



Australian Government  
Cotton Research and  
Development Corporation



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# QUALITATIVE REPORT

on the 2014–15 cotton season:  
A survey of consultants



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& THEIR CLIENTS**  
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## **PURPOSE**

The Cotton Research and Development Corporation (CRDC) commissions this survey each year to provide current and longitudinal knowledge of on-farm practices and attitudes, to aid the research, development and extension effort within the Australian cotton industry.

## **COVERAGE**

Data was collected by Crop Consultants Australia Inc. (CCA) from 41 cotton consultants, who answered most or all of the questions about their own practices and attitudes, as well as those of their grower clients.

The consultants represented 290 cotton growers, and covered 111,069 hectares: 54 percent of the Australia cotton production area for the 2014-15 season (not adjusted for row spacing). This is based on the 2014-15 production figure of 205,482 hectares (Cotton Australia).

## **METHODOLOGY**

The survey consisted of 70 quantitative and qualitative questions, which sought to draw out both the details of actual agronomic practices and consultants' views of those practices. It was conducted in July and August 2015, with questions referring to the 2014-15 cotton season. Questions that collected data on clients or areas were only made available to one participant from a consultancy to avoid duplication.

## **DATA COLLATION**

The online Cvent survey program ([www.cvent.com](http://www.cvent.com)) was used to compile the data. Interpretations are up to the user.

## **ACKNOWLEDGMENT**

Thank you to the consultants who took the time and effort to complete this survey. The data in this survey provides valuable information for researchers and industry organisations in planning and carrying out projects. Thank you to Crop Consultants Australia and Black Canvas graphic design for the compilation of this report.

## **DISCLAIMER**

The Cotton Research and Development Corporation (CRDC) provides the information in this publication to assist understanding of the agronomic performance of the Australian cotton industry. CRDC accepts no responsibility or liability for the accuracy or currency of the information contained in this publication, nor for any loss or damage caused by reliance on the information and management approaches surveyed. While the 2014-15 survey contains information that should be of value to extension officers and researchers in defining future industry needs and as an information source in seeking to improve industry management practices, users of this publication must form their own judgement about the information it contains.

Crop Consultants Australia took all care in the gathering and collating of the data; however, the data was provided by individual consultants and agronomists and therefore is subject to associated constraints.



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# THE CONSULTANTS AND THEIR CLIENTS

## ABOUT THE CONSULTANTS

1

Are you completing the survey on behalf of the business or business unit?

41 respondents

35 consultants completed the survey on behalf of their business or business unit, which involved completing the specific questions relating to staff, hectares and clients. Six consultants completed the survey questions only relating to individual practices and attitudes.

2

Which of the following best describes your employment as a consultant?

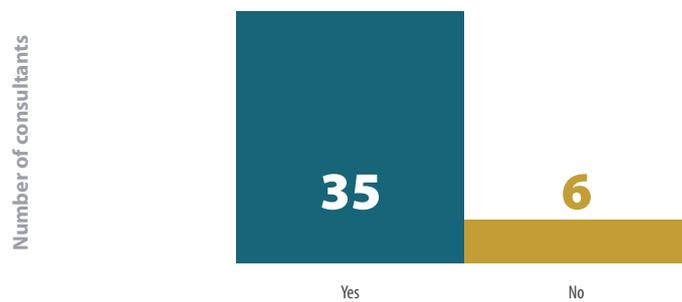
41 respondents

3

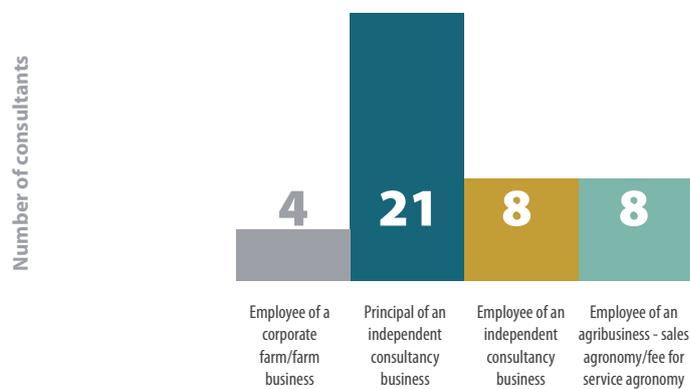
For how many seasons have you worked consulting in cotton?

41 respondents

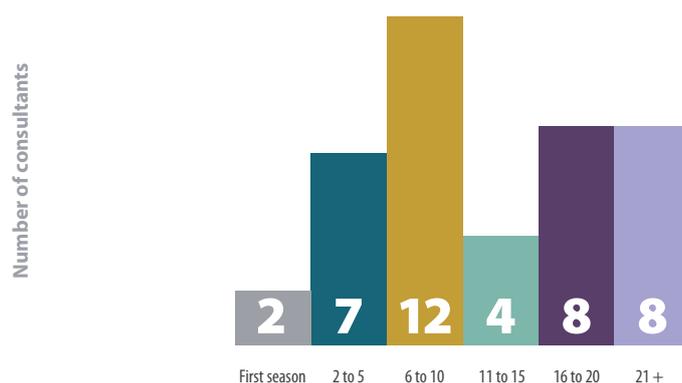
PRIMARY BUSINESS PERSON COMPLETING SURVEY



NATURE OF CONSULTANCY



NUMBER OF SEASONS CONSULTING IN COTTON





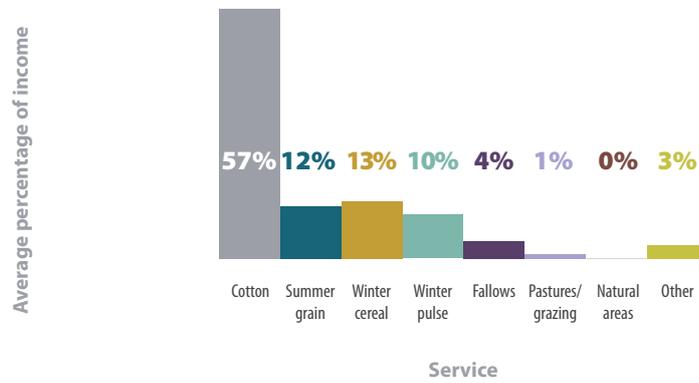
# THE CONSULTANTS AND THEIR CLIENTS

4

What percentage of your consultancy income is derived from these services?

40 respondents

PERCENTAGE OF CONSULTANCY INCOME FOR SERVICES

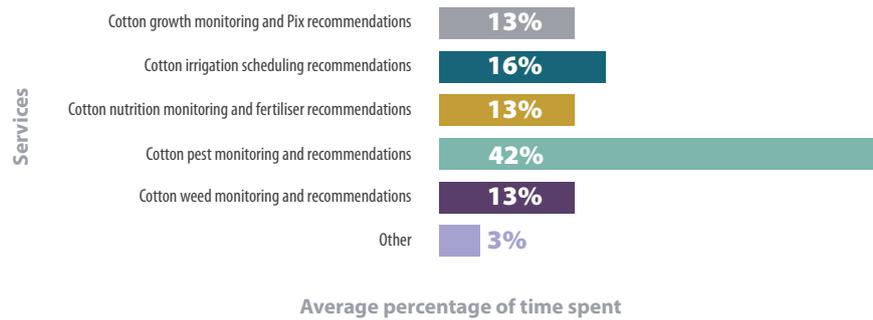


5

What percentage of your cotton consultancy time is derived from these services?

41 respondents

PERCENTAGE OF TIME SPENT ON COTTON CONSULTANCY SERVICES



6

What were the 'other' cotton services in Question 5 that you spent time on?

9 respondents

- Defoliation.
- Extension.
- Farm management.
- Farm planning.
- Ground prep and plant establishment.
- New development/trials.
- Organising contractors, making sure jobs are done on time and to a certain standard.
- Organising contractors.
- Planning areas and variety. Bed-preparation, defoliation and picking.



# THE CONSULTANTS AND THEIR CLIENTS

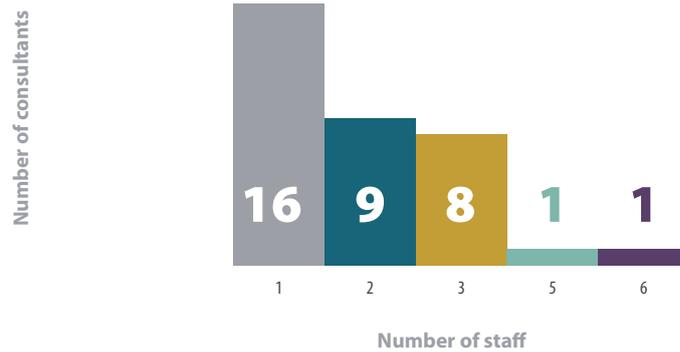
## ABOUT THE STAFF

7

How many full time/permanent staff (including yourself) were employed in your business to service cotton clients in January 2015?

35 respondents

NUMBER OF PERMANENT STAFF SERVICING COTTON CLIENTS AT JANUARY 2015

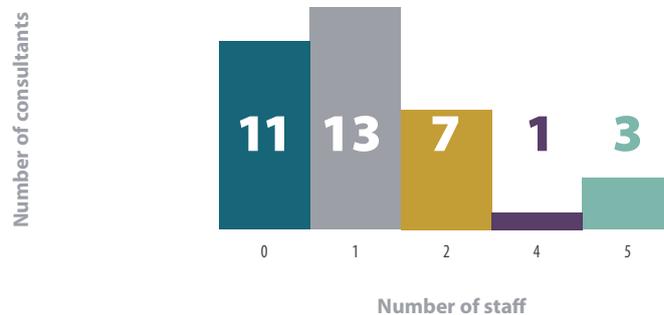


8

How many part time/casual staff were employed in your business to service cotton clients in January 2015?

35 respondents

NUMBER OF PART TIME/CASUAL STAFF SERVICING COTTON CLIENTS AT JANUARY 2015



9

With reference to recruitment for the 2014-15 season, how hard was it to find suitable applicants and fill positions?

40 respondents

EASE OF RECRUITING SUITABLE STAFF IN 2014-15





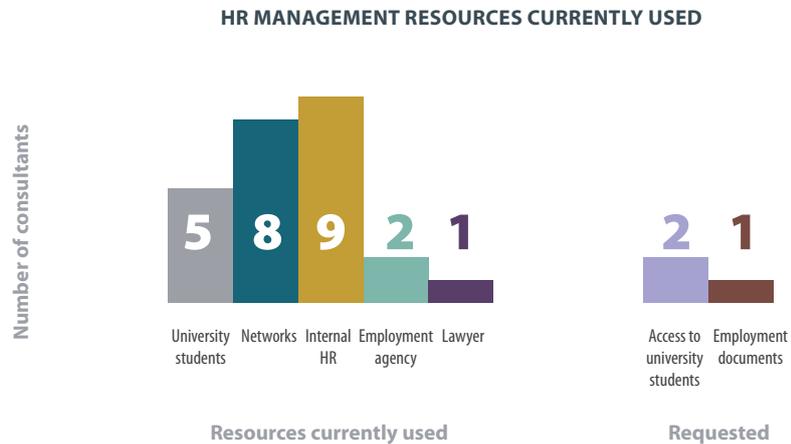
# THE CONSULTANTS AND THEIR CLIENTS

10

What HR management resources do you currently use? What resources would you like to have available to help your consultancy with HR?

27 respondents

This was an open question and the graph shows the most common responses. Please see the appendix for full individual responses.

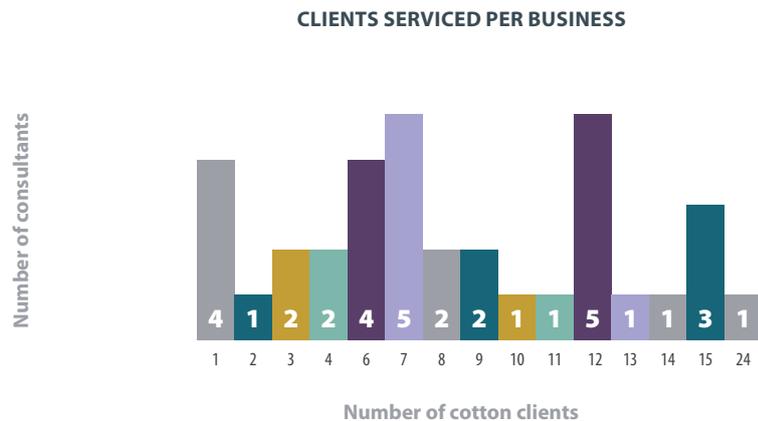


## ABOUT THE CLIENTS

11

How many cotton clients did the business (or business unit) service in 2014-15?

