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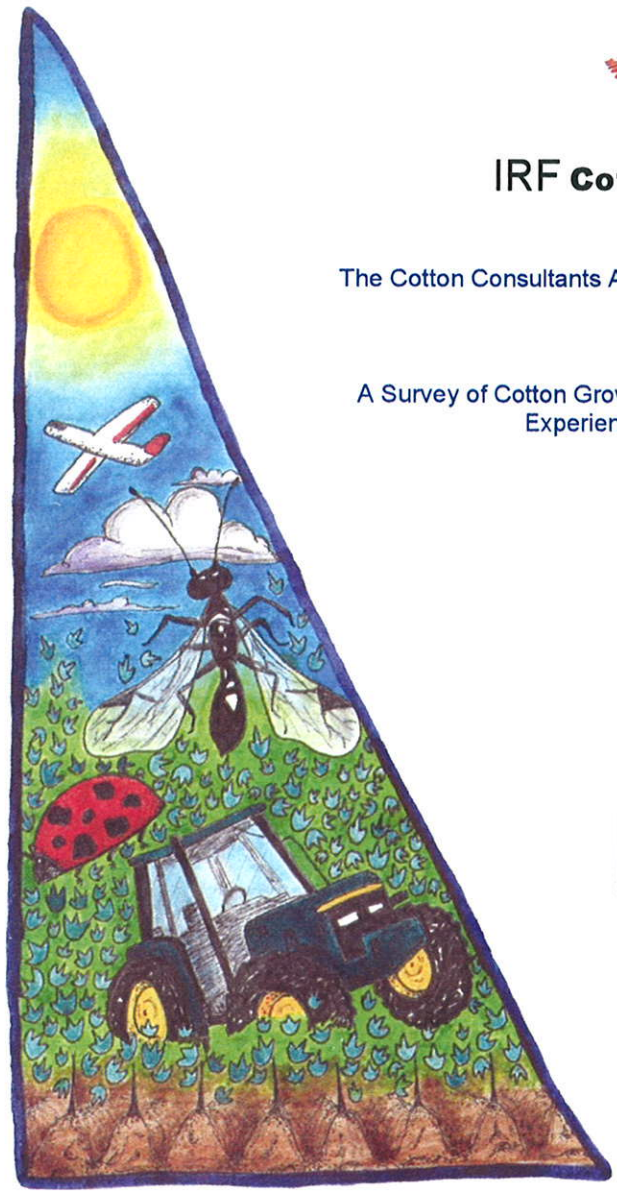

IRF **Cotton Research**

The Cotton Consultants Australia 2005 Bollgard Comparison Report:

A Survey of Cotton Growers' and Consultants' Experience with Bollgard in the 2004-2005 Season

A Report Prepared for

Australian Government
Cotton Research and Development Corporation

Cotton Catchment Communities CRC

On Behalf of

Cotton Consultants Australia Inc

Institute for Rural Futures, University of New England

Artwork by Emily Wade Designs – irf@metz.une.edu.au

IRF **Cotton Research**

The CCA 2005 Bollgard Comparison Report:

A Survey of Cotton Growers' and Consultants' Experience with Bollgard in the 2004-2005 Season

A Report Prepared for

The Cotton Research and Development Corporation
&
The Cotton Catchment Community CRC

On Behalf of

Cotton Consultants

Brendan Doyle, Ian Reeve & Michael Coleman

December 2005

IRF Cotton Research
University Of New England
Armidale NSW 2351

ACKNOWLEDGEMENTS

The authors would like to thank the members of Cotton Consultants Australia Inc. for their assistance in providing information for this report. A special thank you to Jon-Maree Baker in the CCA executive office along with the CCA survey committee. This report would not be possible without the generous assistance of CCA members throughout the valleys, the survey team would like to thank them for their time.

It is stated here and must be understood by any reader that 'users of the information contained in this report do so at their own discretion'. While every care has been taken to verify the accuracy of figures and associated claims, the data is supplied by respondents across all cotton growing regions, and their individual assessments and interpretations are 'best estimates' from sampled survey data and must be used in that light.

Finally while all care has been taken in the preparation of this report, users of the compiled information do so at their own risk and discretion.

EXECUTIVE SUMMARY

This report provides a summary and overview of the performance of Bollgard cotton in the Australian industry over the 2004-05 cotton season. To assist in interpretation of these data, information from the first commercial year of Bollgard cotton, the 2003-04 season is presented for each quantitative section of the survey. Data relating to the final year of Ingard cotton 02/03 is presented in conjunction with the 2003-04 season and 2004-05 for data at the aggregate level. For the 2002-03 season, a reduced cotton planting and the widespread trialing of Bollgard varieties reduced the number of comparisons available such that valley-by-valley reporting was judged to be unreliable.

Management considerations that drive adoption of Bollgard were canvassed, these include; managing risk associated with operating the growing operation, particularly OH&S and spray timing issues - logistics. Reducing the variability of cost and uncertainty associated with ccontrolling pests and environmental considerations – boundary areas, populated areas and other sensitive sections of the farm such as waterways and grazing paddocks. The final and perhaps most variable consideration driving adoption are lifestyle factors – increasing available time, reducing general hassles associated with the crop and other spray intensive commitments.

In terms of operational issues, the views of respondents were sought with regard to irrigation management and refuge requirements. Irrigation management of Bollgard revolves around the need for higher early fruit retention and the impact this requirement has on timing of irrigations early in the season. Irrigation intervals are often referred to as shorter than comparable conventional crops.

Consultants and growers expressed frustration relating to refuge requirements as they are seen as a cost burden to the largest extent. The shortage of viable options is problematic for managers and a concern regarding the maintenance of the refuge throughout the season. The suggestion is made quite clearly by respondents, that putting water onto a crop that has no commercial value is hard to justify, hence anecdotal evidence that a large percentage of refuge was unattractive throughout the 2004-05 season could have substance. Dryland systems appear to be at a greater disadvantage. As has been the case in other seasons, the question of using neighbouring crops as refuge is canvassed.

