondent farms with:	
	A creek or river	Grazing stock at least sometimes
Central Queensland	54 %	33 %
Darling Downs	59 %	34 %
Border Rivers	78 %	61 %
St George / Dirranbandi	89 %	80 %
Gwydir	90 %	50 %
Lower Namoi	56 %	62 %
Upper Namoi	83 %	64 %
Macquarie	73 %	73 %
Southern NSW	55 %	72 %
Total	**68 %**	**55 %**

Grazing stock and riparian areas

Table 14 also shows that grazing stock are present at least sometimes on 55% of respondent farms, most commonly on farms in the St George/Dirranbandi , Macquarie and Southern NSW regions. Of those respondent farms with both riparian areas and grazing stock, 71% have at least some riparian areas fenced and 84% have at least some stock watering points away from the river (Figure 33).

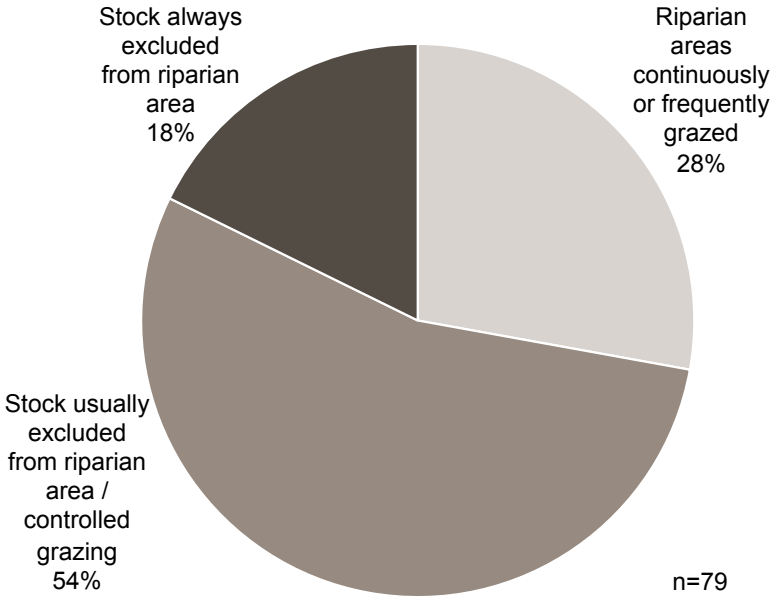
Q. For areas that may be grazed, does your farm have:

Figure 33 Riparian fencing and stock watering points on farms with both riparian areas and grazing stock



Q. Which of these best describes how you usually manage grazing in your riparian zone

Figure 34 Management of grazing in riparian zone for respondent farms with both riparian areas and grazing stock



Comments made about riparian grazing were:

- Would like to fence more, time and money are the problem.
- Infrequently grazed.
- Removed stock from river completely 8 years ago, was always fenced off but lippia no longer a problem weed. General riparian health improved 100%.
- Grazing keeps weed species in check.
- Our farming operations are a long way away from the riparian area which is just access to the river. Some areas the stock are always excluded. Other areas are continuously grazed because it is the start of the watercourse so little channels throughout.

Management of riparian zones

Q. In managing this riparian area, have you undertaken any of the following activities in the last 5 years?

91% of respondents with a riparian area had undertaken at least one activity related to managing their riparian zone in the past 5 years. By comparison, in 2011 40% of all respondents and approximately 60% of respondents with a riparian area had indicated they were 'actively managing' the riparian zone.

Of the 111 growers responding to this question:

- 52% were controlling weeds
- 81% controlling feral animals
- 33% controlling erosion
- 24% considered riparian areas for IPM
- 69% left fallen logs and rocks in place
- 46% identified it as a sensitive area on the farm map
- 14% revegetated areas
- 71% allowed or encouraged natural regeneration of native vegetation
- 11% did other activities to manage the riparian zone, incl:
  - Fenced off (5)
  - Grazing exclusion (5)
  - Better control grazing
  - Excluded access for vehicles
  - The area is mostly in an undisturbed state
  - Lippia control
  - Closed off corner of the farm.