35 respondents



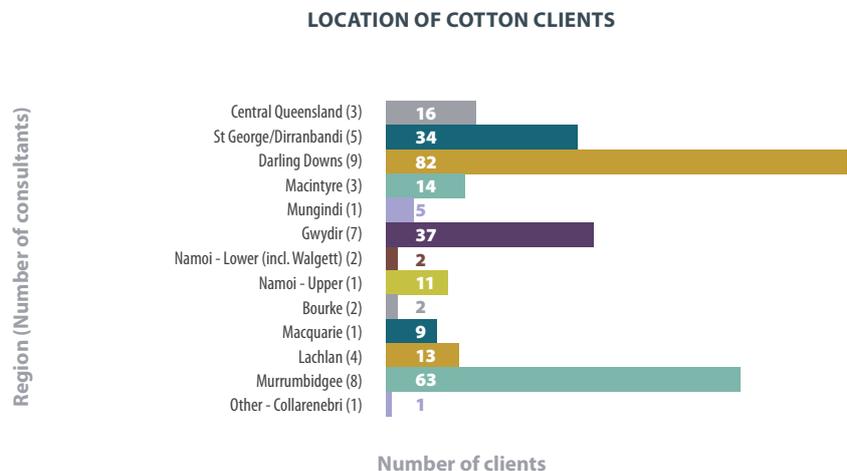
12

In which region/s are your cotton clients based?

35 respondents

**Note** Some consultants have clients in more than one region, hence the total number of consultants is higher than the 35 respondents across the regions. A total of 290 clients were represented in the survey.

The six consultants who were not the primary respondent on behalf of the business, indicated they had growers based in Central Queensland, Darling Downs, Macintyre, Gwydir and Upper Namoi regions.





# THE CONSULTANTS AND THEIR CLIENTS

13

Where were the 'other' clients in Question 12 located?

3 respondents

One consultant recorded one client in the Barwon River – Collarenebri region, this client has been captured in the Gwydir region throughout the survey.

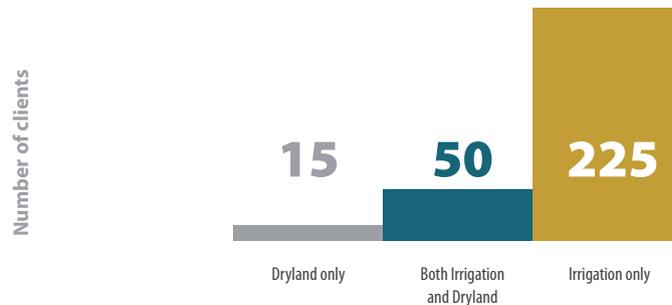
Additionally, one consultant had noted a client in Cunnamulla (captured in the St George/Dirranbandi region), and one consultant noted that one client had farms in Murrumbidgee and Lachlan areas (captured in the Murrumbidgee and Lachlan regions accordingly).

14

How many of your cotton clients have dryland only, irrigation only, or dryland and irrigation?

35 respondents

IRRIGATION STATUS



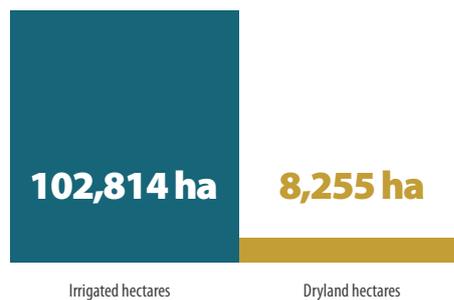
15

How many hectares of cotton (total area, not adjusted for row spacing) did your clients grow in the 2014-15 season?

35 respondents

Clients grew of total of 111,069 hectares of which 102,814 were irrigated and 8,255 were dryland.

TOTAL SURVEY HECTARES





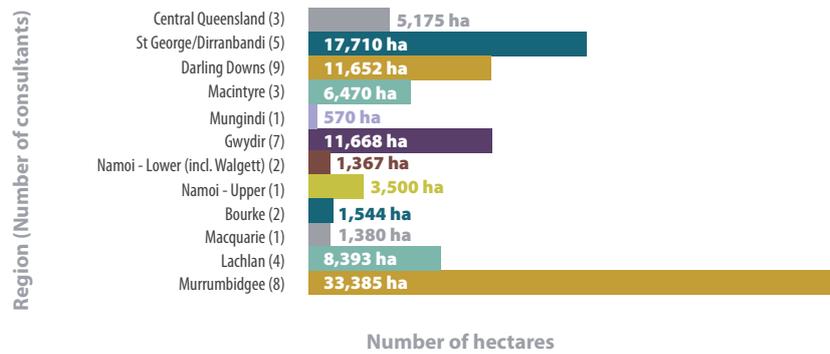
# THE CONSULTANTS AND THEIR CLIENTS

16

In which region/s are the irrigated cotton hectares of your clients situated?

35 respondents

IRRIGATED COTTON HECTARES BY REGION

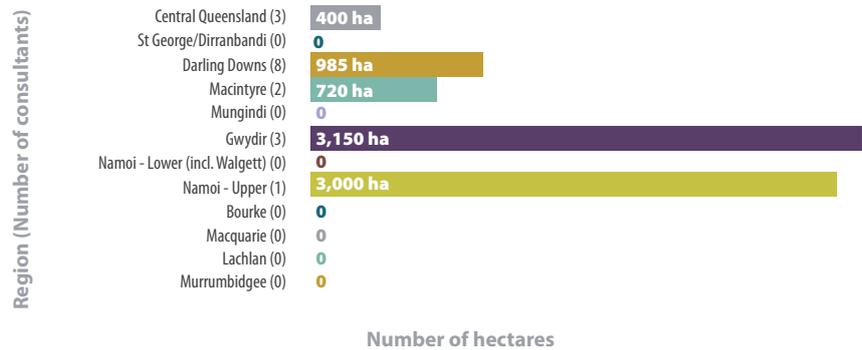


17

In which region/s are the dryland cotton hectares of your clients situated?

21 respondents

DRYLAND COTTON HECTARES BY REGION





# ON-FARM PRACTICES AND ATTITUDES

## PLANTING

18

Of your irrigated cotton hectares in 2014-15, how many were back-to-back cotton, i.e. cotton grown in the same field in the 2013-14 and 2014-15 seasons?

34 respondents

A total of 22,628 irrigated hectares (22 percent of irrigated survey hectares) were back-to-back cotton.

19

Of your irrigated cotton hectares, how many were planted once, planted twice, or planted more than twice?

35 respondents

In total, 3,543 hectares were planted more than once.

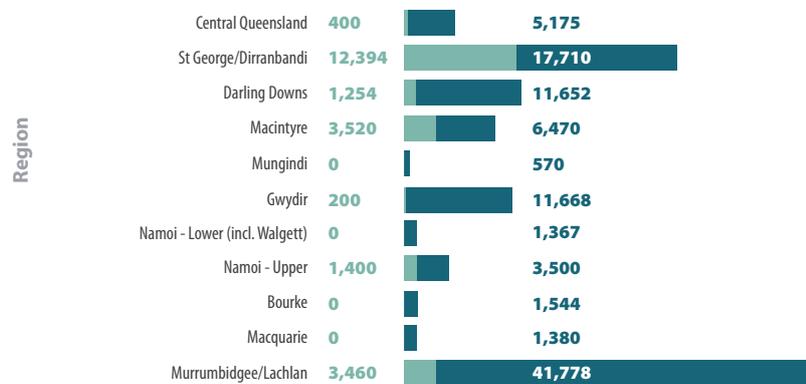
20

If replants were required, please select the reasons.

29 respondents

**Note** Other responses included: 5 mm rain on dry planted and couldn't get the water quick enough to it; got caught with rain watering up on very dry soil and couldn't get the water around quickly enough; 75BRF had poor seedling survival rate; fertiliser burn; nitrogen burn; and, pressed soil set hard hampering emergence.

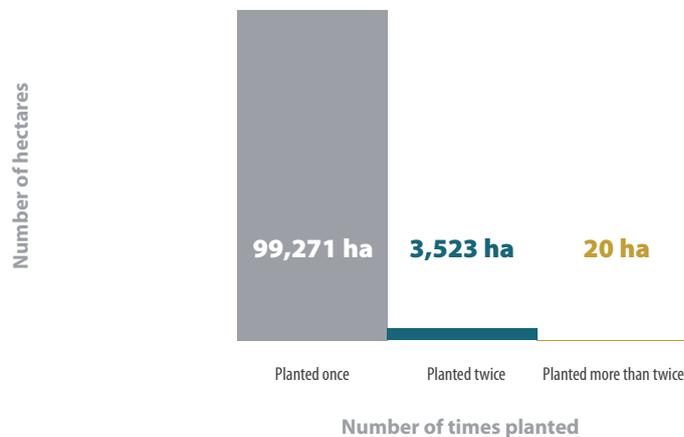
### BACK-TO-BACK IRRIGATED COTTON



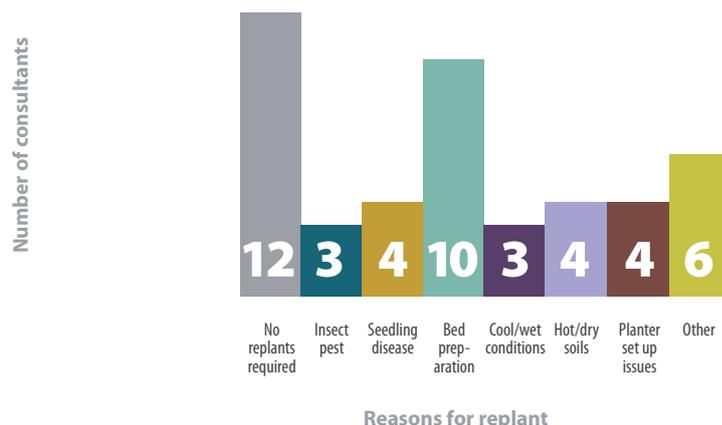
Back-to-back portion of total irrigated survey hectares

■ Back-to-back hectares ■ Total irrigated hectares

### REPLANTED IRRIGATED HECTARES



### REASONS FOR REPLANTS





# ON-FARM PRACTICES AND ATTITUDES

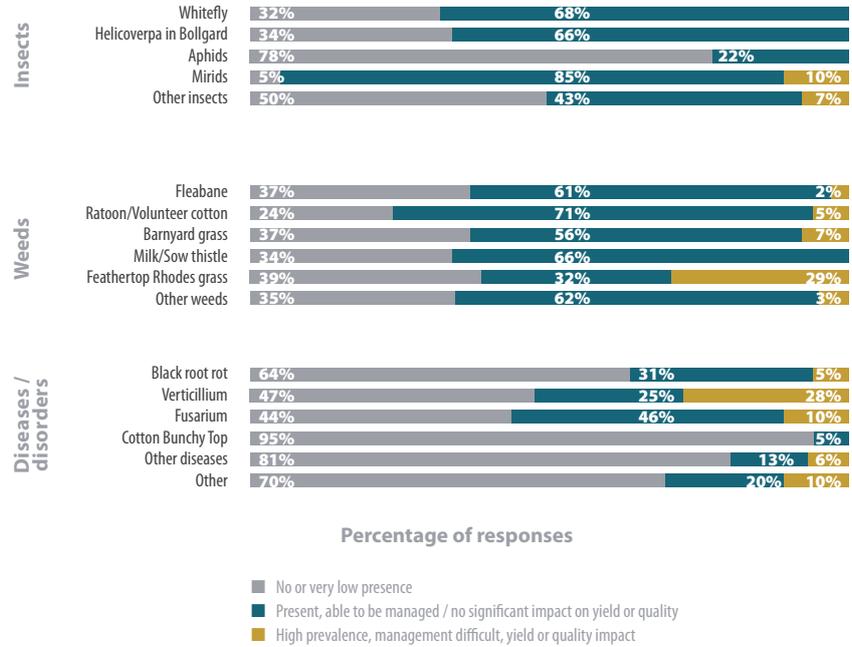
## INSECTS, WEEDS AND DISEASES

21

In general, what was the prevalence of insects, weeds and diseases in the 2014-15 season?