The 2004-05 season saw a very even result for yield when comparing conventional and Bollgard crops. For the 50 sample fields supplied, the average for both types of cotton was 10 bales, a dramatic increase over the average yield reported in 2003-04 where conventional cotton for the sample of 64 comparison fields resulted in an average of 7.73 against an average of 8.27 for Bollgard. Differences in yield quality between the two types of cotton were largely not observed in 2004-05.

In the 2004-05 production season, Bollgard varieties received an average of three sprays as opposed to an average of 11.4 sprays on conventional cotton, a reduction of 8.4 sprays on average. In the previous production season, there was a slightly higher average number of sprays on Bollgard crops where 3.4 sprays occurred, and slightly less on conventional with 11.1.

Bollgard fields were sprayed for green mirids up to four times by only three per cent of respondents to the survey who had sprayed for green mirids. 23 per cent of respondents sprayed green mirids three times, while nearly half of the respondents sprayed twice. Approximately 8 per cent of respondents listed four sprays for green vegetable bug, all other secondary pests were sprayed a maximum of two times.

The financial result for Bollgard when considering variable input costs resulted in 66 per cent of comparisons ending in an economic benefit from growing Bollgard. This is a declining trend where the result for the first year of Bollgard was 84 per cent of comparisons showing a benefit and in the last year of Ingard, 2002-03, 89 per cent of comparisons favoured the technology.

The report as presented raises a range of questions in regards to the future trend of adoption of this technology by the industry. Specifically, it is clear that the vexed question of refuge heath

and underlying economics needs to be more fully understood and explained to the industry so that informed decisions can be made.

Importantly, unpacking the attitudes and opinions of agronomic managers and growers with respect to the lifestyle component of the decision process, will be important if the Corporation is to impact on the course of the technology into the future.

TABLE OF CONTENTS

1. INTRODUCTION

This document highlights the performance of Bollgard cotton in the Australian Industry during the 2004-05 season. Data drawn from the 2003-04 season and aggregate data from 2002-03 are also used to provide background trend data.

1.1. Objectives of the Study

This study aims to use data collected from Cotton Consultants Australia Inc. members to allow for an independent analysis of the performance of Bollgard cotton in the Australian Industry. In conjunction with empirical quantitative data, qualitative information from growers and consultants is used to inform the reader of the underlying thoughts and attitudes surrounding issues of importance to the industry.

1.2. Methods

Data for this report is drawn from two sources

Cotton Consultants Australia (CCA) conducts an annual survey of consultants that canvasses quantitative and qualitative information at the end of each season. Table 1.1 presents the sample for the 2004-05 survey. The response rate is approximately 56 per cent of the 2004-05 cotton area. Qualitative responses in the survey are from this group, Quantitative data used for analysis is drawn from a sub-set of consultants who provided data on 50 comparable Bollgard and conventional fields.

Table 1.1 – Survey responses – CCA Consultant Survey

	Survey Conventional	Survey Conventional RR	Survey Bollgard II	Survey Bollgard II RR	Total Survey Responses	04/05 Industry Estimate
St George	3162	397	7139	10405	21103	39800
Darling Downs	6535	1309	7565	4696	20105	53334
Macintyre	9667	3327	15237	9494	37725	41340
Gwydir	8219	7582	9356	8739	33896	70144
Namoi	3209	1477	5302	18137	28126	48866
Upper Namoi	175	0	220	6975	7370	12333
Macquarie	176	308	0	1347	1831	6700
Bourke	2198	131	3949	4001	10279	11900
Capricorn	2372	688	2441	4187	9687	22064
Southern NSW	286	507	0	4040	4833	7960
Group Total Ha's	35999	15727	51208	72022	174956	314441

In addition, the CCA also conducts the annual Cotton Grower Feedback Survey. This instrument is now sent to all growers in the industry and provides a valuable mechanism for understanding growers' perspectives on a range of important issues facing the industry. The finalised survey resulted in usable responses from 97 growers with reported cotton area for the 2004-2005 season of 56,805 hectares or 18.2 percent of the 314,000 hectares grown for the season. The distribution of production contexts and geographic spread is comprehensive. Summary data on the sample are presented in Table 1.2 below.

The data in Table 1.2 are displayed by aggregated regions to provide a level of anonymity to respondents. These groupings and the number of respondents for each aggregated region are displayed in Table 3.

Table 2 – Characteristics of Grower Survey Sample

	Nth Qld	Darling Downs	West	Central	Upper Namoi	Macq & Sth[1]	Industry Total
	Mean	Mean	Mean	Mean	Mean	Mean	Mean
Total Cropping Hectares	2033	889	6352	4093	1248	6400	3490
Green Ha	1657	498	1690	2856	670	2575	1643
2004/5 Cotton	381	229	1020	623	388	873	586
2004/5 Winter Cereals	549	139	1115	1724	389	1325	930
2003/4 Yield	6.9	6.4	7.7	8.0	6.3	7.8	7.2
2004/5 Yield	7.3	5.9	9.5	9.5	6.8	8.8	8.0
Bollgard % 2004/5 (Weighted)	69%	62%	79%	68%	92%	86%	74%
Irrigation water with 100% of total storage, allocation and other sources - Ave Megalitres	4683	1213	29547	10292	3108	30500	12403
Percentage of this total that is currently available for next season.	44%	22%	32%	40%	72%	44%	36%

A guide to the varacity of the data from the grower survey can be determined by examining the percentage of Bollgard planted in 2004/05. When calculated, the weighted average is 74.4 percent. This figure is quite close to the reported observed average for the season of approximately 72 percent.

Table 3 – Aggregated Regions – Grower Survey Responses

Combined Regions	Regions described	Number of Respondents
Nth Qld	Emerald, Dawson Callide	6
Darling Downs	As described	28
West	Macintyre, StGeorge, Dirrinbandi, Bourke	24
Central	Mungindi, Gwydir, Lower Namoi, Walgett	28
Upper Namoi	As Described	7
Macq & Sth	Macquarie, Hillston, Hay	4
Total		97

1.3. *Report structure*

The report begins with an overview of some of the management considerations facing growers and consultants. This is followed by the major section of the report, Bollgard performance.

Bollgard performance is segmented examines: yield, reductions in sprays, secondary pests, active ingredients comparisons and economic outcomes.

