CLIENTS | PEOPLE | PERFORMANCE

# Cotton Catchment Communities Cooperative Research Centre

## Cotton Grower Survey

### Project Report

August 2011

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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# Contents



## Table Index



## Appendices

# 1. Purpose of report

This final report provides an overview of the process followed and deliverables provided to the Cotton CRC by GHD for the project: Cotton Grower Survey 2011.

## 1.1 Background

The Cotton CRC and CRDC sought to gather quantitative information on cotton growers' usage and adoption of research and key farming practices, with a particular focus on change since 2007, in order to:

- Gain an understanding of where to focus research;
- Review the adoption of past research; and
- Undertake an economic analysis of the Cotton CRC's investments and impact.

Existing information on Cotton CRC investments and related farming practices were collated into 'stories' by Ingrid Rencken (Crop Protection) and Guy Roth (Soils & Nutrition; Water). These drew together information from project data sets, the CCA survey and the last grower survey conducted in 2007.

A new survey of cotton growers was necessary in order to fill the gaps in current information about farm practices. Due to the relatively tight timeframes and previous low responses rates to written/electronic surveys it was agreed that the most reliable approach would be to gather the information through structured telephone interviews.

At the same time, there was also seen to be a need to develop evaluation expertise within the Cotton CRC's development and delivery (D&D) team.

# 2. Methodology

The project approach was developed in collaboration with Janine Powell and Ken Flower to use a collaborative approach that would gather the required information about cotton growers' practices whilst also presenting an action learning opportunity for the D&D team.

The steps followed in the project were:

**Step 1: Project inception**

A meeting held with Janine Powell and Ken Flower on 13 May 2011 to agree on the scope and approach for the survey and for engaging the D&D team.

**Step 2: Training component**

A training guide was developed (see Appendix A) to provide the Cotton CRC D&D team with an understanding of evaluation with a particular focus on quantitative surveys.

A short training workshop was held on 8 June 2011 in Narrabri for the D&D team in advance of the evaluation planning sessions (see Appendix B).

**Step 3: Evaluation design**

The survey was designed in collaboration with the Cotton CRC impact assessment group and D&D team during workshops on 8 and 9 June 2011. It involved three phases:

1) **Agreement on key evaluation questions**

   These were based on the findings of the evaluation stories prepared by Guy Roth and Ingrid Rencken and discussion amongst the group.

2) **Design of the survey questions**

   The D&D team as a group considered and decided on broader aspects of the survey (participants, demographic questions, etc.) then broke into small groups (generally with the relevant target lead) to prepare survey questions for each technical area.

   These were reviewed and refined with Ingrid Roth and the group as a whole.

   The question design included agreement on the use of prompts and response options.

3) **Pilot testing and refinement**

   The draft questions were tested by some members of the D&D team through pre-arranged interviews.

   The group then worked together to revise the questions and interview guide.

Further refinement was done through follow up discussions with Janine Powell and Yvette Cunningham and a peer review of the survey tool by Keryn Hassall (GHD survey specialist).

A copy of the survey and cover letter is attached as Appendix C.

### 4) Contact list

The Cotton CRC/CRDCs grower list was taken to be the population of cotton growers. This list of growers, dryland growers or managers had been extracted from the C-Vent database. It should be noted that there is a recognised level of bias in using this list as it is only those growers who have chosen to register themselves with the Cotton CRC/CRDC. As it emerged, there are considerable gaps and inaccuracies in the list.

The list contained 986 names. People who were known not to have grown cotton last season, left the industry, were not growers or were a secondary contact for a farm included already were removed, leaving to a **target population of 869**.

### 5) Sampling

An initial random sample of cotton growers was drawn from the Cotton CRC/CRDC industry list. This was done by:

(a) Using an excel function to allocate a random number to each name on the list;

(b) Selecting those names that corresponded to the top **302** random numbers;

(c) Adjusting the sample so that the proportion from each region was comparable with the proportion of each region in the total population, with some adjustment to enable sufficient numbers in each region; and

(d) Removing any names that the D&D team knew didn't grow cotton in the 2010-11 season, were no longer in the industry or duplicates for the same farm. These were then replaced with the next numbers in the random sample.

Based on the rate of response in the first week, a secondary sample of a further **258** names was selected from the list. A filter was first applied to include predominantly names for which there are phone numbers and then the random selection process was again applied. As far as possible those growers on the list who were known to be or possibly likely to be from the same farm as someone already on the list were removed from the sample and substituted with others.

Due to the challenges in contacting growers in the sample, the CRC D&D team then further supplemented the sample population by contacting various people who they knew personally.

In total, **636** growers were contacted or attempted to contact.

**Table 1 Sample selection**

| Region | Original list | Target population* | % of target pop | Selected for sample | % of total sample |
|---|---|---|---|---|---|
| Burdekin | 3 | 8 | 100% | 8 | 1% |
| Bourke | 5 | 3 | 100% | 3 | 1% |
| Central Queensland | 85 | 62 | 60% | 37 | 7% |
| Darling Downs | 236 | 218 | 54% | 118 | 21% |
| St George Dirranbandi | 51 | 49 | 59% | 29 | 5% |
| Border Rivers | 57 | 59 | 73% | 43 | 8% |
| Gwydir | 109 | 106 | 60% | 64 | 11% |
| Lower Namoi | 161 | 156 | 72% | 112 | 20% |
| Upper Namoi | 94 | 91 | 81% | 74 | 13% |
| Macquarie | 112 | 74 | 76% | 56 | 10% |
| Lachlan Murrumbidgee | 25 | 43 | 44% | 19 | 3% |
| TOTAL | 986 | 869 | | 563 | |

* excludes those known to be duplicates per farm, not growers or known not to have grown cotton in 2010-11

### Step 4: Mail-out of survey and letter of introduction

The Cotton CRC printed the survey as a booklet and mailed it out to the two sample populations together with a letter of introduction signed by Philip Armytage. The first mailout occurred on 15 June and the second on 29 June.

### Step 5: Telephone interviews

Telephone interviews were conducted by the GHD team and the Cotton CRC D&D team in the period 20 June to 22 July. Surveys were either completed by interview or, in many cases, the growers opted to return the survey by post. There was considerable difficulty in reaching growers by phone and numerous calls were made to try to contact each grower on the list.

### Step 6: Data entry

It was agreed to use the CRDC's preferred C-Vent web based survey system for data entry as this would enable the industry to house the survey responses in a central repository. With assistance from Helen Dugdale, the questions were all entered into the C-vent system.

Survey responses were then entered into this system.

### Step 7: Analysis & reporting

Data was extracted from C-Vent for excel analysis and reporting.

# 3. Survey participation

## 3.1 Survey completion and industry coverage

A total of **177 growers** representing **137,978 ha** (160,032 field ha) of cotton production in 2010-11 completed the survey. Of these 95 were completed by interview and 82 by mail, fax or email (mostly in response to a phone call asking them to participate with 11 growers returning the survey unprompted).

This represents **20% of cotton growers** as defined by the target population from the Cotton CRC/CRDC industry list. It would represent a higher percentage of the total number of current cotton growing farms on the industry list as we aimed to have only one response per farm (whilst many farms have multiple people included on the industry list) and we discovered that a large number of growers on the list have not grown cotton for many years. The industry list is not comprehensive and some additional people outside of that list were also contacted to complete the survey. On balance it would be fair to estimate that the survey draws results from approximately 20% of cotton growing properties.

## 3.2 Survey respondents

The survey was completed by a broad mix of respondents, not just the 'usual suspects' of industry engaged growers. The combination of the random sample process and follow up by telephone has achieved response beyond the 'industry regulars'. Many of the growers who completed the survey are not the familiar participants in industry events and research programs. This adds significantly to the robustness of the survey and gives some confidence that it can be considered reasonably representative of the industry as a whole.

The sample size for each region was weighted to align with the regional distribution of all growers on the industry list, with adjustment to enable sufficient sampling of growers in the smaller regions such as Bourke and the Lachlan Murrumbidgee and some balance between hectares grown/number of growers.

**Table 2 Survey participation rates by region**

| Region | Number completed | % of sample for region | % of all completed surveys |
|---|---|---|---|
| Burdekin | 0 | 0% | 0% |
| Bourke | 3 | 100% | 8% |
| Central Queensland | 11 | 30% | 6% |
| Darling Downs | 37 | 31% | 21% |
| St George / Dirranbandi | 16 | 55% | 9% |
| Border Rivers | 8 | 19% | 5% |
| Gwydir | 19 | 30% | 11% |
| Lower Namoi (incl. Walgett) | 40 | 36% | 23% |
| Upper Namoi | 10 | 14% | 6% |
| Macquarie | 16 | 29% | 9% |
| Lachlan Murrumbidgee | 17 | 89% | 10% |

28% of growers contacted or attempted to contact completed the survey as outlined in Table 3.

**Table 3 Survey response**

| Participation or response | Number of growers |
|---|---|
| **Completed survey** | **177** |
| (by phone) | (95) |
| (by mail, fax or email) | (82) |
| **Did not grow cotton in 2010-11** | **93** |
| **Chose to return by mail but not received** | **83** |
| **Declined** | **118** |
| **Could not be contacted** | **153** |
| **Duplicate with another farm** | **21** |
| **Total contacted/attempted to contact** | **645** |

The survey was undertaken by a combination of the Cotton CRC's D&D team and GHD with varied responses as indicated in Table 4.

**Table 4 Interviewers and response**

| Interviewer | Target Number interviews | Completed | Didn't grow 2010-11 | Declined | Promised but not received | Could not contact |
|---|---|---|---|---|---|---|
| **GHD team** | **160** | **118** | **78** | **68** | **60** | **69** |
| **Cotton CRC Total** | **80** | **59** | **15** | **50** | **24** | **84** |
| Duncan Weir | 15 | 4 | 0 | 21 | 0 | 2 |
| Susan Maas | 8 | 3 | 3 | 5 | 0 | 11 |
| Rebecca Rogan | 8 | 0 | 0 | 3 | 2 | 7 |
| Jim Wark | 8 | 4 | 1 | 1 | 1 | 6 |
| Dallas King | 8 | 5 | 0 | 2 | 5 | 1 |
| Sally Ceeney | 8 | 3 | 2 | 0 | 1 | 4 |
| James Hill | 8 | 3 | 0 | 0 | 0 | 5 |
| Geoff McIntyre | 8 | 5 | 1 | 0 | 4 | 0 |
| Peter Verwey | 8 | 4 | 2 | 1 | 0 | 8 |
| Yvette/Janine | 8 | 10 | 0 | 0 | 0 | 3 |
| David Larsen | 8 | 3 | 4 | 1 | 1 | 2 |
| Rachel Holloway | | 15 | 2 | 16 | 10 | 35 |
| **Combined total** | **240** | **177** | **93** | **118** | **84** | **153** |

## 3.3 Challenges faced

Both the GHD and Cotton CRC interview teams found it far more difficult than expected to contact growers, this for number of reasons including:

- Timing – whilst June-July would often be a good time of year, a number of growers were still picking cotton (exceptionally late) and the seasonal conditions meant that many were planting grain crops;
- Many growers could not be contacted even after 6 or more attempts via phone and email during and after business hours;
- Contact details – the grower list drawn from the C-Vent industry database is incomplete and out of date. This is not simply a matter of currency, there are a number of obvious omissions from this list with growers who have been involved with the industry for many years not included;
- Many growers had not grown cotton last season – many had not grown cotton for a number of years and some no longer considered themselves cotton growers;
- A lack of rainy days during the survey period; and
- Numerous surveys being conducted at the same time, including a UWA survey (Cotton CRC student), the Ag Census and a Syngenta survey.

# 4. Findings

Survey data and findings are provided as:

- A survey findings report which is attached as Appendix D; and
- Survey results stored in the C-Vent system.

An electronic data set of survey results and analysis on enclosed CD as listed in:

- Table 5;
- Spreadsheets of grower contacts for updating the industry list; and
- List of names of growers who wish to receive a summary of survey findings.

**Table 5 List of data files provided on the enclosed CD**

| Folder | File name | File type | Description of contents |
|---|---|---|---|
| **Raw data** | Full data set_one respondent per worksheet | Excel | C-Vent export: one survey per worksheet |
| | Full data set_one worksheet per question | Excel | C-Vent export: one question per worksheet |
| | Full data set_single worksheet version | CSV | C-Vent export: one worksheet of all data |
| | Information and advice - summary tables | Excel | C-Vent export: summary of information and advice questions |
| | Weed and pest management - summary tables | Excel | C-Vent export: summary of weed and pest management questions |
| | Cross tabulation of data with regions | Excel | C-Vent export: cross tabulation with regions |
| | Sample_Cotton Grower Interviews_working version | Excel | Working (original) version of contacts list |
| **Data analysis** | Areas by region | Excel | Analysis of total, irrigated and dryland areas, by region (and WUE table) |
| | Cotton research opinions | Excel | Analysis on research opinions of respondents |
| | Cultivation | Excel | Analysis on changes in cultivation practices |
| | Fibre quality management | Excel | Analysis on fibre quality |
| | Full time employees | Excel | Analysis of full time employees per ha |
| | Groundwater monitoring | Excel | Analysis on groundwater user responses |
| | Information and advice | Excel | Analysis on sources of information and advice |
| | Irrigation | Excel | Analysis on methods of irrigation |
| | Native vegetation and riparian areas | Excel | Analysis of native vegetation and riparian area management |
| | New growers | Excel | Analysis on new grower responses |
| | Nutrition and soils | Excel | Analysis of nutrition and soil practices |

| | | | |
|---|---|---|---|
| | Regions vs seasons grown | Excel | Analysis of seasons grown, per region |
| | Weed and pest management | Excel | Analysis on IPM and IWM |
| | Years' experience | Excel | Analysis of respondent and farm experience |
| **Updated grower contacts & report distribution** | Sample_Cotton Grower Interviews | Excel | Contacts list with response, notes and updated details |
| | Updated Contacts, report distribution, etc. | Excel | Updates provided in survey, including desire to receive report |
| **Reports** | Findings Report Cotton Grower Survey 2011 | Word & PDF | Findings report |
| | Project Report Cotton Grower Survey 2011 | Word & PDF | This project report |
| **Training materials** | GHD Evaluation Training Materials Cotton CRC June2011 | PDF | Training materials prepared for D&D team |
| | Evaluation Training | PowerPoint | PowerPoint for training session |
| | Agenda for training and workshop session | PDF | Training and workshop agenda outline |
| **Survey** | Cotton Grower survey 2011_mailout version | PDF | Mail out version of survey |
| | Cotton Grower survey _letter | PDF | Cover letter from survey |
| | Cotton Grower survey_interviewer's guide | PDF | Interviewer version of survey |

## 4.1 Survey method

This survey was planned as a phone survey in order to gain higher response from the 'non-regulars'.

As it turned out, many growers chose to return their survey by mail. However, the phone calls definitely helped to gain the response and some growers indicated that this was important. Just 11 of the 177 surveys (6%) were returned without prompting by phone.

The mail-out was important, interviews were much simpler (and likely more accurate) where growers had reviewed the survey in advance and prepared responses. Also, some growers said they would not participate in phone interviews but were more willing when explained that the Cotton CRC had mailed them the survey.

One grower who returned his survey by mail unprompted by a phone call actually rang to say *"I don't do phone surveys but this is important – so don't call it'll be in the mail"* and then had a detailed discussion.

Ideally, the phone calls would occur soon after the mail-out – the staggered mail-out helped in this regard. It was unfortunate that many growers were still picking or were planting on the back of recent rain just as the survey was mailed out.

## 4.2 Follow up with growers

To encourage response and indicated thanks for participation, growers were offered:

1. A summary of survey findings to be email to them; and
2. To be entered into a draw to win a registration to the 2012 Australian Cotton Conference.

### 4.2.1 Reporting findings to growers

**125 respondents (68%)** indicated that they wished to receive a copy of the survey findings by email.

The attached findings report has been prepared in a style to enable it to be circulated to industry. It would also be worthwhile to report findings in industry media such as Spotlight and CRC eNews. A Cotton CRC/CRDC response to the findings may also be warranted at a later date.

### 4.2.2 Cotton Conference Registration Draw

128 respondents (70%) indicated they would like to be entered into the draw to win a registration to the 2012 Cotton Conference provided by the Cotton CRC.

This indicates that a high proportion of growers were interested in this, but perhaps it was not a substantial incentive for completing the survey.

A winner of the draw was selected randomly to be:

Paul & Georgina Krieg Glenroyal, Brookstead, Q 4364 Phone: 0429939244; 07 4693 9244

This was advised to the Cotton CRC and announced by Cotton Australia during the Cotton Collective week.

# 5. Growers contacts list

As noted previously, the cotton industry list maintained by the Cotton CRC and CRDC has many omissions and inaccuracies.

Surveyed growers were asked to provide updated contact details. These are provided in a spreadsheet along with other changes/comments made in the interview contact spreadsheet.

Surveyed growers were asked whether or not they would be happy to be kept on a shared list between Cotton CRC, CRDC and Cotton Australia. Responses are presented in Table 6 and noted against individual names on the spreadsheet provided.

Some growers expressed surprise that their contact details were incorrect as they knew Cotton Australia had correct contact details for them – assuming that a shared contacts database was already in place.

**Table 6 Respondents who were happy for contact details to be kept on a shared list between Cotton CRC, CRDC and Cotton Australia**

| | # of Respondents | % |
|---|---|---|
| Yes | 172 | 89% |
| No | 9 | 5% |
| Need more information to decide this | 13 | 7% |

# 6. Recommendations

Based on the experience in conducting the survey and the analysis of results we recommend:

1. **Reporting of results to industry**

   68% of survey respondents indicated that they wish to receive a summary of survey findings. A direct email / post to these growers would be valuable both for reporting findings, acknowledging their contribution and encouraging participation in the future.

   Broader communication to industry (e.g. through Spotlight, CRC eNews) of some key findings and the intended response to these would be worthwhile.

   The findings report has been prepared in a 'stand-alone' format to enable it to be readily distributed to industry and other stakeholders.

2. **The Cotton CRC and CRDC invest in a major update to the grower contact database**

   It is logical to maintain a centralised database rather than a diverse set of different contacts list in different places. Maintaining current contact details and adding new growers to the list requires considerable investment and input. A secondary output of this survey has been to gather updates to growers' contact details – however this has primarily been only for those people already on the list. Many growers are missing completely from the grower list (including some who are heavily engaged with industry affairs). This may be simply that they are not appropriately marked as growers in the database but does justify investigation and correction.

   Peer review of the list to identify missing growers would likely help.

3. **A survey of grower practices be repeated on an annual or bi-annual basis, with this becoming the primary survey for industry research**

   To reduce the demand on growers and obtain valuable industry data, a core cotton grower survey is recommended to be undertaken on a regular basis (every year or two). Other projects could feed questions into this to reduce the number of surveys that growers are asked to complete.

   Quick turnaround for reporting and communication and promotion of results will be important to help build interest and commitment for participation.

   We suggest that future surveys be designed primarily as a mail survey with the phone calls being a prompted and an option for phone interview if preferred. It could be posted to all growers and then a random sample selected for follow up calls.

   Wide industry involvement and promotion may help. There may be potential to explore avenues for partnerships with agribusiness firms whose field staff may help in promoting and gathering survey responses (e.g. CSD, cotton merchants, etc.).

4. **Avoid having numerous surveys conducted simultaneously**

A number of surveys were being undertaken at the same time, including some by research programs. This did reduce the participation rate.

5. **Consider the potential to provide participating growers with a personalised report, showing their practices in relation to the industry/regional results**

   There is potential to prepare for growers an individually tailored report that benchmarks their practices against others. However, this may require too much effort for the value gained.

6. **Research analysis**

   The findings report presents results about each survey question with some cross-analysis. There is potential for more detailed research analysis of these results through a diversity of cross analyses and review. For example, it would be possible to look into the yields gained at a range of applied fertiliser rates. Research review to consider the limitations of the data and meaning of results would be required if this type of analysis were to be conducted.

   This could be of interest for growers as it benchmarks practices against results such as yield or calculated financial return. A series of such analyses could be undertaken and reported in industry media over the coming 12 months.

7. **Communications**

   The awareness and use of the Cotton CRC's information tools did not appear to be overly high. Increasing promotion of Cotton CRC information products would be worth investigating.

Appendix A

# Training Materials

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# Evaluation and Surveys

## Training notes

**Prepared for the Cotton CRC's Development & Delivery Team**

**June 2011**

| | |
|---|---|
| Determine Evaluation Purpose and Scope | •Why is the evaluation being done?<br>•How will the results be used? By who?<br>•What are the boundaries?<br>•What resources are available? |
| Develop Key Evaluation Questions | •What questions do you need to answer at the end of this process? |
| Select the Evaluation Method/s | •How will you gather the information you need?<br>•What type of information is needed?<br>•What information is already available?<br>•What method or mix of methods is most suitable? |
| Design Tools | • Surveys: What type? How to conduct?<br>• What questions to ask to get the information you need? |
| Review and Pilot Test | •Will the survey work as intended? Are questions interpreted as planned? Will it meet expectations?<br>•Peer review<br>•Pilot test with a small pool of the sample population |
| Sampling | •Who can provide you with this data? What type of person, where and how many responses do you need?<br>•Sampling methods, unit of sampling, sample size<br>•Target population, accessible population, sample, respondents |
| Conduct Survey | •Making it work - introductions, distribution, preparation, interview team, encouraging reponse, data entry |
| Analysis | •How will you handle the data provided?<br>•Can coding the the data collection intrument help?<br>•How will you analyse the findings? |
| Reporting and Use of Findings | •How will you communicate the results?<br>•What are the limitations of the data?<br>•Where can you reasonably extrapolate?<br>•Who will the findings be made available to and how? |

# Contents



These materials have been prepared for a workshop on 8, 9 June 2011 which has the purpose of designing and conducting a survey of cotton growers' use and adoption of the Cotton CRC's research outputs and products. The notes have some broader context about evaluation and then focus on surveys.

*Examples relevant to cotton research and adoption are included in italics beside the cotton boll symbol.*

## Determining Evaluation Purpose & Scope

Perhaps the most important step in any evaluation is to clearly determine the purpose and the scope of the evaluation, considering questions like:

- Why is the evaluation being done?
- What are we needing to find out?
- How will the information be used?
- Who wants the evaluation? Should they be involved in planning?
- Is an external or internal evaluation suitable?
- What are the resources available?
- What is the broader context?

## Developing Key Evaluation Questions

"Key evaluation questions" (KEQs) or "research questions" guide the evaluation – they clearly articulate what it is that we, or the intended users of the evaluation report, are wanting to know. We will start to develop these in the process of determining the purpose and scope of the evaluation. They generally relate to the targets or intended outcomes of a program and to the purpose of the evaluation.

*In a broad sense, KEQs may relate to things such as:*

- *To what extent did the Cotton CRC research influence cotton farmers?*
- *To what extent did the Cotton CRC research influence cotton farming practices?*
- *Have recommended best practices been taken up widely across the industry?*
- *Has the research program been worth the investment?*
- *How should the program be modified to improve its potential to achieve the program objectives?*

KEQs are usually framed to meet the needs of decision-makers, and must be relevant to stakeholders in the outcome. It is important to establish key evaluation questions with both decision-makers and stakeholders at the commencement of the evaluation.

In some evaluations, questions are asked of people directly (such as in a survey). These questions are not the same as the KEQs but are used to gather information to help answer the KEQs. KEQs focus and help us to clearly identify what survey questions we will need to ask. Having the key evaluation questions right is really important to the effectiveness of the evaluation. Be sure to focus on these before we start to design survey questions.

The key evaluation questions will rarely be answered directly, rather they are answered through the evaluation process that gathers and synthesises answers to a whole range of subsidiary evaluation questions. Once we have the key evaluation questions, plan out the subsidiary evaluation questions. These may not yet be the survey questions but may be intermediate questions that help define the KEQs. For example, they may be define the specific set of questions about farm practices that contribute to the broader KEQ.

*A key evaluation question may be: "How effective has the Cotton CRC been in fostering the adoption of best practice nutrient management by cotton growers?"*
*The survey questions related to this may need to ask about the specific practices being used such as "Do you use soil tests?" "To what degree do soil tests influence your fertiliser rates?" as well as the role of the Cotton CRC in influencing these practices.*

An evaluation framework can be helpful for confirming the key evaluation questions, deriving the subsidiary evaluation questions and then determining the evaluation methods. This framework summarises and guides the evaluation approach. Program logic (input-output-outcome) models are widely used and simple for this purpose. They set out the chain of causal logic between the inputs and activities of the project, and the intended outcomes. An example is included as Appendix A.

## Selecting the evaluation methods

Once the KEQs are confirmed, we can begin to think about what data could inform them and how best to gather new data.

There are a number of considerations in choosing the evaluation method/s to be used to answer the KEQs, including:

- The nature of the key evaluation questions
- Qualitative or quantitative data requirements
- The nature of the target population
- Available data and documentation
- Budget.

There are a wide range of methods that can be used in an evaluation, and each can take many forms:

- Document review –project records, public documents, participant documents, websites, etc
- Data analysis – project data, census data, commercial data (e.g. volume of pesticides sold)
- Consultation – surveys, focus group interviews, narratives
- Participant observation – observing behaviour at field days, in meetings, etc
- Case studies and most significant change
- Biophysical monitoring – e.g. water quality trends.

Some questions may be answered from review of program records – such as what research was done and where it was disseminated. But questions of perception, uptake and influence must be asked of the people themselves. This is where surveys form an important information collection method for evaluation.

It is useful to determine the KEQs and the underlying evaluation questions and to map these against the potential data sources. This will help to identify what data that is already available can answer the questions, what will need to be collected and the overlap between potential data sources. This can then be reviewed to help decide on the limitations and the preferred source of data for each area of information. For example, retrieving data collected by the Cotton CRC website may be easy to access but would not include people who have accessed research by means other than the website.

**Steps in Evaluation Planning** (Wissemann)

I. Clarify the evaluation request:
   - Why is the evaluation being requested (purpose)?
   - Who wants the evaluation, should a steering committee be formed to oversee it?
   - Should an external evaluation (or evaluation team) be used (for reasons such as impartiality, credibility, expertise or trust)?
   - What is the evaluation likely to mean to stakeholders?
   - The resources available (time, funds, personnel);
   - The political context within which the evaluation will be conducted;
   - Whether to evaluate (because of unrealistic expectations or ethical considerations).

II. Focus the evaluation. This includes determining the scope of the evaluation and writing the key questions that the evaluation will answer.

III. Identify information needs. Identify the information that needs to be collected to answer the key questions.

IV. Identify information sources and data collection methods. Determine where and how the information will be obtained.

V. Decide on the methods of data analysis and reporting procedures. Various forms of quantitative and qualitative data analysis may be performed. A number of reports may be produced, each tailored to a different audience.

VI. Sequence evaluation activities and produce a written plan, including timelines and assigned responsibilities (where necessary).

*The following table outlines some potential data sources relative to some evaluation questions.*

| ***Key evaluation question*** | ***Evaluation questions*** *(examples)* | ***Potential data source*** |
|---|---|---|
| *How effective has the Cotton CRC been in fostering the adoption of best practice nutrient management by cotton growers* | *How many and what segments of cotton growers have accessed key nutrient management products of the Cotton CRC?* | ▪ *Data collected automatically by the Cotton CRC website*<br>▪ *Lists of people who have requested information through other channels*<br>▪ *Survey of cotton growers*<br>▪ *Survey of growers registered with the Cotton CRC* |
| | *Perceived value and influence of the Cotton CRC nutrition products* | ▪ *Survey of growers registered with the Cotton CRC as having received the information* |
| | *What proportion of cotton growers are soil testing?* | ▪ *Data from soil testing laboratories*<br>▪ *Survey of cotton growers*<br>▪ *CCA survey* |
| | *What proportion use their soil test results in their fertiliser decisions?* | ▪ *Survey of cotton growers*<br>▪ *Survey of growers registered with the Cotton CRC*<br>▪ *CCA survey*<br>▪ *Survey of fertiliser supply companies* |

## Qualitative & quantitative techniques

Key evaluation questions may be qualitative or quantitative in nature or a combination of both. This can have a significant impact on the suitability of various evaluation techniques and the manner in which they are conducted.

Quantitative information: Amounts of things, or things that can be counted. Numeric measures.

Qualitative information: Information that we cannot reasonably use maths on. This often relates to understanding what people think and the range of views that exist.

*A quantitative measure may be "the % of cotton growers who use soil testing to inform nutrient management decisions" and "% of growers who have accessed Cotton CRC's nutrition products.*

*Cotton grower views about the validity and limitations of soil testing and the role of the Cotton CRC in influencing these views are qualitative information.*

Many evaluations will involve a combination of qualitative and quantitative data requirements. These terms can refer to both/either data or the approach to analysing data. Some examples of the types of activities that are done in each analysis approach, for each data type, are shown in the following table.

| | | ANALYSIS APPROACH | |
|---|---|---|---|
| | | **Quantitative** | **Qualitative** |
| **DATA TYPE** | **Quantitative** | calculating – mean, total<br>cross-tabulating<br>identifying patterns<br>statistical testing of relationships | interpreting meaning from numbers<br>exploring causal relationships<br>finding themes |
| | **Qualitative** | counting<br>coding<br>classifying<br>*converting qualitative to quantitative data for analysis* | interpreting meaning from text<br>synthesising<br>narrating |

Several techniques, such as surveys, can be used for gathering either or both qualitative and quantitative data. The way in which they are used and analysed will vary.

Some techniques, such as focus group interviews are intended for gathering a qualitative understanding of the range of views on a topic. They are not suitable for quantitative research.

## Design the evaluation tools

Once the evaluation questions, techniques and target audiences have been determined we have a good basis to start to design the evaluation tools (e.g. survey instrument, interview guide, desktop review framework).

If time permits, it is helpful to complete the review of previous data first so that the gathering of new information can be most efficient. This will help to clarify what questions need to be investigated further and which segments of the population to target.

If we are to use several techniques for gathering new data it is helpful to ensure that they align well and do not duplicate (other than where data triangulation[1] is intended). This can be done by planning them at the same time (if to be conducted concurrently) or sequentially (if one data tool is to build on the findings of the first).

Once we have drafted the evaluation tools it is good practice to have the client or other stakeholder review them to ensure that they will effectively gather the required information and that there are not unknown biases.

**The remainder of these notes are focussed on the design and use of surveys.**

[1] *Triangulation refers to the use of multiple techniques to look at the issue from different angles, building the robustness and credibility of the data.*

## Surveys

Surveys are one of the key methods used for social research, both qualitative and quantitative. Surveys use some form of questionnaire or interview guide. Responses may be made through written reply, web based or interviews.

Choosing the most appropriate survey technique will depend on a number of factors, including:

- The nature of the research (e.g. focus groups are useful for exploring and understanding the range of views and attitudes that exist whilst a questionnaire or structured personal interview is more suitable for quantitative measure of practices or views)
- Sampling method, population characteristics
- Budget available
- Timeframe for completion.

Having started with clarifying the evaluation purpose, design of the key evaluation questions and careful selection of the evaluation technique, we should now have a clear understanding of what the survey hopes to achieve. The next key steps are:

- Design of the survey tool
- Sampling of the intended respondent pool from the target population.

Good design is crucial to the useability of the data that emerges.

### What kind of survey?

Most surveys for program evaluation are conducted just once in a short timeframe (sometimes this type is called cross-sectional), but there are some other forms of survey for specific purposes:

- Longitudinal: a survey of a single sample group across time (often used in long-term health and child development studies).
- Panel: a survey repeated over time, each time with a different sample from the same target population (Australia's monthly unemployment rate is estimated using a panel survey)
- Comparative: selecting more than one sample, generally with different characteristics, to compare with each other (often used in health research to compare a control group with a group receiving treatment. It could be used to compare myBMP growers with non-BMP)

### How to conduct the survey?

The relative advantages and disadvantages of some more common ways of conducting a survey are described in the following table.

Some considerations about how to conduct the survey include:

- Cost and resourcing (such as interviewer time and training, travel, phone calls, postage, web facility charges, venue hire, data entry and analysis)
- Interviewer availability
- Literacy levels and/or computer familiarity of the target population
- The balance of qualitative and quantitative data that is being sought
- Timeframe – how can we be most sure to get a good response rate from the target population in the time available?

- What is the best means to get the required response from the target population?
- Understanding that different people prefer to have input in different ways.