41 respondents

### PREVALENCE OF INSECTS, WEEDS, DISEASES/DISORDERS

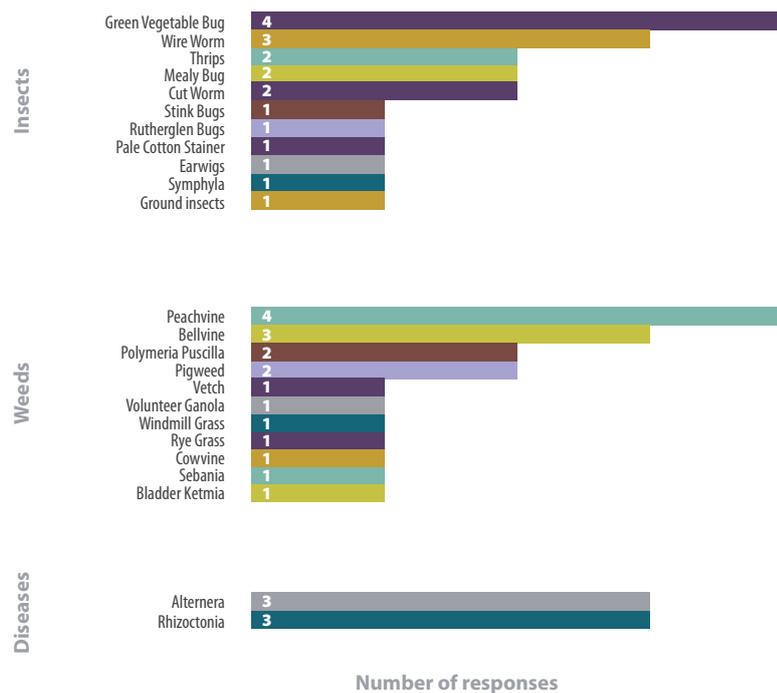


22

Other insects, weeds and diseases specified.

19 respondents

### DETAILS OF 'OTHER' INSECTS, WEEDS, DISEASES/DISORDERS FOR PREVIOUS QUESTION





# ON-FARM PRACTICES AND ATTITUDES

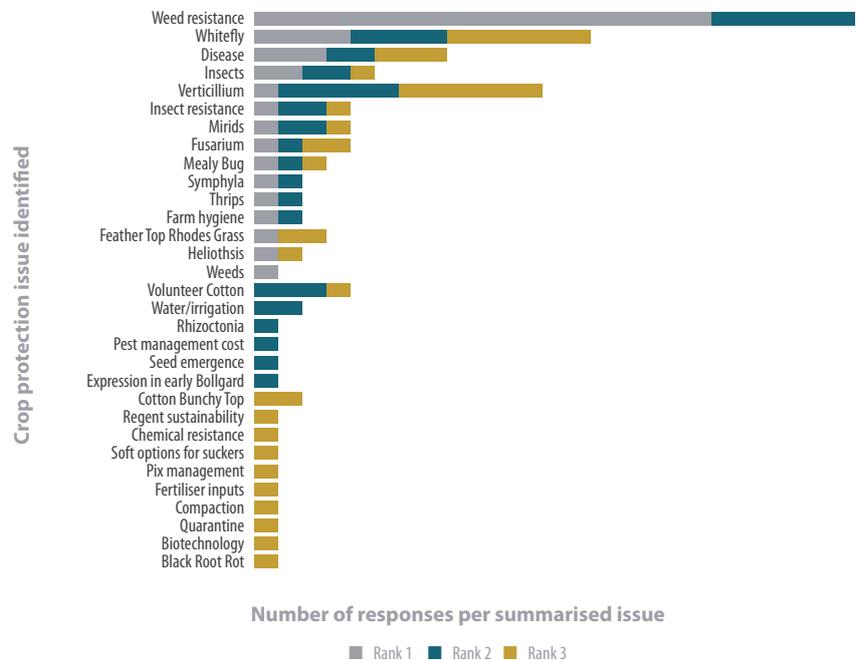
23

What do you consider to be the top three crop protection issues for the cotton industry?

39 respondents

**Note** This was an open question, common responses were summarised and counted as ranked (1 = highest priority).

## SUMMARY OF RESPONSES FOR TOP CROP PROTECTION ISSUES FOR COTTON INDUSTRY

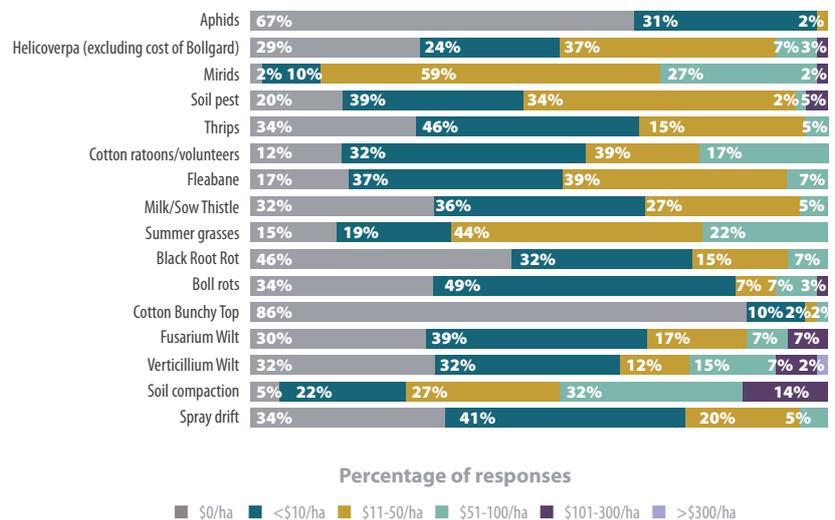


24

Rate the average impacts you think the following pests, weeds, diseases and disorders had on the profitability of your clients' cotton crops in 2014-15, either through budgeted or unbudgeted costs or through yield loss.

41 respondents

## ESTIMATED FINANCIAL IMPACTS OF INSECTS, WEEDS, DISEASES/DISORDERS

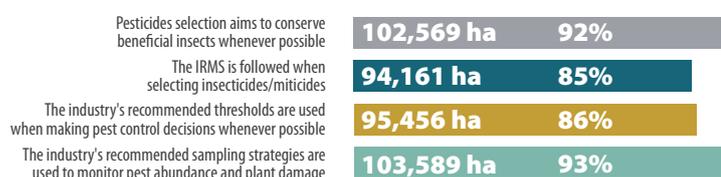


25

With regards to insect pest management in 2014-15 cotton fields, how widely used (in terms of total irrigated and dryland hectares) were the practices listed?

35 respondents

## INSECT PEST MANAGEMENT PRACTICES



Number of hectares / Percentage of total survey hectares



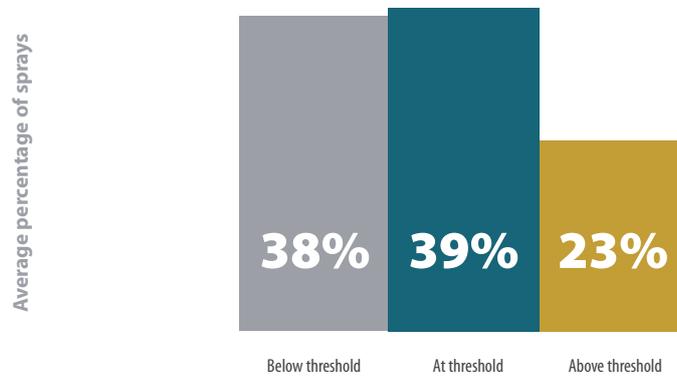
# ON-FARM PRACTICES AND ATTITUDES

26

With regards to industry Mirid thresholds, how often were the sprays you requested for Mirids above, at or below the industry's general threshold?

40 respondents

MIRID SPRAYS COMPARED TO INDUSTRY THRESHOLD

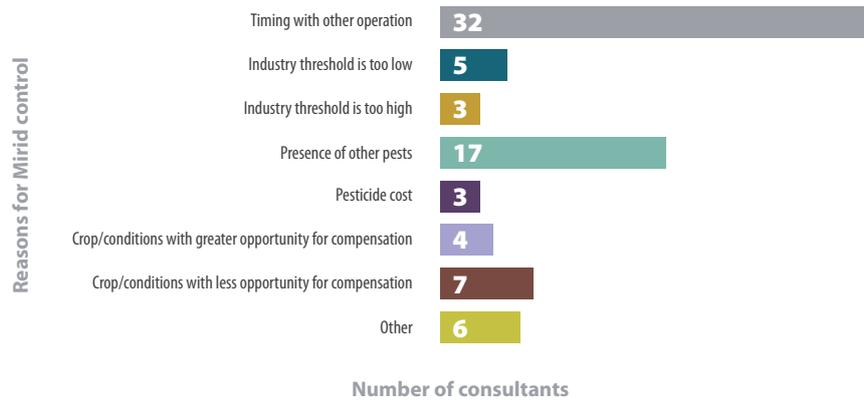


27

Where the decision to control Mirids was not in line with industry thresholds, what were the reasons?

39 respondents

REASONS FOR MIRID CONTROL OUTSIDE INDUSTRY THRESHOLD

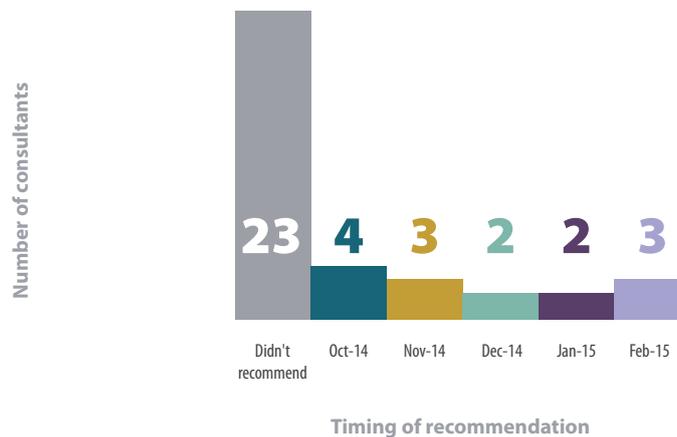


28

When during the 2014-15 cotton season did you make your first recommendation to apply dimethoate/omethoate?

37 respondents

TIMING OF FIRST DIMETHOATE/OMETHOATE RECOMMENDATION





# ON-FARM PRACTICES AND ATTITUDES

29

How often were the sprays you requested in 2014-15 for Silverleaf Whitefly consistent with the industry's Threshold Matrix?

35 respondents

CONSISTENCY WITH SLW THRESHOLD MATRIX

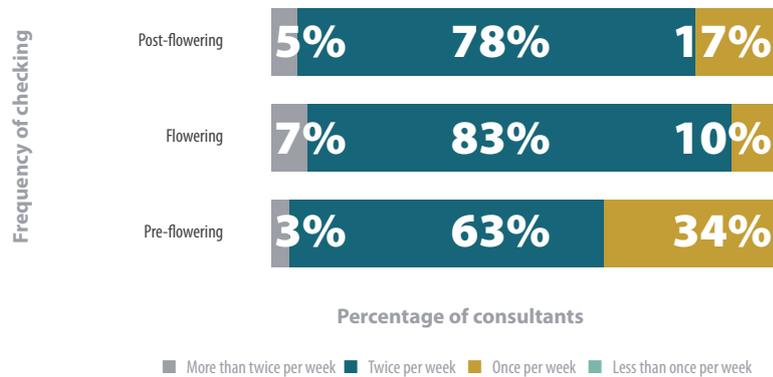


30

How frequently do you check Bollgard II cotton for making decisions about insect pests: pre-flowering, during flowering and post flowering?

41 respondents

FREQUENCY OF CHECKING BOLLGARD II COTTON FOR SPRAYING



31

How many hectares of cotton crops exhibited symptoms consistent with Verticillium Wilt during the 2014-15 season?

35 respondents

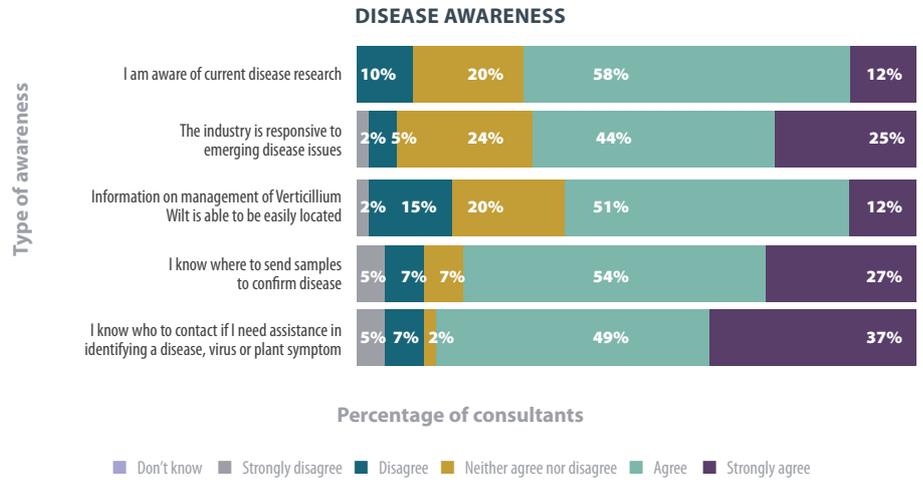
The area of cotton affected by Verticillium Wilt was 8,259 hectares.