Comments about riparian areas were:

- "Floods have helped regenerate all aspects of riparian, flora and fauna."
- "Spraying weeds near river with current laws
  Riparian areas are feral pig highways (need better assistance to get rid of feral pigs) - European carp are destroying our rivers, we must find a solution."
- "The riparian area looks after itself fairly well. Trees and foliage have regenerated a lot since the floods."
- "In the last 10 years have had 2 huge floods followed by a prolonged drought."

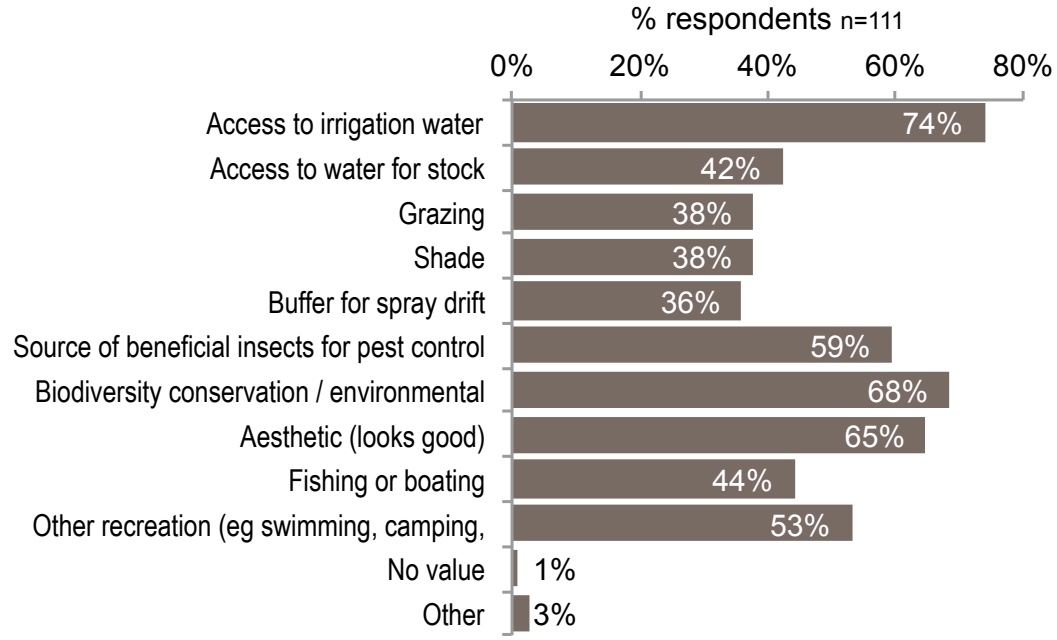
Valuing the riparian zone

Q. Which of the following do you value your riparian area for, if any?

90% of respondents identified something they valued about their riparian zone. Access to irrigation water, biodiversity conservation / environmental, aesthetics and as a source of benefit insects for pest control were the most frequently identified values (Figure 35). Over a third of respondents valued the riparian area as a buffer for spray drift, a consideration that may impact on the condition of these areas.

60% valued their riparian zone for recreation (fishing or boating and/or other recreation such as swimming, camping, walking, bird watching).