We may use a mix of techniques for conducting the survey to ensure that we can get the required response and types of information needed. For example, we have found it useful to pre-empt a telephone interview with a short fax-back (or email back) survey – using the survey for the quantitative questions and to prompt thinking in advance of a telephone interview to explore the more qualitative aspects of the evaluation. This helps to prepare the interviewee as well as providing some written responses which the interviewer can delve into further. The written component can be used to help schedule interview times.

**Scoping interviews:** If we are to use a structured survey tool it can be very helpful during the design stage to undertake a series of unstructured interviews to help identify the issues and the potential response categories. For example, we may use open-response questions for an ultimately closed-response question which is to appear in the final survey. The responses gathered from open, scoping questions can help to inform the selection of closed response options.

*Telephone surveys were chosen for this cotton grower survey as there is a short timeframe and we wanted to reduce the bias that arises from relying only on those people who choose to return a written survey. Because the data is to be used in an economic analysis the survey will need to gather largely quantitative data on adoption of practices / usage of Cotton CRC research.*

## Interviews

Interviews are a valuable method which can be conducted in several ways and for many different techniques and purposes.

The broad types are:

**Structured** – uniform wording and approach, questions asked as written, answers recorded exactly as given, equivalent to a written survey.

**Semi-structured** – uses an interview guide, builds discussion around an area of focus.

**Unstructured** – start on the topic of interest then let the informant lead. Used to help develop a formal interview or for sensitive issues or conflict.

**Convergent** – a series of interviews that are informed by the findings of the earlier interviews. e.g. may start with broad questions and then funnel in to more specific questions as findings emerge).

Interviews can be conducted in several different ways:

- Telephone
- Face to face
- Focus groups – generally using semi-structured interviews.

Interviewing may be chosen as a means of gathering response to a survey.

| Type of Survey | Advantages* | Disadvantages* | Managing these issues |
|---|---|---|---|
| **Telephone interview** | Allows discussion and clarification around both questions and responses<br>Costs are low compared with personal interviews (avoid travel and facility costs and less time requirement) | People are often wary of cold-callers and may screen unsolicited calls<br>The timing of calls may be interruptive; participants may be easily distracted, leading to interruption of the survey process<br>Survey length should be kept to a minimum<br>The use of visual cues needs to be planned (i.e. sending a hard copy of the survey before telephoning)<br>Potential for interviewer bias<br>It can be more difficult to build rapport with a person we cannot see, or to assess the level of sincerity in the answers<br>Long questions or those leading to a long response are generally inappropriate<br>Accessible population is reduced to those whose phone numbers we have/can access<br>Generally limited to simpler questions which people can readily answer without needing to search through records or think through their answer<br>Potential for interviewer bias | Letter of introduction from a respected organisation or person<br>Send survey questions or outline in advance<br>Using interviewers who are known and respected by the target population<br>Schedule interviews – e.g. ring or email in advance to set up an interview time |
| **Personal interview** | Very good response rates<br>Allows discussion and clarification around both questions and responses<br>Longer interviews tolerated<br>Allows the use of visual aids<br>Attitudes can also be gauged from body language and visual cues<br>Shows a high level of commitment to hearing the person's views<br>May be able to discuss some more sensitive issues or gather more information from records, etc | High costs compared to other survey types (time and travel costs)<br>Time consuming<br>Smaller sample size due to effort required to conduct interviews<br>Potential for additional sample bias due to being restricted to those people we can meet with<br>Potential for interviewer bias | Letter of introduction may encourage greater participation<br>Send survey questions in advance, particularly if they will need to review records or gather data before we come<br>Use a team of interviewers located in each region (recognising potential for bias)<br>Use personal interviews of key stakeholders to help design the survey tools |

| Type of Survey | Advantages* | Disadvantages* | Managing these issues |
|---|---|---|---|
| **Paper questionnaires (mail or fax back)** | Costs are low compared to telephone and personal interviews<br>Eliminates potential interviewer bias<br>Allows the use of visual aids (compared with a telephone interview)<br>Can be managed to allow respondents anonymity | Requires considerable effort in designing a questionnaire for easy interpretation and self-completion<br>Participant cannot get clarification of any question<br>Evaluator cannot get clarification of any answer<br>May result in biased group of respondents – the greater effort required may mean that only people with strong opinions reply.<br>Low response rate<br>Requires organising to allow sufficient response time<br>Requires respondents to be literate | Letter of introduction may encourage greater participation<br>Develop a questionnaire that is easy for the respondents to provide the information we need<br>Provide a stamped (or freepost), addressed envelop to encourage response<br>Provide both a post back, fax back or email back facility (depending on length)<br>Issue reminders from 1 week before the due date<br>Conduct scoping interviews first to help target and refine the design<br>Incentive to encourage response (e.g. prize draw, payment, provision of results) |
| **Electronic questionnaire (e.g. web based)** | Costs are low compared to telephone and personal interviews<br>Data entry is done for us<br>Results are immediately available for analysis, which can be monitored during progress of the survey<br>Can include more complex questions than in a telephone interview (e.g. scales and comparisons)<br>Allows the use of visual aids<br>Potential for respondents to remain anonymous<br>Eliminates potential interviewer bias<br>Analysis of responses may be simplified by associated software<br>For online surveys, responses are accessible for incomplete questionnaires, so a higher response rate can be achieved than for postal questionnaires | Requires considerable effort in designing a questionnaire for easy interpretation and self-completion<br>Participant cannot get clarification of any question<br>Evaluator cannot get clarification of any answer<br>Respondents are limited to those who have internet access or those for whom we have email contact details, and those who are reasonably computer literate – for extension issues this may be too much bias<br>Requires respondents to be literate<br>Completion rates may be low for lengthy or complex surveys<br>Time and cost of set-up may not be justified for a small sample group<br>Apparent ease of use of online survey tools make it easy to make mistakes in questionnaire design and analysis that result in invalid results | Free web survey tools are available (though may be limited in functionality)<br>Questionnaires can be created in MS Word or PDF using the forms functionality and emailed to participants<br>Use where the entire target population is known to be computer savvy or use as one means of gaining responses<br>Incentive to encourage response (e.g. prize draw, payment, provision of results)<br>Try to use for tick box answers rather than open text |

## Survey Questions

Refer back to the table or framework where we have mapped our key evaluation questions and subsidiary questions against the intended data sources. Draw from this the questions that need to be answered through the survey – and stay focussed.

Some considerations in design:

- **Respondent time** is precious – asking excessive questions may reduce response completion or accuracy of the latter questions. Stay focussed on information we need to allow us to answer the KEQs and avoid adding a lot of 'nice to know' but unnecessary questions that may lengthen the survey. Don't repeat questions that can be answered through another data source (unless we feel there is a need to repeat the question to 'test' or strengthen the existing data).
- **Ambiguity** in questions or response options need to be avoided or we may end up with meaningless data. Be careful to ask the right question and think about how someone else may interpret it. After drafting the questions try to think of potential ways they may be answered. Can the question be misunderstood? Peer review and pilot testing is particularly helpful for this. For example*, "Did you harvest last year?" may be answered "Yes" by two respondents, however respondent one harvested a cotton crop, while respondent two was contracted to harvest wheat from their neighbours' property.*
- **Multiple things in one question**: Asking multiple things in one question will confuse the interviewee and give responses that cannot be interpreted reliably. For example: *"Do you soil test and use it to plan your nutrition program?"* is not useful if we also want to know the % of growers who test soils, regardless of how they use the results.
- **Bias in wording**, which may influence the response. An example may be *"How did the research improve your management strategies?"* This question appears to lead to a positive response about the research, and it may be difficult for the respondent to provide the information they want.
- **Personal or potentially sensitive questions** may reduce survey response rates. Attempt to ask only those questions which will inform the evaluation. Be ready to provide an explanation of how personal or sensitive information will be handled (i.e. to provide background, but unidentifiable information).
- **Language**: The survey should be presented in language familiar to the survey group. Be careful with jargon – while there may be industry accepted acronyms, play it safe and spell them out (at least initially). The use of easily understood language goes a long way to ensuring survey participants do not feel alienated, and may improve the quality of responses.
- **Logical flow**: Try to create a logical flow to questions, beginning with those that are easily answered. Think of the questions the respondents most want to answer – and put them near the beginning of the questionnaire. Otherwise if people cannot easily where they can say what they really want to say – they'll include it in the answers to other questions. This makes the results difficult to interpret, and is particularly a problem with online questionnaires, where the respondent cannot see all the questions.

- **Assumptions**: Avoid assuming that people know about the program or product that we are evaluating. Also avoid having assumptions in the questions or interpretation of the responses. Are we asking about larger-scale changes to management or the implementation of small or discrete changes?
- **Branding**: In some cases people will know about the advice/practice/product being recommended but may not associate that with the source. Consider whether brand recognition and/or practice or product awareness are important to evaluate and ask questions appropriately. This can be particularly relevant for a CRC where there are multiple parties delivering the services and so the CRC may not necessarily be recognised as the source of the advice/practice/product in question.
- **Timeframe**: It may be important to include in our question a clarification of the timeframe/frequency of responses. e.g. "*What changes have you made to your planting techniques in the past 2 years"?*
- **Information in questions**: As questions become more involved it becomes appropriate to present information within the question or logical grouping of questions to provide some context and boundaries for the question, e.g. *"Between 2008 and 2010, Mary Smith from the Cotton CRC conducted training courses on planting techniques. Have you participated in these? If yes, what were your key learnings from this? ...."*

**Demographic questions** will be required to help determine the characteristics of the respondent. This will allow later analysis of data according to those segments of the population. So as to only ask the necessary questions, consider how we may wish to segment the respondents and also identify what information we can gather prior to the interview. Often these questions are asked at the start of the interview as they are easy to answer, show we are interested in the person as an individual and help to build rapport.

*Demographics relating to the cotton industry and research may include: Industry role (Grower vs Consultant vs industry body vs ginner, etc);Region; Dryland vs irrigated; Farm size; Area of cotton grown; Years in industry; Prior involvement with industry activities; Prior involvement with Cotton CRC activities (eg participation in training courses). Some of these characteristics may be identified from the industry list or training records.*

**Screening questions** are used to gain an indication of how relevant the question/s is to the respondent, and how relevant the respondent is to the target population. Some of the survey participants may be able to provide more relevant information than others. These questions help us to understand the context of the answers we receive. Screening questions can be used at the beginning and throughout our survey and may link with our demographic questions. If it is clear they are not within the target population, thank them for their time and move on.

*If we were evaluating the impact of Cotton CRC communication materials an initial screening question may ask "do you receive communications from the Cotton CRC?" If they replied no then we may probe further about specific communication products (in case they are unaware they are from the Cotton CRC). If they still answered no to all of those then we may ask a few questions to understand this sector that is non engaged with the CRC (e.g. where they do receive information) and leave it there. If they answered yes then we would continue with a more in-depth survey.*

### *Question types*

In the broadest sense, questions may be open or closed in nature.

**Closed questions**: In seeking quantitative data, it is often desirable to present closed questions, or those requiring a limited response. Yes/No questions can gather data which is easily recollected. However they need to be designed carefully to ensure that the responses are meaningful and without ambiguity.

**Open questions**: For information which may not be as easily recollected, or questions which may not seem easily interpreted, it may be advantageous to form our enquiry as an open-ended question or as part of a guided discussion. They may be appropriate where we do not want to bias/prompt the response by providing details or response options (e.g. we want to know what information products they can recall rather than prompt whether they know of a certain list of products).

Open ended questions are commonly used for qualitative research where we are seeking views, attitudes and insights. They can also be used for quantitative analysis by coding the responses received. In this case it is particularly important that all interviewers use a consistent style of questioning (e.g. all use a given sent of prompts or all use no prompts). In this case the open questions need to be written to ensure that the response will be within a defined parameter. e.g. *"What type of nitrogen products do you use? What machinery do you use?"* will elicit a more defined response than *"How do you apply nitrogen?"*

If a limited response question has not been worded specifically, the list of possible response choices can help to guide the respondent. Open-response questions need to be well structured and specifically aligned to the information we are trying to collect.

**Structured response formats** limit the way a respondent provides information. These surveys don't require the interviewers to have as much understanding of the issue and responses as do other survey types.

Some types and conventions in their use include:

- A checklist can be used to allow the respondent to select multiple items. Ensure that all alternatives are presented, that there aren't duplications within a response option and that the wording is unbiased. We may supplement a checklist with an open response 'Other' field. In an interview we may choose to read the response options or use them simply as a recording tool (unprompted). Either way is suitable but we will need to ensure that all interviewers use the same method for the same questions.
- On written and electronic questionnaires, the convention is to use a circle for each option when only one option can be selected, and to use a square when multiple options can be selected.
- Scale questions allow the respondent to indicate their level of agreement or feeling on a subject. Scales may take a number of forms as described in the table below.
- If using a 1-5 type scale, there is no standard convention as to whether we put the strongly favourable to the smallest value or the highest. Whichever approach we choose, it is useful to be consistent.
  As a guide, we suggest to present these scales with the least favourable / least in agreement response being at the top or the left hand side. If we are using numbers assign the unfavourable / least agreement view to the lowest number.

For example:

1. = strongly disagree
2. = somewhat disagree
3. = undecided
4. = somewhat agree
5. = strongly agree

- For some questions it will be important to include a 'Not Applicable' option, which may be assigned to a zero value. If the question is not applicable to all respondents and they are forced to choose a response within the scale then we will have dubious results. For example, a question about furrow irrigation being asked of all cotton growers should have a N/A option as otherwise dryland farmers or irrigators who use other application methods are being forced to provide a view on something that is not relevant to them and thus clouding the results.

**Multiple item or matrix questions** (also called Likert scales) are often used in written or web surveys as they allow us to ask several questions at once. Response options are often based on an interval scale.

*Please indicate how you were able to:*

| | I found it very easy | I had a few problems | I found it difficult | I was unable |
|---|---|---|---|---|
| *Access the Cotton CRC website* | ☒ | ☐ | ☐ | ☐ |
| *Understand the Cotton CRC research* | ☒ | ☐ | ☐ | ☐ |
| *Implement the Cotton CRC research* | ☐ | ☐ | ☒ | ☐ |

Presenting a number of questions in this format allows us to see the response for each item as well as the relationship between responses for each of the questions within the set.

*In the above example, analysis may find that although a respondent found it very easy to access the website and understand the research, the research itself was difficult to implement. We could say from this information that implementation of the Cotton CRC research in this case was not related to initial access to or understanding of the research. Had we simply asked whether the respondent had found it easy to implement the research there would be no indication as to why the respondent had found implementation difficult. Using program logic in planning our evaluation can help clarify these causal linkages, for further exploration in our survey.*

***Ask the right question to get the right reply!***

**Response scales** There are a number of response scales that can be used as described in this table. Understanding the technical terms is not necessary. Each of these broad categories of survey question types has a number of different formats. They are differentiated by the type of data generated by the question. The type of data generated by the survey question constrains the type of analysis we can perform.

| Question type | Dichotomous or binary | Open-ended numerical | 1 – 5 scale, etc | Forced ranking | Ordinal scale | Select all that apply (Multiple Choice) | Open-ended comments |
|---|---|---|---|---|---|---|---|
| **Data type** | Dichotomous – questions which may be answered by choosing one of two categories e.g. Yes/No Female/Male | Ratio - ask some physical measure, such as income, years of education, or how long their phone call was on hold. | Interval – similar to ratios. Values are assigned to categories, the distance between which are the same (from first to second, second to third etc) | Ordinal - rank in order all options (e.g. if 5 options give a 5 to the answer most preferred, a 4 to the next best, etc) | Ordinal - values are assigned to ranked categories. The distance between categories has no value. E.g. Years, number of pickers. | Nominal or categorical - values are assigned to categories which cannot be ranked | Text - which may be later coded. |
| **Analysis** | Average, tally | Multiply, divide …and | Average, add, subtract …and | Cumulative frequency distribution …and Can't average | Cumulative frequency distribution …and Can't average | Frequency distribution Not for averages | Response tally |
| **Example** | *Have you accessed the Cotton CRC website?*<br>o *Yes*<br>o *No*<br><br>*How long have you been involved in the cotton industry?*<br>o *Less than 5 years*<br>o *5 or more years* | *How much has it cost you to implement the Cotton CRC research?* | *On a scale of 1 – 5 (with 1 being not at all satisfied and 5 being extremely satisfied and 5 being), please indicate your level of satisfaction with the Cotton CRC's research publications.* | *Rank in order of preference the following (with 3 being most preferred and 1 least):*<br><br>☐ *Phone survey*<br>☐ *Web survey*<br>☐ *Mail survey* | *In which of the last five years did you first access Cotton CRC research?*<br><br>o *2007*<br>o *2008*<br>o *2009*<br>o *2010*<br>o *2011* | *Which of the following crops did you harvest on your farm last year?*<br><br>☐ *Cotton*<br>☐ *Cereals*<br>☐ *Pulses*<br>☐ *Other*<br>☐ *None of the above* | *What practices do you use to minimise nitrogen losses?* |

Adapted from Great Brook Consulting (2007)

## Review and Pilot test the Survey

Now we have designed the survey, how sure are we that our questions elicit the type of answers we are after? How confident are we that our interviewers understand what we are trying to achieve? What if the respondents can't answer the questions? What if the survey takes longer than we expected?

An important part of design is to review, pilot test and if needed refine the survey tool (i.e. questionnaire). We may also pilot test the data collection instrument (i.e. what we will use to input data, e.g. spreadsheet). Even with experienced survey design it is near impossible to pre-empt all the ways that someone may interpret a question. For most structured surveys we can't adapt the survey tool once we start – so pilot testing is important to allow us to ensure that the survey is being used and interpreted as expected, that it is clear and unambiguous and will gather the data required.

We may wish to use two steps for this final review:

- Have the draft survey reviewed by a peer group and/or the client/stakeholder to ensure that it will answer all the questions they required and is considered suitable.
- Pilot testing is then done using the final draft survey tool with a small sample of the target population before we go 'live' with the survey.

Piloting allows us to:

- Ensure that our questions are easily understood, presented in a logical order and ultimately provide the information we are seeking to attain.
- Identify questions to which almost all of the respondents answered in the same manner, meaning that the question may be redundant.
- Ensure that the response options are suitable.
- Identify questions within the survey which appear to make the respondents uncomfortable, or which are often skipped. Some thought may then be given to the value of the question (do we really need to ask it?) or to reforming the question or providing an explanation of why the question is important to us.
- See how long the survey takes to deliver.
- Assess whether the instructions to interviewers have been understood.
- Allow interviewers to become familiar with the survey requirements.
- Test the data collection and analysis design.
- Determine whether the information we are gathering addresses our aims.

***Who to pilot test with?***

Pilot testing may be done with people we are familiar with as they may be more willing to be 'guinea pigs' for us and give us useful feedback on the survey tool. Make sure that our testers are suitable examples of the type of people in the target population.

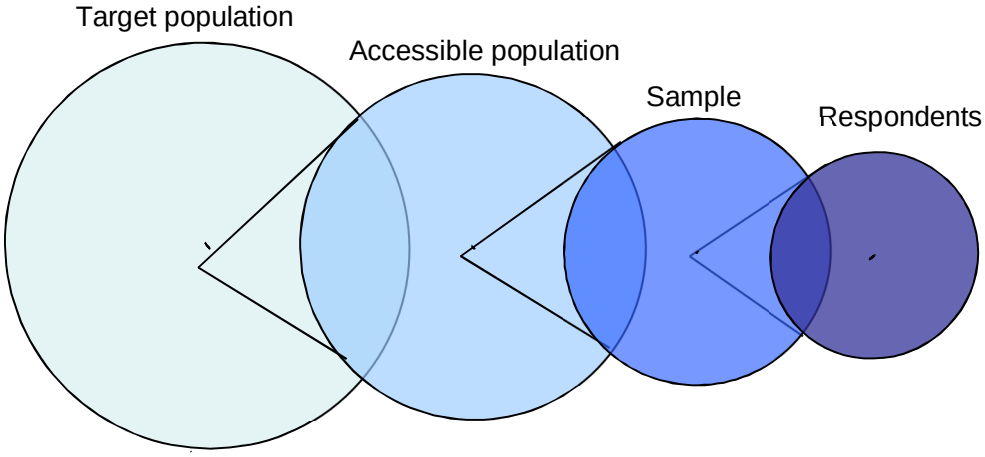
By this stage we should have determined the target population. A subsample can be selected to represent the target population and the segments within it. *If for example we determine that 80% of the target population are irrigated cotton growers, and the remaining 20% are dryland cotton growers (and that these proportions have some meaning for our survey), our pilot sample would be similarly represented.* Select people who will not be members of the final sample.

## Sampling Methods

Sampling technique and sample size will influence how we can interpret the results and the bias to be considered. For example to be able to confidently extrapolate findings from the sample group to the larger population will require an adequate sample size and a suitable, random sampling technique.

### Identifying a population and sample

To determine who to interview we need to first determine the target population for the specific survey and generally we will then need to draw a sample from this. The following diagram describes the terms used in this section.




Target population is the entire population of people who could provide the information we're seeking.

Accessible population refers to those people within the target population that can be accessed and surveyed.

Sample is the group from the accessible population from which we will attempt to gather the information.

Respondents are those people in the sample who do participate in the survey (some may not want to or can't be contacted). Respondents are those people who respond to all questions.

#### *Target population*

What types of people can we ask to get the best information for this evaluation? In selecting who we would like to provide us with information, we can determine which characteristics of the people are relevant to the survey being conducted (see demographics in previous section for examples).Those people who meet these criteria are referred to as the 'target population'. Look back to where we have identified the information needs to be gathered to help answer the key evaluation questions. This will help to shape criteria for determining the target population.

The purpose of determining the target population is to keep the survey focussed on the needs of the evaluation and to allow us to begin looking at how this population is characterised.

*If we were interested in understanding cotton growers' views about hosting trials for a specific Cotton CRC project then we would have a relatively small target population of those cotton growers who had hosted those trials. If we were interested in understanding the awareness of that research amongst cotton growers then our target population becomes all cotton growers, with the trial co-operators becoming a segment within that population that we would wish to identify.*

### *Accessible population*

It is likely that not everyone in the target population is able to be contacted to be surveyed. Practical considerations will influence who falls into the accessible population. For example, a telephone interview can only be conducted with someone who can be contacted via telephone.

Be aware of potential bias in the decisions around what defines 'accessible', and that the means of obtaining a contacts list may have inherent bias. For example, we may use a list of names and contact details provided by the client. Depending on how they have obtained and managed this list of names, it may be biased towards those people who are registered with them, automatically excluding people who have no engagement with them.

### *Sample population*

If we could survey the entire target population, their responses would give a very reliable answer to the question. This is not usually that simple. What if we couldn't identify all these people? What if some of them didn't want to give us information? What if we don't have enough time or resources to survey them all and manage all that data?

We can sample a manageable number of people from this population, and if they are selected carefully then they are likely to be sufficiently representative of the whole target population to collectively answer the question on behalf of the whole target population. So we need to know enough about the characteristics of the target population to select a representative sample.

Existing lists of people have often been compiled for a variety of reasons, and provide useful background information. Looking at this information we begin to get an idea of the characteristics of the sample that would be useful in representing the population.

*For the survey of usage and adoption of Cotton CRC research by growers it has been decided to focus on those people who have grown cotton in the previous 5 years (thus excluding those who have just re-entered the industry as seasons improved). The target population is everyone who has grown cotton at some time between 2006-2010 (inclusive).*

*The accessible population consists of those people whose names and phone numbers are on the industry list.*

*The sample consists of the part of the accessible population who have been selected using random or non-random sampling techniques.*

*Once the survey has been conducted we will have an idea of how many people participated overall, and to which questions they responded. These are the respondents, and it is from the responses of these people that we seek to measure the perspectives of the entire target population.*

## Defining the unit of sampling and unit of analysis

In all surveys, responses are provided by a person. But it is not always the person that is the actual unit of interest. The unit is likely to be one of:

- Business (may have multiple people and multiple properties)
- Property (may have multiple people)
- Person (one person may relate to multiple properties, multiple people may be selected from the same property).

Before the sample can be selected, we need to be clear on the unit of sampling and unit of analysis. These are not always the same.

The choice of the unit of sampling will influence the wording of questions, as well as the sample selection.

*If we want to know the proportion of hectares in a region managed in a certain way then the unit of analysis is the hectare, but the unit of sampling would be the property. In this case, it would be reasonable to stratify the sample by property size, and select the sample based on the total number of properties and the total hectares operated by these properties.*

## How do we select our sample?

Ideally, the people we determine as being accessible would be available in great numbers, and we would be able to choose how many we would like to make up our sample. Arriving at a number would be partly based on our resources and time and would help us to determine what kind of survey we design (when budgeting, remember to include background research, survey design, interviewer training, time, phone calls and facilities, data entry, analysis and reporting).

***The principles for selecting a sample that can represent the target population are that sufficient are selected to collectively represent the diversity of the whole target population, in similar proportions to minimise the risk of bias in the results.***

If some units (people or properties) of the target population have a higher probability of being selected, then this gives bias to the sample and the survey results cannot be seen as representative of the target population. Random selection is used to reduce bias of the sample, as all members of the target population have equal chance of selection. However, sometimes we need to gather information from whoever is available. With such non-random sampling we can't be confident that the information is representative of the entire population as individuals within the population would not have had an equal probability of being selected for the sample

There are a range of sampling and selection techniques that may be used. These are grouped broadly as either random or non-random. Some of the key sampling methods and related techniques are described in the following table.

Sampling may also be event based (using routine or special events as basis for sampling) or time based (sampling according to different days, weeks, periods). These are common in transport surveys where the unit of sampling is the trip.

## Sampling and selection techniques

| Random (or probability) sampling | | Non-random (or non-probability sampling) | |
|---|---|---|---|
| Each person in the accessible population has an equal probability of being selected for the sample group.<br>Used when we want to extrapolate findings to make conclusions about the whole population. | | Some members of the accessible population have more chance of being selected for the sample group than others.<br>It is not possible to know how representative the response of the sample is of the larger population. | |
| **Sampling method** | **Selection technique** | **Sampling method** | **Selection technique** |
| **Simple random sampling** | One of the easiest ways of generating a simple random sample is to allocate each person in the accessible population a number (in this case from 1-1,000). Use a random number generator (either in Excel or on the internet (e.g. Random.org)) to generate 200 random numbers between 1-1,000 and select those people in the accessible population with numbers corresponding to those generated. | **Convenience sampling** | Sample is made up of whoever is conveniently available |
| **Systematic sampling** | Selecting every nth case.<br>e.g. generate a random number between 1-10. If the result is 4, we would select every fourth person from the accessible population for the sample group.<br>This is only a random sampling method if the sequence of the list has no bias. A list of names in alphabetical order is likely to have bias, so must be first be randomised. This is easiest to do by allocating each record a random number and sorting by that number. | **Snowball sampling** | Building a sample progressively through informants. i.e. asking the people we interview to suggest other people to be interviewed |
| **Stratified sampling** | Enabling us to build a sample group where a number of subgroups are represented.<br>We would divide the accessible population into non-overlapping groups and randomly select from each of these to ensure that each sub-group is represented. | **Quota sampling** | Sampling to fill a quota, with the sample gathered over time, and collection for each group is completed when the quota is reached. Quota sampling always has more than 1 group.<br>Similar to stratified sampling; however predetermined numbers of people are selected from non-overlapping groups. People are not randomly selected, but selected to fill a quota (e.g. 200 females, 200 males). |
| **Cluster sampling** | Surveying whole clusters of a population sampled at random | **Dimensional sampling** | Multi-dimensional quota sampling |
| **Stage sampling** | Sampling from clusters sampled at random | **Purposive sampling** | Hand picking supposedly interesting or typical cases |

## Calculating the sample size

The purpose of a sample survey is to use the responses from a sub-set of the target population to estimate the responses from the entire target population. For this to work, the respondents, in aggregate, must be representative of the entire population. If there is very little variation in the population then a smaller sample is needed than if there is a lot of variation in the population. For a population with diverse characteristics that we want to understand, or that may have a diverse range of responses to the questions we're interested in, we need a larger sample size. i.e. if we assume that a larger sample includes more people from the population, it follows that the responses from a large random sample are more likely to include the diversity of the population and represent the views of this population.

If all the population held exactly the same information and perspective, a small sample size would be sufficient – but if that was true there would probably be no need for a survey.

There is a standard statistical formula to calculate sample size that takes into account:

- Size of the target population
- Estimated diversity of the population on key parameter
- Precision required in the result, usually expressed as ± a certain percentage (e.g. an estimated 147 growers ±5%) – greater precision requires a larger sample size
- Level of confidence required in the result (usually 95% confidence, or 99% for very important surveys).

A simple "percentage of population" approach is unlikely to give a statistically valid sample size.

For example, with a target population of 1000 (people, properties, or other unit), and requiring 95% confidence in the result:

- With a more diverse population, and requiring precision of ±5% in the result – 278 respondents would be needed
- With a less diverse population and requiring precision of ±10% in the result – 58 respondents would be needed.

The easiest way to calculate a valid sample size is through an online sample size calculator. One is provided by the Australian Bureau of Statistics as shown in Appendix B.

## Conducting the survey

Practical considerations will influence the logistics of how we conduct the survey and encourage response. Below are some things to consider.

**Duration of survey** How long will we allow responses to keep coming in? This needs to be specified at the outset of the written or web survey to indicate the 'last response date'. A period of 3-4 weeks is common. Interviews may be conducted over a similar timeframe – don't leave them all to the end as there are often difficulties contacting people.

**Letter of Introduction** It is a good idea to have a letter of introduction outlining why the survey is being done, how the results will be used and the types of questions contained. If suitable try to have the letter sent by the lead stakeholder or industry organisation. For web/mail surveys this could be attached to the survey. For interviews these would be mailed/emailed out a week prior to commencing interviews. Include contact details for queries.

**Scheduling interviews** If the survey is to be done by interview, ask the person to suggest a time when we can call or meet with them to talk through the survey. Be prepared if they want to do the survey straight away.

**Send questions in advance** It may be best to provide the survey in written form prior to an interview. This makes it easier to use checklist and multiple choice questions. It is particularly helpful if the respondent needs to look up information or data in advance. We may give the respondent an option to return all or part of the survey by mail, possibly instead of requiring an interview or using the interview to clarify any points. When we do this we could include an option for the person to nominate a time when they wish to be contacted.

### Interviewing

An interview is a discussion with a person whose views you are seeking. Whilst a structured interview is more confined it is still based on a discussion. A highly structured survey saves time and maximises the focus on evaluation requirements, a guided and conversational survey may decrease anxiety in respondents, encourage rapport and ultimately increase the quality of information gained. It is important to be flexible and tailor our interviewing techniques to the respondent while remaining focussed on achieving our data goals.

The beginning of the survey is our chance to set the tone of the survey as a whole and the importance of creating an appropriate first impression cannot be overlooked.

Be aware that you are imposing on the respondent's time and privacy. The preference for keeping telephone interviews short and to the point means a strongly focussed interview is most appropriate. If the discussion goes off track then tactfully bring it back to focus. Also be careful not to overly rush the discussion, forcing the respondent into hastily made responses.

Be aware that some issues may be sensitive to some respondents and can lead to them 'off-loading' or being quite distressed – be sensitive and handle this gently.

Using appropriate language (verbal and non-verbal), building trust and establishing rapport will help achieve meaningful responses – particularly important for unstructured interviews.

Interviewing within our area of knowledge enables you to build rapport with respondents; it may also induce a level of bias in our reporting or guidance of their responses. Interviewing outside of our knowledge area may confuse the respondent (e.g. not understanding what they say) - concentrate on listening and recording actual responses while guiding the respondent back to the question if necessary.

A final question like 'Is there anything else you'd like to say' shows respect for the respondents' views. At the end of the survey, thank the participant for their time and offer to provide them with a copy of the final results (if possible).

**Resourcing** Be sure that all of our interview team are available for the necessary time period. Consider our options if the surveys take more time than allocated.

**Encouraging response** In asking someone to participate in a survey we are asking them to contribute their time and information for the 'greater good'. Different things will motivate different people / groups to respond. For some it is about how the information will be used to benefit their industry/themselves. Prize draws or payments are commonly used for broader community surveys. For web/written surveys a reminder email can be helpful.