# ON-FARM PRACTICES AND ATTITUDES

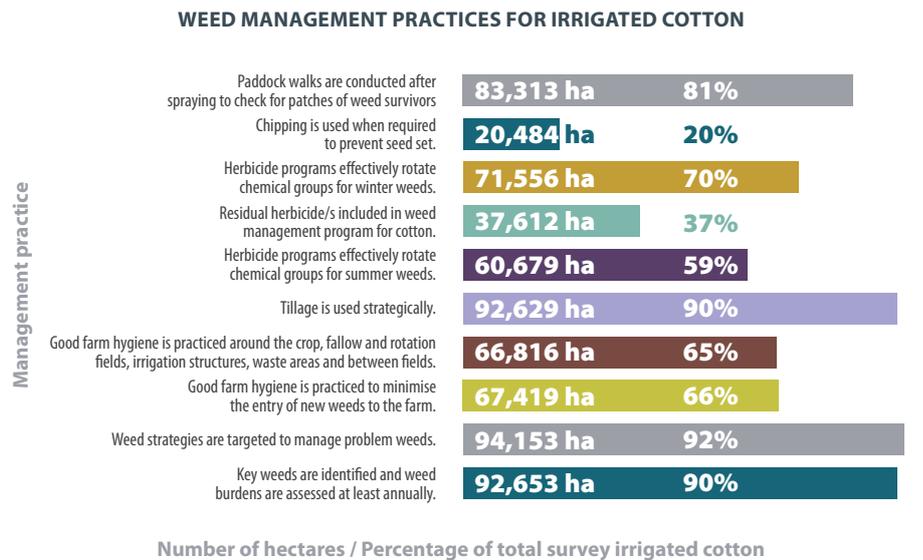
32

Please give your opinion on each of the following five statements.  
41 respondents



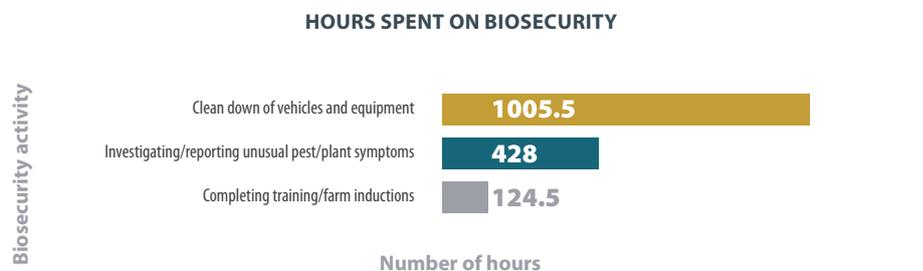
33

With regards to weed management in the fields used for your clients' hectares of irrigated cotton in 2014-15, how widely used (in terms of hectares) were the practices listed?  
35 respondents



34

To the best of your ability, please estimate how many hours in the 2014-15 cotton season you spent on biosecurity.  
40 respondents



35

Other biosecurity time specified.  
3 respondents

Insect check frequency difficult to answer as second check through the week could be irrigation but scouting for insects as well.

Probably a poor question.

Wash ute every week with Farm Cleanse. If I go to another valley will wash ute before and on return.



# ON-FARM PRACTICES AND ATTITUDES

## HERBICIDE MANAGEMENT

36

Of the irrigated and dryland hectares over which you consulted in 2014-15, please estimate the total areas you believe to contain populations of herbicide resistant weeds.

30 respondents

37

In your estimation, how much additional cost per year is being incurred to manage glyphosate resistant weed populations?

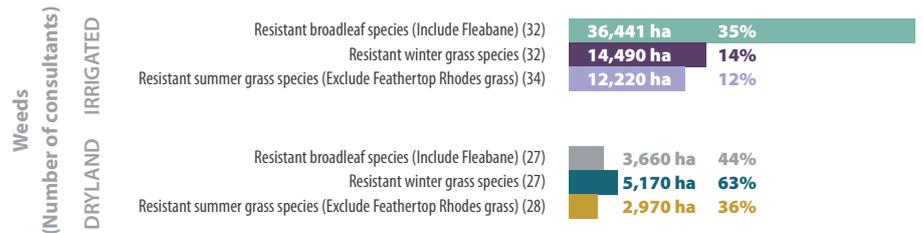
33 respondents

38

Comments on cost of managing glyphosate resistant weed populations.

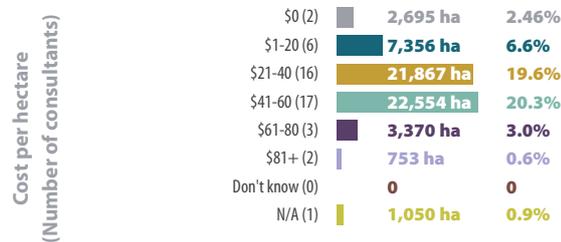
21 respondents

### PRESENCE OF HERBICIDE-RESISTANCE WEEDS



Number of hectares / Percentage of total irrigated and dryland hectares

### ADDITIONAL COST PER YEAR TO MANAGE GLYPHOSATE



Number of hectares / Percentage of total survey hectares

There were a range of comments regarding the cost and management strategies for glyphosate resistant weed populations, see the appendix for full individual responses.



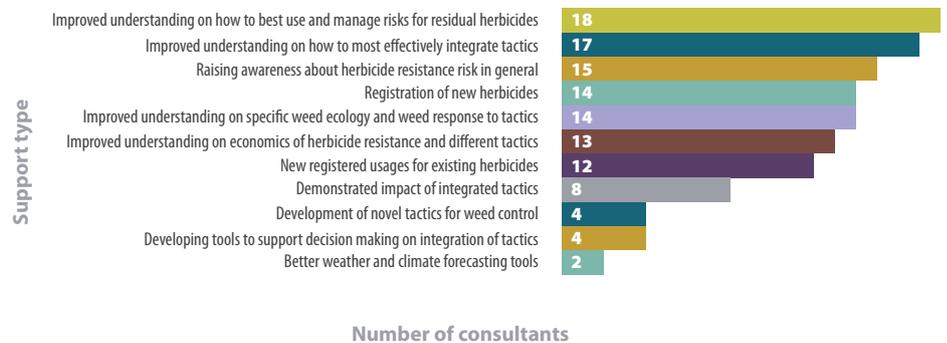
# ON-FARM PRACTICES AND ATTITUDES

39

Which of the following do you think would provide the best support to you and your clients to manage herbicide resistance (both existing populations of herbicide resistant weeds and the threat of herbicide resistance)? Consultants selected up to three.

41 respondents

## TOP THREE CHOICES OF SUPPORT FOR MANAGING HERBICIDE RESISTANCE

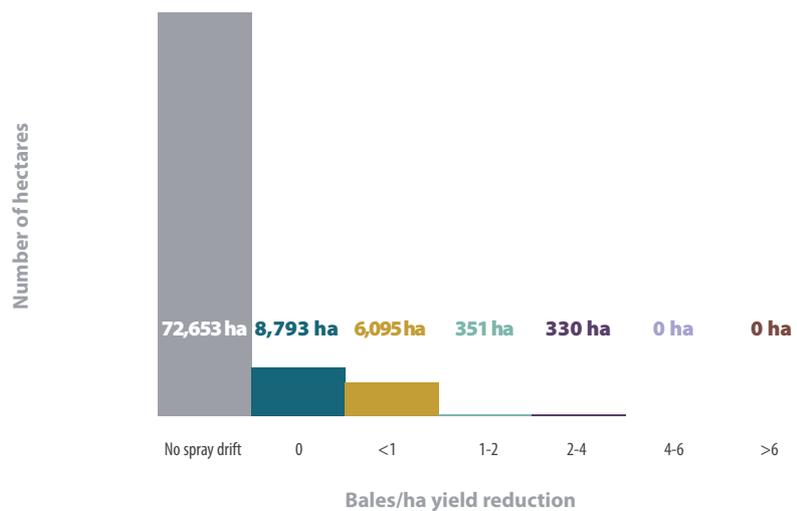


40

What impacts did spray drift from Group I herbicides (e.g. 2,4-D, MCPA, Starane) have on your clients' cotton yields this season? Please indicate your best estimate.

36 respondents

## IMPACT FROM GROUP I HERBICIDES SPRAY DRIFT ON COTTON YIELD





# ON-FARM PRACTICES AND ATTITUDES

## NUTRIENT MANAGEMENT

41

Thinking about fertiliser decisions for cotton crops, which tools are used by you to assist with fertiliser recommendations for your cotton clients and their irrigated hectares and dryland hectares?

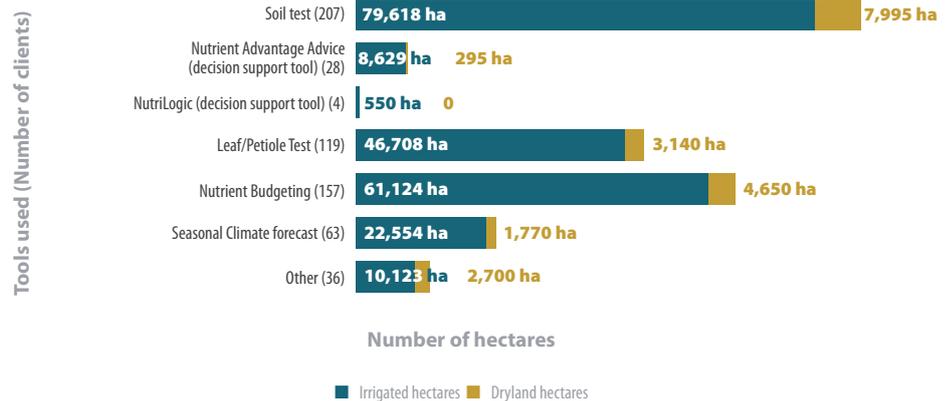
35 respondents

42

Other fertiliser tools used specified.

7 respondents

### TOOLS USED FOR FERTILISER RECOMMENDATIONS



- Back Paddock software.
- Back Paddock Soil Mate.
- Excel spreadsheet.
- Field historic performance. Target yield. Previous crop removal. Pix used.
- N-tester.
- Soil Mate decision making tools, consultation with Chris Dowling.
- Soil Mate.



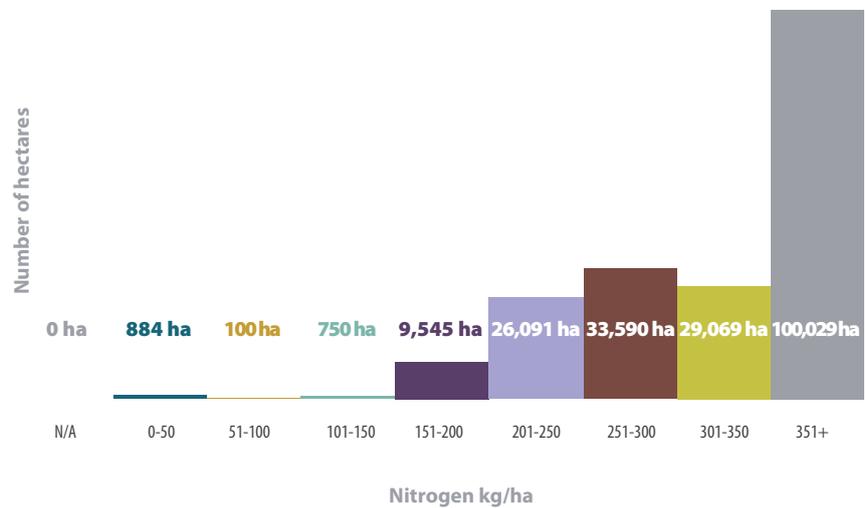
# ON-FARM PRACTICES AND ATTITUDES

43

What is your best estimate on how much nitrogen was applied per hectare for your total irrigated cotton hectares in 2014-15?

35 respondents

### NITROGEN ON IRRIGATED COTTON HECTARES

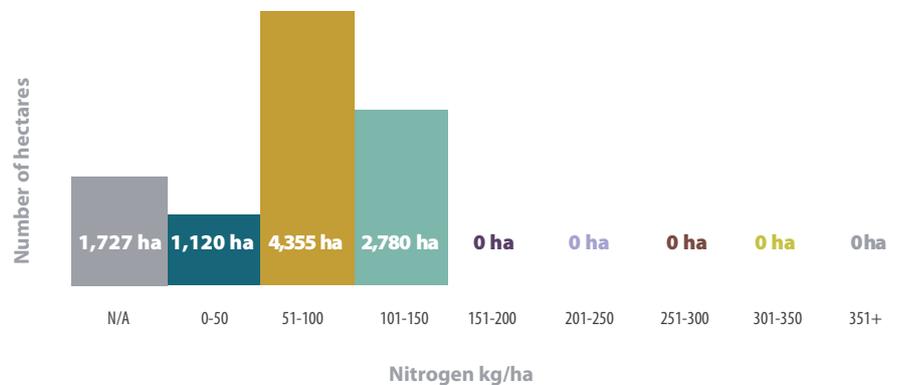


44

What is your best estimate on how much nitrogen was applied per hectare for your total dryland cotton hectares in 2014-15?