Figure 35 Valued features of the riparian zone on cotton farms



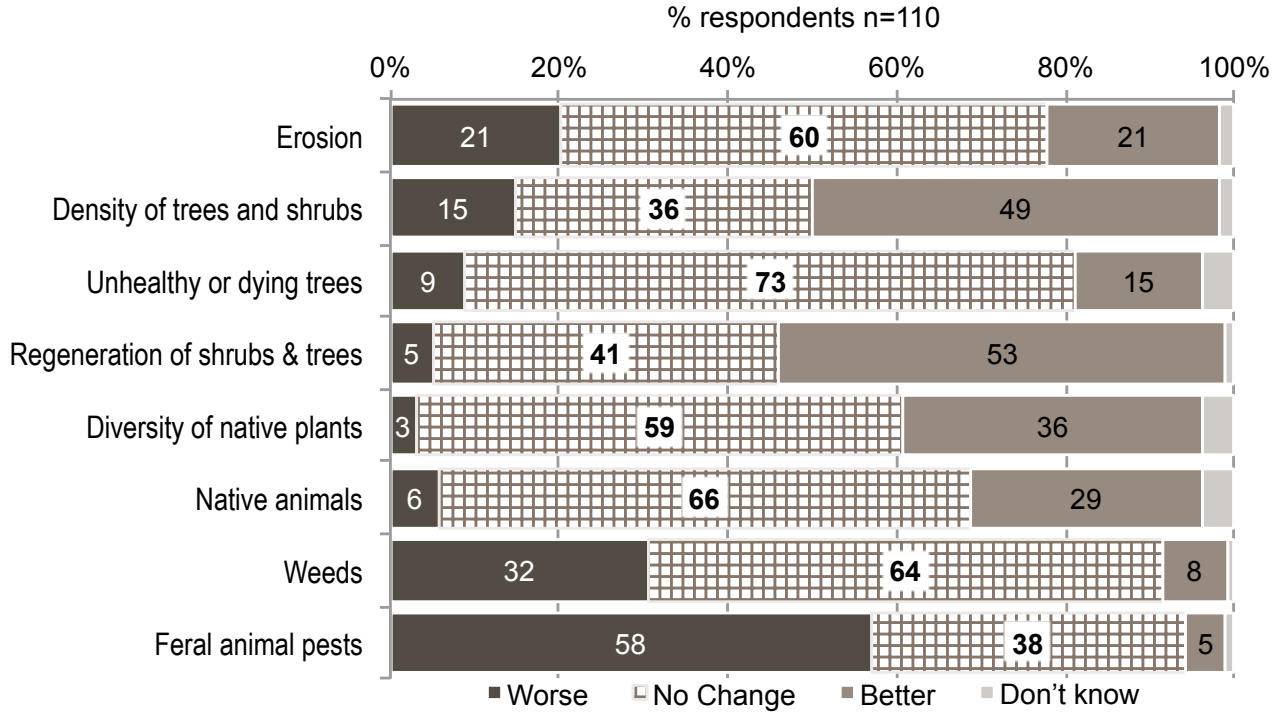
Other = Wild life habitat; May be able to bale hay occasionally; River partly fenced off - no stock.

Changes in condition of riparian areas

Q. Have you noticed any significant changes in riparian areas on your property over the last 10 years?

The most frequently mentioned change was a worsening of feral animal pests (58% of respondents). Most noted improvements were in the regeneration of native plants (53%) and the density of trees and shrubs (49%). Two respondents noted other worsening condition, being: 'Environmentally damaging tree species e.g Cuban wattle'; 'Areas of bank slumping following the flood but these appear to be stablising and regenerating now'. One noted other improvement in 'increased birdlife, crustaceans'.