**Declined response** If someone declines participating in an interview, try to explain to them the purpose of the survey and ask if a later time would be better or if someone else from that farm would be more suitable to contact (suitable where farm is the population unit). If they really don't want to do it then don't force the issue.

**Preamble** Prepare a standard introductory preamble for all interviewers to use. Explain the purpose of the survey, how the results will be used, how the information will be handled (i.e. confidentiality), the population being interviewed (not names), what they will benefit and how long the survey will take.

**Interview team** Interviews are often conducted by a small team. It is important that all interviewees have a standard approach to introductions, asking the questions and using prompts and that they have a common understanding of what is sought from each question. Consider holding regular team meetings/teleconferences to check for consistency and clarify any emerging issues. Pilot interviews can help to establish a common understanding.

**Allocating interviews** Do we interview people we know or not? This really depends on the nature of the survey and what we are trying to achieve. Either way will have some influence on the results. Unstructured or semi-structured interviews are often more appropriate if we know the person. Keep track of who has conducted each interview so that potential biases in the data can be assessed.

**Data entry** How will we gather the findings from multiple interviewees? Excel spreadsheets and web based data entry forms can be used. For qualitative information it is important to gather the insights, which requires interviewees skilled in summarising conversations into key points and analysis that can gather the range of views without bias.

**Debrief** A debrief of interviewees at the end of a survey can be a useful way to gather insights arising that may not be so readily picked up from analysis of results. This is particularly valuable for qualitative or open ended questions. We may use someone independent of the process to facilitate the debrief. Focus on the purposes of the survey and the questions to delve into and compare the range of views presented.

# Analysis

Previous sections make mention of some of the design and sampling requirements to allow different types of analysis. Design and sampling will determine what analysis we are able to meaningfully do.

## Planning for analysis

The first step in survey analysis is to understand the questionnaire and the requirements of the survey – particularly the key evaluation questions and any specific information or measurement to be gathered. Deciding the analysis priorities depends on understanding the survey priorities.

Review the questionnaire in the context of the KEQs and any other expectations for the survey to determine which questions:

- Are most important?
- Are easy to analyse, and which require more interpretation?
- Are there to help understand the responses to other questions?
- Go together and should be analysed together?
- Identify subgroups to analyse separately?
- Are only relevant to some respondents?
- Should be analysed together with other data? (e.g. program data, census data etc)
- Can be analysed in what way (refer to the earlier table on response scales).

How will we gather the data and analyse it? Keep analysis in mind when designing the questionnaire and data handling tool. Data handling and analysis may be streamlined through design and coding in the data collection instrument.

For example:

- When analysing a checklist, code positive responses as 1 and no response as 0. This way, when it comes to determining the percentage of positive respondents it is simply a case of adding up the 1's and dividing them by the number of responses for that category.
- Responses from scaled questions can be coded as whole numbers (e.g. from 1 – 5, where there were 5 choices offered).

Analysis of single questions is generally quite simple. If we want to do comparison across multiple questions then more sophisticated analysis is needed. New versions of Excel allow multiple 'countifs', alternatively we may need to have responses input to a database.

## Deciding the outputs of analysis

Analysis can be an exploratory process – but needs some direction. The KEQs set out the purpose and priorities for analysis, but more specific direction can be set by defining with the end user what would be provided in the survey report (or evaluation report).

- Do end users have specific expectations of analysis outputs (tables, charts, sentences, data sets, etc)?
- Is a report required or purely a data set to feed into other analysis?
- What is the most meaningful way to communicate the type of information we have gathered?

Once the broad specification of outputs is agreed, then we can plan the analysis tasks, based on agreed priorities and outputs. Because analysis can be time consuming, this planning and prioritisation step is important to manage the workload.

## Analysing survey data

There are two main approaches to analysis of survey data:

- Analysis of the survey respondents only – so that we can say *"37% of respondents…"*
- Population expansion – estimating the values for the population based on the responses, with weighting to adjust the representativeness of the sample if required. With a suitable sample and correct analysis, we can say *"the survey found that approximately 35% of cotton growers…"*

### *Analysis of the survey respondents only*

Most survey analysis involves basic descriptive statistics. More sophisticated analysis can be conducted if needed, and if these skills are available.

Descriptive statistics include:

- Count and percentage of respondents giving each type of answer
- Comparison of subgroups of respondents giving each type of answer
- Average or total of responses (where suitable).

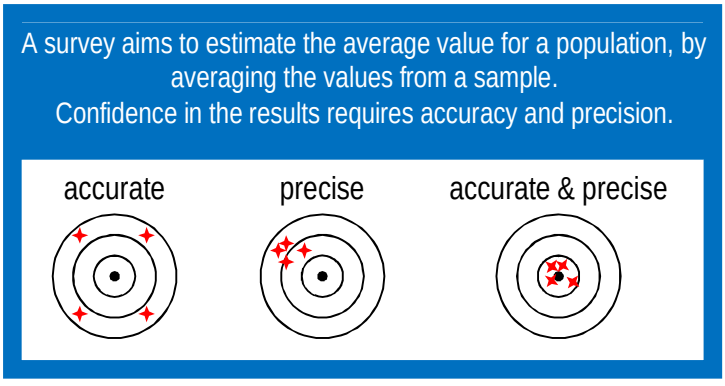
A common convention is that for surveys with a small number of respondents, counts rather than percentages are used with reference to the total number of respondents in the pool or in the segment. E.g. *"5 of the 20 growers surveyed indicated…."* or *"1 of the 5 Gwydir growers interviewed…"* This acknowledges the small respondent pool and limitations of the data.

### *Population expansion*

Responses from a properly collected and managed sample survey can be used to estimate the values for the target population. To test suitability of the set of respondents for this use, there are a few steps:

- Check whether the distribution of respondents across key parameters matches the target population (e.g. proportions in each region, property size, etc)
- Where the proportions are substantially different, seek to supplement part of the sample to enable representativeness
- Where the proportions are slightly different, but the sample diversity appears sufficient, then use weighting to adjust the representativeness of the respondents.

Weights are used when aggregating data to adjust the value for the subgroup by the weight for the appropriate group. Weighting allocates a proportional value to the responses of sub groups to balance the population values. For example, if our target population is fairly evenly divided between dryland and irrigated growers, but the proportion of our respondents is closer to 60/40, then weighting can be used to adjust the estimation.



To determine the weights, calculate:

- Proportion of the target population in each group
- Proportion of the respondents in each group
- Take the total number of respondents and work out how many would be in each group if the proportions were exactly the same as the target population (the 'ideal respondent proportion')
- Divide the number of people in the ideal respondent group by the number in the actual respondent group to calculate the weights.
- The table below provides an example.

| | Target population | | Respondents | | Ideal respondent proportion | | Weights | |
|---|---|---|---|---|---|---|---|---|
| Dryland | 850 | 47% | 111 | 56% | 94 | 47% | 0.85 | (94.4/111) |
| Irrigated | 950 | 53% | 89 | 45% | 106 | 53% | 1.19 | (105.6/89) |
| Total | 1800 | | 200 | | 200 | | | |

## Analysing text responses

Text responses can be summarised and synthesised qualitatively, and can also be coded and handled as categorical data. For this type of analysis, first read all the responses for a question and then identify themes and common messages. Once we have a list of thematic categories for responses to a question, we can then read through the responses again and record a code for each of the themes mentioned by the respondent.

When identifying themes across text responses, it is important to define a manageable number of thematic categories, so they have to be broad enough to include a range of related comments from respondents. Once we have interpreted all the text responses or a question, and coded then, then we can form tables to summarise the number of respondents mentioning each of the themes.

Direct quotes may be drawn from text responses to highlight a point in the report and help communicate views. Generally avoid putting names against quotes but we may use a general source reference (e.g. Grower, Gwydir). Quotes may be identified by a consistent formatting style (e.g. "centred and in italics").

*A response to a question on practice change may be "I read about the research on XXX and wanted to try it, but I couldn't really understand …., and when I rang the CRC to ask, no-one could tell me. But I thought I'd try anyway, and then the fertiliser salesman told me …., but then the flood came and I couldn't try it anyway."*

*In our analysis, we may consider that this response contains the following 5 themes:*

- *Willingness to try new practice*
- *Unclear advice from CRC*
- *Inconsistent advice from industry partners*
- *Influence of weather*
- *New practice not implemented.*

## Reporting and Appropriate Use of the Data

Respondents have entrusted information to us, with the expectation that it will be used and interpreted with care.

### Reporting

Survey findings may be collated as a data set to feed into a broader analysis, or reported in their own right.

An evaluation report commonly includes:

- The purpose of the evaluation
- The background *e.g. an overview of a program being evaluated*
- The process used for evaluation
- The context of the findings and the limitations of the data findings
- Recommendations.

The final availability, distribution and confidentiality of the survey report will be determined by those commissioning the evaluation depending on the sensitivity and purpose. For example, survey findings may be kept confidential for 'in-house' use only, published in limited release or made publicly available. It is useful to determine the intended availability of the report before commencing the survey as this will dictate whether or not we are able to promise a copy of the report to the interviewees. If the full report is not made public then we may have agreement to provide a summary of key findings to the interviewees. The evaluation report is generally the property of the organisation that has commissioned the evaluation rather than the evaluator.

*The current survey of cotton growers is being undertaken to gather data on usage and adoption of Cotton CRC research outputs to feed into an economic analysis of the Cotton CRC. The survey findings will therefore be provided as a data set for use in that analysis and as otherwise considered appropriate by the Cotton CRC.*

### Appropriate use of data

Take care not to make claims on behalf of the target population unless we are confident that the sample, survey design and analysis was designed and conducted in a way that allows us to sustain any claim on behalf of that population. Instead, we can report on the findings from survey respondents. Equally, when commenting on the information from respondents, ensure that the interpretation and communication reflects the intent in which it was provided.

Unless people are happy to put their name to comments, data should be treated anonymously. Take care not to present data in a way that any individual can be identified. For example, do not display summary data disaggregated to such small groups that some contain less than 5 people or properties. In an industry or region where many people know each other, personal identification can be easy for respondents, even if not apparent to the data analyst.

## Glossary of terms

| | |
|---|---|
| Confidence interval | The range of the estimated value for a population, based on the sample – usually expressed as ± a certain percentage. For example, an estimated value of 150 properties ± 5% would mean that the true value is between 142.5 and 157.5 |
| Confidence level | Level of confidence that the survey result within the required confidence interval – it is usual to design surveys for a 95% confidence level |
| Population expansion | Statistical method to estimate the proportions of the target population based on the answers of the respondents, so that we can legitimately say "40% of cotton growers" have taken up a certain practice |
| Qualitative | Interpretive or descriptive information based on opinions, perceptions, feelings and beliefs § |
| Quantitative | Information based on numerical data § |
| Questionnaire | The set of questions used in a survey – including a self-completion questionnaire (online or paper), or an interview based on the set of questions |
| Respondent | Each instance of the unit of sampling that has responded |
| Respondent burden | The amount of effort for the respondent to participate in the survey – a combination of the time to answer the questions and the effort to find or work out the answers |
| Sample | A subset of the target population, selected for a survey, which should be selected to be representative of the target population |
| Survey | The collection of information about characteristics of interest from some, or all, units of a population using well-defined concepts, methods and procedures § |
| Triangulation | Use of multiple techniques to look at the issue from different angles, to confirm and test interpretations |
| Target population | The entire population of interest (based on the unit of sampling) |
| Unit of analysis | Unit by which responses are analysed (e.g. per hectare, per property, per person) |
| Unit of sampling | Unit from which sample is selected (e.g. selecting from all people working on cotton properties or all cotton properties?) |
| Weighting | Used in *population expansion* (estimating the proportion in the target population on the basis of the respondents), where the respondents are not sufficiently representative of the population. Weighting allocates a proportional value to the responses of sub groups to balance the population values. For example, if our target population is equally divided between dryland and irrigated growers, but our respondents are 60/40, then weighting can be used to adjust the estimation |
| § Indicates definitions from the National Statistical Services Handbook http://nss.gov.au/nss/home.NSF/pages/NSS+Handbook | |

# Appendix A Program Logic – Regional NRM example

| | Outcomes | Definitions | *Example* |
|---|---|---|---|
| Longer term goals ↑ | **Vision for NRM in the region** | Aspirational vision for the state of the catchment in 20-50 years.<br>Defined in regional strategies, used to guide planning and set a context | *Biodiversity conserved*<br>*Sufficient suitable habitat for specific species in place* |
| | **Improved state of the asset** | Condition of the resource is improved in line with regional targets | *X ha of native vegetation*<br>*Connected corridors link X% of native vegetation habitat* |
| | **Enhanced social state** | Land managers, organisations, communities, institutions and industries are better positioned (individually and collectively) to contribute to NRM in their everyday activities | *Farmers willing to manage native vegetation and working together to manage corridors and other NRM issues*<br>*Organisations promote benefits of native vegetation* |
| Intermediate outcomes ↑ | **Landscape or industry changes** | Aggregate of the enduring changes made across the region or industry | *Total ha of native vegetation re-established (and surviving)*<br>*Km of riparian corridors connected* |
| | **Practice change** | Ongoing changes in management practice of land managers, organisations, communities, institutions and industries that is carried out in addition to the projects | *Stock excluded as required*<br>*Further trees planted beyond project funds*<br>*Existing native vegetation managed for biodiversity* |
| | **Changes in capacity and willingness** | Changes in knowledge, attitude, norms, skills, aspirations, confidence, resource allocation, social networks and partnerships of land managers, organisations, communities, institutions and industries | *Active seeking of opportunities for management and establishment of native vegetation / habitat*<br>*Group formed and active* |
| Immediate outcomes | **Outputs - Biophysical** | Project deliverables – immediate biophysical results that are concrete and tangible | *No. trees planted*<br>*Ha fenced* |
| | **Outputs - Non-biophysical** | Immediate, non-biophysical result of activities, generally related to people's involvement, eg:<br>• Community plans agreed<br>• EOI responses received<br>• Participation in events<br>• Management agreements | *Revegetation plan agreed*<br>*No. of people involved with the tree planting and training exercise*<br>*Management agreement signed*<br>*Partnerships established* |
| Inputs ↑ ↑ | **Project activities** | Activities carried out directly by the project, eg by staff and project managers | *Media releases and communications*<br>*Revegetation plans developed*<br>*Trees and materials purchased*<br>*Training activity provided* |
| | **Foundational activities** | Activities that inform decisions about projects, e.g. regional NRM strategies, investment plans, research, data gathering, planning | *Mapping of areas of habitat and identification of potential corridors and gaps*<br>*Research to identify critical habitat needs* |
| **State Assumptions:** | | What assumptions underlie this logic? | *That training, communication and individual plans are the most effective way to stimulate this change* |

*Prepared by GHD Hassall for "Making Successful Investments in NRM Practice Change" project. Adapted from frameworks prepared by the Australian Government NRM Team, Clear Horizon and the University of Wisconsin*

# Appendix B Sample size calculator


The Australian Bureau of Statistics National Statistical Services provides an online sample size calculator. Available at: http://nss.gov.au/nss/home.nsf/pages/Sample+Size+Calculator+Description

The calculator allows us to calculate either the sample size needed to achieve a certain confidence in the results; or the confidence interval achievable from a certain sample size.

**Confidence level** – how confident do we want to be that the result we get is within the confidence interval specified? 95% is the usual level, or 99% for very important surveys.

**Population size** – how many are in the target population of the appropriate unit of sampling (properties, people, etc)? Estimate the population size if the real value is not known. If we leave it blank the calculator will assume a population of over 100,000.

**Proportion** – what proportion of the population do we expect will have the characteristic we're looking for (e.g. what proportion are research users). This indicates how diverse the population is. If we have no way to estimate this, leave it blank and the calculator will use 0.5 to give the largest appropriate sample size.

**Confidence interval (+/-)** – the precision of the answer, usually expressed as ± a certain percentage (e.g. an estimated 147 growers ±5%). For a more precise result, the sample size must be larger. A confidence interval of .05 or .1 is usual (±5% or ±10%, depending on the importance of the result). Upper and lower values will be shown after we enter the proportion.

Standard error & Relative standard error (RSE) – leave these blank for sample size calculations.

**Figure 1 NSS sample size calculator**

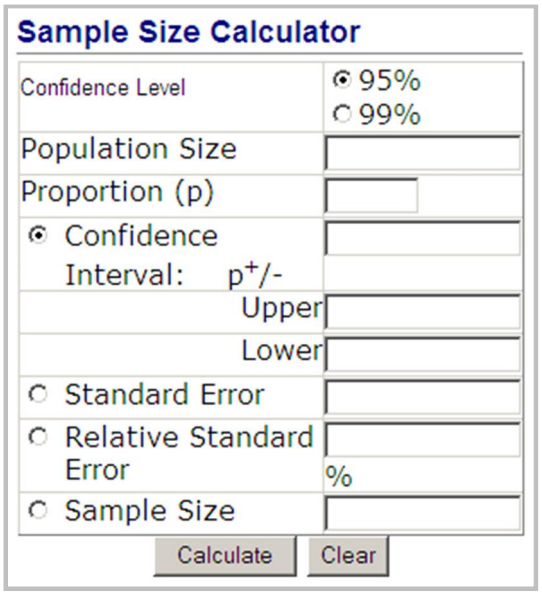



**Table 1 Some examples of a sample size prepared using the calculator**

| | | | |
|---|---|---|---|
| Confidence level | 95% | 95% | 95% |
| Population size | 1000 | 1000 | 1000 |
| Proportion | 0.5 (50%) | 0.8 (80%) | 0.8 (80%) |
| Confidence interval | 0.05 (±5%) | 0.05 (±5%) | 0.1 (±10%) |
| | | | |
| Sample size required | 278 | 198 | 58 |

**Table 2 Some examples of a confidence interval calculated using the calculator (based on a target sample size)**

| | | | |
|---|---|---|---|
| Confidence level | 95% | 95% | 95% |
| Population size | 1000 | 1000 | 1000 |
| Proportion | 0.5 (50%) | 0.8 (80%) | 0.8 (80%) |
| Sample size used | 300 | 100 | 50 |
| | | | |
| Confidence interval | 0.047 (±4.7%) | 0.75 (±7.5%) | 0.11 (±11%) |

## References and Further Reading


Australian Bureau of Statistics 'Online Sample Size Calculator'. *National Statistical Services* http://nss.gov.au/nss/home.nsf/pages/Sample+Size+Calculator+Description

*Action Research Resources* [a collection of papers by Bob Dick et al] http://www.scu.edu.au/schools/gcm/ar/arp/arphome.html

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CLIENTS | PEOPLE | PERFORMANCE

Cotton CRC

# EVALUATION & SURVEYS

Ingrid Roth & Keryn Hassall

CLIENTS | PEOPLE | PERFORMANCE

## Purposes of training session and workshops

- *To build the D&D team's skills in evaluation with a particular focus on quantitative analysis, survey design and sampling.*
- *To prepare, test and refine an agreed survey tool for a survey of cotton growers' usage and adoption of Cotton CRC research – which will feed into the Impact Assessment*
- *For target leads to have a key involvement in determining questions*

CLIENTS | PEOPLE | PERFORMANCE

# Agenda for Training Session

| | |
|---|---|
| 1:30pm | Why evaluate? Why is this grower survey needed and how will it be used? *Janine Powell*<br>Determining Evaluation Purpose & Scope |
| 1:45 | Developing Key Evaluation Questions |
| 1:50 | Select methods |
| 2 pm | Design tools |
| 2:10 | Sampling Methods |
| 2:20 | Interview techniques |
| 2:30 | Analysis & reporting<br>Appropriate use and context of the results, understanding of data limitations |
| 2:40 | Preparation for next session:<br>• Overview of how survey will be developed<br>• Role of target leads |
| | *Afternoon Tea* |
| 3 –7pm | Impact Assessment Group meeting – Key evaluation questions |

CLIENTS | PEOPLE | PERFORMANCE

| | |
|---|---|
| Determine Evaluation Purpose & Scope | •Why is the evaluation being done? How will the results be used? By who?<br>•What are the boundaries? What resources are available? |
| Develop Key Evaluation Questions | •What questions do you need to answer at the end of this process? |
| Select the Evaluation Method/s | •How will you gather the information you need? What type of information is needed?<br>•What information is already available? What method or mix of methods is most suitable? |
| Design Tools | • Surveys: What type? How to conduct?<br>• What questions to ask to get the information you need? |
| Review and Pilot Test | •Will the survey work as intended? * Are questions interpreted as planned?<br>•Will it meet expectations? * Peer review<br>•Pilot test with a small pool of the sample population |
| Sampling | •Who can provide this data? What type of person? Where? How many responses do you need?<br>•Sampling methods, unit of sampling, sample size<br>•Target population, accessible population, sample, respondents |
| Conduct Survey | •Making it work - introductions, distribution, preparation, interview team, encouraging reponse, data entry |
| Analysis | •How will you handle the data provided? * Can coding the the data collection intrument help?<br>•How will you analyse the findings? |
| Reporting and Use of Findings | •How will you communicate the results? * What are the limitations of the data?<br>•Where can you reasonably extrapolate? * Who will the findings be made available to & how? |

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Determine Evaluation Purpose and Scope

## Determine Evaluation Purpose & Scope

Be really clear about this with all the key people involved

- Why is the evaluation being done?
- What are we needing to find out?
- How will the information be used?
- Who wants the evaluation? Should they be involved in planning?
- Is an external or internal evaluation suitable?
- What are the resources available?
- What is the broader context?

CLIENTS | PEOPLE | PERFORMANCE

Develop Key Evaluation Questions

## Develop Key Evaluation Questions

- What do you really need to know?
- Get these nailed down before you do the survey questions

- High level KEQ for this:
  - What impact has the Cotton CRC had to growers, catchment and communities?
  - Has it generated $1 billion in benefit?
- Next level KEQs are about the portfolio areas

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Select the Evaluation Method/s

## Select the Evaluation Method/s

Many options, may use a combination.

Choice depends on:

- The nature of the key evaluation questions
- Qualitative or quantitative data requirements
- The nature of the target population
- Available data and documentation
- Budget

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Design Tools

## Design the tools and data instruments

- Question design / survey instrument
- Data gathering tools

**Interviews**

Structured

Semi-structured

Unstructured

Convergent

Telephone
Face to face
Focus groups

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Review and Pilot Test

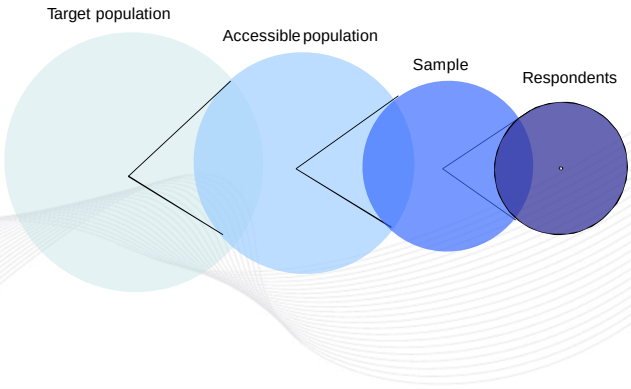
## Review and Pilot Test

- This is part of the design
- Before you launch out to do the whole survey, give it a go, see if it works

CLIENTS | PEOPLE | PERFORMANCE

Sampling

## Sampling



CLIENTS | PEOPLE | PERFORMANCE

- What is the unit of sampling? eg person or farm
- What segments do you want to consider?
- What variation is there in the population about the issues being surveyed? (this influences sample size)
- Random and non-random sampling

***The principles is to select enough that they collectively represent the diversity of the whole target population, in similar proportions to minimise the risk of bias in the results.***

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# Selecting a survey sample for the Cotton CRC

Goes with file: Sampling_CRC_CRDC_complete_grower_group.xls

## Steps in selecting a sample from a list

1. Define the target population
2. Review the list to be sure it is appropriate for the target population
3. Mark as excluded any record that is not in target population or not suitable to sample
   - We added a column 'Exclude' – with X for those to exclude
   - Excluded Burdekin, Bourke, and some who we knew had sold, etc
4. Allocate a random number to each record that is not excluded
5. Use the random number to select the required number of records.

## 2. Review the data (can use a pivot table)

| Count of Source ID | Exclude | |
|---|---|---|
| Cotton Region | X | (blank) |
| BOU | 5 | |
| BRI | 2 | 55 |
| BUR | 3 | |
| CQD | | 83 |
| DDO | 3 | 232 |
| GWY | 1 | 108 |
| LAM | | 23 |
| MAQ | | 111 |
| NAM | 5 | 156 |
| SGD | | 48 |
| UNA | | 93 |
| (blank) | 1 | 52 |
| Grand Total | 20 | 961 |

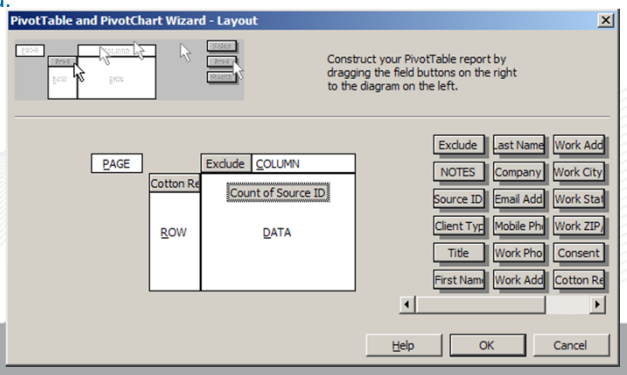
Pivot tables are a great Excel tool

- summarise
- cross-tabulate

Excel 2003: Data menu
Excel 2007/10: Insert menu

## Create the pivot table to summarise the data

- Region as the main dimension of interest (pivot table row)
- Exclusion is important (pivot table column)
- Count the SourceID field – every record has this ID, so every record gets counted.




## 3. Exclude records not in target population

| Exclude | NOTES |
|---|---|
| X | not grower |
| X | sold farm |
| X | CRDC board |

- We added a column 'Exclude' – with X for those to exclude, and noted why excluded

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## 4. Allocate a random number

| RandNum |
|---|
| 8133 |
| 1340 |
| 5892 |
| 3572 |
| 5160 |
| 81 |
| 7656 |
| 687 |
| 9667 |
| 2159 |
| 6509 |

=RANDBETWEEN(1,10000)

produces a random number, between 1 and 10,000

- Once you've copied the formula to all the rows that are not excluded, copy and paste as values (to avoid new random numbers being generated each time)
- Choosing a maximum much larger than the number of records reduces the chance of duplicate random numbers (which can sometimes complicate sampling).

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## 5. Use the random number to select records

- We want to select 300 from the population of 961
- An easy way is to sort the list by the random number (ascending or descending) and choose the first 300.
- This requires good hand-eye coordination and is fiddly with large data sets.
- An easier and more reliable way is to use formulas.

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## 5. Use the random number to select records

- Find the random number that is the 300th in sequence from either end
- You can use CountIf formulas, then test a few numbers until you get 300 as the answer

| | Number | Formula result | Formula |
|---|---|---|---|
| Number of records with random number < | 3195 | 300 | =COUNTIF(RandNum,"<"&C10)-COUNTBLANK(RandNum) |
| Number of records with random number > | 6800 | 300 | =COUNTIF(RandNum,">"&C11) |

- So, from this list, you'll have 300 if you select
  - all records with a random number < 3195
  - OR all records with a random number > 6800
- Or you can generate a new random number for each

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## 5. Use the random number to select records

- Add a column to flag if the record is selected in the sample
- Use a formula to determine if that record's random number is <3195 (but not blank)

  =AND(RandNum>0,RandNum<3195)
- Result is 'TRUE' if meets both criteria
- Review distribution across regions of records with 'TRUE'.
- Lachlan Murrumbidgee region is 2% of the population, but 2% of the sample is only 6 people – too much chance that we cannot get interviewees from 6 people.
- So drew a second sample looking for a higher %

## 5. Use the random number to select records

- Second attempt took the 300 largest random numbers on the list (or could have generated new random numbers).

  =RandNum>6800
- Result is 'TRUE' if meets this criterion.
- Review distribution across regions of records with 'TRUE'.
- Lachlan Murrumbidgee region is 2% of the population, but 4% of this sample – 11 people.
- All other regions suitable proportions, so this sample will be used.

## Summary of proportions

| | Region | Original list | Population | % of Pop | Selected for sample | % of sample |
|---|---|---|---|---|---|---|
| BUR | Burdekin | 3 | 0 | 0% | 0 | 0% |
| BOU | Bourke | 5 | 0 | 0% | 0 | 0% |
| CQD | Central Queensland | 83 | 83 | 9% | 28 | 9% |
| DDO | Darling Downs | 235 | 232 | 24% | 74 | 25% |
| SGD | St George Dirranbandi | 48 | 48 | 5% | 19 | 6% |
| BRI | Border Rivers | 57 | 55 | 6% | 17 | 6% |
| GWY | Gwydir | 109 | 108 | 11% | 26 | 9% |
| NAM | Lower Namoi | 161 | 156 | 16% | 43 | 14% |
| UNA | Upper Namoi | 93 | 93 | 10% | 33 | 11% |
| MAQ | Macquarie | 111 | 111 | 12% | 35 | 12% |
| LAM | Lachlan Murrumbidgee | 23 | 23 | 2% | 11 | 4% |
| | Region is blank | 53 | 52 | 5% | 14 | 5% |
| | TOTAL | 981 | 961 | 100% | 300 | 100% |

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## Using the selected list of people

- These 300 have been selected randomly from the larger list.
- Some will not be suitable (eg didn't grow cotton in past 5 years) or not available for interview.
- Aim is to have 160 completed interviews.
- Bias will be introduced if you choose the people from the sample that you contact first.
- So don't contact the nicest or nearest people first – contact them in the order of the random number.
- Try to contact people more than once – to avoid bias against people who are busy, out of range, etc

CLIENTS | PEOPLE | PERFORMANCE

Conduct Survey

## Conducting the Survey

- Duration of survey
- Letter of Introduction
- Scheduling interviews
- Send questions in advance
- Resourcing
- Encouraging response
- Declined response
- Preamble
- Language
- Sensitivities and how data will be handled
- Interview team
- Allocating interviews
- Data entry
- Debrief

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Analysis

## Analysis

- Open comments can be coded for analysis
- Data often presented as % of respondents or [X of N] respondents
  - use N if very small number in respondent population or segment
- If you want to say % of industry need to do population expansion – involves weighting if proportions in respondent population don't align with target population

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Reporting and Use of Findings

## Reporting

- Who will the report go to?
- Will it be public?
- Different formats?
- Confidentiality
- Appropriate use
- Evaluation report commonly includes:
  - The purpose of the evaluation
  - The background *e.g. an overview of a program being evaluated*
  - The process used for evaluation
  - The context of the findings and the limitations of the data findings
  - Recommendations.

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## Preparation for next session:

- Overview of how survey will be developed
  - KEQs to be agreed this afternoon
  - Survey questions to be developed in pairs tomorrow, collated, reviewed, tested
- Role of target leads
  - Be sure that you have clear KEQs – drive this discussion if needed
  - Work with a partner to develop the survey Qs for your section tomorrow
- Sample list
  - Review and remove anyone who didn't grow cotton at all between 2006-2010 (inclusive)
  - Remove duplicates per farm ie keep one name only per farm

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## Themes

- Pests
- Weeds
- Diseases
- Soils
- Nutrition
- Water
  - Farm
  - Catchment
- Delivery products

Appendix B

# Agenda for workshop and training session

# Usage & Impact of Cotton CRC Research

## Cotton Grower Survey

## Workshops 8 & 9 June 2011, CRDC Narrabri

**Background**

The Cotton CRC's Impact Evaluation work (led by Janine Powell) focuses on the areas of Crop Protection, Soils and Nutrition, Water and New Products. Lead authors are currently preparing the 'stories' of program inputs, outputs and outcomes, gathering all available data.

The economic assessment requires information on grower adoption of key practices and usage of research and delivery outputs, most of which is not known. A telephone survey of cotton growers is planned as the most appropriate means to gain this information in the necessary timeframe. Whilst GHD Hassall (Ingrid Roth & team) will lead the survey it was seen as a good opportunity for building evaluation capacity in the D&D team and also important to involve the D&D team in the process.

The workshops are a key element for training and survey design. We felt it was important for the target leads to be a part of the process of review of existing information and survey planning and therefore the workshops are timed around the planned meeting of the Impact Assessment team.