A detailed section of graphs looks at sprays by pest by production stage in appendix 1. The report is finalised with detailed graphs by active ingredient and production valley in appendix 2.

[1] Responses in the Macquarie and Southern regions are dominated by corporate entities, hence higher than expected mean scores are reported on some characteristics.

2. MANAGEMENT CONSIDERATIONS

This section of the report outlines motivations for growing Bollgard Cotton, highlighting costs and benefits associated with the technology, perceptions regarding irrigation management, and the thoughts of consultants and growers regarding refuges.

2.1. *Reasons for Growing Bollgard*

The reasons for growing Bollgard can broadly be grouped into the following categories

- Managing risk associated with operating the growing operation, particularly OH&S and spray timing issues – logistics.
- Reducing the variability of cost and uncertainty associated with ccontrolling insects.
- Environmental considerations – boundary areas, populated areas and other sensitive sections of the farm such as waterways and grazing paddocks.
- Lifestyle factors - reducing general hassles associated with the crop and time commitments.

Table 2.1 outlines the reasons that consultants attribute as to why Bollgard is grown.

Table 2.1 Please give reasons for growing Bollgard II cotton - in order of importance

	Reason 1	*Reason 2*	*Reason 3*	*Reason 4*
Southern NSW	Cost savings.	Environmental.	Time savings.	Earliness.
Southern NSW	Bollgard is grown in sensitive areas such as along the river and highway to minimise the risk of spray drift onto sensitive areas.			
Macquarie	Ease of logistics - 95% of the reason.	Yield potential unknown.	Cost.	
Macquarie	Stabilise yield performance.	Reduce number of sprays.	Ease of management for smaller growers.	Deferred payment until near picking for the technology.
Macquarie	Risk management for cool season & high Heliothis years.	Grower convenience.	Robust control of Helicoverpa.	Earliness.
Bourke	Cost.	Lack of experienced labour due to previous drought.	Payment terms.	
Bourke	Ease of management of Helicoverpa.	Expectation of a better yield (which is yet to be proven).	Expectation of cheaper Helicoverpa control (which is yet to be proven).	
Bourke	Reduced chemistry.	Increased gross margins.	Lifestyle.	
Gwydir	Management of Heliothis.	Environmental.	Allows for better management in other areas of cotton growing.	Product shortages.
Gwydir	Increased profits.	Reduced sprays.	More OH & S and Environmentally friendly.	
Gwydir	Risk management.	Ease of management	Environmental.	

		/ lifestyle.		
Gwydir	Sensitive areas.	Help reduce resistance to conventional.Heliothis chemistry	Yield (varieties).	Reduced insecticide costs.
Gwydir	Less spraying in general.	Sensitive areas.	Greater early season retention.	Better overall Heliothis control.
Gwydir	Environmentally sensitive areas.	Technology.	Ease of management.	Lifestyle.
Gwydir	Sensitive areas.	Heliothis costs known up front.	Hopefully it creates an Armigera sink.	Ease of management, allowing less stress and more time to concentrate on other agronomic aspects of the crop.
Namoi	Decrease of inputs and therefore costs.	Increases options for Helicoverpa control.		
Namoi	Cost.	Risk management.	Personal reasons (stress etc).	Less dependent on chemical availability.
Namoi	IPM.	Known costs.	Less chemical usage.	OH & S.
Namoi	Cost reduction.	Lifestyle – quality.	Environmental.	Management.
Namoi	Reduced sprays.	Increases profits.	More OH & S friendly.	More environmentally friendly.
Namoi	Reduced cost of insecticides- that is, you know basically what it will cost.	Higher yields and higher gross margin.	Allows the grower to concentrate more on nutrition and water now that bugs are taken care of to some extent.	
Namoi	Isolate hard to spray areas.	Cost.	Ease of management.	Eliminating one of the limitations of achieving high yield (Heliothis).
Namoi	Cost.	Effective control.	Resistance management.	
Namoi	Manage Heliothis risk and costs.	Environmental.		
Namoi	Price.	Relatively static cost of production.	Ease of management.	Reduced chemical load on the environment.
Upper Namoi	Lifestyle.	Lifestyle.	Environment.	No spray plane in the air.
Upper Namoi	No spraying for Heliothis.	Less stress.	Higher yield.	Cost effective.
Upper Namoi	Reduced sprays.	Sensitive areas.	Reliability during rainy spells - no wash off.	
Macintyre	Insect control (Helicoverpa).	Cost - hopefully cheaper.	Labour - less required.	Machinery - less pressure on spray booms.
Macintyre	Robust yield performance.	Reduce requirement for spraying.	Easier farm management.	Compatible with the environment.
Macintyre	Ease of management.	Environmental.	Cost.	
Macintyre	Reduced chemical sprays.			

Macintyre	Improved financial return to grower.	Reduced risk of any upside costs.	Easer to manage - especially in Dryland.	Higher upside for possible yield increases.
St George / Dirranbandi	Cost effective.	Better lifestyle - reduced stress levels for growers.	Better environment - reduced pesticide going into environment.	
St George / Dirranbandi	Heliothis control.	Yield.	Management ease in a mixed farming system.	
St George / Dirranbandi	Environmental care.	Check on yield potential.		
St George / Dirranbandi	Reduce the number of insecticides.	Environmental management.	Ease of Management.	Improved Helicoverpa control.
Darling Downs	Excellent management of Heliothis.	Potential for lower costs in high pressure years.	Little spraying required.	
Darling Downs	Resistance control.	Ease of growing.	Yield Potential.	Environmentally friendly.
Darling Downs	Reduced risk in yield variability due to Heliothis.	Less chemical use.	Fusarium.	Lifestyle.
Darling Downs	Less use of pesticides, therefore good for the environment.	Generally costs less to produce (if price doesn't rise too much more).	Generally better yielding (on the Downs anyway).	Save time - not constantly out spraying as with Conventional cotton.
Capricorn	Reduced risk of insecticide cost blow-out.	Reduced environmental effects.	Reduced grower workload with regards to no. of sprays.	
Capricorn	No budgeted Heliothis sprays.	More time allowed on different aspects of growing cotton.	Better BGII varieties coming through the system, and more research time is given to developing these varieties.	
Capricorn	To avoid high numbers of sprays in sensitive growing regions.	To contain chemical costs and reduce spray labour.	Keep up with the latest varieties.	Increase yield.
Capricorn	Reduced environmental impacts.	Reduced risks.	Cost.	