Figure 36 Observed changes in condition of riparian areas over 10 years

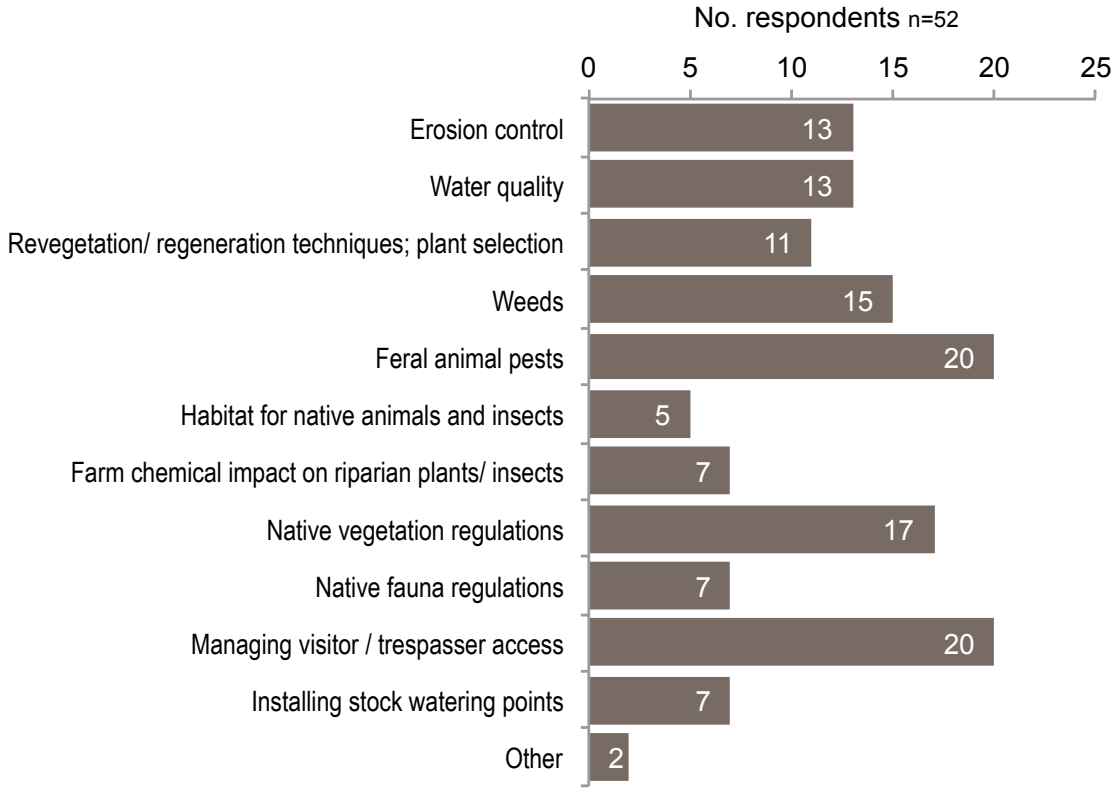


Information and support about riparian areas

Q. Please tick any of the following issues that you would like information or support about in relation to your riparian areas

52 respondents (half of the respondents to the riparian area questions and 29% of all respondents) indicated some issues for which they would like information or support. The leading issues were feral animal pests, managing visitor / trespasser access and native vegetation regulations (Figure 37).

Figure 37 Interest in information or support on riparian area topics



CottonInfo

Q. Are you aware of CottonInfo - the cotton industry's joint extension program (consisting of regional development officers, technical specialists and myBMP)?

CottonInfo was recognized by 82% of respondents (Figure 38). 63% both recognized CottonInfo and indicated they received information or contact from the team. There was some regional variation in the awareness of and access to CottonInfo (Figure 39).