## Wednesday 8 June 1:30 pm Training session

**Lunch available** **1pm**

*Purposes:* *To build the D&D team's skills in evaluation with a particular focus on quantitative analysis and survey design.*

*To prepare the team for designing and undertaking this survey.*

Training notes will be circulated in advance. [NB: To allow the D&D team to leave on Thursday afternoon, the training session has been condensed and you will gain most value if you have read the notes beforehand.]

| | |
|---|---|
| 1:30 pm | Why evaluate? Why is this grower survey needed and how will it be used? *Janine Powell* |
| | Determining Evaluation Purpose & Scope |
| 1:45 | Developing Key Evaluation Questions |
| 1:50 | Qualitative & quantitative research methods |
| 2 pm | Sampling Methods |
| 2:10 | Survey Design |
| 2:20 | Interview techniques |
| 2:30 | Analysis & reporting |
| | Appropriate use and context of the results, understanding of data limitations |
| 2:40 | Preparation for next session:<br>• Overview of how survey will be developed<br>• Role of target leads |

**Afternoon Tea** **2:45 pm**

## Wednesday 8 June 3pm Impact Assessment Group meeting

*Purpose:* *To understand what data has been found and what data gaps remain*

*From this agree on the key evaluation questions for the grower adoption survey*

Chair: Janine Powell

| | | |
|---|---|---|
| 3 pm | Introduction and purpose | Janine Powell |
| 3:15 | Crop Protection : Weeds, pests, diseases | Ingrid Rencken |
| 4:15 | Soils | Guy Roth |
| 5 pm | Water: Production & Environmental | Guy Roth |
| 6 pm | New Products (mainly only delivery products) | Yvette Cunningham, Janine Powell |
| 6:30 | Collate and review key evaluation questions | Ingrid |
| 7 pm | Dinner at CRDC | |

For the purposes of the grower survey, target leads will be asked to play a key role in gaining agreement on the key evaluation questions for their topic area. *It would be helpful if the target leads could review the information/discussion with the authors for their topics before the meeting.*

## Thursday 9 June 8 am Survey design session

*Purpose:* *To prepare, test and refine an agreed survey tool*

*For D&D team to gain skills in survey design and sampling*

*For target leads to have a key involvement in determining questions*

| | |
|---|---|
| 8 am | Key Evaluation Questions: Finalisation & prioritisation |
| 8:30 | What are the indicator practices relating to each of these questions? |
| 9 am | Agree on question types to be used<br>Potential alignment with CCA questions *Tracey Leven* |
| 9:20 | Design introduction & demographic questions |
| 9:40 | Develop survey questions for one agreed topic area |
| *10:15* | *Morning tea / Question Review* |
| 10:30 | Develop survey questions:<br>Work in pairs with target leads to develop questions for each topic area |
| 11:15 | Review as a group and review by CRC/CRDC<br>*Janine Powell, Tracey Leven, Paula Jones*<br>Adapt as needed & collate |
| 12 pm | Practice interviews & refinement |
| *12:30 pm* | *Lunch* |
| 1 pm | Pilot testing – phone interviews of supportive growers who've been pre-arranged to have a pilot interview at this time<br>Adapt survey as required |
| 2 pm | Population sampling, Allocation of interviewees<br>Finalise next steps: Final review, Data entry, Timelines, Teleconferences |
| *3 pm* | *Afternoon Tea & Close* |

Appendix C

# Survey form and cover letter

Australian Cotton Research Institute
Locked Bag 1001
NARRABRI NSW 2390
Ph: 02 6799 1500
Fx: 02 6793 1171
www.cottoncrc.org.au

16 June 2011

Dear

The Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) is currently undertaking a phone survey to help us understand cotton growers' use and adoption of research and key farming practices. We would greatly appreciate your participation as the information will help to:

1. Direct future cotton industry research and extension efforts
2. Present a case for future Australian government investment in the Cotton CRC

The Cotton CRC winds up in June 2012. Since commencing operations in 2005 the Cotton CRC has invested over $70 million in cash and $124m in-kind in research for the benefit of the cotton industry, with $43.6 million of this funding being additional to that collected through grower levies. The Cotton CRC is currently applying through a competitive process to the Australian Government for a further 5 years of investment in cotton industry research.
The cotton grower survey is being independently conducted by Ingrid Roth and team at GHD together with the Cotton CRC's own development and delivery team. To ensure a non-biased response, a sample of cotton growers has been randomly selected for interview. I am writing to you to let you know you have been selected.

You will be contacted by one of this team in the next few weeks to arrange a time for a phone interview. The interview will take about 30 mins and will work through the questions listed in the attached survey. If you prefer to you can return your response by post.

All information gathered will be treated confidentially – your responses will be collated with others from across the industry and you will not be individually identified.

The information we collect from you about your farming practices and opinions will give us valuable understanding of current grower practices, information sources and use of research. It will also feed into an economic analysis of the impact of the current Cotton CRC. This is a vital part of the Cotton CRC understanding just how effective the investment by growers and the partners in the CRC has been,

As a small way of saying thanks for participating in the survey we are offering you a chance to **win a registration to the 2012 Australian Cotton Conference**.

Kind regards,

Philip Armytage
Chief Executive Officer
Cotton Catchment Communities CRC

# Cotton Grower Survey 2011

As part of evaluating and directing cotton industry research and extension, the Cotton Catchment Communities CRC (Cotton CRC) and CRDC are collecting information on cotton growers' farming practices and information sources. It is particularly focussed on the 2010-11 season.

This will give us an understanding of where to focus research as well as being fed into an economic analysis to help with presenting the case for future government investment in industry research through an extension to the current Cotton CRC.

In this survey we will firstly collect some information about your situation followed by your farming practices and how you make decisions about these practices. Your name has been included in a random sample of cotton growers selected for this survey.

Your information will be treated with confidence. The information will be for understanding overall industry practice and use of the Cotton CRC's research. Your name won't be identified in the responses.

You are likely to be contacted by telephone in the next few weeks by a member of the survey team to arrange a time for an interview to talk through this questionnaire. It will take about 20-30 minutes. While it's not essential, you may find it quicker if you can look through the questions beforehand, gather any necessary information and have the questions in front of you when we call.

If you prefer, you can return the survey by post by 12 July to Ingrid Roth,
PO Box 802 Narrabri 2390.

If you have any queries at all, please feel free to call or contact:

Ingrid Roth 02 6792 5330 or 0428 195 485
PO Box 802 Narrabri 2390
ingrid.roth@ghd.com

As a small way of saying thanks, we're offering to put survey respondents into a draw for a registration to attend next year's Cotton Conference.

Cotton Catchment Communities CRC

Australian Government
Cotton Research and Development Corporation

## 1. Is this survey relevant for you?

This survey refers specifically to practices you have used on cotton, particularly in the 2010-11 season.

If you are not the best person to talk to about this farm then please us know of a more suitable person to contact.

1. Did you harvest cotton in the 2010-11 season?

- o Yes
- o No, not planted
- o No, planted but not harvested

*If no,* thanks for your time but we're trying to focus on one season so we won't ask you to complete the survey. We are interested in your broader views:

1. a. Do you have any comments you'd like to make about cotton research?

1. b. Let's check that the contact details that the Cotton CRC have for you are right?

---

## 2. Your farm:

2. We want to be sure not to double up on any farms, what farm/s are you responding for? Farm name/s:_____

3. Prior to the season just gone, in how many of the previous 5 seasons did you grow cotton? *(i.e. 2005-06 onwards)*

0 1 2 3 4 5

4. Have you grown cotton before that time? Yes/No

5. How many years have you personally been involved in the cotton industry ?

Less than 1 year 1-4 5-9 10-14 15-19 more than 20 years

6. How many years since your farm business first started growing cotton?

Less than 1 year 1-4 5-9 10-14 15-19 more than 20 years

7. Can you tell me what is your:

_____Total farm ha (incl cropping, grazing, native veg)

_____Total cultivated ha (area developed for cropping, including fallows)

_____ Area of native vegetation (ha)

## 3. Your 2010-11 season

8. **For your Irrigated Cotton in the 2010/11 season (if any), what was your:**

_____Irrigated cotton Ha 2010-11

_____Average Irrigated Yield per ha 2010-11

_____Average Number of irrigations per field of cotton

_____ML applied for cotton

9. **For your Dryland Cotton in the 2010/11 season (if any), what was your:**

_____Dryland cotton Field Ha harvested

_____Dryland cotton Green ha harvested (ie solid plant equivalent)

_____Average dryland Yield per field hectare

_____ Dryland Cotton Field Ha planted but not harvested

Row configuration/s used? …….

10. What was your total rainfall in August-March? _____mm

11. Did you experience significant flooding of your cotton crop? Yes/No

12. Including yourself and family, how many full time equivalent employees did you employ year round? (ie excluding short term seasonal staff)

_____ This financial year (2010-11)?

_____ Last financial year (2009-10)?

*eg you may employ someone 2.5 days/ week or full time for half the year – this would be 0.5 Full time equivalent*

## 4. Information and advice

13. Who do you talk with to get information and advice about cotton growing?

14. If you use an agronomist or other consultant, what aspects of your farming business does this person/people advise you on?

15. Which websites do you use for information about cotton growing?

16. Which of these Cotton CRC Tools and information resources do you use?

- ☐ Cottontales
- ☐ Cotton CRC e newsletter
- ☐ *my*BMP
- ☐ CottASSIST
- ☐ NutriLOGIC
- ☐ Crop development tool
- ☐ Day degree calculator
- ☐ Aphid and mite loss tools
- ☐ Cotton CRC Weed identification tool
- ☐ Cotton CRC Pest identification tool
- ☐ CottonMap
- ☐ Cotton Pest management guide
- ☐ Australian cotton production manual
- ☐ COTTONpaks (eg WATERpak, NUTRIpak, etc)
- ☐ NRM Guides eg Birds on cotton farms, Fish on farms, etc

17. Are there any other printed or email information/news that you receive and use?

18. Have you done any training or educational courses that have been useful to you in your cotton production decisions? If yes, what?

19. Of all these people, resources and courses we've talked about, which two of would you say are your most important information sources?

1.
2.

20. When you are looking for information on aspects of cotton growing, do you generally find it easy or hard to find the information you want?

*Very Hard* *Hard* *Okay* *Easy* *Very Easy* *Not applicable*

21. What additional information would you like that you can't find?

## 5. Techniques for improvement in irrigation

*These questions are for irrigators only*

22. Do you irrigate cotton (even if you didn't in the past season)? Yes/No

23. Which of the following methods, if any, did you use for cotton irrigation scheduling last season?

- ☐ C probe
- ☐ Neutron probe
- ☐ Visual crop monitoring
- ☐ Weather forecasts
- ☐ Evapotranspiration (ET)
- ☐ Other. ……

24. For your furrow irrigation systems, if you have them, please tell me anything you have done in the last 5 years to optimise them

- ☐ Not relevant because changed to an alternate irrigation system
- ☐ Not relevant for any other reason ……

- ☐ Redesign field slope and length
- ☐ Maintenance of field slope
- ☐ Change in bed or row configuration or furrow shape
- ☐ Metering of siphons
- ☐ Taking soil characteristics into account in irrigation management
- ☐ Changing siphon flows/size
- ☐ Understanding uniformity distribution
- ☐ Irrimate / benchmarking
- ☐ Irrigation to deficits
- ☐ Other ……

25. Can you tell me of anything else you have done across the farm to improve your irrigation efficiency in the last 5 years (since 2006)?

26. Can you tell me what your approximate Water use efficiency was in bales/ML?

____ bales/ML

Does this calculation include rainfall? Yes/No

## 6. Water quality monitoring

*These two questions are for groundwater users only:*

27. Do you monitor the quality of your groundwater? If yes, how often?
    - o More than annually
    - o Annually
    - o Every few years
    - o Once
    - o Never
    - o Not groundwater user
    - o Other

28. What do you monitor for?

## 7. Weeds

The next question is about herbicide resistance which can be managed through things like rotating chemistry and using a range of IWM techniques such as (cultivation, chemistry, survivor control, prevent seed set) and monitoring.

29. How important do you believe herbicide resistance is to your cotton farm?
    - o Very important, key focus of my IWM strategy
    - o Important, actively manage to prevent herbicide resistance
    - o Important but not actively managed
    - o Not a priority
    - o Not aware of herbicide resistance

30. What changes have you made in weed management or seen in weed populations in the past 5 years?

## 8. Diseases

31. Do you do a survey or otherwise monitor for the presence, distribution and severity of diseases on your farm? (This may be done yourself or by your consultant or you may get the information for your farm from the industry disease survey if your farm is involved in that)

Yes / No

If yes, how often?

- o More than once a season
- o Once per season
- o Less than once per season

32. To prevent the entry and spread of weeds and diseases on your farm how regularly do you use the following strategies:

| | | | |
|---|---|---|---|
| Come clean – go clean | Never | Sometimes | Always |
| Washdown facilities | Never | Sometimes | Always |
| Control of weeds | Never | Sometimes | Always |
| Control of volunteer cotton | Never | Sometimes | Always |

## 9. Insects

33. How important would you say integrated pest management (IPM) principles are to your overall pest management program?
On scale of 1-10 where 1 is not important and 10 is very important

| *Not important* | | | | | | | | | *Very important* |
|---|---|---|---|---|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |

34. What practices or overall farm management do you use for IPM?

35. In a broad sense, what do you think are the economic benefits to you of conserving beneficial insects for cotton?

## 10. Agronomic practices for fibre quality

36. What, if anything, do you do to optimise fibre quality? This may include active consideration of fibre quality outcomes in other farm management decisions

## 11. Native Vegetation

37. Are there any areas of your farm that you have revegetated in the past 5 years?

Yes/No

If yes, How many ha_____?

38. Are there any other areas of native vegetation you have actively managed in the past 5 years? Yes/No

If yes, how many ha_____?

39. How long is the riparian area (i.e. river frontage) on your property?

____km (if any)

40. How much of this do you actively manage (eg revegetation, preserving native vegetation, bank stabilisation)? _____ km (if any)

## 12. Soils and Nutrition

41. Which of these factors did you use when calculating your fertiliser application rates for the 2010-11 cotton crop?

- ☐ Soil testing for nutrients
- ☐ Leaf/petiole testing
- ☐ Field history / crop rotations
- ☐ Target or expected yields
- ☐ Agronomist recommendation
- ☐ Fertiliser efficiency and losses
- ☐ Fertiliser prices
- ☐ Variable rates based on yield mapping
- ☐ Use of manures and/or composts
- ☐ Other (please list) ……

42. Please indicate your fertiliser use in cotton in 2010-11

| Fertiliser | 2010/11 season Irrigated | 2010/11 season Dryland |
|---|---|---|
| Preseason nitrogen – solid fertiliser (kg/n/ha) | | |
| Preseason nitrogen – gas fertiliser (kg/n/ha) | | |
| In season nitrogen – solid fertiliser (kg/n/ha) | | |
| In season nitrogen – gas fertiliser (kg/n/ha) | | |
| In season nitrogen – water applied fertiliser (kg/n/ha) | | |
| Preseason phosphorus – fertiliser (kg/p/ha) | | |
| In season phosphorus – fertiliser (kg/p/ha) | | |
| Preseason potassium – fertiliser (kg/k/ha) | | |
| In season potassium – fertiliser (kg/k/ha) | | |
| Zinc fertiliser (kg/zn/ha) | | |
| Sulphur (kg/s/ha) | | |
| Trace elements (identify) | | |

43. How have your cultivation practices changed across the farm in the past 5 years?
(ie across all rotations that include cotton)

- Increased (_____how many more operations / year)?
- Similar
- Decreased (_____how many less operations / year?)

## 13. Cotton research

44. How well do you feel that the cotton industry is serviced by research and extension? On a scale of 1 – 10 where 1 is very dissatisfied and 10 is very satisfied.

| *Very dissatisfied* | | | | | | | | | *Very satisfied* |
|---|---|---|---|---|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |

45. In critical times and emerging issues (such as mealy bug, whitefly, Cotton stainers, bunchy top, flooding) do you feel that that the research and extension sector responds quickly enough?
Again on a scale of 1-10, where 1 is not at all, 2 is far too slow and 10 is excellent.

| *Not at all* | *Far too slow* | | | | | | | | *Excellent* |
|---|---|---|---|---|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* |

46. Are there any other comments you would like to make about the Cotton CRC and industry research?

## 14. New growers and those re-entering the industry

This set of questions only for those people new to cotton this season or re-entering after a break of 5 years or more

47. Who or what influenced your decisions about whether or not to grow cotton?

48. Do you think you will grow cotton again?

Yes/maybe/No

Comment

49. Have you joined or do you intend to join the Cotton Growers Association?

Yes/No/Maybe

50. Have you joined any other grower / irrigator association? Yes/No

List……..

51. Any suggestions about what the research or industry more broadly can do to help growers new to or re-entering the industry?

## 15. Final queries

Thank you so very much for your time.

52. A summary of the findings will be available from the Cotton CRC. Would you like a copy of this to be sent to you by email?

Yes / No

53. Would you like to be entered in the draw to win a registration to next year's Cotton Conference?

Yes / No

54. Can we please check your contact details – these won't be reported with the results, they are just to be sure that information from the Cotton CRC and CRDC are reaching you:

Name

Postal Address

Email

Preferred contact phone number

55. Are you happy for your contact details to be kept on a shared list between Cotton CRC/CRDC and Cotton Australia?

Yes / No

56. Any further comments?

Appendix D

# Cotton Grower Survey 2011 Findings Report

# Cotton Grower Practices

## 2011 Survey

## A survey of selected cotton farming practices and grower views across the industry

## 2010-11 season


**GHD Hassall with the**

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Cotton Catchment Communities CRC

Australian Government
Cotton Research and Development Corporation

# Contents

# Table Index

# Figure Index

# Purpose

This survey of cotton growing practices on the 2010-11 season was undertaken for the Cotton Catchment Communities Cooperative Research Centre (Cotton CRC) and Cotton Research and Development Corporation (CRDC). It sought to establish the adoption of key farming practices by cotton growers to inform review of the impact and adoption of past research and future planning of research directions.

# Survey sample and response

The survey was posted to a sample of cotton growers randomly selected from the Cotton CRC/CRDC industry list and followed up by telephone. To make up for low response rates, this randomly selected group was further supplemented through direct contact with others growers known to the interviewers. There is an element of potential bias in using a list of growers who are registered with or known to the Cotton CRC/CRDC .

A total of 177 growers completed the survey, representing 137,978 ha (160,032 field ha – comprising of 45,410 dryland and 114,622 ha irrigated) of cotton production in 2010-11. This represents 20% of the target population of cotton growers (based on numbers on the industry list less those known to be duplicates per farm, not growers or not having grown in 2010-11). A further 93 of the 636 growers contacted did not grow cotton in the 2010-11 season – some of these had not grown cotton for several years and some indicated that they are unlikely to grow cotton again but some wished to stay on the industry list.

As some growers had multiple farms which differed sufficiently to justify a separate entry per farm, the survey results are based on a total number of 'respondents' of 183.

95 of the surveys were completed by telephone interview and 82 were returned by mail, fax or email.

Table 1 Total hectares surveyed, by region

| Region | Number of respondents* | Dryland (field ha) | Irrigated (ha) | Total Farm (ha) |
|---|---|---|---|---|
| Central Queensland | 14 | 1,679 | 4,832 | 15,260 |
| Darling Downs | 36 | 6,446 | 9,519 | 48,979 |
| Border Rivers (incl Mungindi) | 8 | 3,283 | 8,002 | 23,164 |
| St George / Dirranbandi | 16 | 404 | 30,483 | 190,154 |
| Gwydir | 22 | 15,794 | 15,340 | 117,195 |
| Lower Namoi (incl Walgett) | 40 | 16,098 | 25,343 | 168,467 |
| Upper Namoi | 11 | 1,631 | 2,811 | 21,952 |
| Macquarie | 16 | 75 | 4,241 | 64,598 |
| Bourke | 3 | 0 | 3,025 | 57,400 |
| Lachlan Murrumbidgee | 17 | 0 | 11,027 | 414,723 |
| **TOTAL** | **183** | **45,410** | **114,622** | **1,121,892** |

* The distribution by region is reasonably in balance with the relative numbers of growers in each region.

# Cotton Production

### *The 2010-11 cotton season*

Surveyed cotton farms harvested a total of 137,978 ha of cotton comprising 114,622 ha of irrigated cotton and 23,357 Green ha (45,410 field ha) of dryland cotton. Table 2 indicates for each region the average harvested hectares of dryland and irrigated cotton, yield and rainfall experienced in the 2010-11 season. Dryland cotton was planted double or single skip, solid and some other configurations such as '3m super singles' and 60 inch rows. A further 2,140 ha of dryland cotton was planted but not harvested (Table 3) as well as some irrigated cotton that did not make it to harvest.

Table 2 Irrigated and dryland areas, yield and rainfall of surveyed farms

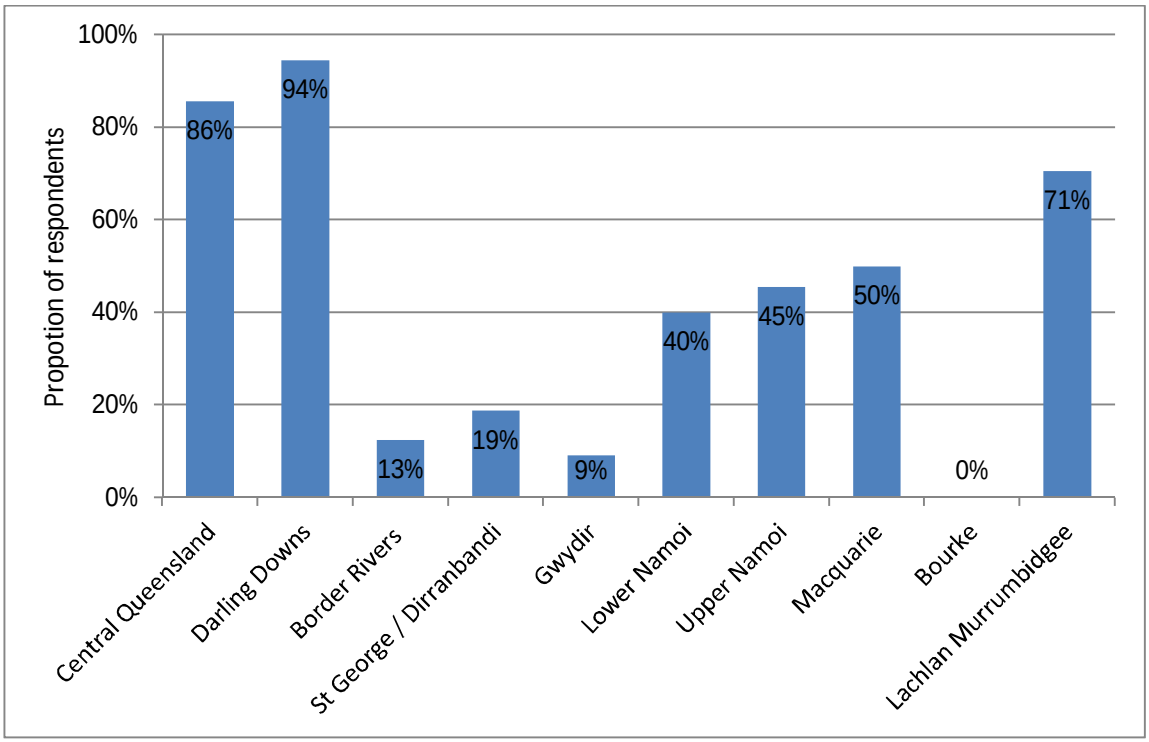
| Region | | Number of Farms | Avg Harvested hectares | Avg. Green hectares | Avg Yield (bales/ha) | Rainfall (mm) |
|---|---|---|---|---|---|---|
| Central Queensland | Dryland | 3 | 929 | 234 | 1.3 | 1227 |
| | Irrigated | 13 | 807 | | 6.1 | 982 |
| Darling Downs | Dryland | 26 | 560 | 148 | 2.8 | 937 |
| | Irrigated | 29 | 372 | | 6.7 | 948 |
| Border Rivers | Dryland | 2 | 75 | 1071 | 2.4 | 410 |
| | Irrigated | 8 | 283 | | 10.1 | 465 |
| St George / Dirranbandi | Dryland | 1 | 404 | 202 | 0.0 | 560 |
| | Irrigated | 16 | 1905 | | 11.3 | 395 |
| Gwydir | Dryland | 17 | 1006 | 466 | 2.1 | 418 |
| | Irrigated | 19 | 685 | | 9.8 | 503 |
| Lower Namoi | Dryland | 16 | 248 | 506 | 2.2 | 459 |
| | Irrigated | 37 | 328 | | 10.2 | 475 |
| Upper Namoi | Dryland | 8 | 0 | 128 | 3.0 | 563 |
| | Irrigated | 10 | 649 | | 8.8 | 557 |
| Macquarie | Dryland | 1 | 0 | 75 | 0.8 | N/A |
| | Irrigated | 15 | 1008 | | 9.1 | 461 |
| Bourke | Dryland | 0 | 1642 | 0 | | N/A |
| | Irrigated | 3 | 1000 | | 9.9 | 225 |
| Lachlan Murrumbidgee | Dryland | 0 | 204 | 0 | | N/A |
| | Irrigated | 17 | 281 | | 9.5 | 436 |
| ALL REGIONS | Dryland | **74** | **614** | **128** | **2.7** | **664** |
| | Irrigated | **167** | **686** | | **9.2** | **579** |

Table 3 Dryland areas planted but not harvested, by region

| Region | Dryland cotton planted but not harvested (ha) |
|---|---|
| Central Queensland | 1108 |
| Darling Downs | 578 |
| Border Rivers | 0 |
| St George / Dirranbandi | 404 |
| Gwydir | 0 |
| Lower Namoi | 30 |
| Upper Namoi | 20 |
| Macquarie | 0 |
| Bourke | 0 |
| Lachlan Murrumbidgee | 0 |
| **TOTAL** | **2140** |

Flooding occurred in a number of regions during the growing season (Figure 1). The actual proportion of farms experiencing flooding in Central Queensland may well have been higher as farms in Theodore were deliberately excluded from the survey as most had not been able to harvest a crop due to flooding.

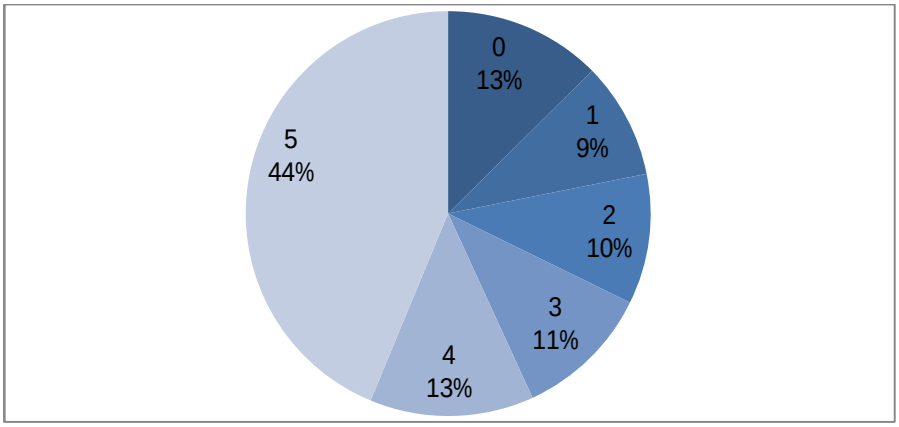
Figure 1 Proportion of farms in each region experiencing significant crop flooding



### *Recent seasons*

Despite the difficult conditions of recent years, almost half of all respondents who grew cotton last season (2010-11) had also grown cotton on their farms in each of the past 5 seasons (Figure 2). 13% were new to cotton growing or returning after a period of 5 years or more. Ten respondents grew cotton for the first time in 2010-11.

Figure 2 Number of seasons in which cotton has been grown on the farm in 5 years prior to 2010-11




[A further 93 growers contacted were not surveyed as they had not grown cotton last season.]

Few growers surveyed were new or recent recruits to cotton production with 91% having grown cotton prior to the 2005-06 season (Table 4). An exception is the relatively new cotton growing region of Lachlan Murrumbidgee where 47% had not grown cotton more than 6 seasons ago.

The long experience with cotton production that most respondents have may be indicative of the industry broadly. It is also likely influenced by the nature of the Cotton CRC/CRDC industry list used which may not include all newer growers. (The grower list for the Lachlan Murrumbidgee region was supplemented for the survey with additional names by James Hill).

Table 4 Proportion of growers in each region who grew cotton in the 5 years prior to 2010-11 (ie 2005-6 to 2009-10 inclusive) and prior

| Region | Number of years in which cotton was grown between 2005-6 to 2009-10* | | | | | | Cotton growing prior to that |
|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | |
| Central Queensland | 7% | 0% | 0% | 14% | 29% | 50% | 100% |
| Darling Downs | 3% | 14% | 11% | 11% | 11% | 50% | 97% |
| Border Rivers | 13% | 0% | 13% | 0% | 50% | 25% | 100% |
| St George / Dirranbandi | 6% | 13% | 6% | 6% | 19% | 50% | 100% |
| Gwydir | 5% | 5% | 18% | 14% | 5% | 55% | 95% |
| Lower Namoi | 5% | 8% | 13% | 18% | 10% | 48% | 98% |
| Upper Namoi | 36% | 0% | 0% | 9% | 9% | 45% | 73% |
| Macquarie | 31% | 19% | 13% | 6% | 6% | 25% | 81% |
| Bourke | 0% | 0% | 67% | 0% | 0% | 33% | 100% |
| Lachlan Murrumbidgee | 41% | 18% | 0% | 6% | 12% | 24% | 53% |
| **Totals** | **13%** | **9%** | **10%** | **11%** | **13%** | **44%** | **91%** |

*All of these survey respondents had grown cotton in 2010-11.

# People

## *Experience*

*Q5. How many years have you personally been involved in the cotton industry?*
*Q6. How many years since your farm business first started growing cotton?*

The cotton industry is made up of a high proportion of growers who have many years of experience in cotton production. Growers were asked about how long they personally had been involved in cotton production and how long the farm enterprise in which they worked had grown cotton. These were generally closely matched and showed that half of the respondents and farms have over 20 years' experience in cotton production (Figure 3) and three quarters have over 15 years experience.

On closer investigation of the regional distribution of individual experience (Figure 4) and farm enterprise experience (Figure 5) in cotton growing, it becomes evident that several of those farms new to cotton growing involve owners or managers who have previously grown cotton.