2.2. *Irrigation Management*

Comments on irrigation management of Bollgard revolves around the need for higher early fruit retention and the impact this requirement has on timing of irrigations early in the season. Irrigation intervals are often referred to as shorter than comparable conventional crops. The full list of comments are presented in Table 2.2, below.

Table 2.2 - Could you contrast any differences in the irrigation management of Bollgard II, compared to Conventional varieties. Does this GM cotton variety have different requirements? If so, which requirements?

Southern NSW	All BGII. But I did notice that plants were more sensitive to water stress.
Southern NSW	Irrigation requirements were similar between Bollgard and Conventional cotton this season, as irrigation intervals were as low as 6 days during the peak of flowering, when temperatures were extremely hot. In general, Bollgard II may have a higher water use early season when it puts on more fruit, however there is little difference late season after shedding.
Macquarie	The main difference was earlier timing of the first in-crop irrigation for Bollgard being earlier than for Conventional. Other interval cycles were same as for Conventional.
Macquarie	Irrigation scheduling is similar to Conventional cotton, using similar moisture deficits. However, if the fruit retention is high (which is normally the case), then the first irrigation timing should be earlier than Conventional, and subsequent irrigations on time. Irrigations are based on fruit retention, with the aid of the early season plant monitoring technique.
Macquarie	Bollgard has a higher, earlier fruit load - predisposes crop to reduced plant size or possibly early cut out. Therefore early irrigations (first & second in crop) need to be earlier than if it was a Conventional crop. Akin to growing Sicala 40 V's V2.
Bourke	Speaking from previous Conventional experience, I didn't treat the Bollgard any different in irrigation scheduling. The only difference was, the first irrigation was slightly earlier.
Bourke	On the soil that we farm, there is not much difference. However, Bollgard is always given preference for timing of irrigation.
Bourke	Obviously, a high nutrient load is required to sustain BG II as a high retention crop, but it also seemed to use more water, and a shorter irrigation interval was required.
Gwydir	Bigger penalty for poor irrigation timing.
Gwydir	More timely irrigations are required to promote growth, i.e. to limit stress due to high fruit loads throughout the season.
Gwydir	Not really, but Bollgard may benefit from earlier watering by a day?
Gwydir	So far, the two seem to be quite similar. However, with this season having a wet start, it was hard to gauge whether the Bollgard has a higher demand earlier on in the season, as it tends to become reproductive earlier than Conventional, which remains vegetative for longer.
Gwydir	Bollgard must be watered earlier, and the first two to three irrigations must be on time, whilst the frame is being built. It is only when frame and plant height are reasonable that one can ease back on irrigation precision, and even then, not by much.
Gwydir	Water 1 day earlier.
Gwydir	You have to be on time with a high fruit retention crop.
Namoi	BG II varieties were typically watered earlier than Conventional. Due to high fruit load and retention, irrigation timing is critical to reach potential yields. The first irrigation is very important, as is the need to water on time or slightly early if in doubt. Occasional crop cut-out due to pulling water up short.
Namoi	Only grew Bollgard.
Namoi	Bollgard cotton requires more irrigations. Shorter intervals are required between irrigations. It does not handle stress as well.
Namoi	Bollgard appeared to be a smaller bush than Conventional while holding as much or more fruit, therefore irrigations were more timely, as it appeared to take longer for Bollgard to recover from stress.

Namoi	To some extent, water requirements were similar to Conventional, if anything maybe a little higher requirement earlier. The same principles apply, however- perhaps just that Bollgard will potentially have a higher fruit load earlier..
Namoi	No - Bollgard and Conventional cotton treated the same in terms of water requirements.
Namoi	The first irrigation was later on Bollgard.
Namoi	Management of growth and fruiting is critical through the growth phase - irrigation/nutrition requirements have to be managed accurately.
Namoi	Bollgard cannot handle extremes in temperature. It responds well to shorter watering intervals, and to higher fertiliser application, including foliar.
Upper Namoi	Too early to say – it could need shorter water intervals. But it may not need any more water overall.
Upper Namoi	It is perceived that Bollgard needs 1 more watering. Nutrition must be at top level to get top yields.
Upper Namoi	Bollgard needed water earlier than Conventional, and at shorter intervals, but the farm set up restricted the way fields were watered.
Macintyre	Not more total water but shorter irrigation intervals.
Macintyre	We believe that Bollgard has used the same amount of water in a slightly shorter time frame.
Macintyre	It has an earlier water requirement than Conventional but not much else.
Macintyre	The first irrigation was earlier than Conventional. Bollgard seem to use more water.
Macintyre	Reduced intervals on Bollgard, vs Conventional cotton. Watered more regularly but less water/irrigation to decrease water logging.
St George / Dirranbandi	Apart from the need to be a little bit earlier with the first in-crop irrigation, (in the absence of rainfall), to ensure good crop vigour coming into first flower, I don't believe GM requirements are significantly different to Conventional cotton.
St George / Dirranbandi	The first water needs to be slightly earlier to avoid stress on plants with high retention. Also requires approx 20-30 extra units of N, and generally an extra K foliar.
St George / Dirranbandi	Earlier first irrigation is necessary to avoid stress; traditionally we have tolerated, (PM of Conventional Cotton.).
St George / Dirranbandi	Generally the same, except that the first two irrigations need to be right on time or slightly earlier.
Darling Downs	Yes. More precise irrigation scheduling will get better yields.
Darling Downs	Watering needs to be more timely and earlier.
Darling Downs	Much less difference than what we were told. Both should not be watered too early (as was suggested with Bollgard). A high yielding Conventional variety needs as much water as high yielding Bollgard.
Darling Downs	Because of the fruit load, many growers are finding they need to water Bollgard II cotton before Conventional. This may also be because, as we have noticed, Bollgard II takes longer to get it's root down than Conventional.
Capricorn	The only thing may be a higher water requirement at early flower, as more bolls will probably be present. Overall, however, there is no real difference. I think any suspected higher requirements have led us to water better, which has also shown the potential of Conventional cotton.
Capricorn	C-probes dictate that BGII is watered on a shorter irrigation cycle of approximately 7 - 10 days, as opposed to 10 - 14 days for Conventional.
Capricorn	No direct comparison possible as we were 100% BG. Water management was not as critical as we were advised pre-season. The plant showed little or no more tendency to early cut out than Conventional.
Capricorn	Bollgard appears to be less forgiving if irrigations are delayed by any length of time, but deficits are similar.