19 respondents

### NITROGEN ON DRYLAND COTTON HECTARES

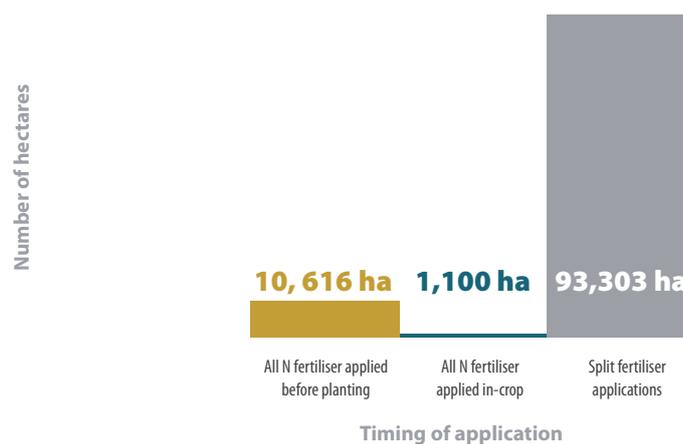


45

In 2014-15, when were the cotton crops' nitrogen fertiliser requirements applied?

35 respondents

### TIMING OF NITROGEN APPLICATIONS





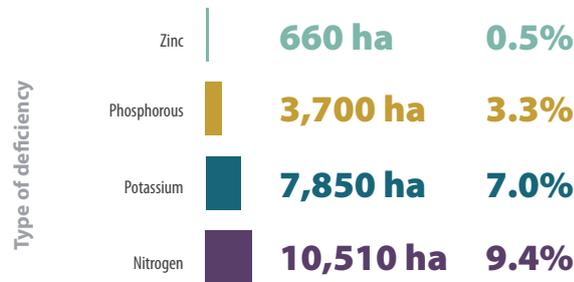
# ON-FARM PRACTICES AND ATTITUDES

46

Across how many hectares did you see evidence or signs of nutrition deficiency during 2014-15?

35 respondents

## NUTRITION DEFICIENCY



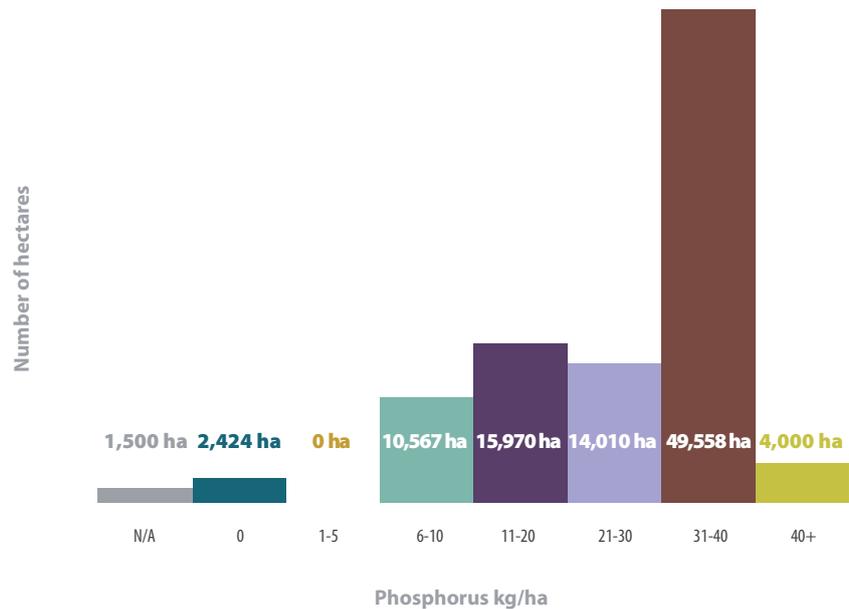
Hectares of nutrient deficiency / Percentage of total survey hectares

47

What is your best estimate of how much phosphorus was applied per hectare for your irrigated cotton hectares in 2014-15? (Kg P applied/ha, not fertiliser product)

35 respondents

## PHOSPHORUS ON IRRIGATED HECTARES





# ON-FARM PRACTICES AND ATTITUDES

## WATER MANAGEMENT

48

What strategies do you and your clients use for growing cotton with limited water?

41 respondents

49

For the irrigated cotton hectares over which you consulted, how much area in 2014-15 season was affected by limited water? Please also indicate your best estimates of yield in each situation.

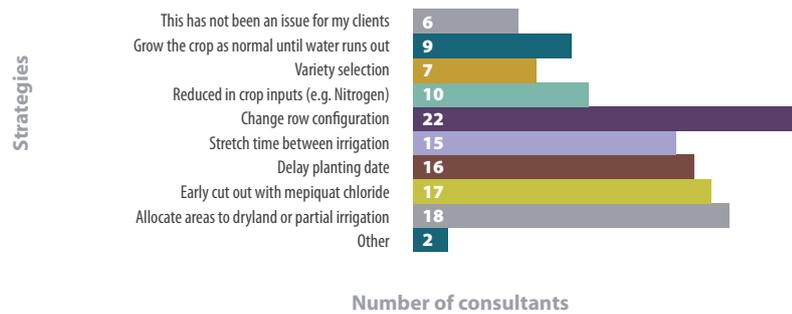
36 respondents

50

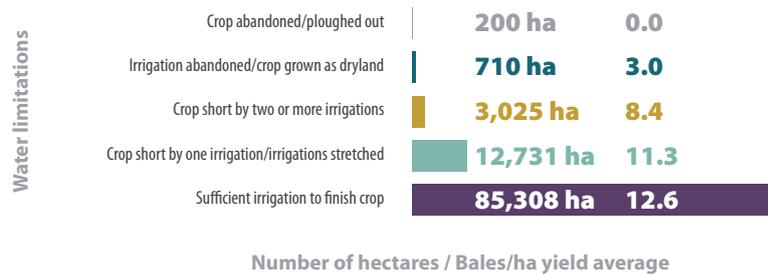
Thinking about your cotton clients, what do you think is the current and likely uptake for the following irrigation technologies?

35 respondents

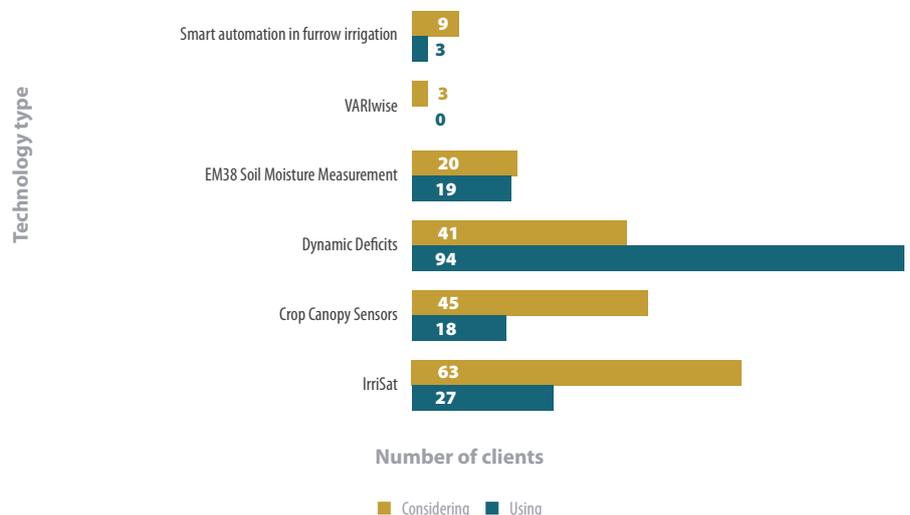
### STRATEGIES FOR GROWING COTTON WITH LIMITED WATER



### AREA AFFECTED BY LIMITED WATER



### UPTAKE OF IRRIGATION TECHNOLOGIES





# ON-FARM PRACTICES AND ATTITUDES

51

Are there other\* irrigation technologies that you think should be researched further and if so what are they and why?

\*Other than those listed in Q50.

11 respondents

Agrotek Probes.

Any new technologies should be investigated. Plus more work needs to be done on these technologies.

Benchmarking the \$/megalitre return for different irrigation application technologies. More work on overhead irrigation application technologies that improve efficiencies.

Dendrometers - measuring stem swelling and contraction to determine stress.

Don't know.

Double checking modern pan evaporation rates and crop factors.

Dynamic deficits.

I think some more information on the above would be good to educated growers from industry leaders.

Not that I am aware of. Still using Neutron Probes to give accurate water deficits and measurements.

Those ones are sufficient.

Yes but I don't know what they are yet.



# ON-FARM PRACTICES AND ATTITUDES

## SOIL MANAGEMENT

52

What symptoms are typically used to identify areas of compaction?

41 respondents

53

Where growers have previously had compaction, what management strategies are being employed to remedy or avoid the compaction, and with what level of success?

36 respondents

This was an open question and the graph shows the most common responses. Please see the appendix for full individual responses.

54

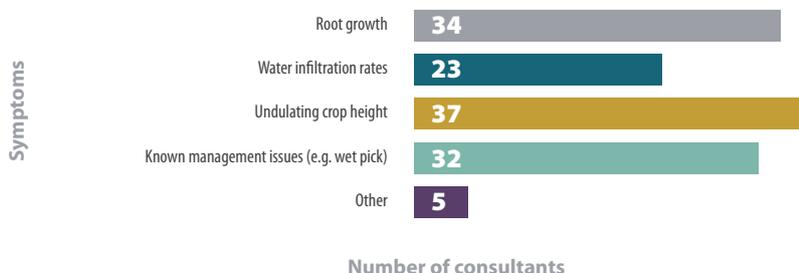
How many hectares of your cotton crops exhibited symptoms consistent with soil compaction at some stage during the 2014-15 season?

35 respondents

**Note** The regional breakdown of soil compaction hectares is approximate where consultants had clients in multiple regions.

32,917 irrigated hectares showed symptoms of soil compaction, 32 percent of the total irrigated survey hectares. 2,202 dryland hectares showed symptoms of soil compaction, 26 percent of the total dryland survey hectares.

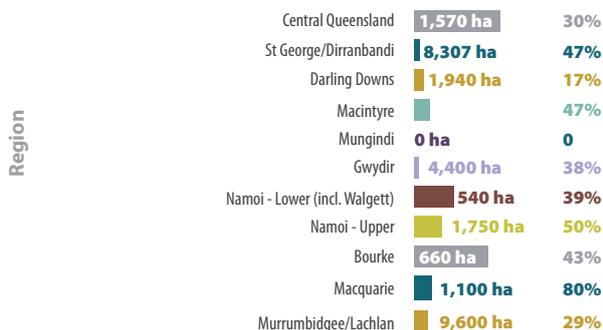
### COMPACTION SYMPTOMS



### SOIL COMPACTION MANAGEMENT STRATEGIES

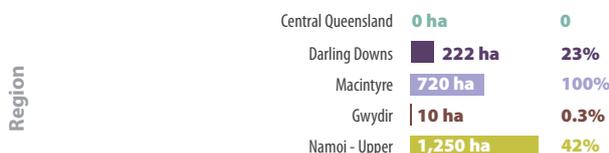


### SOIL COMPACTION SYMPTOMS FOR IRRIGATED COTTON CROPS



### Percentage of irrigated survey hectares per region

### SOIL COMPACTION SYMPTOMS FOR DRYLAND COTTON CROPS



### Percentage of dryland survey hectares per region

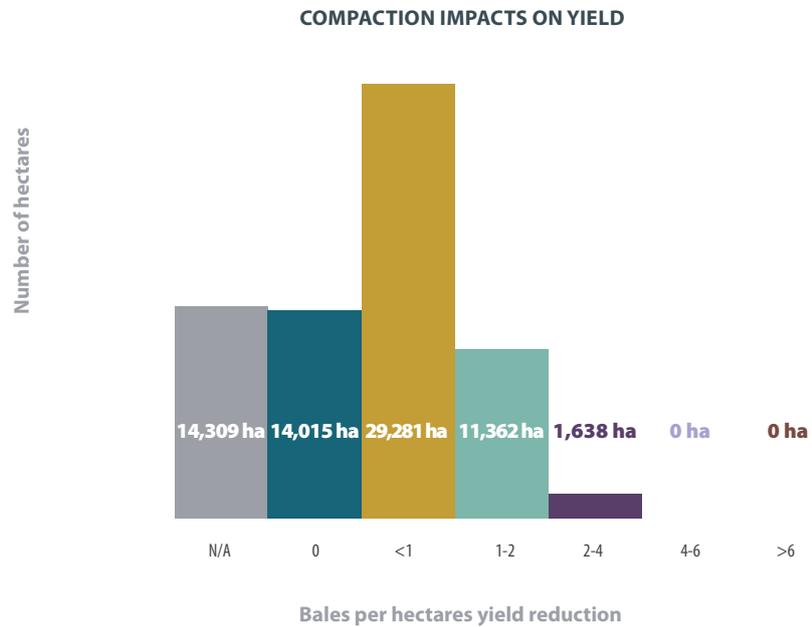


# ON-FARM PRACTICES AND ATTITUDES

55

What impacts do you estimate compaction had on your clients' cotton yields this season? Please indicate your best estimate of total hectares for your irrigated cotton and dryland cotton.