Figure 3 Years of experience of individual growers and farms

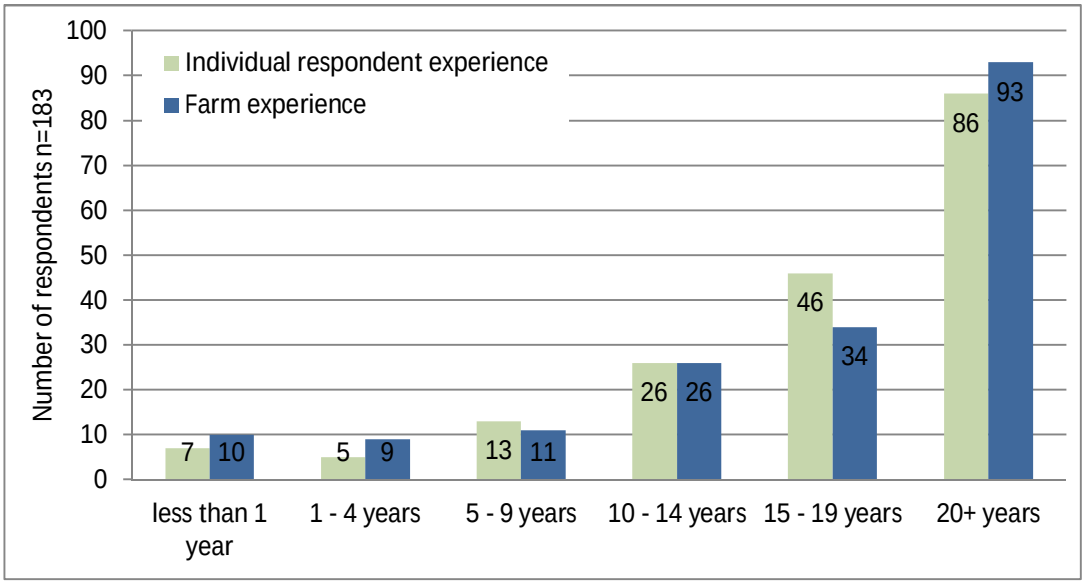


Figure 4 Years of individual grower experience in the cotton industry, by region

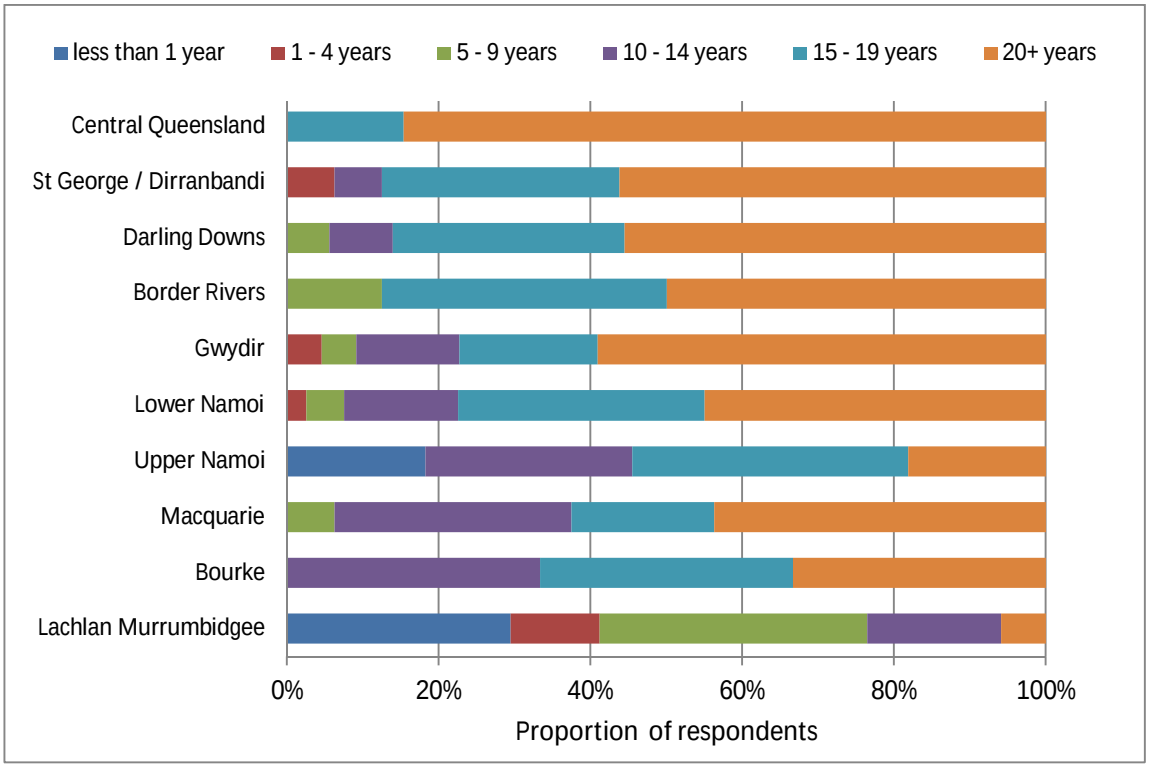
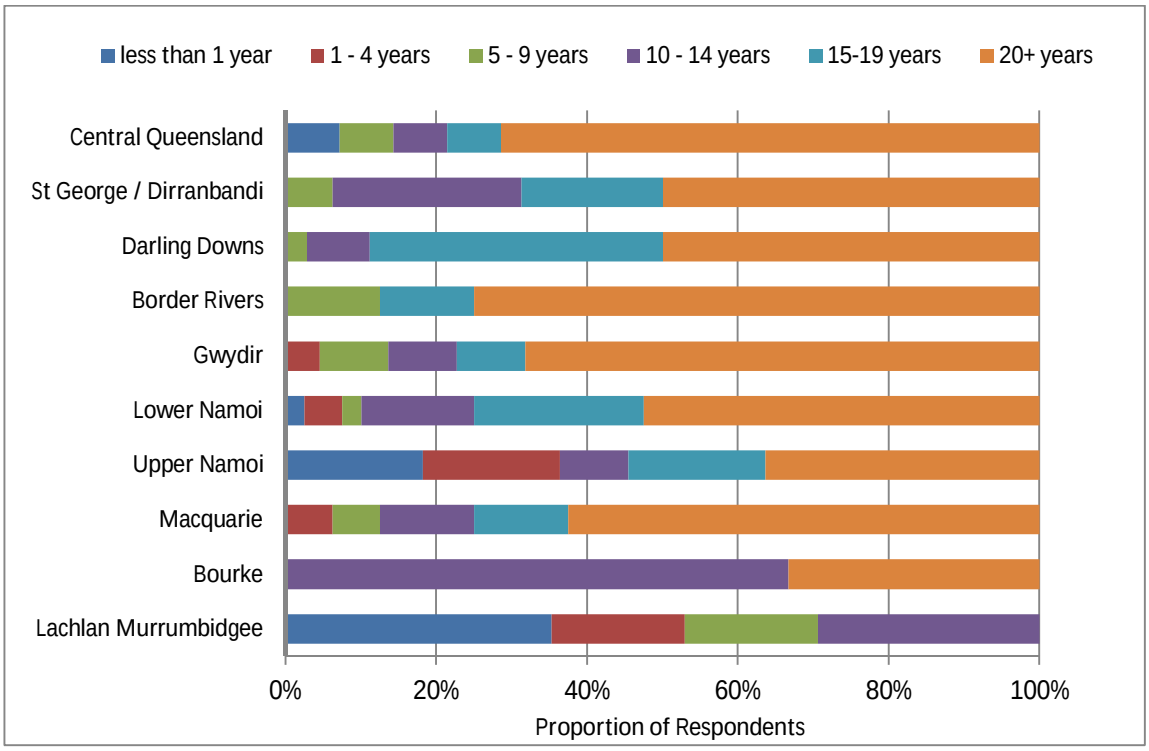



Figure 5 Years of experience in growing cotton for the farm enterprise, by region



### *Employment*

*Q 12. Including yourself and family, how many full time equivalent employees did you employ year round? (ie excluding short term seasonal staff) This financial year (2010-11); Last financial year (2009-10)*

There is very little existing data on employment in the cotton industry. Growers were asked the number of full time equivalent (FTE) staff employed year round on their farm, including themselves. It should be recognised that this is not a complete picture of farm employment as some farms will also employ seasonal staff, which will vary significantly depending on whether they self harvest or use harvesting contractors.

This information (Table 5) shows that employment on surveyed cotton farms has increased from the 2009-10 to the 2010-11 season.

Table 5 Average and range of full time employees on cotton farms per hectare

| Employees | FTE 2010-11 | FTE 2009-10 |
|---|---|---|
| Average FTE/farm | 4.01 | 3.47 |
| Average FTE (per 1000 farm hectares) | 0.65 | 0.57 |
| Average FTE (per 1000 ha cotton) | 4.59 | 3.96 |
| Range of FTE/farm | 0 – 45 | 0 - 35 |

# Land use mix on farms where cotton is grown

*Q 7. Can you tell me what is your:*
*_____ Total farm ha (incl cropping, grazing, native veg)*
*_____ Total cultivated ha (area developed for cropping, incl fallows)*
*_____ Area of native vegetation (ha) Undeveloped, may be occasionally grazed*

Cotton growing farms surveyed had on average approximately 40% of their total land area dedicated to cultivation (of which cotton accounted for approximately 1/3 of the area in 2010-11) with a similar proportion dedicated to native vegetation (Figure 6). The land use mix varies substantially between regions (Figure 7) and by farm with the proportion of the farm dedicated to cultivation ranging from 1.5% to 100%.

Figure 6 Land use mix on surveyed cotton growing farms

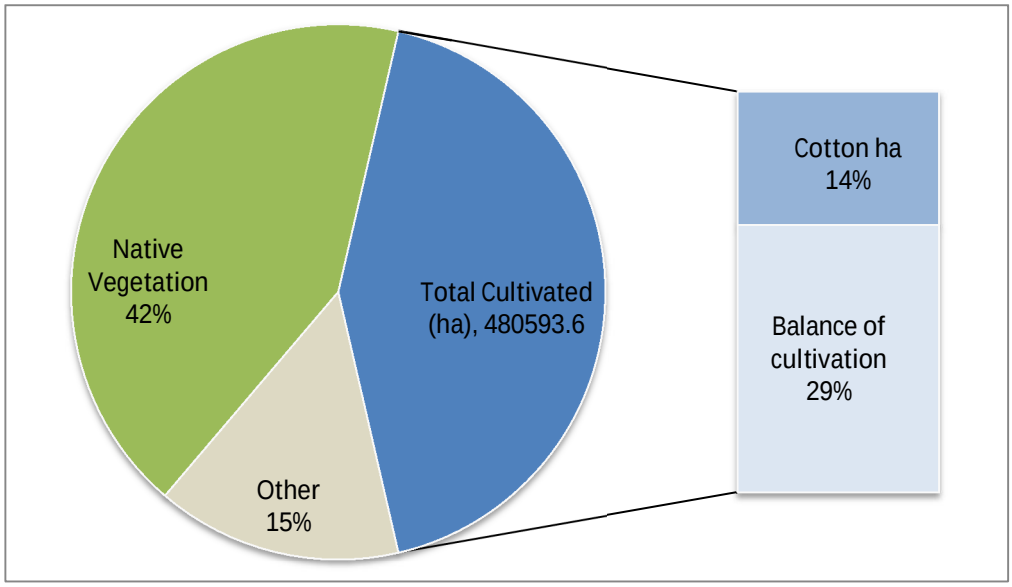
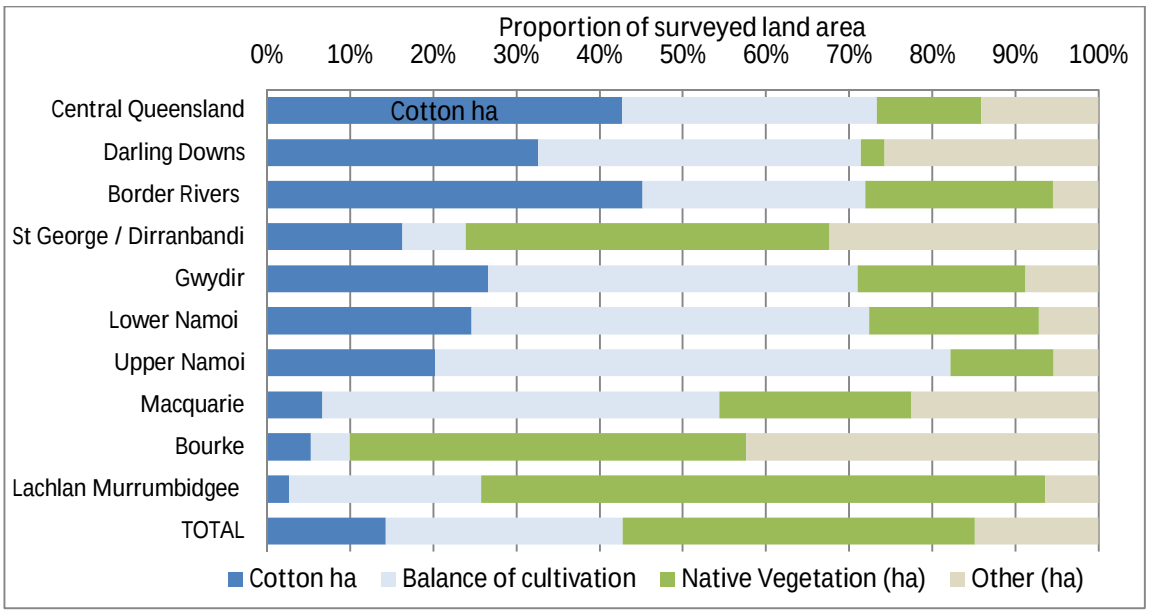



Figure 7 Average land use mix on surveyed cotton growing farms by region



# Native Vegetation and Riparian Zones

*Q37. Are there any areas of your farm that you have revegetated in the past 5 years? If yes, How many ha_____?*
*Q38. Are there any other areas of native vegetation you have actively managed in the past 5 years? How many ha_____?*
*Q39. Is there a creek or river running through your property? If yes, how long is the riparian area (i.e. river or creek frontage)? ____km (if any)*
*Q40. How much of this riparian area do you actively manage (eg revegetation, preserving native vegetation, bank stabilisation)? _____ km*

As illustrated in Figure 6, cotton growers have significant areas of native vegetation on their properties, particularly in the more western regions. Table 6 indicates the proportion of growers and total area that has been revegetated or actively managed in the past 5 years and the riparian zones.

Table 6 Revegetation and active management of native vegetation and riparian zones in past 5 years and length of riparian zone on surveyed farms

| | % Growers who revegetated | % Growers actively managing | Revegetated Area (Ha) | Area managed (Ha) | % Growers with riparian zone | Average (km) | Range (km) | Riparian zone actively managed (average km) |
|---|---|---|---|---|---|---|---|---|
| Central Queensland | 7% | 36% | 4 | 261 | 57% | 4 | 2 to 11 | 4 |
| St George / Dirranbandi | 6% | 50% | 20 | 47,846 | 63% | 16 | 0.2 to 60 | 20 |
| Darling Downs | 6% | 28% | 3 | 812 | 56% | 4 | 0.7 to 10 | 4 |
| Border Rivers | 50% | 38% | 1,107 | 900 | 75% | 8 | 2 to 20 | 6 |
| Gwydir | 23% | 59% | 561 | 6,003 | 77% | 14 | 3 to 44 | 6 |
| Lower Namoi | 13% | 38% | 838 | 17,546 | 60% | 8 | 0.5 to 30 | 9 |
| Upper Namoi | 27% | 45% | 224 | 1,233 | 73% | 6 | 2 to 10 | 4 |
| Macquarie | 13% | 31% | 120 | 3,380 | 69% | 10 | 3 to 20 | 6 |
| Bourke | 0% | 67% | 0 | 5,100 | 100% | 23 | 10 to 40 | |
| Lachlan Murrumbidgee | 29% | 41% | 145 | 13,242 | 53% | 7 | 2 to 15 | 7 |
| Totals | **15%** | **40%** | **3,021** | **96,323** | **63%** | **9** | **0.2 to 60** | **8** |

Table 7 Comments on native and riparian area management

| Comment |
| --- |
| No stock |
| River on the boundary is fenced |
| Management consisting of limiting livestock. |
| Feels he is denied access to manage problems in riparian areas such as control of introduced weed e.g. mother of millions and manmade issues such thick box regrowth giving bare understorey that create bare areas. (Poor outcome near stream) he would like to have the ability to more actively manage. |
| In the last 20 years, not in the last 5, the farm has managed native creek |
| Trees planted and stock removed from riparian area |
| Green vegie bugs a big pest in revegetated area |
| Put in pipes to minimise erosion in riparian area. Zone is up to 100 m wide off the river |
| Controlling stock in riparian area |
| Hillston creek areas are seasonal - in good condition but not actively managed. |
| Native vegetation is managed through grazing management. |
| Native vegetation area not stocked, but not fenced. Actively managed so not stocked (good revegetation) |
| May need to consider managing riparian area |
| Leasee of land, not property owner |
| No revegetation - because they won't do a swap |
| Since buying & removing all stock all river & creek bank are natural |
| Native vegetation are fenced off and not stocked |
| Would like to manage riparian area but not allowed to (protected species) |
| Some field without tree lines |
| Native vegetation is an area of native grass that the EPA monitors on their land |
| Riparian areas were allowed to return to native veg over 15 years ago. |
| Fenced and unstocked. |
| Two water courses - Gwydir, Corale Crk |
| Sprays riparian area for noxious weeds |
| Graze around river 1 in 8 years |
| Actively manage by having fenced off majority of river to stock. |
| Very conscious of native vegetation and have no issues. |
| Grazed, mechanical weed maintenance and encouraged. |
| No bank issues with vegetation to the waterline. |
| Are not on the river but do have 36 ha of Native veg along the boundary of the property and surrounding house. Don't graze this area has been fenced off as a natural area. |
| Native vegetation area fenced off and selectively grazed. |
| Native vegetation actively managed is primarily to regenerate summer grasses |
| Removed citrus trees and reduced irrigated cropping area due to water cuts - returning to native scrub |
| Control some weeds , control burn , avoid disrupting the area , avoid spray drift into the area |
| Removed stock to give country a break - seeing good regeneration of young trees |
| Natural state/uncleared riparian |
| Timber around cultivation areas |
| Fenced riparian zone (with CMA), stock intermittently |

# Information and advice on cotton growing

## *Sources of information and advice*

*Q13. Who do you talk with to get information and advice about cotton growing?*
*Q19. Of all these people, resources and courses we've talked about, which two of would you say are your most important information sources?*

Table 8 illustrates that the majority of growers seek advice from a consultant agronomist. In many cases this is the primary and most important source of information, as illustrated further in Table 9 which lists those sources identified as being the two most important sources of information and advice.

Table 8 Sources of information and advice

| Source of advice | # of Respondents (from a total of 183) |
|---|---|
| Consultant agronomist | 161 |
| Other growers (including family, neighbours, and staff) | 79 |
| CSD agronomist | 32 |
| Reseller agronomist | 28 |
| Extension officer | 21 |
| Researcher | 18 |
| Other consultant | 10 |
| Cotton Australia rep | 11 |
| Suppliers | 7 |
| Irrigation consultant | 2 |
| No-one | 2 |
| Other* | 18 |

* 'Other' responses consist largely of various industry organisations and bodies such as ACRI, DEEDI, DPI and CSIRO, and their related publications. This also included accounting, marketing and business representatives. 2 respondents listed field days, and 3 indicated 'all sources available'.

Table 9 Most important information sources for respondents

| Information Source identified as being one of the 2 most important | Number responses |
|---|---|
| Agronomist / consultant | 132 |
| Online tools | 25 |
| Other growers | 25 |
| CSD | 21 |
| Pest Management Guide | 16 |
| Own experience/family | 10 |
| CRC | 10 |
| Production Manual | 8 |
| Publications/other bodies | 8 |
| Field days | 6 |
| Internet | 5 |
| Weather/news | 5 |
| Education/courses | 4 |
| Research/DEEDI | 4 |
| Resellers/suppliers | 3 |
| James Hill | 2 |

*Q14. If you use an agronomist or other consultant or adviser, what aspect/s of your farming business does this person/people advise you on?*

Table 10 provides a summary of the aspects on which advice is sought on from consultants with insect management and nutrition being the most commonly mentioned.

Table 10 Aspects of farming advised on by consultants

| Choice | Response Total (n=183) |
|---|---|
| Insect management decision (sprays, etc) | 126 |
| Nutrition | 102 |
| Insect checking | 100 |
| Irrigation | 86 |
| Weeds | 83 |
| Rotations & crop selection (i.e. varieties) | 76 |
| Diseases | 66 |
| Soils | 49 |
| Plant mapping/fruit retention | 43 |
| Agronomy/general cotton growing advice^ | 29 |
| Farm mapping | 14 |
| Marketing | 12 |
| Everything^ | 10 |
| BMP | 9 |
| Crop management/growth control^ | 7 |
| Planting/harvesting date (timing)^ | 5 |
| Financial and business management | 4 |
| Human resource management | 0 |
| Other* | 8 |
| N/A (ie do not use a consultant) | 4 |

* Note that this table has been adjusted for 'other' responses that fit into these categories. Due to the large number of responses, the following categories marked ^ were added to the original list for coding of the 'other' responses. Other aspects that were mentioned by respondents include: Tillage methods; Field selection; Technologies; Farm productivity (i.e. sustainable practices, budgeting, etc.)

## *Websites*

*Q15. Which websites do you use for information about cotton growing?*

Many respondents did not identify any websites that they particularly used. Cotton Seed Distributors' (CSD) website was the most commonly mentioned followed by that of the Cotton CRC.

Table 11 Websites used by growers

| Website | Response Total |
|---|---|
| CSD Website | 55 |
| Cotton CRC website | 37 |
| Cotton Australia website | 21 |
| Weather sites | 14 |
| Google | 10 |
| CRDC | 5 |
| myBMP | 5 |
| Suppliers | 4 |
| Financial/market websites | 4 |
| CSIRO | 2 |
| Not specified | 8 |
| Other* | 10 |

* Other websites mentioned include: Ag Facts; AGGRo; Namoi Cotton; Pestgenie; QLD DPI website; Cotton International; Cottassist; Spraywise; Australian Crop Consultant Association.

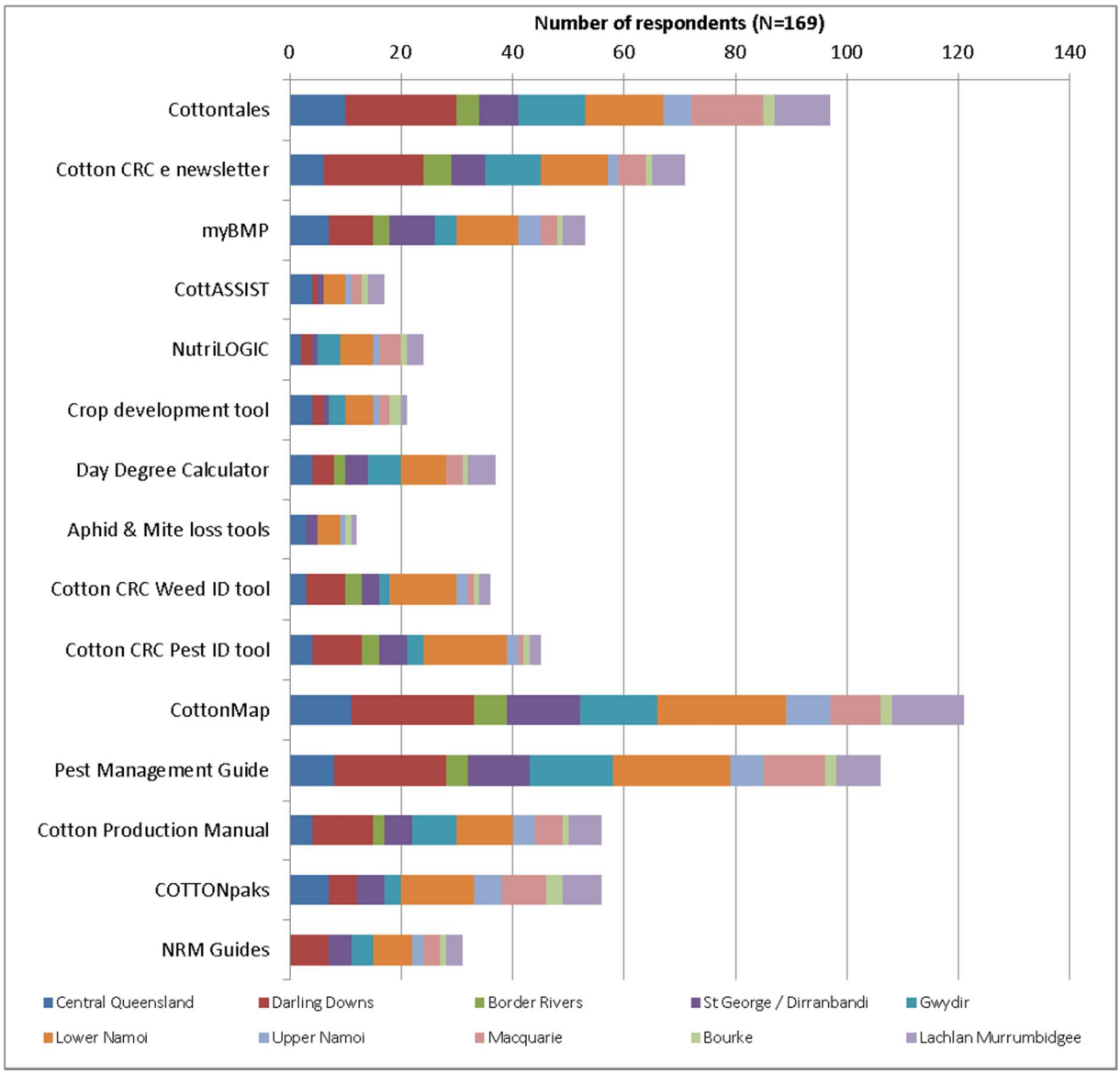
### *Cotton CRC tools and resources*

*Q16. Which of these Cotton CRC Tools and information resources do you use? [question was prompted with the list displayed in Figure 8]*

CottonMap and the Cotton Pest Management Guide were the most widely used of the Cotton CRC tools, followed by CottonTales. The lowest usage was of the CottASSIST suite of tools followed by *my*BMP. However, there is comment from a grower that whilst he does not use CottASSIST himself, these tools are valuable and help to inform the advice from his consultant.

More growers were somewhat hesitant in their indications of using the COTTONpaks, NRM guides and *my*BMP than for the other tools. Conversely, the positive responses were more definite in relation to use of CottASSIST, the Aphid and Mite loss tools and CottonMap.

Figure 8 Usage of CRC tools and other information resources used



### *Other information*

*Q17. Are there any other printed or email information/news that you receive and use?*

The most commonly mentioned other printed or email materials used for information about cotton growing are the Australian Cottongrower (Greenmount Press), CRDC's Spotlight newsletter and CSD information (Table 12).

Table 12 Other printed and email information/news used for information about cotton growing

| Resource | Number of respondents | % of respondents |
|---|---|---|
| Australian Cotton grower | 44 | 41% |
| Spotlight | 33 | 31% |
| CSD email newsletter, Web on Wed. | 23 | 21% |
| News from ginner/marketer | 15 | 14% |
| The Land/Country Life | 9 | 8% |
| Other cotton publications (CSD, CGS, cotton grain, etc.) | 8 | 7% |
| Cotton Australia email updates | 7 | 7% |
| Cotton outlook | 7 | 7% |
| Marketing info brochures | 4 | 4% |
| Supplier publications | 4 | 4% |
| Local area publications | 4 | 4% |
| Brochures from agronomist | 3 | 3% |
| Cotton logic | 2 | 2% |
| Weather updates | 2 | 2% |
| Prices, news, market reports etc. | 2 | 2% |
| [Total respondents for this question] | 107 | |

### *Training*

*Q18. Have you done any training or educational courses that have been useful to you in your cotton production decisions? If yes, what?*

Most growers did not identify any training or educational courses that they had done and found helpful for their cotton production decisions. The course most commonly mentioned was Chemcert (and similar) followed by insect management training (including several mentions of the IPM short course and other courses on insect checking) as presented in Table 13.

Table 13 Education and training courses undertaken and considered helpful by respondents

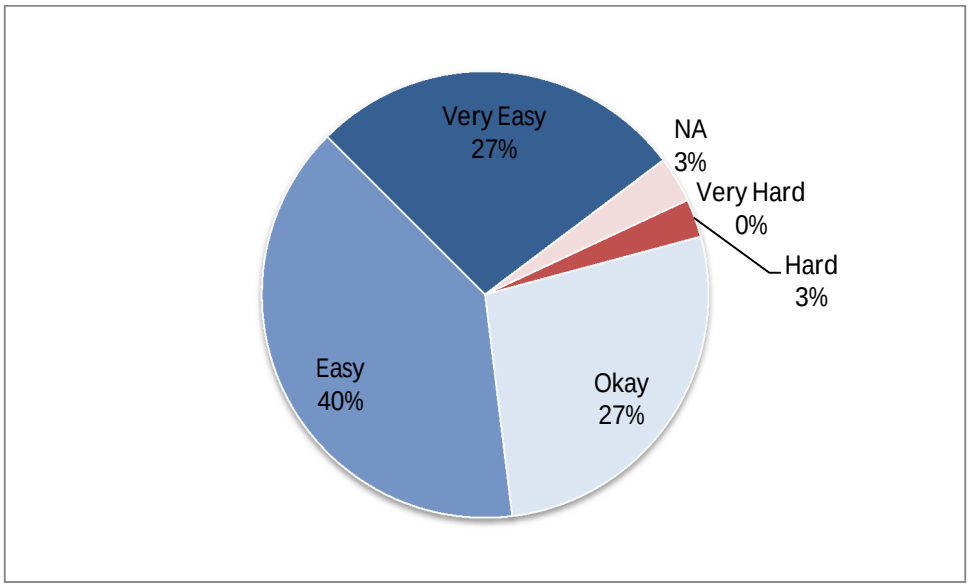
| Training course | No. Respondents | % Respondents |
|---|---|---|
| Chemcert or similar chemical courses | 23 | 13% |
| IPM courses | 16 | 9% |
| Degree/Diploma | 15 | 8% |
| Unspecified course (general agronomy) | 15 | 8% |
| Cotton production course | 13 | 7% |
| Spray application | 8 | 4% |
| Conferences, tours | 8 | 4% |
| Field day/walks | 7 | 4% |
| Water wise /other water management courses | 7 | 4% |
| Soil courses | 6 | 3% |
| Irrigation course | 6 | 3% |
| Monsanto accreditation | 5 | 3% |
| Bollgard course | 6 | 3% |
| Roundup ready training | 3 | 2% |
| CRDC course – Field to Fabric | 4 | 2% |
| No training specified | 77 | 42% |

### *Perceptions of information availability*

*Q20. When you are looking for information on aspects of cotton growing, do you generally find it easy or hard to find the information you want? Very Hard; Hard; Okay; Easy; Very Easy; N/A*
*Q21. What additional information would you like that you can't find?*

75% of respondents thought that it was easy or very easy to find information that they were looking for. A few (marked N/A) said that they either didn't go looking for information or relied on their agronomist to source it.

Figure 9 Ease of finding information about cotton growing




When asked what additional information they would like that they could not find, most didn't have any issues. The following were identified:

- Improved Yield (6 respondents)
- Marketing/business/economics of growing (6)
- Weather/climate/flooding (5)
- Soil/Fertiliser/Nutrition (4)
- Pest/weed management (3)
- Markets/price (3)
- Water losses from storages (3)
- Irrigation/ water management (3)
- Local information/networking (3)
- Benchmarking (2)
- Ginning (1)
- New thinking (1)
- Information for high yielding crops (1).

A range of further comments were made about information and advice on cotton growing as presented in Table 14.

Table 14 Further comments on information and advice

| Further Comments |
|---|
| ***Information availability*** |
| Do things more simply now. Browse information - but you can have too much - selective about what to take in |
| Information available, usually only takes 1 phone call |
| Not aware of the CRCs tools – think that the aphid and mite loss tool would be handy. |
| Has direct contact with researchers and has researchers work on farm |
| Doesn't think a lot is going on in the industry - "very busted" |
| myBMP new web based system is very good for gaining info - big benefit in long term |
| Agronomists are another important information source for them<br>Harder to find info from people in other areas - needs to be documented |
| Word of mouth is 'greatest tool we have'<br>Heaps of info available.<br>Industry is very progressive as a general rule. Doing a good job relative to other industries like wool. |
| Personally don't have time to go online to use tools - rely on agronomist a lot to do the job<br>Walks/field days are good |
| Relies heavily on agronomist because he's new to cotton. Grows maize so has experience in similar systems |
| Publications are very handy (Spotlight, cotton tales etc.) |
| Looks at Weed and Pest ID tools but the agronomist advises them mostly.<br>CSD Agronomist is from Extension and Development team |
| Always thinking about how to do it better<br>This was first year back after a break of 5 - will start to look at info more next year |
| Doesn't use CRC e-newsletter would be interested |
| Expects his consultant to be looking at these resources/tools. |
| Lots of good quality research, Lots of talk |
| James Hill is helpful, Always trying to get us up to speed with BMP online |
| Agronomist keeps up to date and passes information on |
| ***Specific Issues*** |
| Conducted their own research into stopping deep infiltration however ran out of money to support ongoing research |
| GPS to improve farming technology a good thing but have to be careful you are not making management decisions on the wrong assumptions. |
| Pix applications subjective. Getting crop to finish when wanted. |
| Disease is a big issue e.g. Fusarium wilt |
| Water measuring programs are plentiful - but they use none. Concept isn't that complicated, they already know the numbers. 'Nothing like footprints in the paddock'<br>Use soil corer from US, which makes a big different to WUE |
| Markets are the hardest thing to predict due to volatility<br>Agricultural commodities are difficult to pick |
| Need better weather forecasting. |

# Irrigation Improvements

The information in this section is based on responses from the 167 survey respondents who were irrigators (Table 15).