2.3. *Refuges – Consultants' Impressions*

Consultants and growers are often frustrated by refuge requirements as they are seen as a cost burden to the largest extent. The comments in table 2.3 indicate that the shortage of viable options is problematic for managers and a concern regarding the maintenance of the refuge throughout the season. The suggestion is made quite clearly that putting water onto a crop that has no commercial value is hard to justify, hence anecdotal evidence that a large percentage of refuge was unattractive could have substance. Dryland systems appear to be at a greater disadvantage. As has been the case in other seasons, the question of using neighbouring crops as refuge is canvassed. The mix of refuges used are outlined in Table 2.4.

Table 2.3,,Could you summarise the thoughts or opinions of your growers with respect to refuges grown for Bollgard II fields?

Southern NSW	Pigeon Peas are very difficult to establish. Heliothis pressure did not seem very high in peas compared to cotton, or what you would expect in maize. I would suggest that cotton or maize would perform better.
Southern NSW	Pigeon Peas were a successful refuge crop this season, as a result of later planting into warmer soils. 50% sprayed cotton was also used in non-sensitive areas.
Macquarie	Has not been researched enough - i.e. areas; refuge options; grey areas of rules and enforcements.
Macquarie	Refuges have a cost, particularly the high water component. I believe that attractive refuges can be maintained with less water than cotton, that is by using two thirds of the water of cotton. Some growers are putting minimal effort into maintaining refuges.
Macquarie	Growers accept refuges, but why unsprayed cotton and double Pigeon Peas? More flexibility in options, such as Corn, would be nice, as Pigeon Pea is susceptible to hoppers, and is more difficult to establish in cool conditions.
Bourke	All growers chose Pigeon Pea, due to less area to commit water to, especially taking into account 100% Bollgard.
Bourke	Very definitely keen on sprayed Conventional cotton. There are quite a few unknowns about Bollgard II and its profitability.
Bourke	We would like to see a refuge option that could be economically viable and still remain compliant with Monsanto regulations.
Gwydir	I am annoyed with having to grow Pigeon Peas that are very costly with no return.
Gwydir	Most of the smaller growers are happy to use Pigeon Pea, and harvest the seed if worthwhile, to reduce some cost of the refuge. Sorghum and Corn require three different planting times, however larger growers are looking at the use of Sorghum to be able to get income from their inputs into the refuge.
Gwydir	Growers do not like refuges.
Gwydir	Refuges make sense from a resistance point of view. However, the fact that they (Pigeon Pea) have to be irrigated as thoroughly as the crop, and the fact that weed control is far from brilliant, leaves a sour taste in the mouth!!
Gwydir	Pigeon Pea is OK, but we would like a crop that would pay its way, at least breaking even with costs. 50/50 cotton not a problem.
Gwydir	Unsprayed cotton is very expensive.
Gwydir	A lot of growers do not seem to understand the importance of refuges, and management of them can be poor in some situations.
Namoi	Growers are fairly happy with them, particularly cotton refuges.
Namoi	The majority of the refuge (90%+) was Pigeon Pea. Growers like Pigeon Pea as it requires less area, uses less water, is easy to grow, and is attractive. Depending on feedback and yields, unsprayed cotton may be an option, especially if higher insect years are experienced. At this stage, however, Pigeon Pea is preferred.
Namoi	They understand that refuges have to be grown but find it hard to justify using water on a non-economical crop. Growers are worried that Pigeon Peas are a source of Mirids and GVB, so control is necessary and therefore an extra cost is involved.
Namoi	Concern over the area that is involved. There is also concern about people who do not undertake pupae control effectively.
Namoi	Some growers are happy to use Pigeon Pea, although dislike that at times it is hard to produce a stand, because of the seeds tendency not to germinate in wet weather.

	Some growers thinking about exploring other options such as Sorghum or Corn, hoping to produce a stand easier plus make a profit.
Namoi	It is very important that refuges are grown and managed correctly to ensure the future of Bollgard II cotton.
Namoi	Pigeon Peas are a hard refuge to grow, unsprayed cotton may be a better option in the future. PP were hard to get established, as we had flood damage which killed a hectare of PP. They also appear to take a lot from the soil, and future crops never appear to grow as well in an area that has had a PP crop.
Namoi	More options are required.
Namoi	Most understand refuges to be critical to maintain effective Bollgard II management.
Namoi	Refuges are becoming more accepted. Growers would like more options, particularly options not requiring irrigation.
Upper Namoi	I will need to be more flexible In mixed areas. We grow early sunflower; maize; Sorghum; soybean; and late sunflower.
Upper Namoi	Growers are not real hot on giving refuges the treatment they deserve. They need more care and attention.
Upper Namoi	Growers can see the importance of refuges, but they are not high on the list of priorities.
Macintyre	Not prepared to waste water on refuges. Therefore 50% Conventional is grown.
Macintyre	They see refuges as a hidden and unappreciated cost of growing Bollgard.
Macintyre	Unsprayed cotton generally yielded 5 to 7.5 bale / Ha and, although later to mature, was economical. But this will only work in an IPM system, and you must manage the crop well with water and nutrition. Pigeon Pea gave good results if managed well, but does create a weed problem. No other refuge was used.
Macintyre	Costs them money for very little returns /Ha.
Macintyre	Need to have options in Dryland due to a large area being unproductive. Pigeon Peas were well managed in irrigated situations.
St George / Dirranbandi	Most growers view refuges as a necessary evil, though some of them just view the refuge as evil. They like to keep the area as low as possible - Pigeon Peas are used in preference to unsprayed cotton.
St George / Dirranbandi	Generally there are no complaints, although they would like to see it smaller in area.
St George / Dirranbandi	Very happy.
St George / Dirranbandi	Overall, I don't believe the growers realise the importance of refuges, and view it as an extra cost.
Darling Downs	10% unsprayed. This year this was a costly option because of low yields on refuges.
Darling Downs	Refuges have a real cost. 10% unsprayed adds $200 - $500 per Ha to Bollgard. This year it was around $300/Ha. Most years unsprayed refuges yield 50% - 70% of sprayed field yields.
Darling Downs	Fairly expensive (e.g. unsprayed cotton). Dryland options are too limited, and why isn't Pigeon Pea an option in this case?
Darling Downs	Pigeon Peas: the 5% refuge is a direct cost of Bollgard, and must be considered. Sprayed cotton: will use all of Conventional grown for this. Unsprayed cotton: yielded almost nothing this year. Corn/Sorghum is too impractical and involves midge dangers etc.
Darling Downs	Not enough options for Dryland growers. Many growers (dryland and irrigated) believe there are enough other crops being grown in the district without needing refuges. Masses of Sorghum and Corn are usually grown.
Capricorn	A lot of growers do not fully appreciate the importance of the refuges in managing resistance, and therefore they are often poorly managed. This a major concern for resistance developing.
Capricorn	Growers generally understand the importance of refuges, and somewhat reluctantly comply fully with regulation refuges.
Capricorn	Expensive - increases the cost/Ha of growing BG. In a diverse cropping area such as ours, with an abundance of summer crops, lucerne, unsprayed maize, Sorghum in close proximity to cotton, the refuge requirements are a little inflexible.
Capricorn	Refuges are an added cost to grow on top of licence fees, and need to be included in