Figure 38 Awareness of CottonInfo

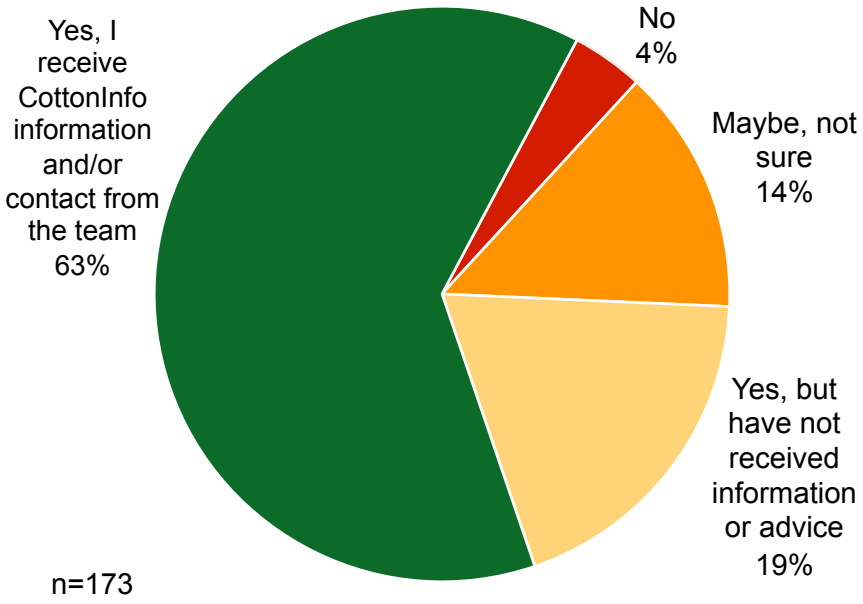
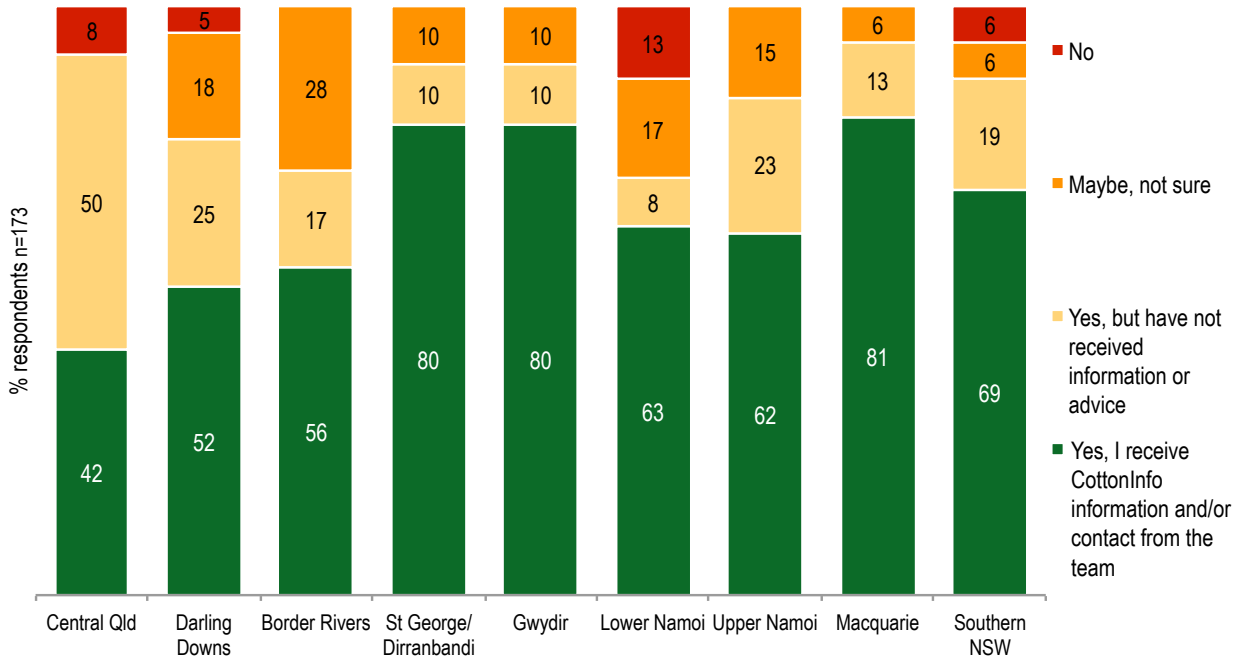


Figure 39 Awareness of CottonInfo by region



Q. Do you source information from the CottonInfo team or information resources (eg Cotton Pest Management Guide, Cotton Production Manual, myBMP etc)?

78% of respondents indicated they had sourced information from the CottonInfo team or information resources (Figure 40). The highest rate of use is in St George/ Dirranbandi, Gwydir and Southern NSW.

It is interesting to note the proportion in each region who indicated that they source information from CottonInfo is generally higher than those who indicated in Figure 39 that they receive information from the CottonInfo team.