Table 15 Number and proportion of irrigators per region

| Region | Irrigated | % of respondents for region |
|---|---|---|
| Central Queensland | 13 | 93 |
| Darling Downs | 29 | 81 |
| Border Rivers | 8 | 100 |
| St George / Dirranbandi | 16 | 100 |
| Gwydir | 19 | 86 |
| Lower Namoi | 37 | 93 |
| Upper Namoi | 10 | 91 |
| Macquarie | 15 | 94 |
| Bourke | 3 | 100 |
| Lachlan Murrumbidgee | 17 | 100 |
| **TOTAL** | **167** | **91** |

(58 of these irrigated growers also produced dryland cotton in the 2010-11 season.)

### *Water Use Efficiency*

*Q26. Can you tell me what your approximate Water use efficiency was in bales/ML?*
*____ value bales/ML; Don't know*
*Q 26.1 Does this calculation include rainfall?*
*Q8. For your Irrigated Cotton in the 2010/11 season (if any), what was your:*
*____Irrigated cotton Ha 2010-11* *_____Average Irrigated Yield in bales per ha 2010-11*
*____Average Number of irrigations per field* *_____Total ML irrigation water applied for cotton*

Table 16 provides a breakdown of the water use and yield for a range of in season rainfall categories whilst Table 17 provides the same information according to regional total and averages.

69 growers (41% of irrigator respondents) did not know their water use efficiency (WUE) in bales per ML. Of those who did, approximately one quarter had included rainfall in this calculation of water use efficiency.

A few growers mentioned that it was somewhat meaningless to consider WUE this season due to the extreme weather conditions (flood).

Table 16 Water usage, yield and water use efficiency grouped by rainfall categories

| Seasonal Rainfall Aug-March mm | Number of respondents # | Total irrigated ha | Average Yield (bales/ha) | Average No. irrigations /field | ML applied (total ML) | ML/ irrigated ha | WUE bales/ML | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Grower estimate* | Calculated^ |
| **0-100** | 2 | 1,424 | 11.9 | 8.0 | 10,658 | 7.5 | - | 1.6 |
| **100-200** | 4 | 1,559 | 9.0 | 6.7 | 8,593 | 5.5 | 1.4 | 1.6 |
| **200-300** | 7 | 5,635 | 10.1 | 6.4 | 36,384 | 6.5 | 1.3 | 1.6 |
| **300-400** | 16 | 11,244 | 9.9 | 9.0 | 46,842 | 4.2 | 1.7 | 2.4 |
| **400-500** | 20 | 42,295 | 10.0 | 6.0 | 234,331 | 5.5 | 1.7 | 1.8 |
| **500-600** | 23 | 11,697 | 9.7 | 6.1 | 63,275 | 5.4 | 1.7 | 1.8 |
| **600-700** | 14 | 9,612 | 9.0 | 5.5 | 41,081 | 4.3 | 1.6 | 2.1 |
| **700-800** | 4 | 883 | 6.7 | 6.3 | 1,992 | 2.3 | 2.6 | 3.0 |
| **800-900** | 2 | 1,356 | 8.3 | 3.9 | 3,703 | 2.7 | 2.8 | 3.0 |
| **900-100** | 5 | 1,675 | 5.9 | 2.1 | 1,758 | 1.0 | 2.0 | 5.6 |
| **1000-1100** | 9 | 2,215 | 4.9 | 2.3 | 4,180 | 1.9 | 1.8 | 2.6 |
| **1100-1200** | 4 | 1,315 | 3.9 | 1.5 | 1,655 | 1.3 | 1.3 | 3.1 |
| **1200-1300** | 3 | 2,200 | 9.3 | 2.7 | 2,820 | 1.3 | 2.8 | 7.3 |
| **1300-1400** | 1 | 757 | 9.3 | 6.0 | 4,921 | 6.5 | 1.5 | 1.4 |

# This table present information from a total of 124 respondents as not all growers were able to provide a rainfall estimate

* 76% of respondents who gave an estimate of WUE indicated that rainfall was not included in their calculation

^ The calculated WUE is based on total water use and average irrigated yield/ha on each farm, it does not take rainfall into account

Table 17 Water usage, yield and water use efficiency grouped by region and total

| Region * | Number of respondents | Total irrigated ha | Avg. Yield (bales/ha) | Avg. No. irrigations/ field | ML applied (total ML | ML/irrigated ha | WUE bales/ML | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Grower estimate | Calculated |
| Central Queensland | 13 | 4,832 | 6.1 | 3.3 | 12,658 | 2.6 | 1.6 | 2.3 |
| Darling Downs | 29 | 9,519 | 6.7 | 2.1^ | 13,290 | 1.4 | 2.6 | 4.8 |
| Border Rivers | 8 | 8,002 | 10.1 | 6.6 | 29,560 | 3.7 | 1.7 | 2.7 |
| St George / Dirranbandi | 16 | 30,483 | 11.3 | 7.4 | 209,487 | 6.9 | 1.8 | 1.6 |
| Gwydir | 19 | 15,340 | 9.8 | 6.3 | 85,246 | 5.6 | 1.8 | 1.8 |
| Lower Namoi | 37 | 25,343 | 10.2 | 6.3 | 91,735 | 3.6 | 1.5 | 2.8 |
| Upper Namoi | 10 | 2,811 | 8.8 | 4.5 | 7,558 | 2.7 | 2.4 | 3.3 |
| Macquarie | 15 | 4,241 | 9.1 | 6.5 | 25,801 | 6.1 | 1.3 | 1.5 |
| Bourke | 3 | 3,025 | 9.9 | 6.0 | 23,675 | 7.8 | 1.1 | 1.3 |
| Lachlan Murrumbidgee | 17 | 11,027 | 9.5 | 10.0 | 40,977 | 3.7 | 1.6 | 2.5 |
| **ALL REGIONS** | **167** | **114,622** | **9.1** | **5.8** | **539,986** | **4.7** | **1.8** | **1.9** |

* Refer to notes on previous table which also apply here
^ Figure is lower due to supplementary irrigation on some farms on the Darling Downs

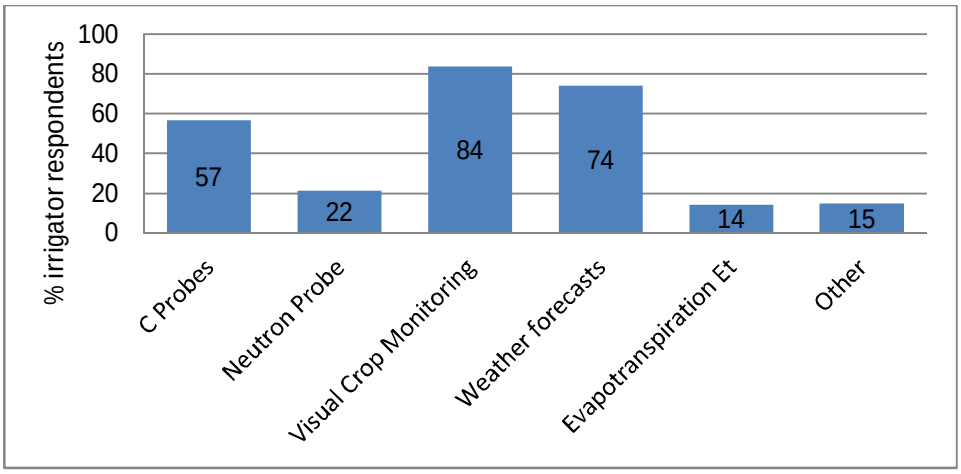
### *Irrigation scheduling*

*Q23. Which of the following methods, if any, did you use for cotton irrigation scheduling last season? [listed categories as in Figure 10]*

With the exception of 2 respondents all used some technique for scheduling irrigations with the most widely used being visual crop monitoring (Figure 10 and Figure 11). 40 respondents (24% of irrigator respondents) used only visual crop monitoring and/or weather forecasting for their irrigation scheduling.

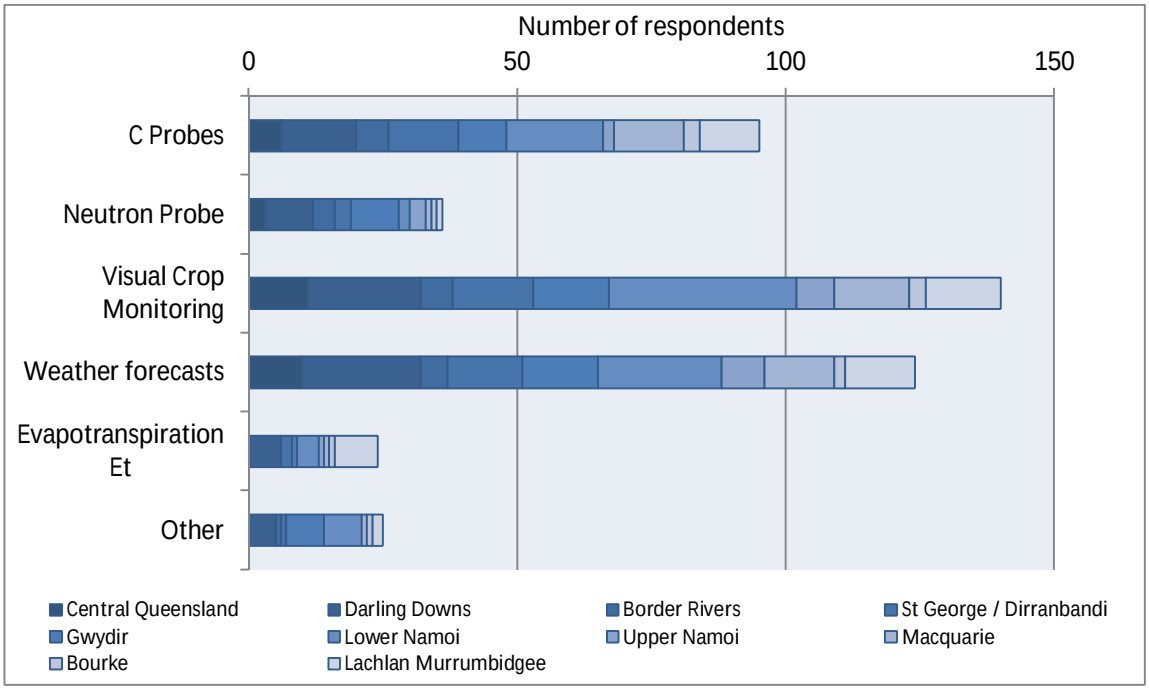
116 (70%) of irrigator respondents used either a capacitance probe (C-Probe, including Enviroscan) or neutron probe. A small number (8.5%) used both. It is interested to note the continuing use of neutron probes for moisture monitoring and scheduling.

Figure 10 Methods used for irrigation scheduling of cotton




"Other" irrigation scheduling methods used were: Shovel (6 respondents); Hand Probe (5); Experience/Instinct (4); Calender days (4); Capacity to water (2); Agronomist Plant Mapping (1).

Figure 11 Irrigation scheduling methods by region



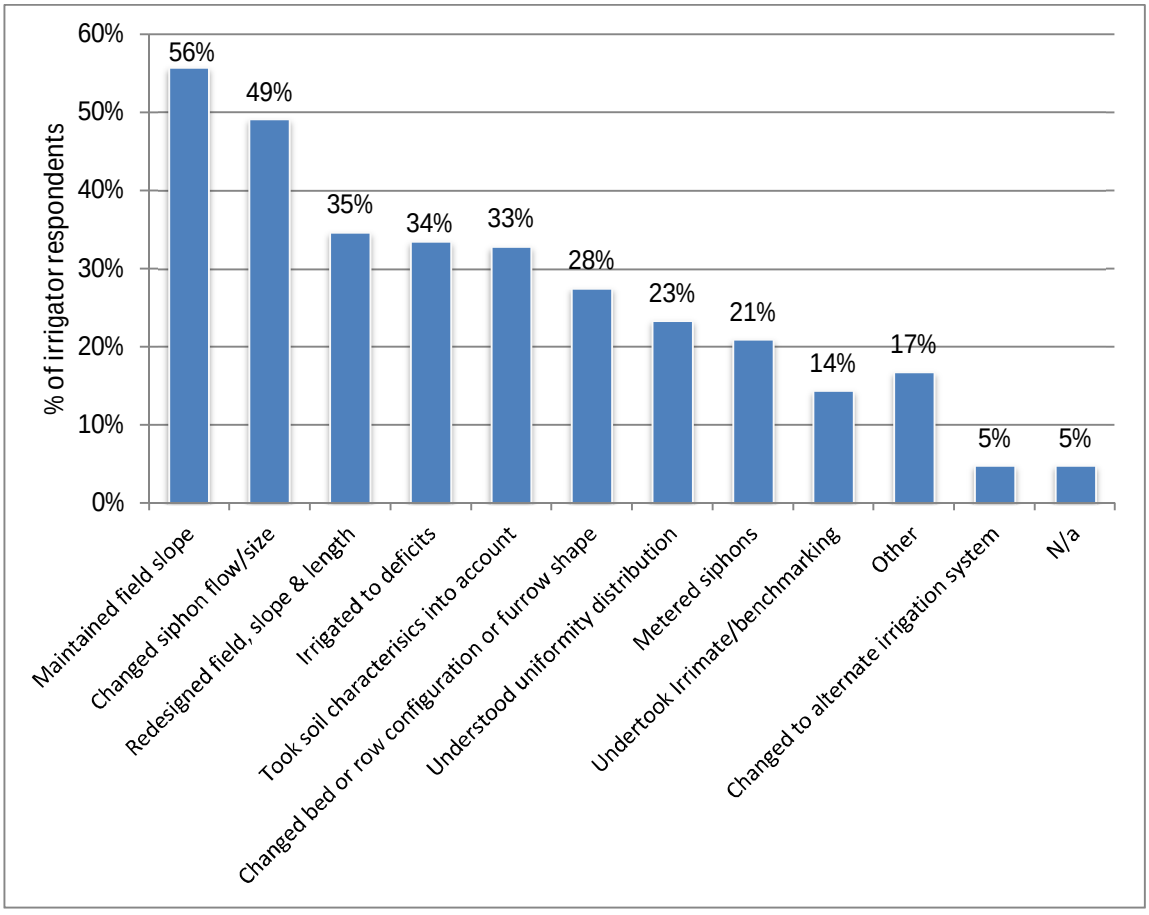
### *Irrigation improvements*

*Q24. For your furrow irrigation systems, if you have them, please tell me anything you have done in the last 5 years to optimise them. [Have you... worked through list as presented in Figure 12]*

Over the past 5 years, 96% of irrigators surveyed had made some form of improvement to their furrow irrigation systems or had changed to an alternate irrigation type. Figure 12 shows that maintenance of field slope was the most widely used.

Almost half of the surveyed irrigators had made changes to the flow or size of their siphons and 20% had metered their siphons. A small percentage (5%) of irrigator respondents had installed alternate irrigation systems.

Figure 12 Improvements to furrow irrigation




"Other" methods identified for improving furrow irrigation:

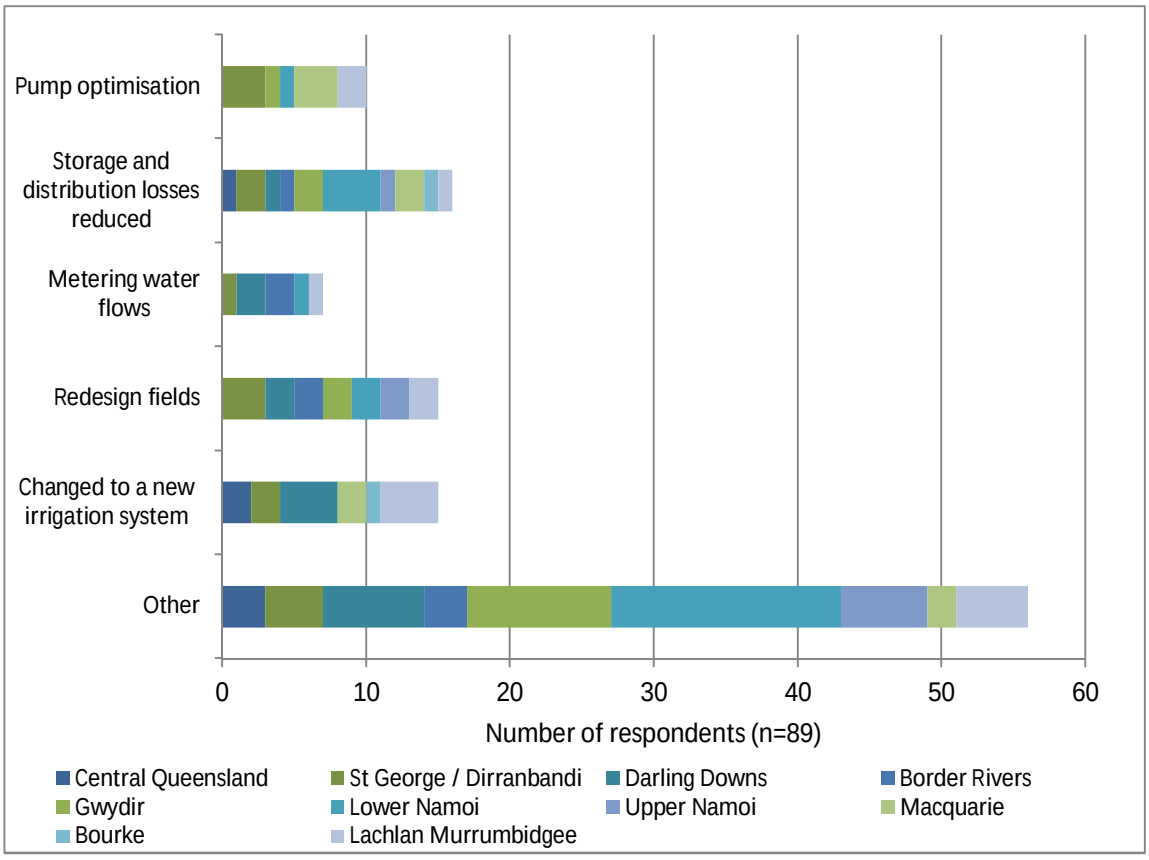
- Increased head/flow (6 respondents)
- Monitoring storage/water table/etc. (6)
- Timing (6)
- Use of probes (3)
- Channel maintenance/changes (3)
- Changes to water outlet (siphon/sprinkler) (3)
- Pipes through bank (PTB) (2).

Table 18 Irrigation efficiency improvements over the past 5 years

| Improvement | Response Total | Response % |
|---|---|---|
| Redesign fields | 22 | 20% |
| Changed to a new irrigation system | 18 | 16% |
| Storage and distribution losses reduced | 16 | 15% |
| Pump optimisation | 14 | 13% |
| Metering water flows | 11 | 10% |
| Distribution: banks/ditches/channels | 10 | 9% |
| General improved maintenance/management | 7 | 6% |
| Storage: bores/dams/capacity | 7 | 6% |
| Tailor crop to suit irrigation methods | 3 | 3% |
| Pipe through bank (PTB) | 2 | 2% |
| Total | 110 | |

*Q25. Can you tell me of anything else you have done across the farm to improve your irrigation efficiency in the last 5 years (since 2006)? [unprompted]*

Figure 13 Improvements to irrigation in the last five years, per region




"Other" includes those categories added in Table 18.

Table 19 Additional comments on irrigation

| Irrigation Comments |
|---|
| Bankless channels. yield down due to cold season |
| Optimising irrigation - depths and shapes, trials with short irrigation cycles, early water shut-off and scheduling. |
| Supplementary irrigation of some fields: 165 ha, Double skip, 2 irrigations, 4.3 b/ha |
| Only small tweaks to redesign fields<br>Dry during growing period |
| Irrigation tweaking restricted by bore delivery rates |
| 72-82% efficiency on flood |
| Haven't done much in the way of improvement since '06 |
| Slope and run length tailored to suit soil movement + irrigation efficiency<br>Altering timing to refine flow rates, time of irrigation and intervals between irrigation<br>Would like to know water use efficiency, but there is no set standard or clear explanation - not sure if there is a clear definition or how to go about it (i.e. recycled water? include pumped back water?) |
| Also uses a 100 ha drip from storage in WLD - 25 mm/day<br>Furrow surprisingly efficient from storage. Saving a ML, growing 1 bale less<br>Speed of getting water on has increased in recent years (up to 70 m/hr this year)<br>Still calculating 2010/11 WUE value, but says it's going to be a higher value than 09/10. Previous years WUE were 1.44, 1.23, 1.58 (08/09, 07/08, 06/07 respectively)<br>Mentioned that everyone measures irrigation different, so you're not comparing apples with apples (e.g. rainfall, soil moisture profile, etc. affects bales/ML measure) |
| Changed contractors<br>Channel leakage<br>Using consultant for measuring water |
| Due to drought not too much capital spent during last few years. |
| No water this season just 2 passes with lateral on 80 ha. Flooding responsible for low yields. |
| Cotton flooded, did not put out secondary roots so had to water to keep plant going regularly when soil was already wet |
| Not really full irrigators - just supplementary |
| Very reliable 3 day BOM forecasting for Narrabri<br>Helps in irrigation scheduling |
| Disaster from floods<br>'Capacity to water' = how much water we have access to<br>Change in row configuration from 2 m -> 1 m -> 2 m |
| Ginning not finished yet so doesn't know WUE - was difficult to accurately monitor water use lase season as some runoff from farm occurred and some unmetered pumping of overland flow<br>Irrimate irrigation evaluation for 2 seasons and water track for 2 seasons |
| Not known sue to the very wet season and use of non-allocated water during whole season. |
| PWUI 1.39 bales/ml |
| Maximum of 10 hours of irrigation run.<br>Electrifying the bore pumps<br>Aim to gain 4% WUE per year.<br>GVIA trials conducted<br>Water supplies from: Bore, High security river flow and grey water ex Moree Town |
| 4.5 bales/ml is for 2008/9 season under centre pivot - last 2 years too dry or too wet to give a fair comparison |
| Our properties were developed properly in the first place that would make them easy to irrigate and efficient.<br>Most of rainfall was received by mid-December and very little when needed most |
| workload, allow time to get around all paddocks, experience with the system |
| Supplementary irrigation: 54 ha double skip 5.5 bales/ha |
| Have tended to reduce irrigation deficit on Bollgard II fields back to 55 mm rather than the 65 mm deficit use to use for conventional cotton. |
| Comment made about up grading irrigation pumps to get water on quicker and off quicker |
| Will have furrow and lateral move systems. |

| |
|---|
| Starting soil moisture |
| We now measure only what we can manage |
| Irrigated cotton being grown as single skip. Dryland is double skip |
| Optimise irrigation - getting water on and off field quickly by pushing more water in the head ditch and shorting of irrigation cycles |
| Trialled:<br>1. Lateral move overhead irrigator; 2. Bay less irrigating; 3. various syphon configurations<br>Analysis of overall farm water balance (during and post season) |
| Farm has irrigated cotton under a pivot |
| Have developed a fixed syphon irrigation system suited to his fields which tend to have red country at the top of the fields and black soil at the bottom. |

### *Monitoring of Groundwater Quality*

*Q27. Do you monitor the quality of your groundwater? If yes, how often?*
*More than annually; Annually; Every few years; Once ever; Never; Not groundwater user; Other*
*Q28. What do you monitor for?*

90 of the irrigator respondents were groundwater users. Some regions had no groundwater use (Bourke) or a very small number of groundwater users (Table 20).

Table 20 Number and proportion of surveyed farms using groundwater in each region

| | Number of groundwater users | % of irrigator respondents |
|---|---|---|
| Central Queensland | 4 | 31 |
| Darling Downs | 21 | 72 |
| Border Rivers | 2 | 25 |
| St George / Dirranbandi | 2 | 13 |
| Gwydir | 9 | 47 |
| Lower Namoi | 27 | 73 |
| Upper Namoi | 9 | 90 |
| Macquarie | 4 | 27 |
| Bourke | 0 | 0 |
| Lachlan Murrumbidgee | 12 | 71 |
| Totals | 90 | 54 |

The majority of groundwater users monitor every few years or not at all (Figure 14) with salinity being the most commonly measured parameter (Table 21).

Figure 14 Frequency of groundwater monitoring by region

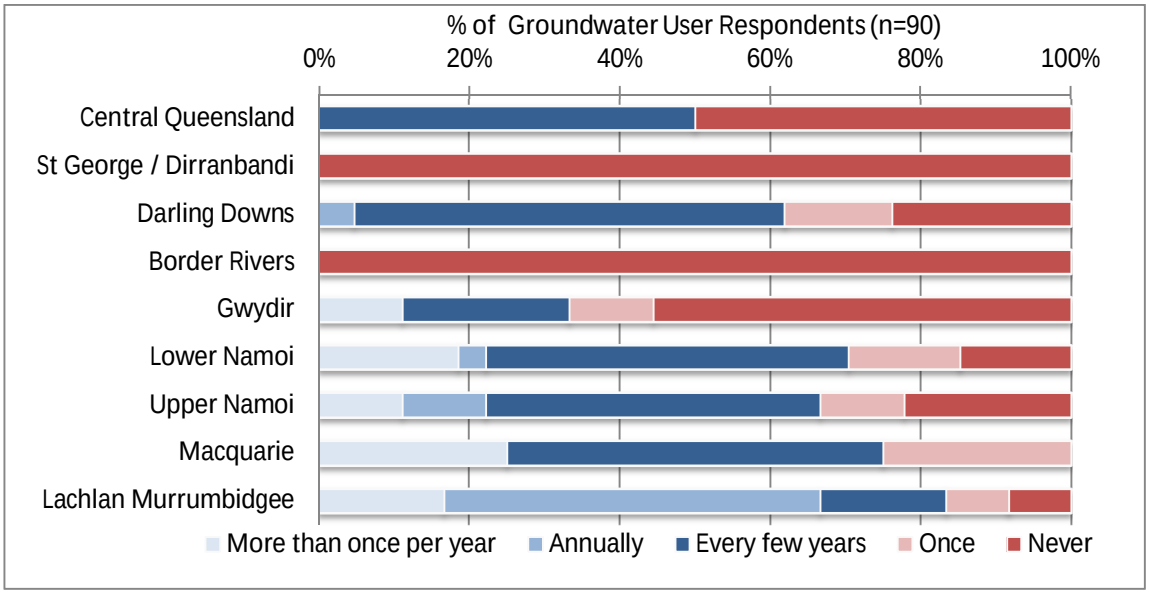



Table 21 Groundwater quality attributes monitored

| | Number of respondents | % of groundwater user respondents |
|---|---|---|
| EC / Salinity | 49 | 54% |
| pH | 23 | 25% |
| SAR (Sodium Absorption Ratio) | 8 | 9% |
| Nitrates | 6 | 7% |
| Trace Elements | 8 | 9% |
| Other: | 17 | 19% |
| General water quality test | (5) | |
| Depth | (4) | |
| Hardness | (3) | |
| Temperature | (3) | |
| RDC | (1) | |
| Cone Index | (1) | |

Table 22 Further comments on groundwater

| Groundwater Comments |
|---|
| There has been little change over time |
| Groundwater is magnificent<br>River-fed bore water is of drinking quality - no salinity issues etc. |
| Very good groundwater |
| Mainly concerned with EC especially with the lateral moves. |
| High quality town water |
| Uses groundwater only as a last resort |
| We regular monitor the ground water level from the surface and we also test for changes in water quality every few years. |
| Salt was the main answer. He asked should he be looking at water quality more often, he was under the impression ground water quality did not change very quickly over time. |
| No water quality testing conducted |
| Salt was the main concern for ground water |

# Crop Protection

Data on crop protection issues and pesticide usage is gathered in detail from the CCA survey. The questions included in this grower survey aimed to seek growers' views and practices in relation to some of the key crop protection issues.

### *Weeds*

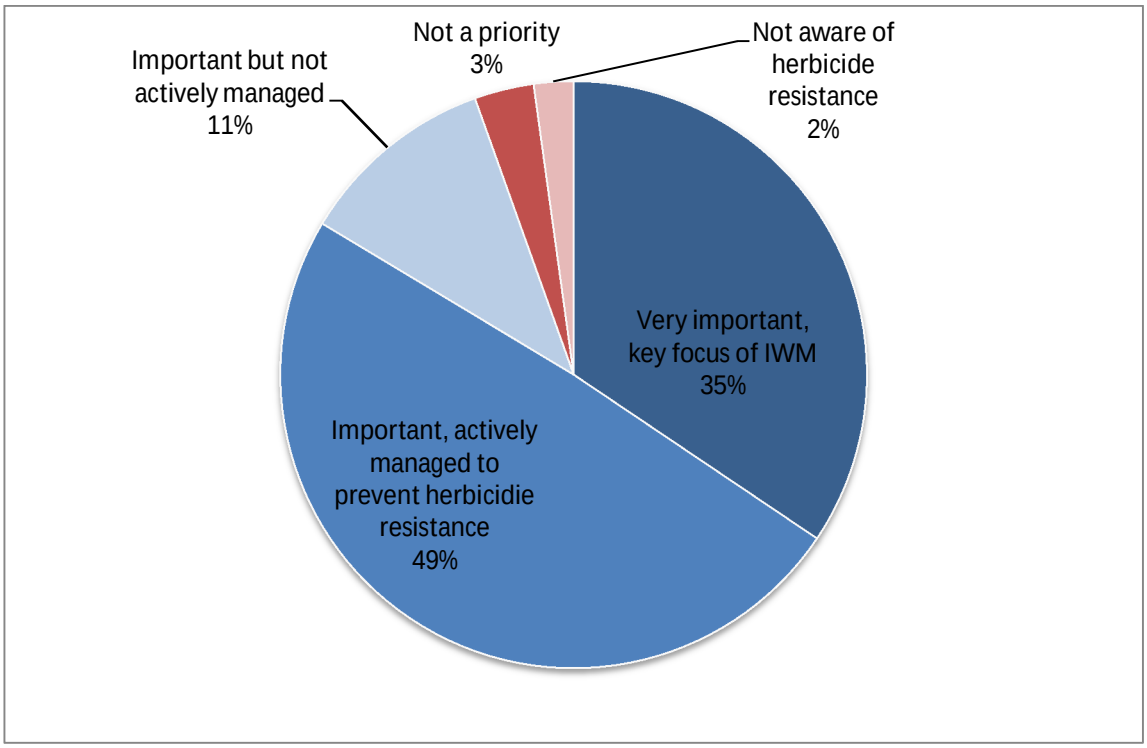
*Preamble to Question: The next question is about herbicide resistance which can be managed through things like rotating chemistry and using a range of IWM techniques such as (cultivation, chemistry, survivor control, prevent seed set) and monitoring.*

*Q29. How important do you believe herbicide resistance is to your cotton farm?*

- *Very important, key focus of my IWM strategy*
- *Important, actively manage to prevent herbicide resistance*
- *Important but not actively managed*
- *Not a priority*
- *Not aware of herbicide resistance*

Respondents generally considered herbicide resistance to be an important issue which they actively manage for. When asked about the changes in weed populations and management, the most frequent mentions were fleabane (Table 23) and Roundup Ready cotton (Table 24).

Figure 15 Perceived importance of herbicide resistance




NB Those who responded "not aware of herbicide resistance" were generally referring to not being aware of it occurring on their own farm.