	the overall cost of the technology. If refuges could be grown that were cost neutral or cost positive, they would be more accepted and better managed.

Table 2.4 In light of these assessments, what is the mix of refuges on the farms you consult on?

Southern NSW	Pigeon Peas, due to the lower area required.
Macquarie	85% Pigeon Pea; 10% Unsprayed Cotton; 5% Maize.
Macquarie	All except one farm used Pigeon Peas. One farm had a mix of Pigeon Pea and unsprayed cotton.
Macquarie	The majority was Pigeon Peas, due to smallest area requirement.
Bourke	Pigeon Pea.
Bourke	All use 50% Conventional unsprayed.
Bourke	Pigeon Pea only.
Gwydir	1. Pigeon Peas; OR 2. 50% Conventional/50% Bollgard.
Gwydir	The majority of farms are using Pigeon Pea for their refuge, at this time less than 5% are using Sorghum or Corn.
Gwydir	Sprayed Conventional cotton is the most common followed by Pigeon Peas. Nobody used the unsprayed refuge this year.
Gwydir	Only use Conventional cotton, i.e. only grow up to 50% Bollgard.
Gwydir	Pigeon Pea. 50/50 Bollgard/Conventional.
Gwydir	Pigeon Pea, unsprayed cotton, sprayed cotton.
Gwydir	Mostly either Pigeon Peas, Conventional sprayed cotton, or a combination of both.
Namoi	Sprayed cotton. 100%.
Namoi	Pigeon Pea 90%+; Maize 1 farm; unsprayed cotton 2 farms.
Namoi	Pigeon Peas.
Namoi	All Pigeon Pea.
Namoi	100% Pigeon Pea.
Namoi	100% Pigeon Pea.
Namoi	Pigeon Pea - 100%.
Namoi	Pigeon Peas 50%; sprayed Conventional 50%.
Namoi	Most are Pigeon Peas only, with the occasional unsprayed cotton refuge.
Namoi	Pigeon Pea and unsprayed refuges are generally preferred. Larger farms tend towards 50/50 Bollgard/Conventional.
Upper Namoi	1. Soybean 60%; 2. Pigeon 40%.
Upper Namoi	Mainly Pigeon Peas. Some Conventional cotton.
Upper Namoi	100% Pigeon Peas.
Macintyre	50% Conventional.
Macintyre	We grew exclusively Pigeon Peas as an unsprayed refuge, or sprayed cotton on farms that were 50% BG or less. Our aim was to minimise our unproductive area.
Macintyre	80% unsprayed cotton, 20% Pigeon Pea.
Macintyre	90% unsprayed refuges 10% Corn.
Macintyre	Unsprayed Conventional cotton in Dryland areas. Pigeon Peas and Conventional cotton (sprayed) in irrigated areas.
St George / Dirranbandi	For those farms with more than 50% Bollgard, where additional refuge is required, it is 99% Pigeon Peas, to keep the area required as low as possible.
St George / Dirranbandi	50/50 Conventional sprayed/Bollgard on 500 Ha, Pigeon Peas on 7900 Ha.
St George / Dirranbandi	All Pigeon Pea, on full Bollgard farms. There are just a few farms with 50/50, so the refuge was Conventional cotton.
St George / Dirranbandi	The majority was 5% Pigeon Pea.

Darling Downs	All types are used.
Darling Downs	We consulted on all the types of refuges. Irrigated Pigeon Pea is becoming more popular. In dryland areas more Conventional cotton is used.
Darling Downs	60 % Pigeon Peas; 20 % unsprayed refuge; 20 % unsprayed cotton.
Darling Downs	Sprayed Conventional cotton, Unsprayed Conventional cotton, unsprayed Sorghum and unsprayed Corn.
Capricorn	All were a mix of Pigeon Pea and unsprayed Conventional cotton.
Capricorn	Mainly sprayed Conventional cotton and then a small amount of 5% unsprayed Pigeon Pea and 15% unsprayed Sorghum.
Capricorn	Pigeon Pea.
Capricorn	A mixture of Conventional cotton and Pigeon Pea. Predominately Pigeon Pea.

2.4. *Refuges – Grower Responses*

Table 2.5 and 2.6 outline growers responses to questions regarding the cost associated with having refuge from a grower's perspective. Clearly the suggested cost fluctuate greatly, depending on the type of refuge grown, input costs (including water costs) and opportunity cost of the resources. The responses to these questions and from consultants indicates that work needs to be done in relation to establishing benchmark costs to assist decision makers with costings for budgeting and comparative analysis purposes.