Figure 40 Proportion of respondents sourcing information from the CottonInfo team or information resources

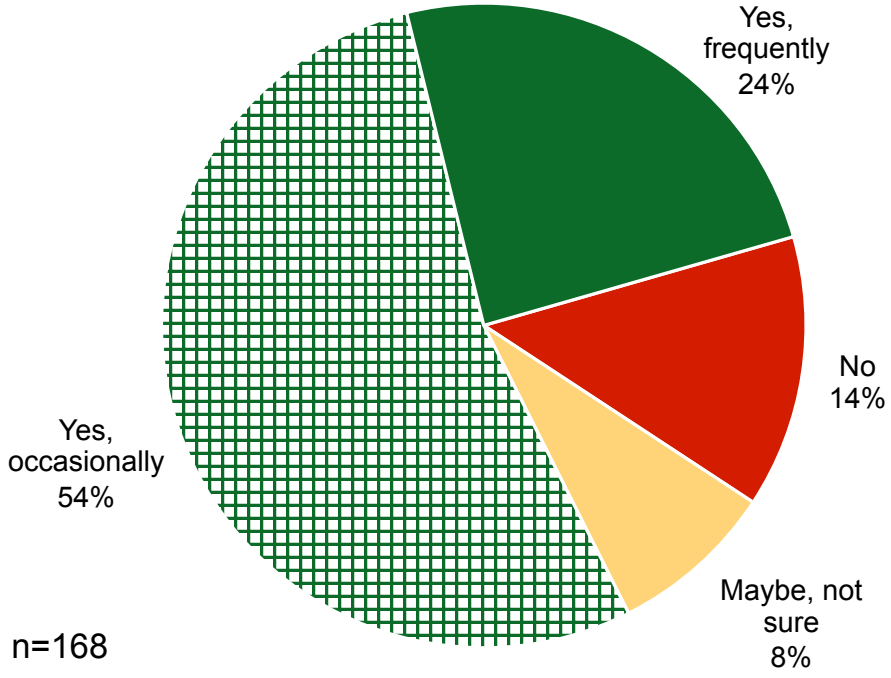
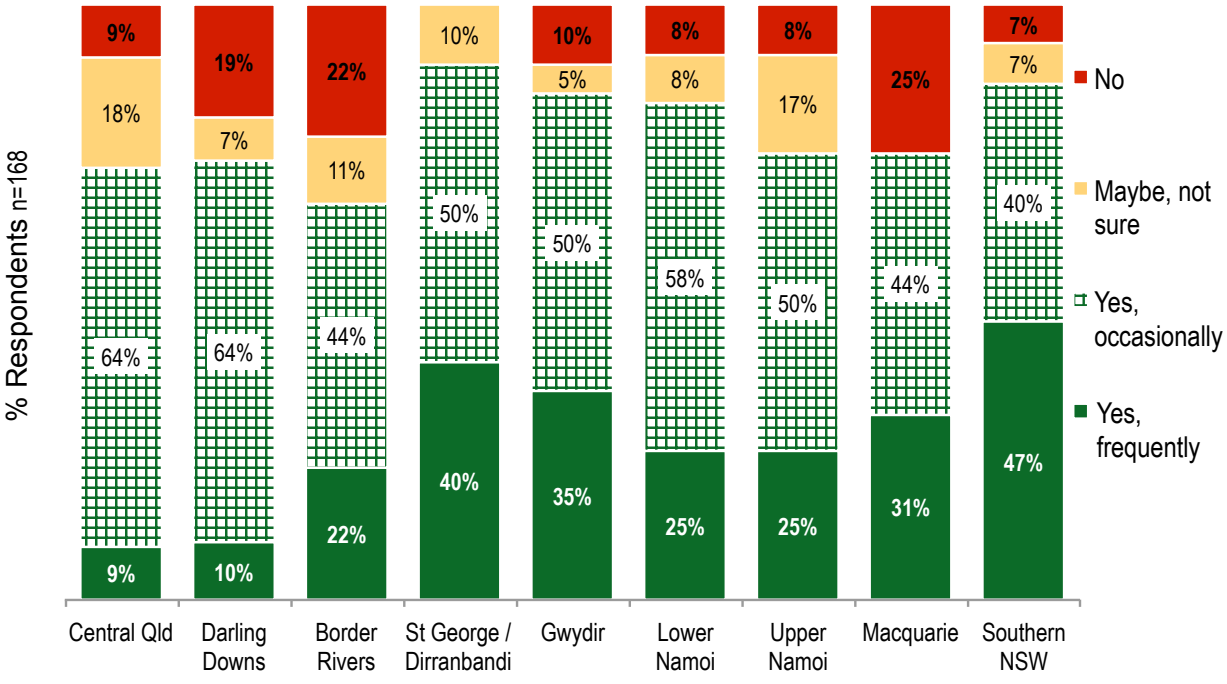