*Q30. What changes have you made in weed management or seen in weed populations in the past 5 years? [unprompted comments]*

Table 23 Observed changes weed populations over the past 5 years

| Comment | # of Respondents |
|---|---|
| Fleabane increase | 78 |
| Overall decrease in weeds | 22 |
| Overall increase in weeds | 6 |
| Volunteer cotton | 15 |
| Increased resistance | 10 |
| Increase in specific weeds:<br>• Native barnyard grass<br>• Ryegrass<br>• Feather top rhodes grass<br>• Windmill grass<br>• Butter cup<br>• Bellvine<br>• White fly<br>• Glyphosate<br>• Phalaris<br>• Polymeria<br>• Umbrella grass<br>• Anoda weed<br>• Deadly nightshade | 30 |

Table 24 Changes in weed management techniques over the past 5 years

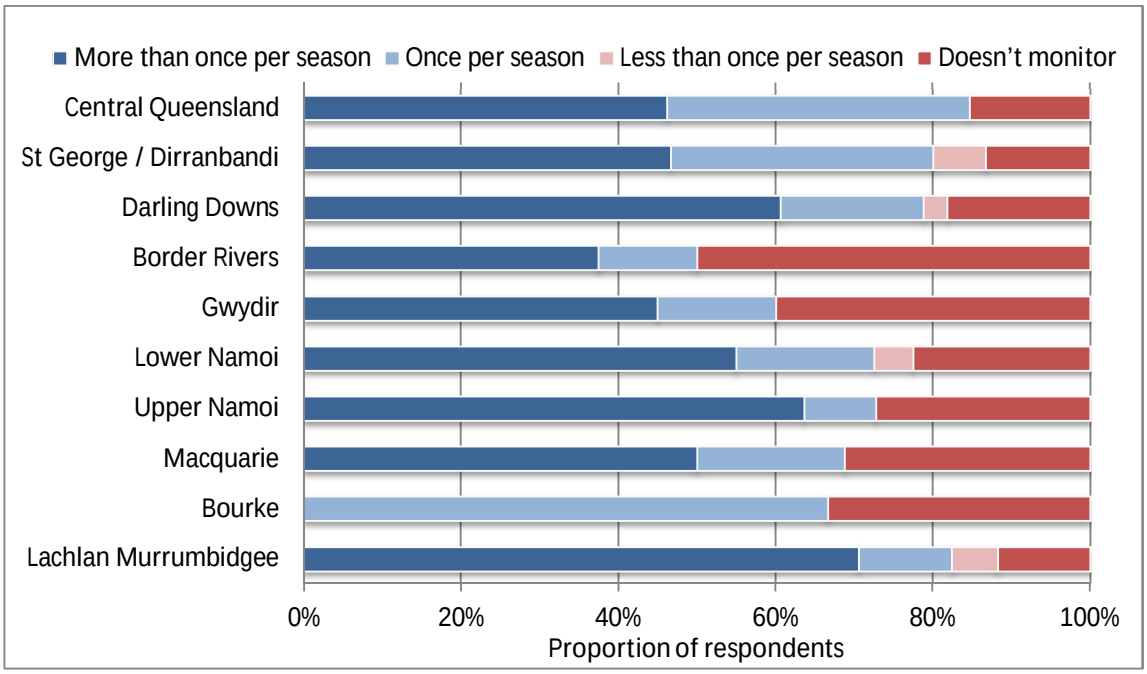
| Comment | # of Respondents |
|---|---|
| Roundup ready | 55 |
| Chemical rotation | 40 |
| Increase cultivation | 29 |
| Change in spray techniques | 25 |
| Crop rotation | 20 |
| Reduced Tillage (less cultivation) | 12 |
| Pre-emergence | 6 |
| More residual herbicides | 4 |
| Less use of residuals/chemicals | 4 |
| Weed seeker | 4 |
| Use of layby herbicides | 4 |
| Minimise seeding | 4 |
| Moisture control | 2 |

### *Disease monitoring and management*

*Q31. Do you do a survey or otherwise monitor for the presence, distribution and severity of diseases on your farm? (This may be done yourself or by your consultant or you may get the information for your farm from the industry disease survey if your farm is involved in that)? Yes / No*
*If yes, how often? More than once a season; Once per season; Less than once per season*

Most growers undertake some disease monitoring (Figure 16). Growers commonly indicated that disease monitoring was undertaken by their consultant agronomist during regular crop checks. Some farms were part of the industry disease monitoring program and referred to that as their primary disease monitoring.

Figure 16 Frequency of disease monitoring, by region



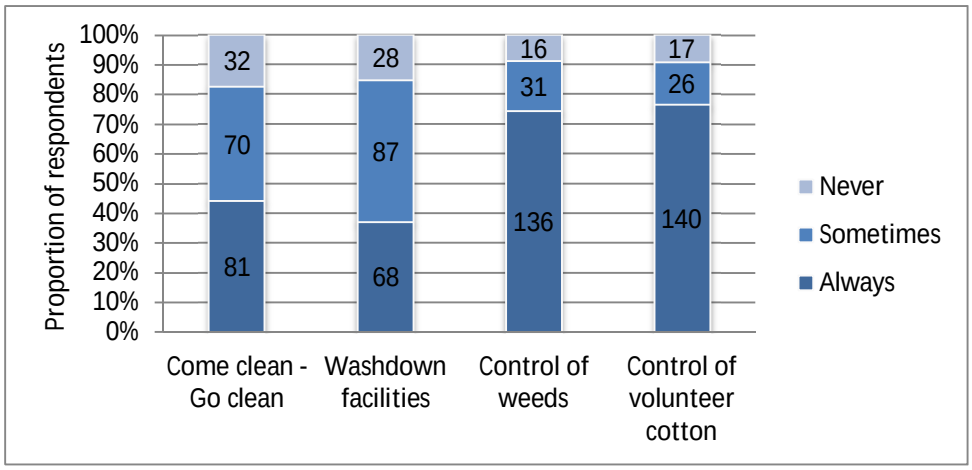

* Note that some respondents are missing from this data - these respondents indicated that they monitored the presence of disease on their farms, but did not specify the frequency of this monitoring.

*Q32. To prevent the entry and spread of weeds and diseases on your farm how regularly do you use the following strategies:*

| | | | |
|---|---|---|---|
| *Come clean – go clean* | *Never* | *Sometimes* | *Always* |
| *Washdown facilities* | *Never* | *Sometimes* | *Always* |
| *Control of weeds* | *Never* | *Sometimes* | *Always* |
| *Control of volunteer cotton* | *Never* | *Sometimes* | *Always* |

Whilst most respondents use farm hygiene practices some of the time (Figure 17), they are not highly diligent in using practices such as come clean-go clean (44% always do) and washdown (37% always). Closer heed is paid to control of weeds and volunteer cotton. Some mentioned that they were stricter about wash down of machinery where contractors were used. There was comment that come clean – go clean was not highly effective or feasible. There was little variation between regions with regard to the use of farm hygiene practices.

Figure 17 Frequency of use of farm hygiene practices for disease management




## *Insects*

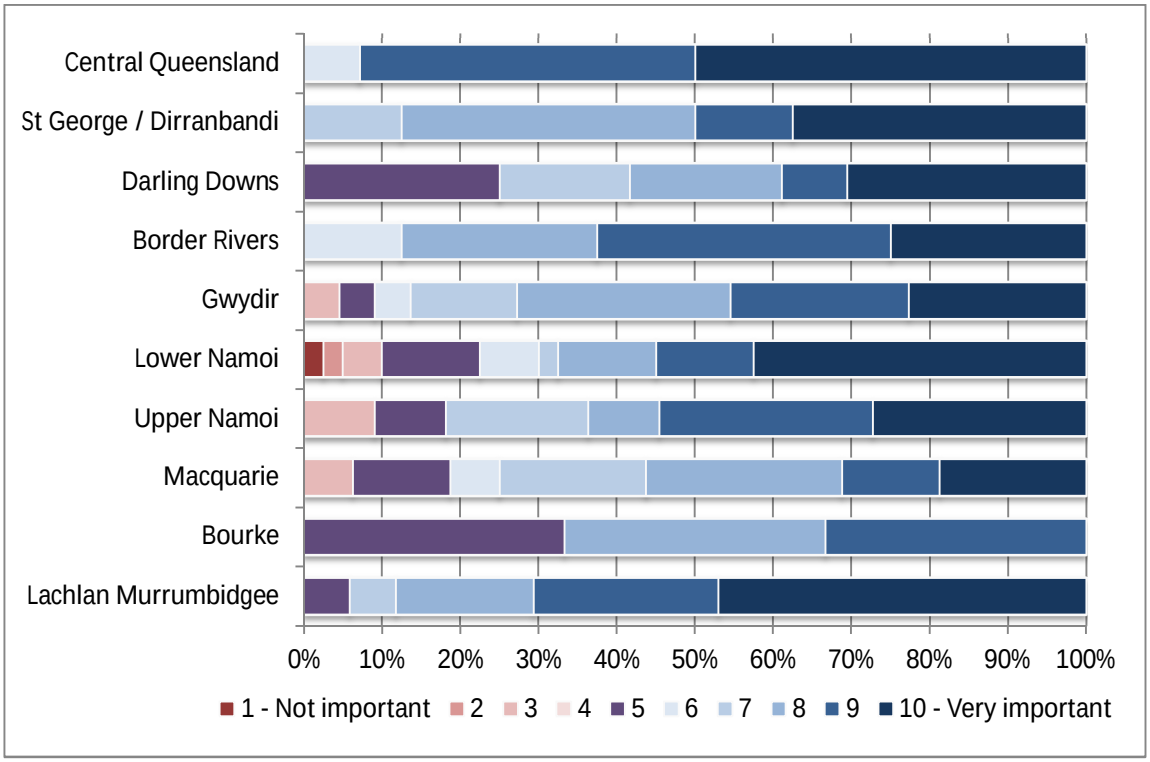
*Q33. How important would you say integrated pest management (IPM) principles are to your overall pest management program? On a scale of 1-10 where 1 is not important and 10 is very important*

The majority of respondents consider IPM principles to be an important part of their pest management program (Table 25 and Figure 18).

Table 25 Average ranking of IPM importance, by region

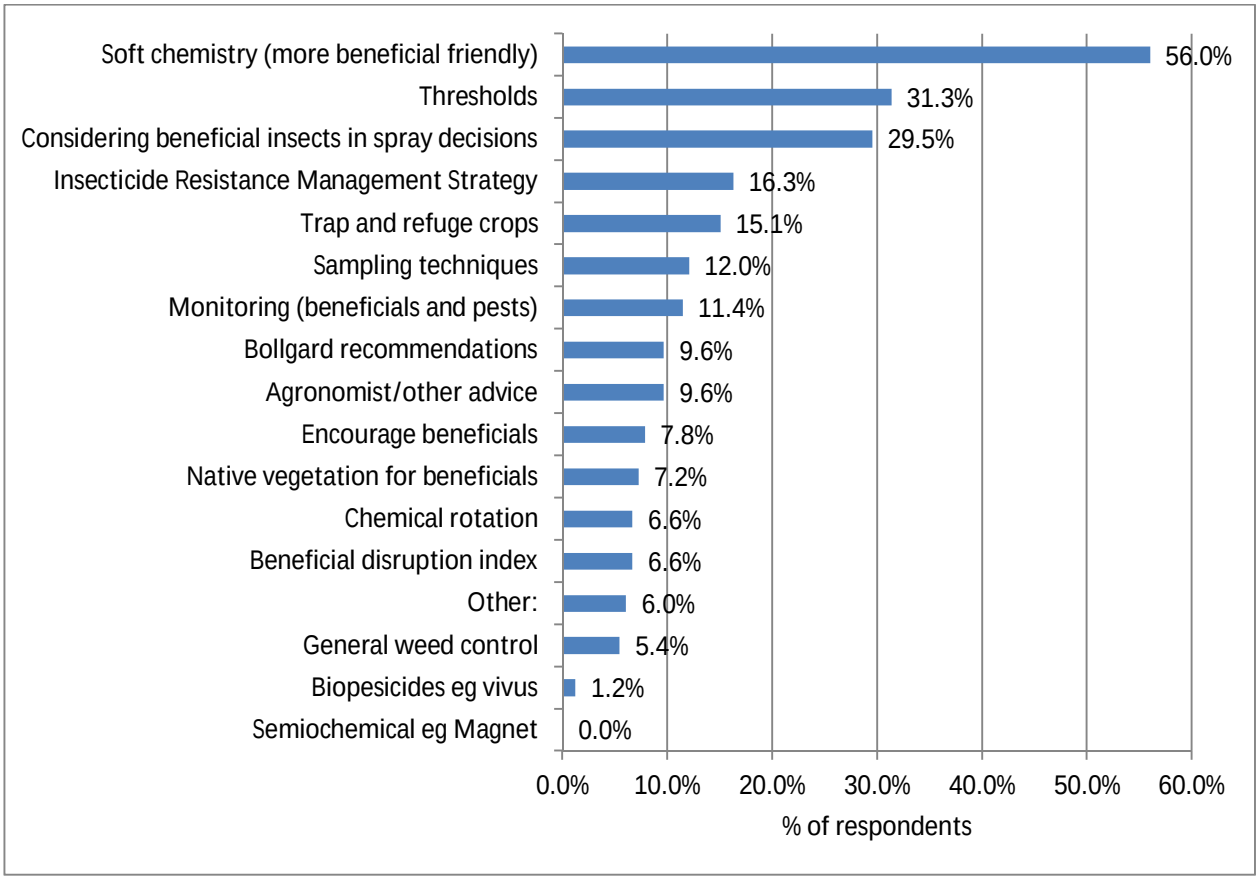
| Region | Average ranking (where 10 is very important and 1 not important) |
|---|---|
| Central Queensland | 9.3 |
| St George / Dirranbandi | 8.6 |
| Darling Downs | 8.1 |
| Border Rivers | 8.9 |
| Gwydir | 8.5 |
| Lower Namoi | 8.1 |
| Upper Namoi | 8.3 |
| Macquarie | 6.9 |
| Bourke | 7.7 |
| Lachlan Murrumbidgee | 8.8 |
| TOTAL | 8.2 |

Figure 18 Importance placed on IPM, by region



*Q34. What practices or overall farm management do you use for IPM? [Unprompted]*

Figure 19 IPM strategies used by respondents




"Other" IPM strategies included: Avoid spray, Crop rotation, Own experience and knowledge, Fertiliser, Guidelines, Hygiene, clean farm, Pupae bust, Sprays.

*Q35. In a broad sense, what do you think are the economic benefits to you of conserving beneficial insects for cotton?*

The main economic benefits of IPM were considered to be less sprays, financial savings and environmental or social benefits (Table 26).

Table 26 Perceived economic benefits of IPM

| Response | # of Respondents |
|---|---|
| Less chemicals/spraying | 73 |
| Dollar savings | 24 |
| Environmental/social benefits | 14 |
| Timing/management/lifestyle benefits | 9 |
| Easier control/less resistance of secondary pests | 9 |
| Yield increases/ quality increases | 8 |
| Willing to spend more to preserve beneficial's | 6 |
| Long term benefits | 5 |
| Yes (unspecified) | 35 |
| Somewhat (depends/ hesitant yes) | 7 |
| No benefits | 2 |

Table 27 Further comments on IPM

| Response |
| --- |
| There is always a compromise based on potential problem - eg certain mirid sprays may Increase whitefly |
| Need to know where on one's property and what's around in terms of pests |
| Slowly becoming more conservative about IPM (not spraying if in doubt)<br>Selective about chemicals (low disruptive chemicals)<br>Also using lower rates<br>Using soaps and oils for Mealy bugs<br>Takes a long time to reduce spraying reliance but once you can see it over time and monitor numbers you'll learn to be patient with the thresholds and avoid spraying too soon. |
| Some beneficials wipe out baddies. Have had sufficient beneficials and didn't have to spray. |
| IPM practices include<br>-insect monitoring<br>-selective soft insecticides<br>-maintaining beneficial's<br>- control of volunteer weeds and cotton |
| Aphids/white flies<br>Sucking pests are most significant to watch |
| Soft chemistry now works better than hard chemistry |
| Not as necessary now we have Bollgard<br>More sucking insects |
| Higher thresholds not as important now with Flex for heliothis |
| All decisions/issues are strongly debated with consultant and the final decision rests with me. |
| They sometimes needs to spray to remove bad pests when they can't keep up |
| With regard to thresholds, take account of beneficials and retention.<br>Lots of beneficials associated with native vegetation. |
| Always stick to the industry thresholds of 3 mirids per metre would most likely not spray for grubs in Bollgard II unless significantly higher than the current threshold. |
| Understand importance of beneficial insects yet rely on agronomist |
| Rely heavily on consultant |
| Not sure of practices - need to talk to agronomist |
| "Guess the consultant would know what to say" |

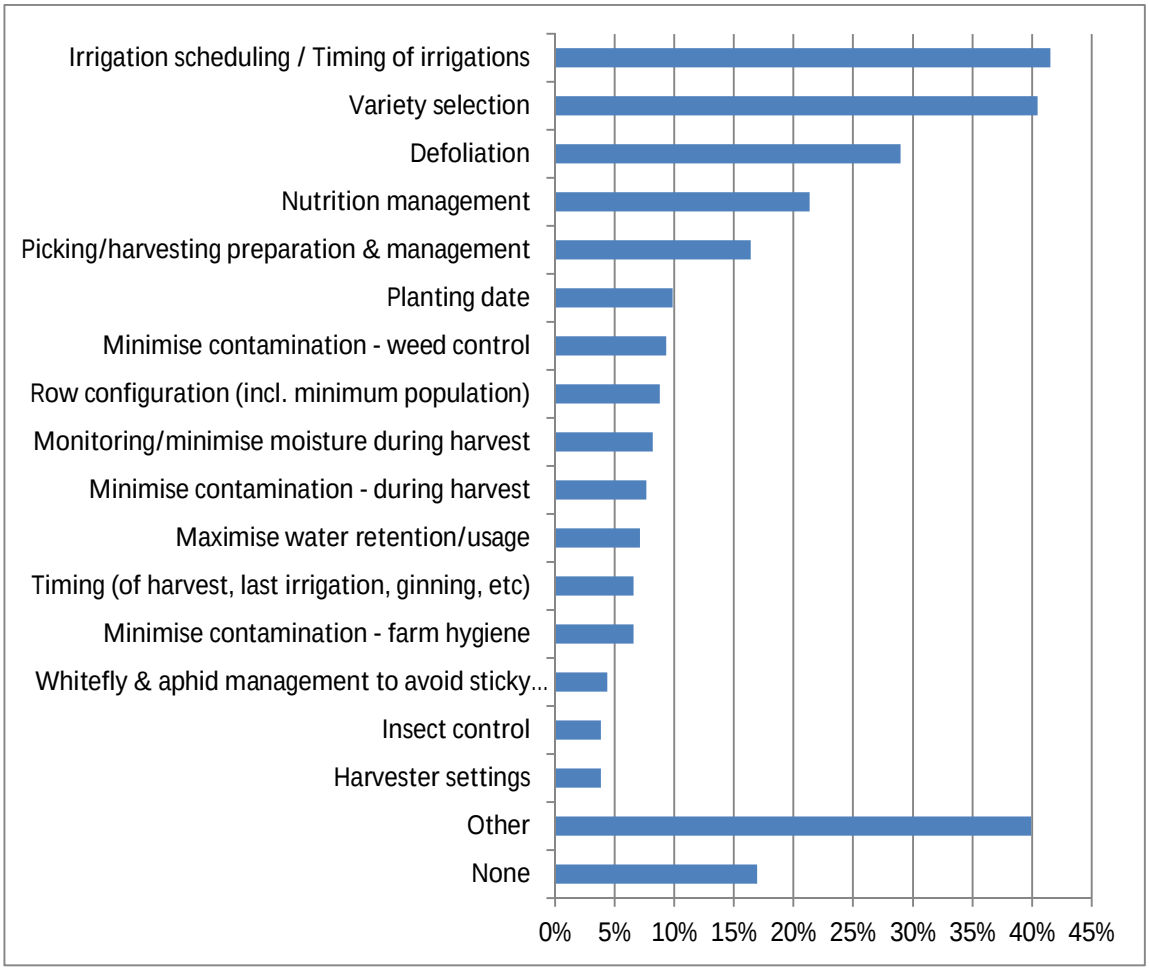
# Agronomic practices for fibre quality

*Q36. What, if anything, do you do to optimise fibre quality? This may included active consideration of fibre quality outcomes in other farm management decisions. [unprompted]*

A range of management options are used to optimise fibre qualities (

Figure 20). These mainly revolved around reducing plant stress.

Figure 20 Strategies used by respondents to manage fibre quality




"Other" included: Avoid stress (5 respondents), Best practice agronomy (6), Maximise Yield (3), Fertiliser/nutrition choices (4), Minimise/eliminate tillage (2), Rotations (3), Nature (weather, etc) 3

# Nutrition

*Q41. Which of these factors did you use/consider when calculating your fertiliser application rates for the 2010-11 cotton crop? [prompted with options listed in graphs]*

Fertiliser application rate decisions are influenced by a variety of measures and factors as depicted in Figure 21 and on a regional basis in Figure 22.

Field history or crop rotations (including green manures), forecast yields and agronomist recommendation are the most widely used factors.

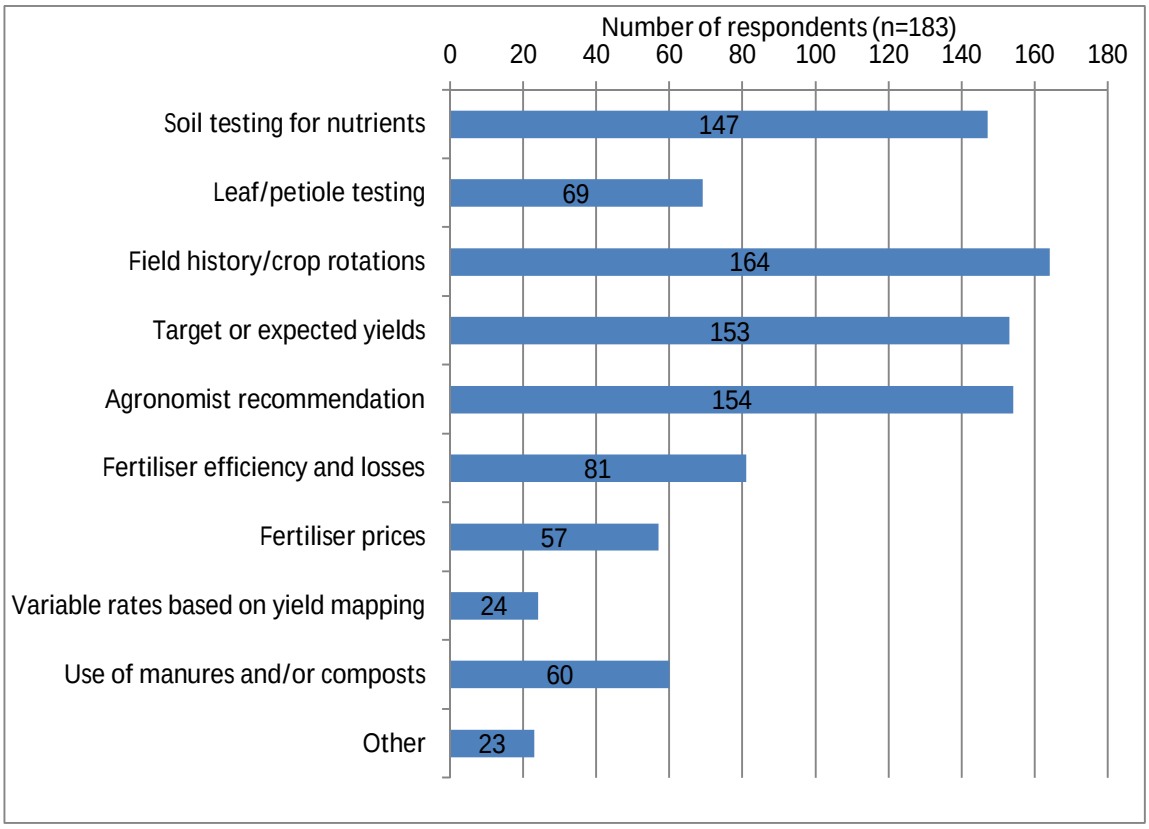
Soil testing is used by 81% of respondents whilst leaf and petiole testing is used by 38%.

Approximately 13% of respondents are using manures or composts in their nutrition programs (Figure 21 and Table 29).

Fertiliser price was not a key determinant of fertiliser rates for most people. Some altered fertiliser type or 'cut back a bit' on rates in response to prices.

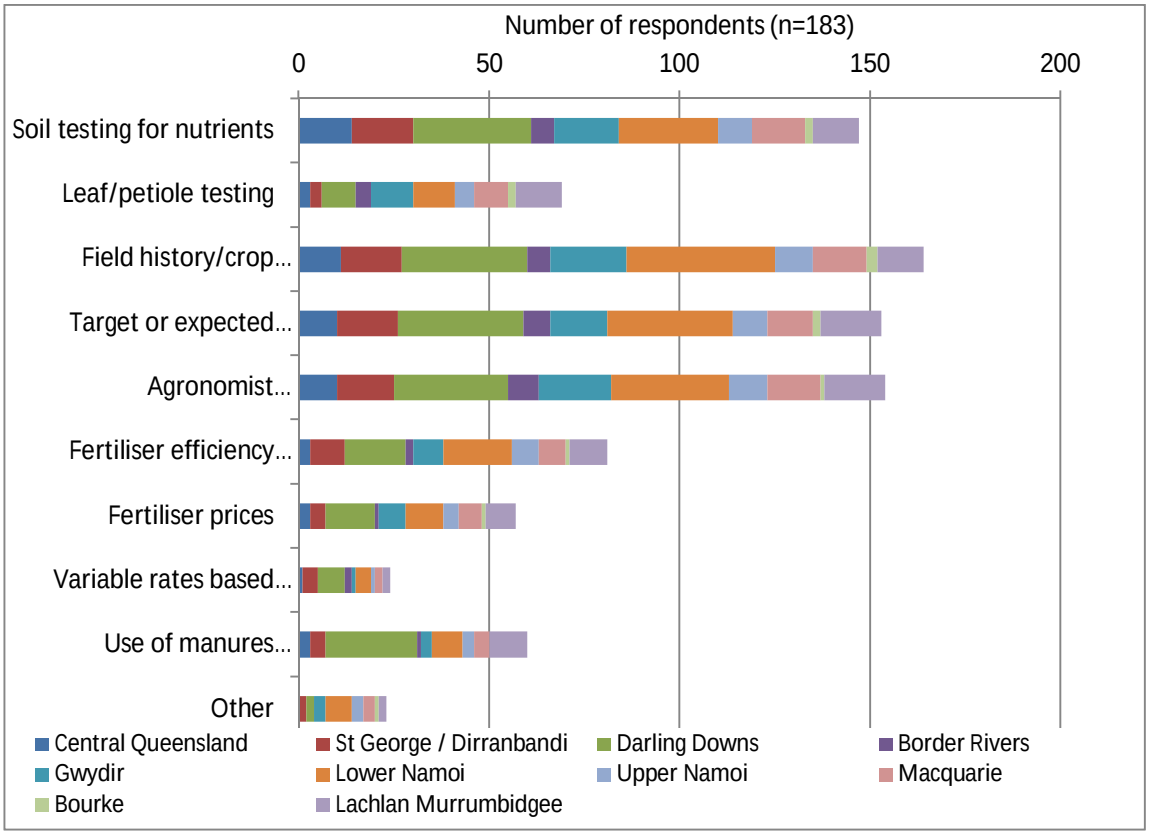
The use of variable rates based on yield mapping remains low. There was comment that this would be the way of the future, the challenge lies in accessing appropriate advice to set up the system correctly.

Figure 21 Factors considered in calculating fertiliser application rates




"Other" methods included: End buggy for urea; Trials on fertiliser types and application rates; No fertiliser used; Ease of application - water run urea; People like Rocky (Dr Ian Rochester); Late application due to rain; MAP for phosphorus, NH3; Timing of application eg pre-plant or in-crop; TM21 compost; Gut feel, fertiliser trials; Measure biological activity, micorrhizal fungi - strategies to manage and avoid; gypsum and lime.

Figure 22 Factors considered in determining fertiliser rates, by region



*Q42. Please indicate your fertiliser use in cotton in 2010-11 [Table 28 provided to complete]*

Table 28 depicts the nutrient rates of fertiliser applied to irrigated and dryland cotton in the 2010-11 season. Note there are several limitations to this data, including:

- Not all growers were able to provide nutrient rates.
- Nutrient rates have been converted from fertiliser rates where possible.
- Some rates provided appeared to be fertiliser rather than nutrient rates and it was not always possible to ascertain this. Where logical we have converted these (eg urea to nitrogen) based on our understanding of the most likely scenario.
- Some growers indicated use of a nutrition and soil management program over several years to support their annual fertiliser inputs.
- Several farms mentioned the use of manures, these have not been included due to difficulty in determining the nutrient rates.
- Some dryland growers applied no fertiliser for the cotton crop, relying on carryover from the previous wheat crop instead.

Table 28 Applied fertilisers as nutrient rates for irrigated and dryland cotton

| Applied Fertiliser (nutrient rates) | Irrigated | | | Dryland | | |
|---|---|---|---|---|---|---|
| | Avg. | Min | Max | Avg. | Min | Max |
| Preseason nitrogen – solid fertiliser (kg/n/ha) | 142 | 11 | 350 | 89 | 50 | 150 |
| Preseason nitrogen – gas fertiliser (kg/n/ha) | 155 | 60 | 300 | 84 | 50 | 140 |
| In season nitrogen – solid fertiliser (kg/n/ha) | 99 | 9 | 300 | 45 | 0 | 180 |
| In season nitrogen – gas fertiliser (kg/n/ha) | 83 | 11 | 200 | 40 | 20 | 60 |
| In season nitrogen – water applied fertiliser (kg/n/ha) | 57 | 9 | 250 | 5 | 5 | 5 |
| **Total applied Nitrogen** | 217 | 30 | 534 | 96 | 33 | 330 |
| Preseason phosphorus – fertiliser (kg/p/ha) | 42 | 1 | 250 | 14 | 2 | 50 |
| In season phosphorus – fertiliser (kg/p/ha) | 20 | 1.0 | 100 | 13 | 3 | 40 |
| **Total applied Phosphorus** | 40 | 1 | 250 | 16 | 2 | 50 |
| Preseason potassium – fertiliser (kg/k/ha) | 32.6 | 0.4 | 120 | 7.6 | 0.4 | 20 |
| In season potassium – fertiliser (kg/k/ha) | 15.2 | 1.1 | 60 | 2 | 2 | 2 |
| **Total applied Potassium** | 28.3 | 0.4 | 120.0 | 6.7 | 0.4 | 20 |
| Zinc fertiliser (kg/zn/ha) | 6.9 | 0.2 | 105 | 3.7 | 0.2 | 15 |
| Sulphur (kg/s/ha) | 6.3 | 0.1 | 55 | 2.4 | 1 | 6 |
| Trace elements * | 21 | 7 | 65 | 4.0 | 4 | 4 |

* Several of the replies relating to trace elements mentioned the products used without rates to calculate nutrient rates or were difficult to convert. These included: Super K, Amplifier, Foliar, Humates, Ignition bionutrient, Calcium carbonate.

A wide range of fertiliser application programs are followed, as evidenced below.

Table 29 Comments on nutrient use and management

| Nutrition |
|---|
| Fertiliser program was unusual for 2010/2011 because it was too wet to soil sample, and couldn't put anything up front so applied urea by air. |
| 25 kg of in season nitrogen fertiliser was placed after floodwater was drained |
| Use long fallow and biosolids and composts |
| What can you do about fertilizer prices? |
| Looks at fertiliser prices but doesn't determine choice<br>Variable rates and yield mapping is the way of the the future - hard to find people with good info on how to set it up (he'd like to do this) |
| Gets own MAP blend made up (209kg/yr) |
| Not going to decrease fertiliser applications because of costs. Yield and quality losses would outweigh any potential savings on fertiliser. |
| Switching to solid preseason nitrogen as more effective in trials |
| Use potassium sulphate |
| Not convinced soil testing is as accurate as people think they are<br>Taken a risk putting nitrogen in early - ir rain comes in over winter than he'll lose the nitrogen |
| No fertiliser applied for cotton - carryover from wheat crop |
| Regular programs used over a number of seasons: Cottonsustain, Murate of potash, Zincoxide, Zincsulphate, Sulphate of ammonia, Chook manure |
| crop destroyed |
| fertiliser price influences type used, not volume used |
| Note for fertiliser rates - long fallow over majority of farm following a low yielding irrigated wheat crop 2 years ago. therefore this seasons soil structure was nutrient charged and in good order. |
| Nutrients applied through lateral irrigation - FlowPhos inseason |

| Fertiliser |
|---|
| Zinc = cotton sustain |
| Water run Urea = 50 units; DAP 180 = phosphorus + nitrous |
| Use liquid fertiliser at planting for Zn (Stoller's Zinc); and P (Stoller's Clearstart) |
| Clearstart fertiliser |
| Uses 15 L of 13Z |
| Fertiliser used contains zinc, sulphur and trace elements - wasn't sure how much. |
| some Nipro flowphos 13z at planting .<br>In season phosphorus (can't remnember rate /ha. |
| for all options between Presseaon Phosphouros and trace element in above table the answer was. 35kg/ha starter 7 (1%zinc) |
| 20 units of the N was applied as a liquid foliar. |
| Used MAP - quoted P 100kg/ha, K 30kg/Ha , Z 3kg/ha |
| water applied fertiliser- 20 on a short fallow area.<br>Phosphorus fertiliser- prescription blend not sure of actual p amount.<br>Potassium fertiliser - as above.<br>Zinc and sulphur - these nutrients also in blend. |
| Preseason Nitrogen called N46 at 100 units (liquid). No in season nitrogen because of severe flooding. |
| Use Cotton Sustain 40kg (NPK) pre season on irrigated and dryland. |
| Uses foliars and also had 1% zinc |

| Manures and composts |
|---|
| This year trialling manure and gypsum across the farm. |
| Uses manures - for P and other nutrition |
| Manures/composts too expensive |
| Use chicken litter as nutrient |
| chook manure 2.5t/ha |
| 6T/ha feedlot manure |
| Applied 300tonnes manure this year.<br>Some starter and composted gin trash applied. |
| manure - cow 4t/ha |
| Manure and compost spreading program. |
| Put biosolids (local treatment sewage) on 30tonnes on a 100 ha per year, |
| Manure is used across the farm. |
| Add manure from feedlot - 10 tonnes/acre/year - not sure of rates of nutrition. |
| only used manure compost pre season |

# Soil cultivation

*Q43. How have your cultivation practices changed across the farm in the past 5 years?*

*Increased (_____how many more operations / year)?*
*Similar*
*Decreased (_____how many less operations / year?)*

Cultivation has generally decreased or remained similar over the past 5 years (Table 30). In some cases they have remained the same because cultivations had been substantially reduced more than 5 years ago. Where an increase in cultivations has occurred this was often due to a need to cultivate to control problem weeds such as fleabane.