35 respondents

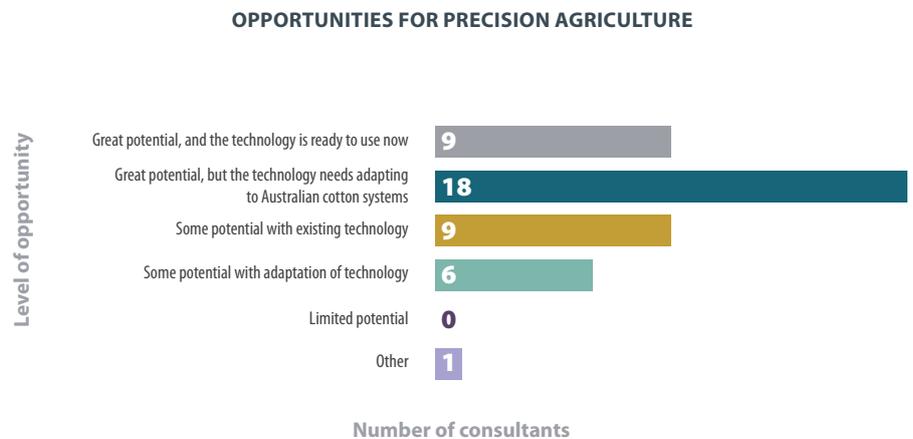


## PRECISION AGRICULTURE

56

Precision agriculture has had a mixed uptake in the cotton industry. In your opinion, what is the opportunity for greater use of precision agriculture technology?

41 respondents



57

With expected fundamental shifts in Precision Ag, including increased automation, and the ability to capture and analyse real time data, how do you see the role of the cotton consultant changing and do you feel equipped to adapt to this change?

31 respondents

This was an open question. Please see the appendix for full individual responses.



## SKILLS DEVELOPMENT

58

The cotton industry through the CottonInfo Joint Venture is actively seeking to support the Crop Consultants Australia in skills development of consultants as a pathway of connecting growers with research. Could you identify which of the following skills areas you would be interested in developing?

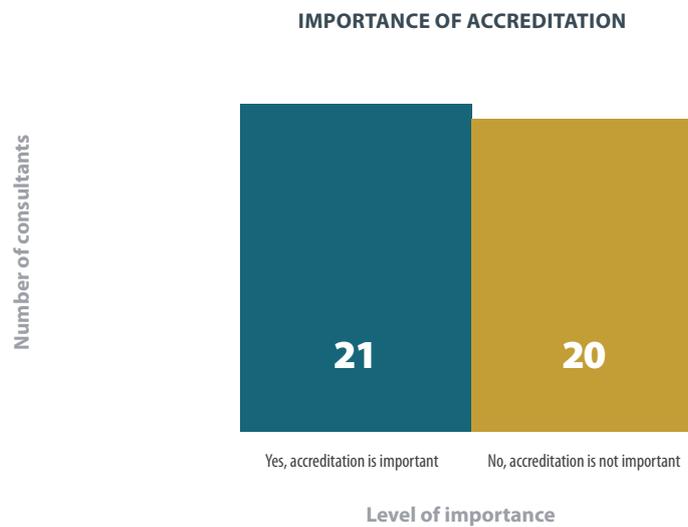
41 respondents



59

In terms of skills development, is formal accreditation important to you?

41 respondents



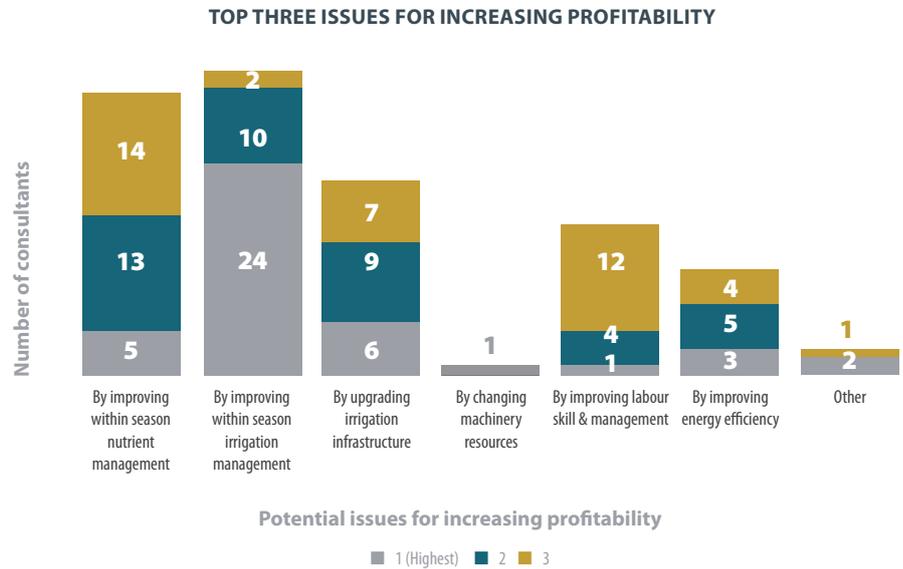


## PRODUCTION IMPROVEMENT

60

The cotton industry is keen to support continued improvement in the profitability of production systems. For the given choices, please rank the top three issues in order of potential for increasing profitability of cotton for your clients.

41 respondents



61

Other profitability issues specified.

3 respondents

Better long term weather forecasting.

Irrigation in crop - bore breakdowns a problem!

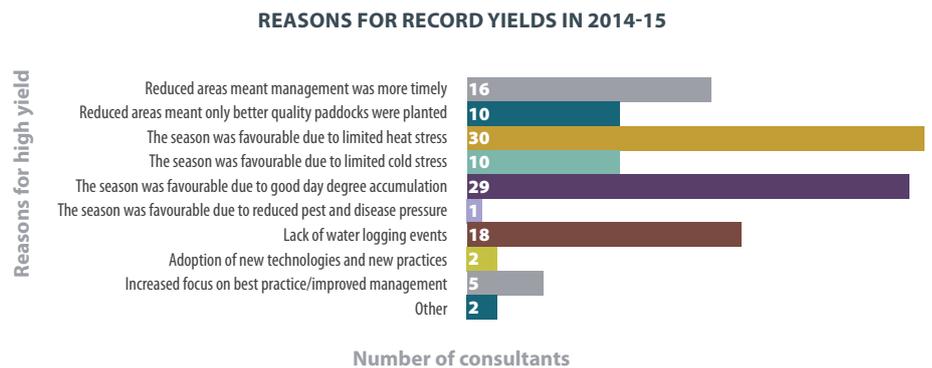
Soil structure.

62

The 2014-15 season has seen record yields in many valleys. In your opinion, what are the main reasons for this increase in production?

Consultants selected up to 3.

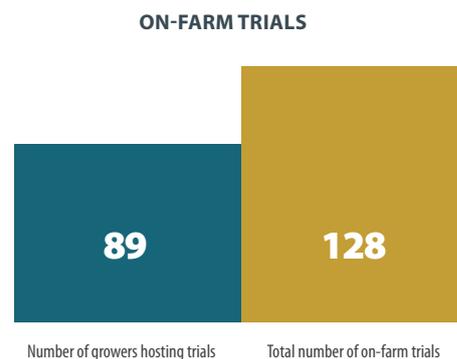
41 respondents



63

How many of the cotton growers that you work with did on-farm trials in the 2014-15 season?

39 respondents





# RESEARCH, DEVELOPMENT & EXTENSION

## INFORMATION AND RESOURCES

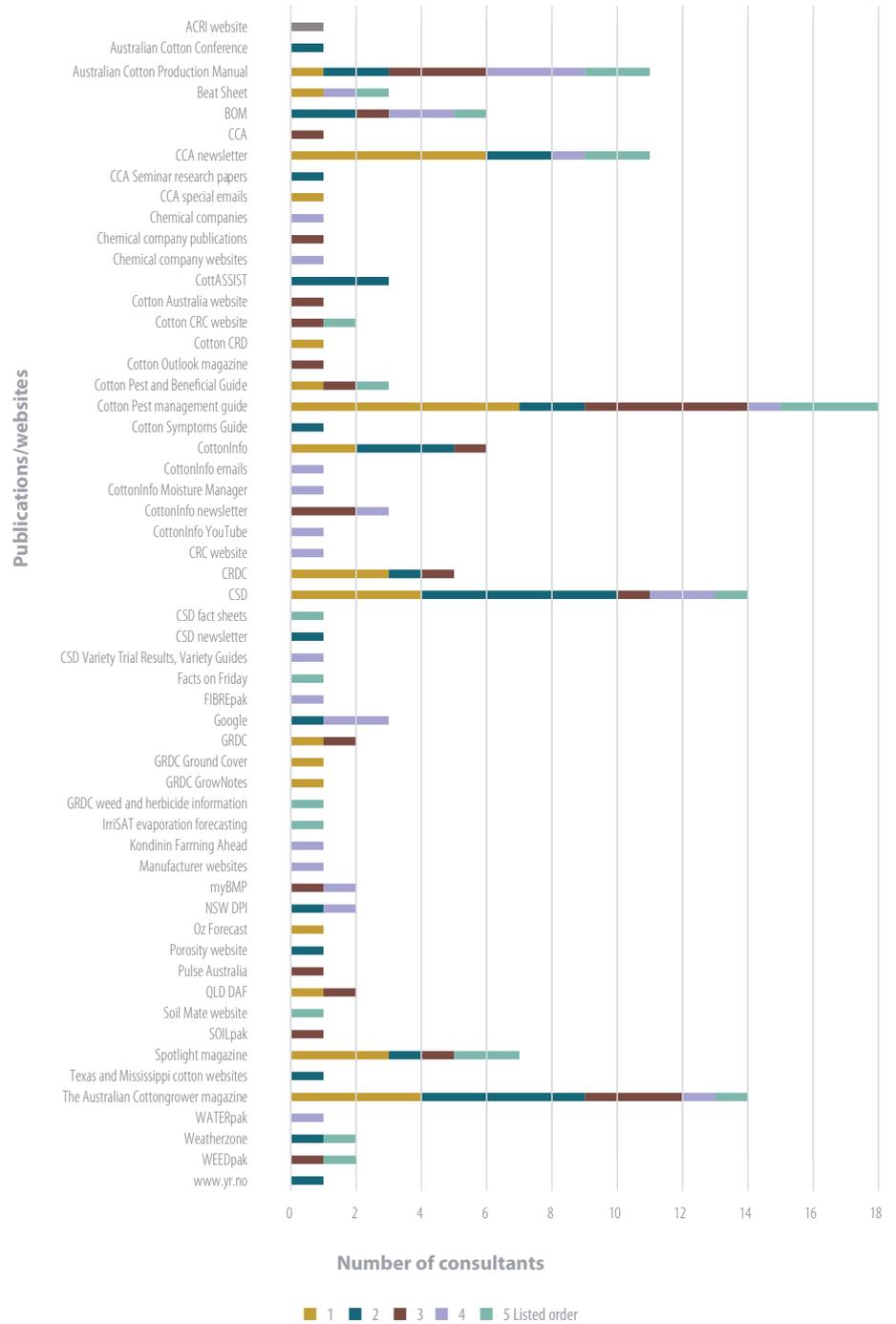
64

Please list up to 5 publications and/or websites that are in your opinion the most valuable sources of information for cotton consulting.

37 respondents

**Note** This was an open question, common responses were summarised and counted as listed 1-5.

VALUABLE SOURCES OF INFORMATION FOR COTTON CONSULTING





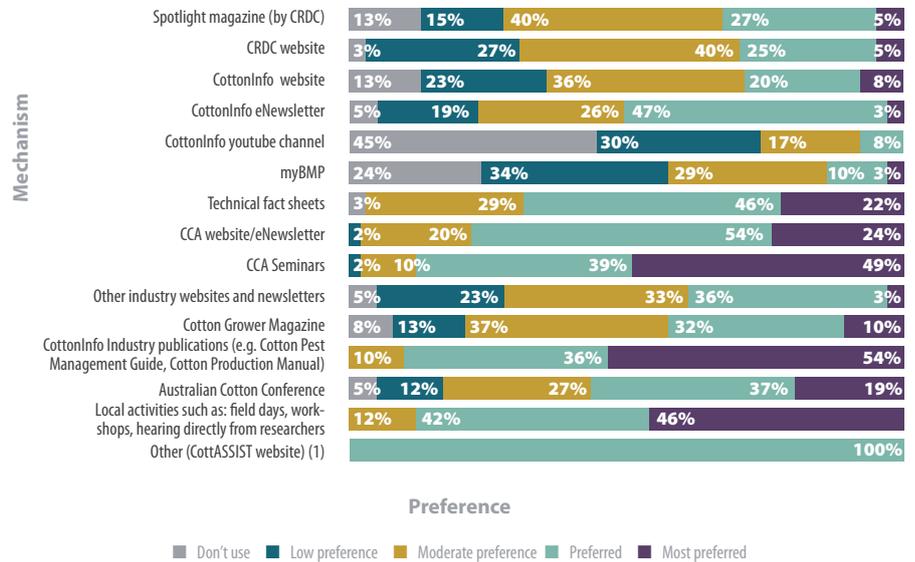
# RESEARCH, DEVELOPMENT & EXTENSION

65

To receive information about cotton research and development, please indicate your preference for each of these mechanisms.