Figure 41 Proportion of respondents sourcing information from CottonInfo, by region



Q. To what degree have the CottonInfo team, information resources and myBMP assisted you to improve practices on your farm in relation to…

Figure 42, calculated using the highest ranking received in any technical area, indicates that CottonInfo information resources and myBMP have helped 89% of cotton growers to improve their management practices.

The degree of influence ranges by topic (Figure 43) with the greatest influence being in the agronomy areas (pests, nutrition, water) and lesser influence in the areas of energy use and natural resource management. This is also shown in Table 15 which presents the net influence in each topic area – the summed proportion of respondents who indicated any level of assistance (a little, moderate, significant or very significant) from CottonInfo, information resources or myBMP in improving practice.

Figure 42 Proportion of respondents indicating assistance from CottonInfo, information resources and myBMP in improving practices on farm

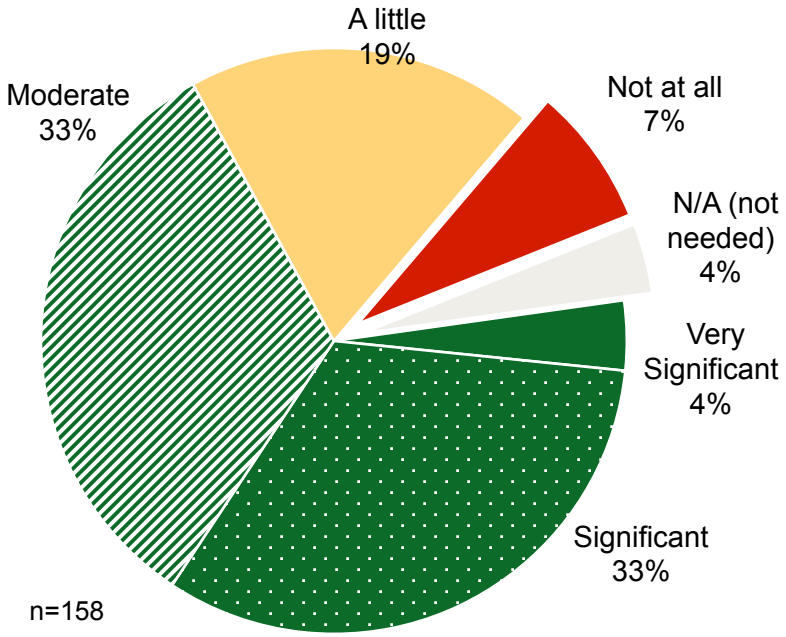


Figure 43 Degree of assistance in changing practices, by topic

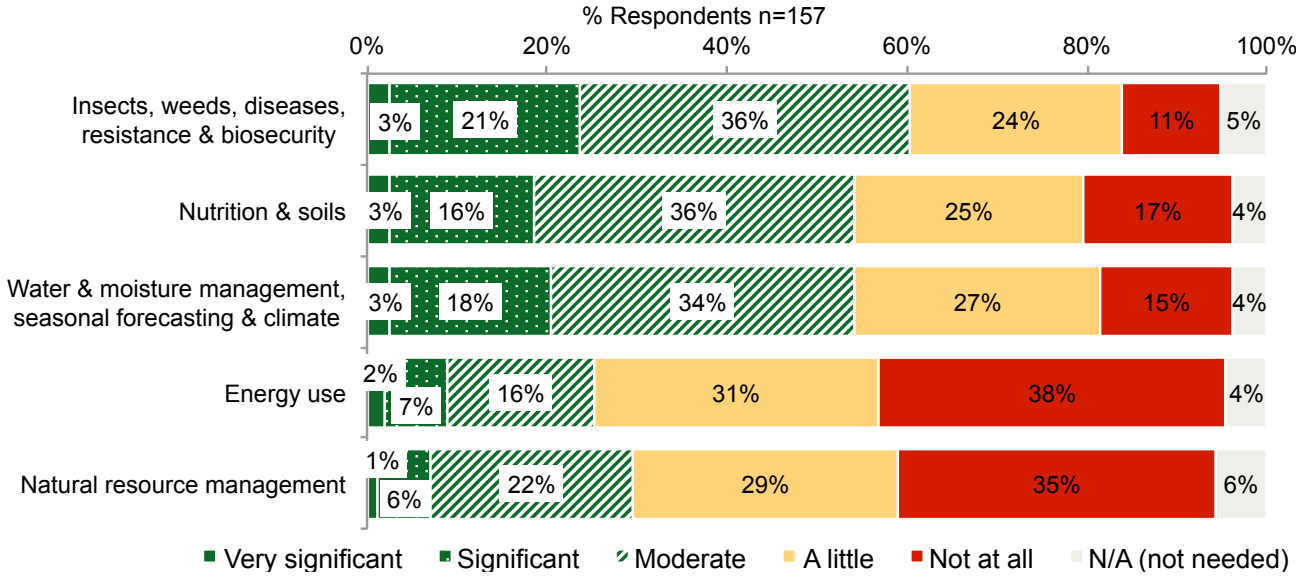


Table 15 Net influence – proportion of respondents indicating that the CottonInfo team, information resources and myBMP had given some assistance in improving practices

	% respondents indicating some assistance in improving practices*
Insects, weeds, diseases, resistance & biosecurity	83 %
Nutrition & Soils	80 %
Water & moisture management, seasonal forecasting & climate	82 %
Energy Use	56 %
Natural resource management	59 %

* ie A rating from "A little" to "Very significant"

Table 16 Comments and suggestions about Australian cotton RD&E

CottonInfo team, information, myBMP

- Get them all doing on farm trials with growers
- Asked our farm manager/ contractor if he used cottonInfo team and myBMP:
  - CottonInfo - Does talk to local rep , but not to source specific information.