Table 30 Changes in cultivation practices over the past 5 years

| Change | # of respondents | % |
|---|---|---|
| ***Increase*** | **14** | **8%** |
| By more than 3 | 0 | 0% |
| By 3 | 1 | 1% |
| By 2 | 6 | 3% |
| By 1 | 4 | 2% |
| ***Similar*** | **59** | **34%** |
| ***Decrease*** | **99** | **58%** |
| By 1 | 9 | 5% |
| By 2 | 35 | 20% |
| By 3 | 23 | 13% |
| By more than 3 | 16 | 9% |

Table 31 Comments about cultivation and soil management

| Comments |
| --- |
| More with cotton than rice etc |
| More tramlining over the last 5 years |
| Tramtracked for 15 years , GPS |
| One field rotation in crop cultivation to control volunteer cotton + fleabane |
| Changes 2 m beds<br>Minimum tillage in last 12 years |
| Dryland is minimum till |
| Increased cultivation this season was for fleabane control |
| Slash & root cut<br>1x sweep cultivation in furrow<br>1 x sweep cultivation hill top<br>1 x gas appilcation<br>1 x rolling |
| Adaptive management- some years require more passes; eg after a wet harvest deep cross rip to remove wheels tracks |
| Cover crops rather than wheat stubble |
| Minimal work over last 5 years due to drought |
| Has gone to 2 metre beds and finds these are working well for him. |
| 2/3 of property cultivated once a year. |
| Trying to go min till especially under lateral move - pupae bust |
| Less than 10-15 years ago |
| Went from wheat (minimum till) to cotton |
| Cultivation for weeds |
| cultivations increased for pupae busting |
| Comments about cultivation & Roundup Ready |
| Decreased cultivations due Roundup Ready |
| Round up flex has changed things - less invasive cultivation, minimises damage around the root zone |
| Decreased with roundup ready cotton. |
| increased cultivations to control Roundup Ready Volunteers |
| In crop- reduced because of roundup ready. Have been zero till in fallow for 20 years. |
| Cultivations decreased due to RR cotton |
| Reduced cultivation with use of RR cotton |

# Views about cotton research

*44. How well do you feel that the cotton industry is serviced by research and extension? On a scale of 1 – 10 where 1 is very dissatisfied and 10 is very satisfied.*
*45. In critical times and emerging issues (such as mealy bug, whitefly, Cotton stainers, bunchy top, flooding) do you feel that that the research and extension sector respond quickly enough?*

The majority of respondents are satisfied with the research and extension effort overall and in response to emerging issues. There is seen to be room for improvement, with several comments relating to a need for an increased extension effort. Comments expressed come concerns and disappointment about the need for the Cotton CRC to apply for funding to continue.

Figure 23 Satisfaction with how the cotton industry is serviced by research and extension

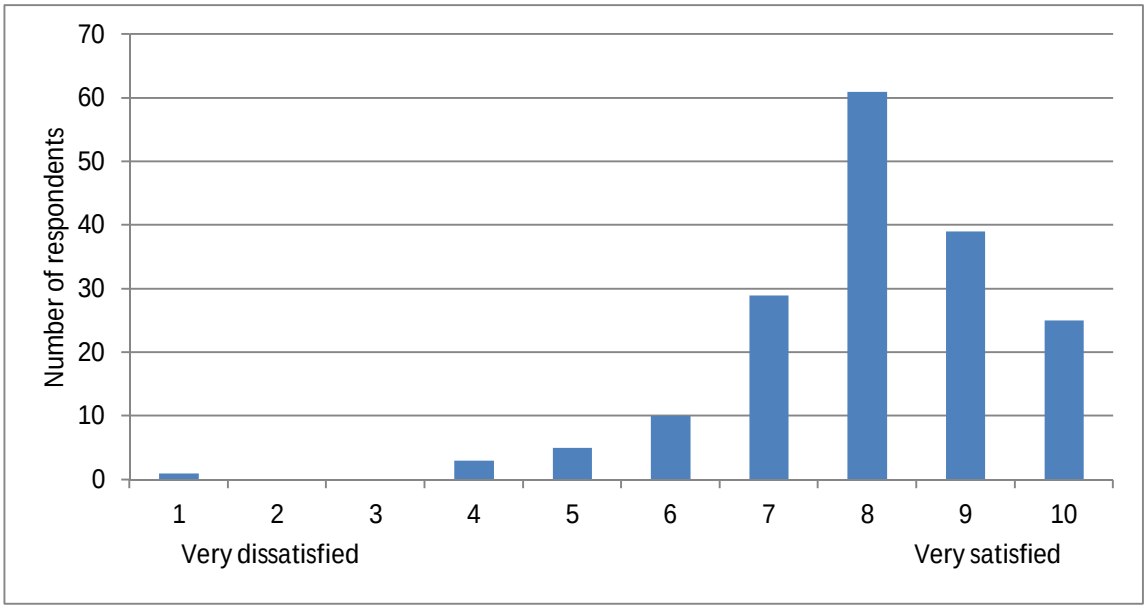



Table 32 Satisfaction with how the cotton industry is serviced by research and extension, by region

| Region | Average Rating<br>1 (very dissatisfied) to 10 (very satisfied) | Range |
|---|---|---|
| Central Queensland | 7.6 | 2 to 9 |
| St George / Dirranbandi | 8.3 | 6 to 10 |
| Darling Downs | 8 | 4 to 10 |
| Border Rivers | 8.5 | 7 to 10 |
| Gwydir* | 7.9 | 1 to 10 |
| Lower Namoi | 8 | 5 to 10 |
| Upper Namoi | 8.2 | 6 to 10 |
| Macquarie | 8.1 | 7 to 10 |
| Bourke | 7.7 | 7 to 8 |
| Lachlan Murrumbidgee | 8.4 | 6 to 10 |
| **TOTAL** | 8.1 | 1 to 10 |

*Note that with the exception of the respondent who chose '1' in the Gwydir region, the range would be 7 to 10 for Gwydir and 4 to 10 for the total survey.

Figure 24 Satisfaction with cotton research, by region

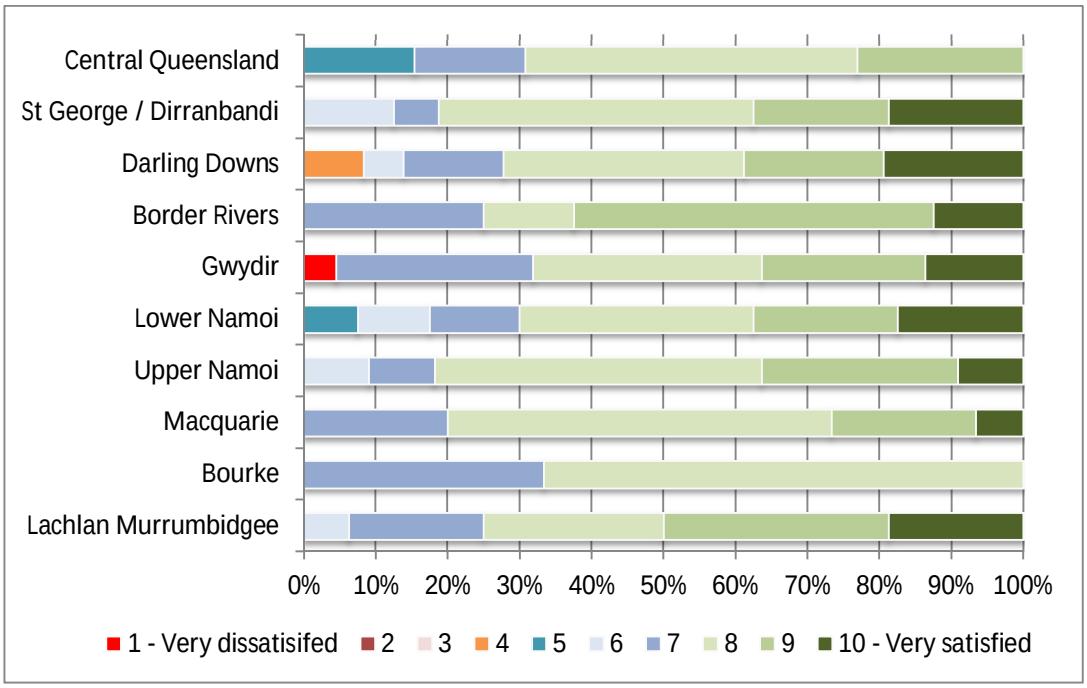



Table 33 Perceived responsiveness

| Region | Average Rating | Range |
|---|---|---|
| | 1 (not responsive at all) to 10 (excellent response rate) | |
| Central Queensland | 6.7 | 1 to 9 |
| St George / Dirranbandi | 8.2 | 5 to 10 |
| Darling Downs | 7.7 | 3 to 10 |
| Border Rivers | 7.6 | 5 to 9 |
| Gwydir | 7.7 | 2 to 10 |
| Lower Namoi | 7.7 | 3 to 10 |
| Upper Namoi | 8.3 | 6 to 9 |
| Macquarie | 8.0 | 7 to 9 |
| Bourke | 7.0 | 7 |
| Lachlan Murrumbidgee | 7.9 | 5 to 10 |
| **TOTAL** | 7.7 | 1 to 10 |

Figure 25 Satisfaction with research and extension responsiveness to emerging need and critical issues

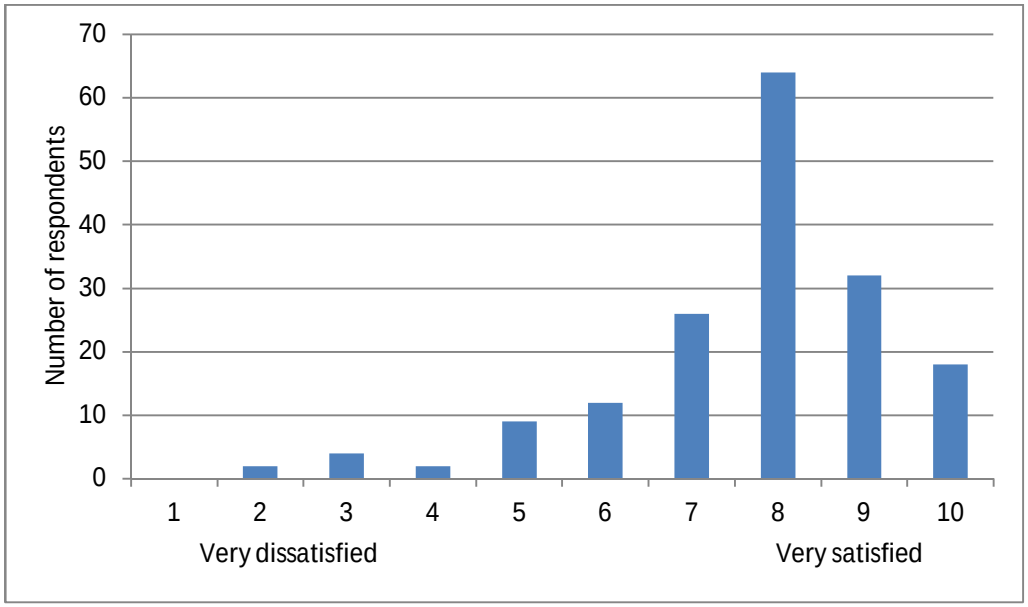
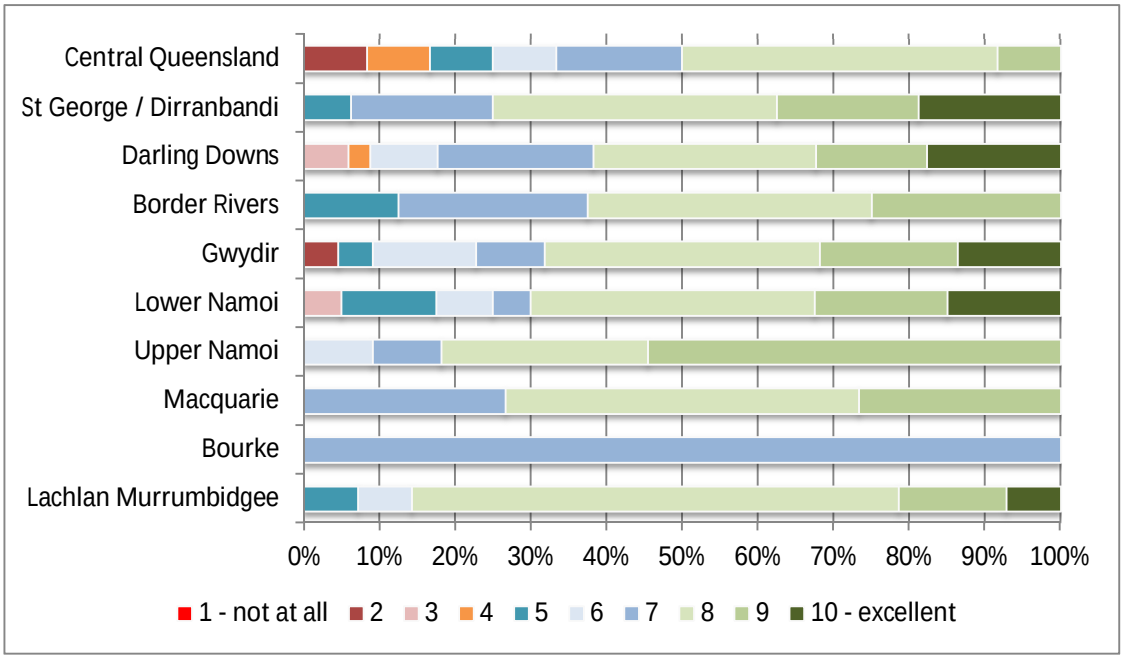



Figure 26 Satisfaction with research and extension response to critical need and emerging issues



*Q46. Are there any other comments you would like to make about the Cotton CRC and industry research?*

Table 34 Further comments about Cotton CRC and industry research and other issues

| Research and development | |
|---|---|
| Central Queensland | The CRC has played an important role for our industry's progress & prosperity. If the industry is unsuccessful in the CRC Extension we will need to carefully map our R&D effort for the future. |
| | Want to see research and extension continue - it is an important part of the industry. |
| | Love to see continuation of Cotton CRC and practical research. |
| Darling Downs | Yes, it's very good. |
| | Little areas like Murgon fall through the cracks eg when there was an IDO we never saw them. Did some work with Dr M. Khan on sucking insects, was good |
| | Too centred on Narrabri |
| | Got us where we are - Critical. |
| | Worried about researchers aging.<br>Need continuing funds available for implementation of research results.<br>Unsure of where funding is heading to |
| | Innovative and progressive industry |
| | Cotton industry has flourished through good times and survives through tough times largely due to its progressiveness in research and development |
| | Great industry with great support. |
| | Don't follow it closely |
| | It is crucial that research and development continues to support our industry for its future and sustainability |
| Border Rivers | Primarily a grain grower, very actively engaged through Agforce in industry R&D and reasonably aware of cotton industry R&D.<br>He commented on discussions in Qld in relation to RD&E in all ag industries and particularly grain and cotton field. A Dept restructure is being proposed with a focus on commodity based institutes such as BSES which allow for stakeholder and government investment and leadership.<br>He discussed the tactical approach of consultants compared with a longer term strategic approach to RD&E. |
| | Generally, the industry research is excellent and is what keeps us all ahead of the game. The CRC extension bid being successful is a must for the industry. |
| | Lucky to have the researchers we do, have built the great varieties we have. |
| St George / Dirranbandi | Keep the CRC going |
| | Critical to the industry that needs to keep going |
| | Do a brilliant job. Hope they can keep funding to do it. |
| | Not sure- have not been following it for long enough |
| | WELL DONE! |
| | The CRC should continue |
| | Researchers do a great job. |
| | Happy with the job they do. |
| | Good research and information - keep the good work up. |
| Gwydir | The CRC does a great job and needs to be continued if possible. |
| | Doesn't feel directly uses research and extension, but his consultant does.<br>"Keep up the good work." |
| | Pretty committed, efficient |
| | Make sure it continues |
| | Necessary industry |
| | All going very well |

| | |
|---|---|
| Lower Namoi (including Walgett) | Not enough co-operation with farmers only seem to work with farmers who do trials otherwise not interested<br>Researchers not very accessible<br>New or returning growers in dark for information |
| | the cotton industry is much more advanced and supported then any other agricultural industry |
| | Sometimes others ahead of dice to their area - they get told before it happens |
| | Research has been practical and results in information that can be applied on the farm |
| | Important that CRC keeps going. Important in coordinating R&E - preventing duplication.<br>CRDC & CSD, Cotton Australia, all doing some R&E.<br>Someone needs to coordinate. |
| | Last 20 years issue - endosulfan |
| | essential to my business |
| | The Cotton Industry has an ideal model of Cotton research in that growers have a say in the research directions and research is partly funded by growers.<br>We have a unique situation in that we are close to the ACRI and have good communication with the researchers there. |
| | to many administration/managers and not enough researchers. too top heavy. |
| | Essential we have research and continue the good work |
| Upper Namoi | Some crops at the CRC appear to be worse than others commercially grown, they also mature later. Is insect control too soft? |
| | Stopped growing cotton a few year ago - may grow again<br>Thinks the industry is good and CRC is doing a great job<br>Very engaged compared to other industries |
| | Better serviced than most other industries |
| | First time growers but it has always been progressive from the outside |
| | Cotton CRC has been of great benefit to the industry<br>There has been a huge improvement in varieties over the last 30 years |
| | Keep up the good work. |
| | Keep up the good work get value for money invested. Keep tellling growers how they benefit even if the benefits are intangible eg: better community education. |
| Bourke | Research has been excellent but I haven't kept up to speed with it |
| Macquarie | It's a shame CRC needs to chase funding again |
| | Having not been growing much over the past 5 years I have not been following the research but I will be now that we are at full production again. |
| | Keep up the good work you do for the industry |
| | Cotton research is close to growers and vice versa<br>Problems are recognised quickly |
| | Good information about research and cotton. |
| | Very good information available |
| | Industry research continues to do an outstanding job |
| Lachlan Murrumbidgee | Cotton industry used to be better serviced but suffered through drought<br>Overall thinks the industry does well, and is headed in the right direction. Using plenty of consultation to determine priorities |
| | Taken a good levy - hopefully doing a good job<br>Not getting a lot of coverage due to not being in a growing area |
| | Very important and needs continued support. |
| | Would like to use it more often |

| Responsiveness of RD&E | |
|---|---|
| Central Queensland | Some aspects of people respond quite quickly but sometimes the research + key question takes time to research and get the findings |
| | The industry showed quick response time to the Whitefly outbreak in 2001. The Mealybug response was slow & at times disorganised & unwilling to find people to act. I suppose the industry has changed significantly over those years and capacity has diminished. This is something our research funders need to address along with showing better intent to manage a crisis like Mealybug. It seems we all need to pull together and set a shared vision for how R&D will look in the future and ensure productive buy-in from all stakeholders. |
| Darling Downs | Not sure yet, relies 100% on agronomist to be up to date with current research. |
| | Slow response to floods |
| | Slow response to flooding issues |
| Lower Namoi (including Walgett) | In the whitefly situation more information has been given by the Ginners then the CRC. |
| Bourke | Too far away from RDE to know about responsiveness - assume it is |
| Lachlan Murrumbidgee | Whitefly response was quick, not so quick on mealy bugs<br>Good people - cotton is one of the most forward industries, tackles problems usually before they become an issue |
| **Extension** | |
| Darling Downs | We used to get trial books and newsletters from CRDC. Used to get notes about grubs and the Beneficial Guide on pests and insects. We still get a monthly email from someone - the Darling Downs Cotton Catchment I think. |
| Border Rivers | An extension officer for Macintyre would be good. |
| St George / Dirranbandi | To get more up to speed with myBMP - district workshops would help<br>eg on-farm workshop |
| Gwydir | Any industry research activites are currently being badly let down by the lack of extension undertaken in the Gwydir Valley since the area lost its extension officer (IDO) a couple of years ago. |
| | There is no industry development officer based in the Gwydir Valley and hense very little industry extension occurs within the Valley. We rely heavily on CSD for extension activities and cordination of research activities. |
| Lower Namoi (including Walgett) | Good service of industry in research.<br>Extension is not as good |
| Upper Namoi | A cotton extension officer in the area would be AWESOME |
| | Lack of extension - all comes down to money. Can't be too critical; with resources available they've done well, but there's a greater need for extension. |
| Macquarie | Would like to see more done about BMP . Lots of people have done initial work on bmp and nothing happening to follow these people up.<br>Would like to see more effort on getting previously audited growers back in the system and getting new growers on board. |
| | Even though I have only ticked 3 CRC tools that I use, I am familiar with most tools mentioned and believe most of the information provided is invaluable to those starting in the industry especially agronomists who need to be up to date on research and informed, to ensure information is delivered at grower level. |
| | can always find people if you want to know something |

| Industry | |
|---|---|
| Central Queensland | May grow again<br>Experience transport issues - too much time to export<br>Burdekin needs a gin<br>Cotton seed monsanto fees were up - one reason why he walked away |
| Darling Downs | Will grow next year. Was in the industry for 25 years (about 10 years ago) but had too many disease problems. They were spending a fortune on sprays, etc. and were concerned about the health effects of all those chemicals on their children.<br>Moved into growing organics instead to reduced chemical usage.<br>Knows there's been a lot of improvements in the industry, such as roundup ready, that eliminate the need for pesticides and tipping. Also knows that some technology improvements have meant that less labour is needed.<br>Was involved in industry bodies in the past, and intends to be in future. Part of a community group called 'Save Our Darling Downs' - protesting against foreigners buying up farms and turning them into mines. Very passionate about this issue (Queensland Cotton is involved with this group as well)<br>Generally thinks the industry is pretty good and innovative - was a member of IPM when he was growing cotton. |
| | Mentioned it was inconvenient to rely on contractors |
| Border Rivers | Lots of issues to stay on top of - cotton not booming like spin - growing cost squeeze.<br>Greens no idea of how rivers work.<br>Credit squeeze - requirement for a rural bank |
| | Growing cotton is my job and hobby, so I love what I do and find the Cotton Industry is very professional. |
| St George / Dirranbandi | Industry has gone through some very trying times therefore there is a need, to focus on confidence and communication rebuilding.<br>response from growers will increase<br>Shortage of expertise (agronomists, farm managaers, ginners (a major issue) |
| **Agronomy, water & other issues** | |
| Darling Downs | Very interested in liquid evaporation control and is concerned about stalling of research and development in this area. |
| Lower Namoi (including Walgett) | more info needed on soils and uniformity in soil testing results. Need an industry standard for cotton.<br>What about soil carbon in cotton. Taking in mind farmers may be taxed in the future |
| | I think dryland cotton research to be increased specifically: more varieties suited to dryland, Bollgard varieties are not so suited to dryland due to their shorter flowering period.<br>Pupae busting in Bollgard varieties breaks down the No till system. |
| Bourke | Research needs to catch up with what is happenning in industry with targetting high yielding crops - especially with nutrition and irrigation<br>Research doesn't match with what growers of high yielding crops are doing |
| Lachlan Murrumbidgee (Southern NSW) | Soil not as fertile in his area<br><br>Shorter cooler summer + seasonal variability<br><br>use more irrigation due to less in crop rainfall |
| Macquarie | Benchmarking across industry |

| Crop protection issues | |
|---|---|
| Central Queensland | Need research into alternate rmp , planting window must go , its the largest restriction to productivity in cq. |
| Border Rivers | Would like to see research on the benefits of Bollgard - price problem - why should they be paying monsanto? |
| Gwydir | I wish they would allow researchers to develop/release 2,4D ready cotton - very helpful in no till dryland systems |
| Lower Namoi (including Walgett) | Big opportunities in white fly |
| Upper Namoi | Like to see more research done on fleabane, don't feel like there's been any progress in the last few years |
| | Bring back Area wide management. |
| **Flooding** | |
| Lower Namoi (including Walgett) | Flood response - get water off as quickly as possible, need to be quick and act early |
| Macquarie | Suggestion to record and communicate the responses to flooding - what did growers do? what worked? what didn't? |

# New growers and those re-entering the industry

The 2010-11 season saw a number of new growers plant cotton and others re-enter the industry after a (generally drought induced) break. The CRDC and Cotton CRC were interested to know how best to engage with these growers and understand their needs.

Eleven respondents returned to cotton production in 2010-11 after a break of 5 or more years. A further ten respondents grew cotton for the first time in 2010-11:

- 1 in Gwydir
- 1 in Upper Namoi
- 2 in Macquarie and
- 6 in Lachlan Murrumbidgee.

### *Reasons for growing cotton in 2010-11*

*Q47. Who or what influenced your decisions about whether or not to grow cotton?*
*Q48. Do you think you will grow cotton again? Yes/maybe/No. Comment*

Almost every grower re-entering the industry indicated that price and/or water were the main reasons that they returned to cotton growing (Table 35). One indicated that, in addition to price, the purchase of a new farm also helped with their decision to grow cotton again.

Growers who were entirely new to the industry had a range of other reasons for deciding to grow cotton as listed in Table 35.

All 21 new and returning growers interviewed for this survey indicated that they would grow cotton again.

Table 35 Reasons for growing cotton in 2010-11 for new growers and those re-entering after a break of 5 or more years

| Summary | # of respondents | % |
|---|---|---|
| Price of cotton | 17 | 85% |
| Water availability | 9 | 45% |
| Local grower success | 3 | 15% |
| Returns | 2 | 10% |
| Technology (i.e. Roundup) | 3 | 15% |
| Advice (from consultants) | 2 | 10% |
| Weed management tool | 1 | 5% |

### *Industry participation*

*Q49. Have you joined or do you intend to join the Cotton Growers Association? Yes/No*
*Q50. Have you joined any other grower / irrigator association? Yes/No*
*If yes, what are these – list by name?*

Approximately half of the surveyed growers new to or re-entering the industry have joined their local cotton grower association.

Table 36 Respondents who have joined, or intend to join, the Cotton Growers Associations

| | Joined CGA | | | Joined other association* | |
|---|---|---|---|---|---|
| Region | Yes | No | Maybe | Yes | No |
| Central Queensland | 0 | 0 | 0 | 0 | 0 |
| St George / Dirranbandi | 0 | 0 | 1 | 0 | 1 |
| Darling Downs | 1 | 0 | 0 | 0 | 1 |
| Border Rivers | 0 | 0 | 0 | 0 | 0 |
| Gwydir | 0 | 1 | 0 | 1 | 0 |
| Lower Namoi | 0 | 1 | 3 | 0 | 4 |
| Upper Namoi | 1 | 2 | 0 | 1 | 2 |
| Macquarie | 4 | 0 | 0 | 3 | 1 |
| Bourke | 0 | 0 | 0 | 0 | 0 |
| Lachlan Murrumbidgee | 5 | 1 | 1 | 3 | 4 |
| TOTAL | 11 (52%) | 5 | 5 | 8 (38%) | 13 |

* Other associations include:

| | |
|---|---|
| Macquarie: | Macquarie River Food and Fibre (MRFF) |
| Lachlan Murrumbidgee: | Hay Water Users Association, Rice growers association, Murrumbidgee ground pumpers, NSW farmers |
| Upper Namoi: | Namoi Water |
| Gwydir: | Gwydir Valley Irrigators |

*New and returning growers made a number of suggestions of things that could be done to help growers in their situation as presented in Q51. Any suggestions about what the research or industry more broadly can do to help growers new to or re-entering the industry?*

Table 37.

*Q51. Any suggestions about what the research or industry more broadly can do to help growers new to or re-entering the industry?*

Table 37 Suggestions for additional research to help new growers

| Region | Comment |
|---|---|
| Central Queensland | Cotton production manual is good as it addresses lots of questions |
| | A lot of people have left the industry and come back - some issues exist<br>Lack of understanding on nutrition and soil - would like to know more on it - new growers can face risks with split applications (spend money on chemicals and insects)<br>Regulation in growing with crops (in grains) is difficult. New Dryland growers face a lot of regulation that can be daunting - agreements are strict and thorough (e.g. with Monsanto) |
| Darling Downs | Got into cotton because of price and return, but is probably not going to grow it again because it has become too expensive (particularly dryland cotton).<br>Last 5 years we have lost money or broken even on their cotton |
| | It's all there – rely on a good agronomist who has kept up to speed while we've been out growing cotton. |
| St George / Dirranbandi | I will be better at answering that next year |
| Gwydir | Priority is to keep whitefly and mealy bugs at bay.<br>For new growers, support depends on individual growers. Industry is fantastic and supportive, but you need to be proactive about it. |
| | Share knowledge |
| Lower Namoi | Make information more available |
| | Have grown cotton for over 40 years, only had a break because of the drought. Kept abreast of what was happening in the industry so it was easy to start again |
| Upper Namoi | Quicker varieties<br>Pupae busting is expensive |
| | New people might consider entering in if there's resources and support available<br>Extension needed:<br>- upper Namoi has lots of new dryland growers<br>-historically, extension officers have helped out<br>- these extension officers need more funding to service new growers better |
| | New growers need to be given a "welcome to Cotton CRC" pack explaining services you can provide |
| Macquarie | Internet tools very handy and easy to use |
| | Educating non-cotton growers on the industry - can be hostile |
| | Encourage to attend meetings, what is available to make informed decisions<br>This is where the cotton industry shines in respect to its openness and fixing problems |
| Lachlan Murrumbidgee | Cotton industry does a good job with new growers |
| | Extension officer only part timer - full time extension would be good (relevant to new growers)<br>can be real challenge to grow<br>New techniques etc. going on in area |
| | Pretty good at supporting growers within Hillston<br>Expansion in last couple of years<br>During earlier part of 5 years time - industry development officer has key |
| | Lots of information available<br>New people need to be made aware - it's not an easy crop to grow.<br>Lot's of ginning + picking leads to high costs - not fully understood |

| | |
|---|---|
| | Good to see someone from association in the field<br>Getting lots of advice from agronomist (and readings provided by him) so may be biased there. Hence would like someone from industry who's more neutral to come out once or twice a season to visit |
| | The only thing he wasn't expecting was that after picking he needed more knowledge on the breakdown of crop residue<br>Would like more knowledge and information for after picking e.g. handling crop residue |
| | New growers need....<br>- information on machinery to do with cotton<br>- advice on hilling up through to picking<br>- new to row cropping, so unsure what's out there |
| | Quicker maturing cotton for us Down South |
| | keep up flow of information |
| | A lot of new growers coming into the industry, concerned not enough extension staff to inform growers of best practices for cotton growing. Predicted 55,000 ha next year. |

# *Thanks*

*Many thanks to the cotton growers who completed the survey, your input is greatly appreciated.*

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