41 respondents

## PREFERENCE FOR RECEIVING RESEARCH AND DEVELOPMENT INFORMATION

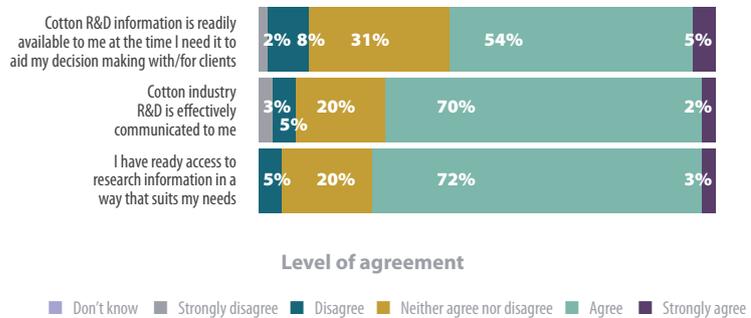


66

Please give your opinion on each of the following statements.

40 respondents

## COTTON R&D INFORMATION ACCESS

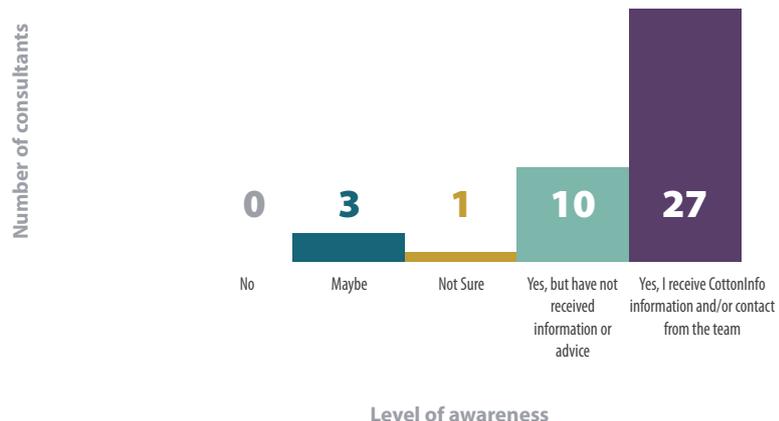


67

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

41 respondents

## COTTONINFO EXTENSION PROGRAM AWARENESS





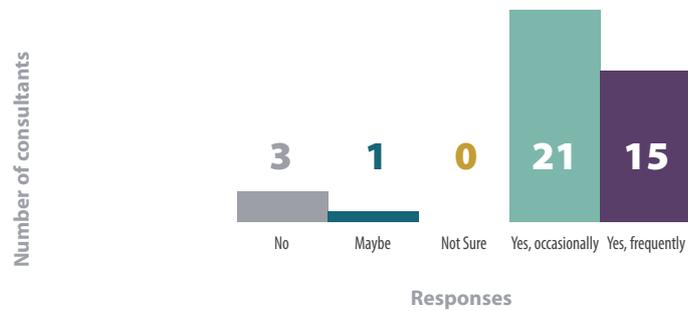
# RESEARCH, DEVELOPMENT & EXTENSION

68

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

40 respondents

COTTONINFO INFORMATION SOURCE

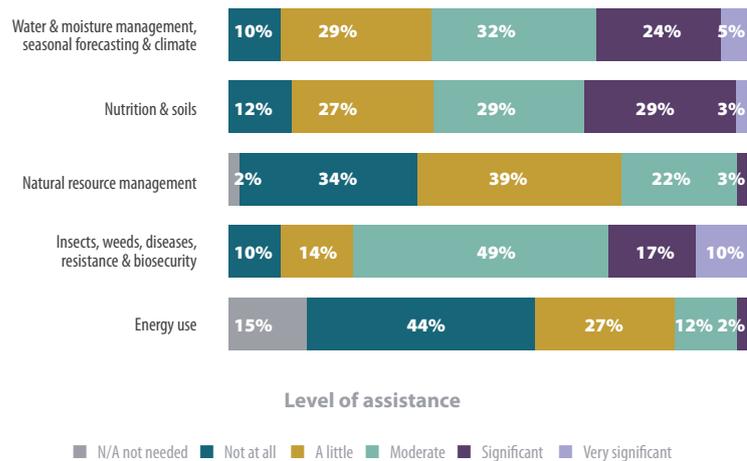


69

To what degree have the CottonInfo team, information resources and *myBMP* assisted you to improve practices on your client's farms?

40 respondents

COTTONINFO ASSISTANCE TO IMPROVE PRACTICES





# RESEARCH, DEVELOPMENT & EXTENSION

70

Do you think the industry is meeting your research needs and what are the key research gaps?

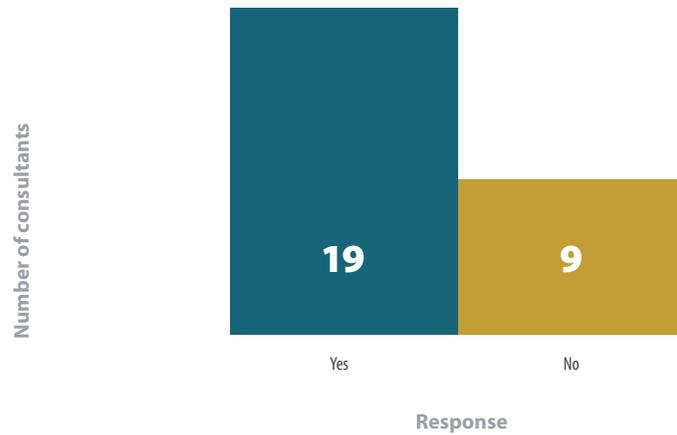
32 respondents

**Note** This was an open question, common responses were summarised and counted as yes or no. The list of key research gaps below is a summary of responses. Please see the appendix for full individual responses.

## KEY RESEARCH GAPS

- ..... Alternaria
- ..... Coordination
- ..... Cotton Mealybug
- ..... Disease management
- ..... Establishing crop
- ..... Genetics for herbicide tolerance
- ..... Herbicide resistance
- ..... Irrigation systems
- ..... New technology
- ..... Nutrition
- ..... Physiology
- ..... Picking cleaners
- ..... Pix management
- ..... Seedling disease
- ..... Silverleaf Whitefly
- ..... Sodic soils
- ..... Soil compaction
- ..... Soil preparation
- ..... Southern specific research
- ..... Spraying
- ..... Verticillium Wilt
- ..... Weed management
- ..... Yield

## INDUSTRY MEETING RESEARCH NEEDS





# APPENDIX

## WHAT IS INCLUDED IN THE APPENDIX?

Following on from here, you will find individual responses to Questions 10, 38, 53, 57 and 70 as these responses expand on, or add to an understanding of, graphed information.

### QUESTION 10

What HR management resources do you currently use? What resources would you like to have available to help your consultancy with HR?

- Company has its own HR department.
- Employees are generally found by word of mouth. No resources required at this stage.
- Employment agents. Word of mouth. University students.
- HR manager - services whole company.
- I recruit myself from contacts at UNE and also utilise travelling students.
- I use a friend who is a lawyer to write up employment documents and agreements.
- I would like some templates covering all the legal requirements for signing up new casual employees.
- McDougall HR, Toowoomba. More HR contact with universities?
- N/A.
- Newsletter and text message system to the clients.
- No need at present with the drought reduced crop areas.
- None - only casual staff required so source them locally (university students). Don't really need any HR help.
- None currently used.
- None X 2.
- None. We are large enough to employ admin that help with HR.
- Self-created resources.
- The HR role in our business is conducted between the 3 staff in our business and this is working satisfactorily.
- Try to use sons and daughters of local farmers coming home for university holidays. University students from word of mouth.
- University contacts.
- Via the network of people I know.
- We currently have a HR manager employed within the business.
- We use internal Landmark HR.
- Word of mouth, local contacts.
- Word of mouth.
- Word of mouth. This year both staff were returning from last season.
- Would like some sort of access to university students that might be interested in bug checking during school holidays.

### QUESTION 38

Comments on cost of managing glyphosate resistant weed populations.

- Glyphosate resistance is a big issue; wherever possible we try to use strategies such as double knocks to reduce the ability of having surviving populations of weeds. This is particular for Feathertop Rhodes, but also for Sweet Summer Grass. We don't have a resistance problem with SSG, but around the region, there are some resistant populations so we are trying to be proactive against it. This is more an issue for our dryland farmers than irrigated, due to the increase of tillage helps bury the seed (if any is set 0 to a depth where it becomes unviable).
- Have identified two new farms/paddocks with resistant Barnyard grass which will be using more residual herbicides such as Dual, Stomp etc. and possibly more knockdown herbicides such as Select, Verdict etc.
- Ryegrass resistance is a very significant and costly issue in this district.
- Pre-emergents are more adopted and also rotating away from glyphosate where possible pre and post crop.
- I am regarding RR cotton as a weed in fallow with inbred roundup resistance. We incorporate cultivation both in crop and fallow, and use hormones whenever possible. Also knock downs near to cotton have started to rely on Paraquat, Hammer and Valor.



# APPENDIX

Some growers are chipping and using layby options to combated resistance.

The increasing selection of tolerant weeds means we are now using significantly more residual and alternative herbicides to control weeds. There is no economic value in RR technology anymore and it is overpriced.

Utilised residual herbicides in the lead up to planting, not too expensive.

It's getting very expensive. Monsanto should re-evaluate their costing on RRF.

Not in this situation yet due to the additional herbicide groups used in crop rotations.

Need to spray when young and small. Effective use of Diuron on channels and roads.

These are managed by cultivation where possible in cotton or double knock spraying in fallows.

The main cost of this is the operation itself.

Cost is \$21 to \$41/ha to prevent glyphosate resistance.

The main issue is the adoption of the full range of control measures in paddock and in non-crop areas.

Reluctance to go back to chipping is an issue. The spread of weeds along roads and waterways is something that will need more attention.

More expensive as chemicals needed to be used are more costly.

Cultivating all fields. Rotation with corn and pre-emergents.

Using Terbyne for Fleabane and factor with Select for Ryegrass.

Increasing use of double knock with Paraquat in fallows and an increase in the use of residual chemicals for grass control.

Only managing through use of residuals (in terms of cotton - obviously rotation, strategic cultivation etc. used). Mainly Diuron or Terbyne rather than layby herbicides of Prometryn etc. some ABYG plants that came through Roundup in the cotton needed group A to control. Residuals to be used here in future. Cost is increasing again but no option or we will be like the US.

Residual herbicides required pre and post emergence and additional tillage required.

Introducing residual herbicides to the program. Chipping. Addition of grass herbicide with the over the top RR sprays.

## QUESTION 53

**Where growers have previously had compaction, what management strategies are being employed to remedy or avoid the compaction, and with what level of success?**

Avoid wet picks. Traffic lanes in field. Use of planes for pesticide applications when field too moist.

Avoiding compaction has been impossible with the substantial rain at picking over the last two seasons, for any fields that hadn't yet been picked. The compaction has been tempered to some extent with deep middle and side busting operations following picking in preparation for the next crop. This has been moderately successful in most cases. Where there hasn't been sufficient water to go back to cotton the fields have been double cropped to wheat to dry them out and get some biological deep ripping initiated.

Changing the 4 row ripping pass slightly to get increased depth. Avoiding working when wet if possible (cultivations etc. - picking is impossible as it is done whatever the condition). If we have the luxury of fallow, planting dryland winter crop to dry the profile right out.

Continual adoption of deep tillage as a standard after picking, particularly when it's wet. One client has not tilled deep for several years and suffered up to 2 bales per ha loss on production due to this.

Controlled traffic - very good success levels.

Deep rip when dry.

Deep ripping - good.

Deep ripping given ideal field conditions - variable success. Crop rotations (trailing different crops for efficacy of compaction amelioration) - success dependant on number of wet/dry cycles. Changing irrigation deficits - consistent and reasonably predictable outcome. Minimum till in crop, staying off the country, reduce machinery weight.



# APPENDIX

Deep ripping if dry. Growing rotation crops to dry out profiles and improve organic matter levels.