Table 2.5 Growing a refuge crop will have cost your business a percentage of potential profit due to area taken by the refuge. Would you be able to estimate this cost and outline the major parts of this cost for your operation?

Central	$250/Ha. Seed. Operation. Chemicals.
Central	$800 per acre.
Central	Loss of productive ground.
Central	Water inputs such as herbicide, labour, opportunity cost of not being cotton area. $950/Ha of Pigeon Pea.
Central	$350/Ha direct variable costs. Ground work, seed, herbicide, cultivation, water, residue removal.
Central	Major costs are weed problems and water use - hard to quantify, but we must do it.
Central	Yes - cost same as cotton, e.g. land preparation, water, insect sprays, management, land use. However, returns nil.
Central	Low impact on cost as it does not take area away from cotton production, but does use available water, probably adds $20/Ha growing cost to cotton crop.
Central	Negative cost - produced more cotton in the refuge than with Bollgard, particularly in a year like last year.
Central	Not big. $145/Ha for 5% of cotton area. On worst paddock.
Central	Still going through financials.
Central	The cost is built into the field areas, it's just part of the management.
Central	Cost of Bollgard licence fee on top of Conventional for the area - this is OK if the advantages of Bollgard/sprays comes to fruition as it did last year and this year.
Central	Cotton treated as per normal. Yield 1/5 bales/acre. Nearly got our costs back. Easier and safer than Pigeon Peas. Would like area to reduce to 5%, then it would be quite okay on cost structure. Refuges are a large cost, not knowing if you are going to get anything back. Profit lost 1.5 bales/acre x 420 bales.
Central	Lost profit around $2200/Ha. Weed control $100/Ha.
Central	Refuge area usually breaks even - opportunity profit lost.
Downs	$300/Ha of refuge - lost income on refuge area.
Downs	Cost 2 Ha. of cotton at 8 bales/Ha (16 bales x 400).

Downs	Not harvested, therefore 10% of gross income i.e. VERY SIGNIFICANT. If harvested, will be later - significant management issues. Especially with contractors and pupae busting. Timeliness.
Downs	$2000/Ha.
Downs	It makes a certain area of the farm non-profitable. You have to have all the inputs into it with no return, i.e. it's a big cost.
Downs	No cost.
Downs	$300 per Ha. Yield loss, poor quality.
Downs	10% of area produced no yield.
Downs	Conventional cotton costs about the same as Bollgard to produce and yielded 10-15% less.
Downs	Cost 20 bales of cotton.
Downs	Cost of insect control.
Downs	Difference in net returns per hectare.
Downs	If I had to grow Pigeon Pea I estimate the extra cost at $100/Ha on top of the Bollgard cost.
Downs	Lost income - $2500 per hectare compared to cotton area.
Downs	Major cost - water (irrigation).
Downs	Sacrificing land area and especially water.
Downs	The corn refuge had a similar return as the cotton because of high yield.
Downs	This cost is absorbed into our daily operation as it is just part of growing Bollgard.
Macq & Southern	5% Pigeon Pea area may represent 3-4% cotton area that could be grown. $1500/Ha. profit??
North Qld	$50,000
North Qld	4 Ha., in worst country. Cost unknown.
North Qld	Not sure. Maybe loss of around $200-$300/Ha?
North Qld	Yes.
North Qld	1 extra insecticide spray on the field that had the refuge. Loss of cotton production.
North Qld	Loss of income $35,000. Seed/water cost $10,000. Reduced cotton production.
Upper Namoi	$30,000 - 12Ha * $2,500/Ha GM foregone. Ridiculous for our area.
Upper Namoi	$37,500 lost opportunity to higher return crop on same area.
Upper Namoi	Not estimated yet. Most convenient option to use.
Upper Namoi	Opportunity cost, water, chemical/herbicide, chipping.
Upper Namoi	Our refuge crop was harvested and yielded .9 ton to the Ha. - we grew 16 Ha. Germination sample 84%. So, now we will seed for the 05/05 season, therefore running line ball re profit margin.
West	Refuge = 3.75 bales/Ha. Bollgard = 11.25 bales/Ha. Conventional = 12.5 bales/Ha.
West	Seed. 2 waters.
West	Estimated cost of refuge is $611/Ha. Loss of cotton production on that area.
West	No.
West	Loss of area, planting, cultivation and mulching and bed renovation for no return.

West	Refuge = 0.07 bales/acre grown - planting, irrigation, destruction.
West	The opportunity cost of the lost cotton production and growing cost of Pigeon Pea, less the increase in gross margin over the total area due to Bollgard.
West	$19000 and 75 ML of water (150 Ha).
West	10%. Loss of production on that area. No return for water used.
West	2% - lost production.
West	Approx. 80 bales of cotton.
West	Labour. Water. Spraying to keep clean.
West	Lost cotton production. Seed and other inputs.
West	Never worked it out.
West	No.

Table 2.6 Could you summarise how refuge cost impacts on your farm as the area of Bollgard increases and how you calculate this cost?

Central	Added cost to licence.
Central	For the future of Bollgard we are happy to accept the loss in production.
Central	Just spread this cost across the area and add it to the cost of the licence. Add insect control cost.
Central	Refuge is grown on unprotected country - so it can be wiped out by floods. Therefore the cost is minimal.
Central	Don't calculate cost - just do it!
Central	Not increasing Bollgard area.
Central	There is not enough room. We have done the sums and it is my aim not to have to grow refuge while Conventional varieties out-yield, and discounts for length are not that great next year.
Central	Bollgard II area will not increase unless other refuge options are available.
Central	Cost is considered as lost opportunity cost.
Central	No effect - no need to grow more Bollgard, so do not have additional refuge costs.
Central	Not really an issue. I would not have planted that area anyway.
Central	50%/50% = no country wasted. Maximum opportunity for net profit.
Central	Usually grow refuge in areas unsuitable for large scale production, e.g. between houses, under power lines etc.
Downs	Grow on paddocks previously set aside for Sorghum - usually a buffer area.
Downs	Haven't costed it, but either dryland option is a difficult choice. 10% unsprayed is messy - makes 2 fields instead of one. Conventional cotton price refuge makes 2 crops instead of one. Drylanders consider 10% unsprayed Conventional an excessive area.
Downs	I have 40 hectares of lucerne and 100 hectares within 1.5km of cotton fields, and think that refuges are a waste of time (!!) and money.
Downs	Goes up at the same rate as area increases. Loss of income per Ha and per ML. Outright costs.
Downs	It makes a certain area of the farm non-profitable. You have to have all the inputs into it with no return, i.e. it's a big cost.
Downs	It will have to be included and then compared to growing Conventional cotton.
Downs	Profit lost is set aside area divided by Bollgard area.
Downs	Each hectare of refuge that produces no income compared with the income produced by the cotton crop.
Downs	How much cotton could we grow with the water used to grow the refuge.
Downs	I do not see a grain (corn) refuge crop as being so much a negative.
Downs	Increases the cost base for Bollgard cotton. Calculate at 10% increase in price for