  - myBMP - Does not find it easy / user friendly to navigate. has attempted to use it as a source of reference / information, but gave up because he couldn't navigate links.
  - Guidance and information via agronomist.
- Most of our new information comes from Cottongrower magazine, consultant of 25 years, CSD and field days etc.
- They are at the forefront of the cotton industry
- myBMP good for "Getting the house in order" , Not used as a go-to for immediate on-farm issues. Refer to agronomist for this. myBMP useful as a protection against being outside legal practice. Do not utlise CottonInfo team, as prefer direct relationship with agronomist as source of current knowledge
- Amanda Thomas is doing a fantastic job.
- Thats what agronomists are for.

Issues

- The industry needs to continually promote/spread awareness of the significance of weed resistance to glyphosate.
- With last season being hot and dry and this season predicted to be similar, continued research into drought tolerant varieties seems rather important.
- Keep plugging away thanks!
- You have not mentioned seed quality. This is a major issue.
- Soil health needs to be a higher priority: So much research goes into fertiliser products/rates etc...would be good to see more information about how we can realistically improve soil health (cheaply) in our production system
- We are doing nutrition + pivot trials, also info team has had a couple of interesting field days
- Compaction needs revisiting, E.g comparing 8 rows Vs 12 rows/ new track machines Vs FWA (frontwheel assist)
- Crop destroyed by wire worm.

Preferences for survey reporting

88 % of respondents indicated they would like to see at a copy of the report of the survey.

The most preferred format was by an email link to the report, with some preferring two or more formats: Email 54%; Hardcopy 13%; Spotlight 11%; Email & hardcopy 5%; Email & Spotlight 4%; Hardcopy & Spotlight 1%; and Email, hardcopy & Spotlight 1%.

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