Deep ripping, growing a winter cereal. Both work depending on how deep the compaction layer is.

Deep ripping, legumes in rotation.

Deep ripping, time and rotation have been the most successful strategies once compaction has occurred. Controlled traffic would be excellent but the use of cotton pickers limits this potential.

Deep ripping.

Deep ripping. Controlled traffic. Good level of success.

Deep ripping. Lime gypsum and manure application.

Durum wheat crop following cotton. Controlled traffic.

Extreme deep ripping by removing Alabamas etc. when centre busting so as to get a greater depth on the first pass then quite often doing a second deep rip on the bed shoulders with side busters and the Alabamas back on the rig. Two deep rip passes have worked the best. Have had 1 grower trial a D10 dozer with the 2 tines so as to get to 50-60cm deep. Though at a cost of \$10,000 for 35ha obviously not really an option.

Have used gypsum in the past, crusher dust on wheel tracks in overhead irrigation, manures, trying to spray with half loads etc. - temporary success.

Listing for pupae control and break out compaction - 80%. Using a plane to spray - 80%. Managing last irrigation as best as possible - 50%. Using more gypsum the following year - 60%.

Minimise machinery operations. Grow winter crop after cotton to dry and crack soil. Deep ripping with dozer. Good success.

Rip and cross-rip, avoid traffic in-crop, spray by plane instead of ground rig.

Ripping is used where possible following a wet pick or following a season where operations have occurred at undesirable times. This is very successful.

Ripping necessary often to get ground prepared but only part solution. Needs wetting and drying cycles to allow the soil structure to repair. Earlier irrigation needed to overcome root penetration problems and to make sure as well grown plant as possible is grown to help repair the soil structure.

Ripping, controlled traffic.

Ripping, cultivation and allowing the profile to dry more than normally would be allowed.

Rotate to cereal crop for 1-2 crop cycles. Allow profile to dry and crack. Try to improve structure.

Rotate to wheat then fallow back to cotton. Deep ripping.

Rotate with wheat and/or deep rip.

Rotation crop is a great remedy. Deep tillage in the right soils and conditions can also help.

Rotation crops and tillage.

Safflower - does a good job in a wet winter.

Single or multiple deep ripping passes and in some cases crop rotation.

Tram tracking, track renovating, reduced traffic, tracks vs tyres. Minimal till seems to improve soil structure. Compaction still occurs but with increasing planter width and spray rigs less area is compacted. Wet pick is still problematic and deep, ripping and cultivation is the only strategy that reduces compaction affect.

Try to fix with cereal rotation crops.

Using the agro plough on 2 passes too bust open compacted layer. We used 2 passes after last years' wet pick, the proof of success was water extraction from 80cm by the first irrigation.

Winter rotation crops, no back to back cotton.



# APPENDIX

## QUESTION 57

**With expected fundamental shifts in Precision Ag, including increased automation, and the ability to capture and analyse real time data, how do you see the role of the cotton consultant changing and do you feel equipped to adapt to this change?**

I don't see the role changing too much. We have contemplated doing some changes with things such as drones and other technology, but yet to finalise our thoughts on how we can utilise it to its full effect. I feel that we are likely to still need to have ground truthing, in-field, in-person monitoring, as there is so much more to growing a crop than watching it on a screen. That being said, I believe that strategic use of some of these technologies can significantly enhance the quality of data and service we provide to our clients, when used properly, effectively and while maintaining a presence in the crop and in the field. Oh and yes, we are prepared to adapt to these changes, the young lad is pushing the old man along :)

I would expect that it will become more prescription based than it is currently and therefore agronomists will need to drill down to certain areas of fields with growers.

At this stage I cannot see any changes in the immediate future but expect it will be 'expected' of consultants to be skilled in these areas. I am not currently well equipped at this point, there will need to be strong training programs to bring people up to speed.

Ability to be more prescriptive.

It will require more time in the office looking at programs, and allow less time in the paddock, which you can tell straight away, not look at 5 different tools to get to the same answer.

Sometimes we are behind in some of the modern technology that enters the market and we have to play catch up which I think should be the other way. We could do with a more specialised course to keep up.

I see an expanding role to properly interpret data generated by precision ag to enable good decisions to be made.

Interpreting information requires extensive in crop experience to ensure correct management decisions. And is very time consuming. Will require computer skills beyond most on ground Agronomists. Will come in varied formats based around retail products rather than agronomic improvements.

It will be easier for the farmer to do things themselves. I am seeing this already. It will be much harder I think, but I am trying to adapt. It is hard to buy capital equipment and have Clients to spend money on these types of services at the moment. It will be easier I think for Corporate types to adapt compared to the average independent.

I see a fundamental change from the paddock to the office. I do not know if this will be a good thing or not and I am not sure of the direct benefits to growers and or consultants. Unfortunately just because something is new it is not necessarily better.

Having a large number of different clients with a huge variety of machinery and technologies makes it very difficult to adapt cotton consultancy with Precision Ag.

Probably not well equipped and I see the ground truthing of precision ag will be time consuming and expensive.

More ground truthing of remotely sensed data.

We have looked at it but currently do not feel there is enough support there to make it a worthwhile exercise. Growers are frustrated that basic back up is not available.

We must keep abreast of the emerging technology and because of my age it is very daunting!

The data needs to give beneficial information that can be acted on, otherwise it is just more data. Expect will need to utilise data sources more often, especially for water-use and nitrogen usage. Given information is easy to access, yes, I feel equipped to adapt.

Yes, but many farmers no.

We will have more of a role in the interpretation of data that is collected, as is happening now, and incorporating this into the cropping program.

Changing to more technology based. I believe most people would easily adapt with basic training.



# APPENDIX

Employing a specialist to collect the data, consultant then analysis it.

Would need to study the technology more to ensure that the right and useful information is passed onto the growers. Consultant have to be across many fields but cannot be experts in all.

Consultants will be able to use the data captured from this technology to develop variable rate maps etc. but I will need to upskill to get better at this.

Not sure how this will all unfold. Cotton consultants will most likely be involved as a facilitator of the introduction of these technologies and will be involved in trying to make practical use of the information gained, but won't have the time or the expertise to handle and analyse all the data.

Consultants will use PA to help increase yield. Consultants will need more focus on PA.

Need to be able to facilitate the management of data and interpret it for the grower. Most growers don't have a good handle on it and want it done for them.

The role of cotton consultants will change as more and more real time data becomes available. There will need to be a trade off with time spent in the field as well as time interpreting the additional data. At this stage time spent in the crop still needs to be the priority. I don't feel equipped to change into spending less time in the field and more on interpreting real time data, there is too much at risk.

Generally need more training before wide adoption through the industry. Need to prove more cases of actual benefits of PA in cotton - e.g. variable pix, defoliation. I think increased automation is still a while away from large adoption (depending irrigation system - bankless channels and overhead closer to the mark than flood at the moment).

Keep the farm up to date with changes and implement the technology onto the farm. Have a general understanding but need further up skilling.

We have some clients who are rapidly adapting to emerging technologies, and we feel competent in participating with those changes. However, as a whole, our focus is on the nuances of the current system. We are keeping up with changes in the industry but will not be rushing to adapt new technologies.

I know how to integrate into my system. But until I can justify the cost of purchasing the new technology and get a ROI. I will not be able to implement it. The companies who specialise with this are quite expensive as is any new technology.

Less field time, more office time. No not well equipped to deal with it.

## QUESTION 70

### Do you think the industry is meeting your research needs and what are the key research gaps?

Yes X 6.

Yes I think the industry is doing a good job of covering the industry's needs as there is only so much that can be done with the limited amount of money available.

Yes - streamlining the extension methods is helpful. There are too many small groups in the industry and information gets lost. DISEASE, DISEASE, DISEASE.

Yes but just needs to be communicated better with all research and trial data.

Yes - retrospectively, compared to other industries cotton is very lucky. Much of the work has been done and now we face a back to the future period of re-learning what we already know. The great danger is generational change in growers, consultants and researchers before the extension teams get up to speed and understand that everything does. Not need to be redone - just modified to fit new varieties. I feel that a lack of experience in some of the CottonInfo team is sucking up resources to get the field staff up to speed - this may be necessary however it can be frustrating. Disease is a gap - until Verticillium resistance is improved we have 10 years of quite large risk of yield loss in back to back systems. Nutrition is a gap.

Yes. More work required on research in establishing crop - soil insect control, disease etc.

Yes. Weed management and herbicide resistance and also energy use probably need more research. More research on cotton role as a major industry leader in the future economic and community sustainability of rural communities would be very worthwhile. Is the wealth from the natural resources getting spread through communities in a sustainable way? The latest Australian Cotton Production Manual is a very good



# APPENDIX

publication giving with a review of the latest info on most aspects of cotton production. More information on the future challenges and how the industry is aiming to meet them apart from the more inputs and more yield game would be good, are there other options.

Yes I think the research continues to be great in the cotton industry. I would like to see more done in relation to new technologies, pix management, irrigation systems and management, nutrition management, picking cleaner, soil preparation, reducing seedling disease and Silver Leaf Whitefly management.

Yes, the cotton industry meets my needs for research needs.

Yes generally quite responsive. I and I'm sure most consultants generally call the researchers direct for information e.g. Alternaria - Steve Allen. If they can't help they can usually point you in the right direction. More on PA as previously suggested, staying on top of disease management e.g., Verticillium, better management of compaction, preventing square loss which happens inevitably in all regions at some point - nutrition always needs ongoing work as there are things we can be doing better, Alternaria fungicide evaluation, better pix management tools than VGR guides, sorting out optimal irrigation deficit in each region etc.

Generally ok. Needs to be more research on genetic modification incorporating herbicide tolerance other than for Glyphosate.

For the most part yes. The biggest issue is that there seems to be way too many players in the game, you have CRDC funded DAFF projects tackling issues, some of which are communicated well, others poorly, then CottonInfo who run different trials and have poor extension, then you have corporate people running trials for their own gain and finally have groups such as CSD running their own trials. Many times these things are contradictory to one another and it is unclear the right options to choose. Another issue we have is that CottonInfo has access to research funding to extend research in the region, but seemingly only provide the extension to small groups of people. We used to have area-wide meetings where all growers would attend.

I think in general they are. I think there is a bit of a gap in the physiology side of things and how every day practices affect the plant from that perspective. I think there is also a gap in relation to spraying. I think older people in the industry (from non Bollgard days) have a much better grasp on nozzles and spray techniques. Young people entering the industry now I think have less knowledge on this as it is a smaller part of the job however it is still extremely important.

I think the industry is doing a good job of meeting my research needs. Some extra work should be devoted to weed management, in particular reference to herbicide resistance. I believe a lot of new research is needed in the areas of nutrition with particular reference to nitrogen, phosphorus, and potassium with regard to attaining and maintaining high and profitable crop yields. I would like to see some more research targeted at the Cotton Mealybug.

Not meeting grower expectations but as a consultant we need research results that is right in all seasons. So we appreciate that research needs time. Also realise that government funding is less than needed to fulfil all research needed.

I am happy to do more trials on farm as my grower's request.

No gaps.

Not keeping up with the best producers. Irrigation application and scheduling.

No. We need southern specific research. I.e. row spacing, pix and sodic soils.

No. Too slow to respond to yield and quality affecting issues. Need to conduct smaller scale, quick turnaround type trials to address immediate issues, similar to the GRDC's NGA. We need more field days. Researchers need to adapt to grower yield expectations e.g. insect thresholds, cotton nitrogen nutrition (there is more to nitrogen requirements for 16b/ha than just a budget - nitrogen loss).

More about the role of nutrients including micros in the plant and what role plant health and micro nutrients have in disease and insect management

We have dropped the ball badly with Verticillium detection and management. Consultants have been telling researchers for 3 to 4 years Verticillium was becoming an issue and we now find out we have had a defoliating strain of Verticillium since the 80s. We have a very poor understanding of how to manage this "new" strain or how it relates to the older strain of Verticillium. NSW DPI has been noticeably absent compared to QLD DEEDI on this issue. I see Verticillium as a bigger threat than FOV now and we are still do little in the way of coordinated research.



# APPENDIX

Verticillium wilt is a huge challenge that needs more work. More labour-efficient surface irrigation techniques. Continued calibration of nutrient critical levels. More tools for summer grass management.

We are still missing out on basic "cotton 101" research regarding best irrigation, nutrition, pix etc. timing for modern very high yielding cotton. We do not understand well enough why some paddocks yield so well compared to adjacent ones.

Very little research done on Southern cotton production. Have increased Thrip pressures early - Northern thresholds don't appear relevant. Variable pix management strategies.

Increased work on Pix management and insect thresholds in southern valleys and Nitrogen requirement in southern valley.

Not in the south. Need more work on sodic soils. Need cold germ at 12C not 18C for planting decisions. Need more work on disease and closer monitoring from industry.



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