	Bollgard for unsprayed refuge.
Downs	Minimal.
Downs	Next year we will use Conventional cotton at 50% as the refuge, as ths cost is too high to set apart any unsprayed area.
Downs	Refuge costs are calculated on a per Hectare basis, and then spread across the Bollgard crop.
Downs	The benefits of Bollgard outweigh refuge cost.
Downs	The cost of a refuge in dry land is too high, this is why I stick to 50%/50%
Downs	Water cost, seed cost, production cost, mulching and cultivation as cotton ground. Water not available to cotton production (Bollgard cotton - surrounded by corn and sorghum). Generally at all stages.
Macq & Southern	Opportunity cost of using this water on refuge instead of cotton = $300 per ML.
North Qld	Have not really calculated. But our process of budgets could estimate for an area.
North Qld	Loss of income $35,000. Seed/water cost $10,000. Reduced cotton production.
North Qld	The more Bollgard you grow, the more refuge required - loss of cotton production area, increased spray cost.
Upper Namoi	Assign the costs and the total area grown.
Upper Namoi	Cost is the gross margin for cotton. The gross margin for Pigeon Peas = lost opportunity.
Upper Namoi	Not estimated yet. Most convenient option to use.
Upper Namoi	We are located in a cool season area which has great diversity of crops and pastures, i.e. not a monoculture area.
West	No. Very simple and very expensive.
West	Put all costs into cotton then average yield and income over total area.
West	Benefits of Bollgard in my circumstances outweigh the extra cost of refuges due to: impact on labour; pesticide in environment; ease of farming i.e. no reentry problems; less reliance on machinery i.e. spray rigs.
West	Calculated as just another input which is a necessity if you want to use the technology.
West	No.
West	The area of Bollgard will not increase at this stage because of the increase in the cost of the technology.
West	It is a cost, but the big picture is that we save money growing Bollgard II, so cost is more than offset.
West	Loss of area, planting, cultivation and mulching and bed renovation for no return.
West	Main cost is the use of water equal to 5% of area, and the loss of production.
West	As costs for our Conventional roughly equal Bollgard, the refuge is a greater loss of production.
West	Cost is based on $ profit per ML of water used on the crop.
West	I don't have refuge crops.
West	It is worthy of consideration.
West	Part of the cost of growing environmentally friendly cotton.
West	Too early to know- may change percentage.
West	Water to keep it healthy is the biggest cost. It becomes a percentage in your water budget.

3. BOLLGARD PERFORMANCE

3.1. Comparing Yield

The 2004-05 season saw a very even result for yield when comparing conventional and Bollgard crops. For the 50 sample fields supplied, the average for both types of cotton was 10 bales, a dramatic increase over the average yield reported in 2003-04 where conventional cotton for the sample of 64 comparison fields resulted in an average of 7.73 against an average of 8.27 for Bollgard. Yield differences on a valley-by-valley basis for the sample can be observed in the next two figures. Yield is also displayed by previous crop for the readers information.

Table 3.1 contains the comments of growers in response to questions on yield differences between conventional and Bollgard crops. Responses are varied as would be expected, however again, anecdotal evidence would suggest that conventional cotton performed more equally with Bollgard that was achieved in previous seasons.

Differences in yield quality between the two types of cotton were largely not observed. Comments in relation to quality are listed in table 3.2.

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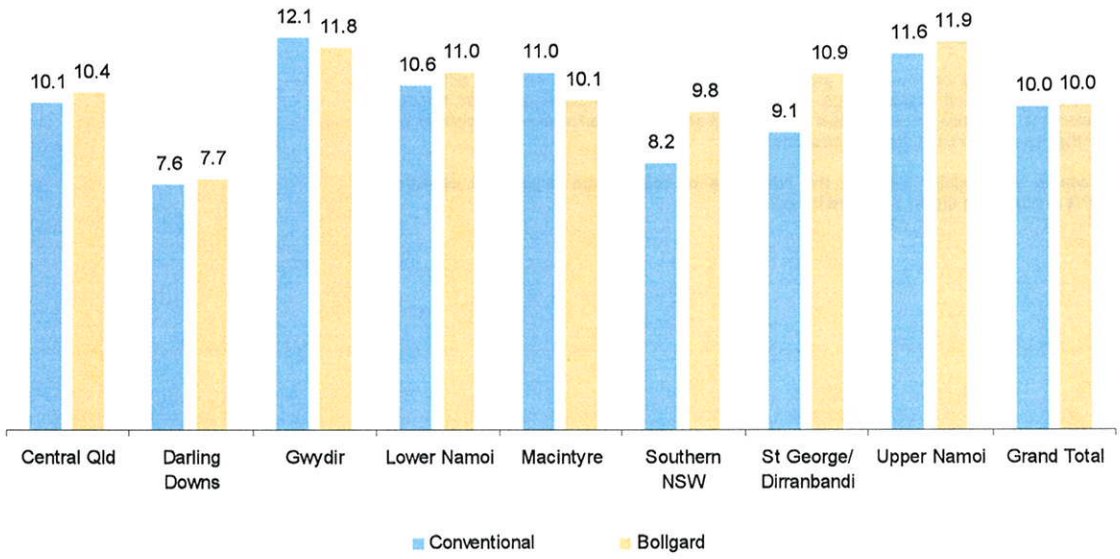
Average Yield - Bales per Hectare 2004-05



Australian Government
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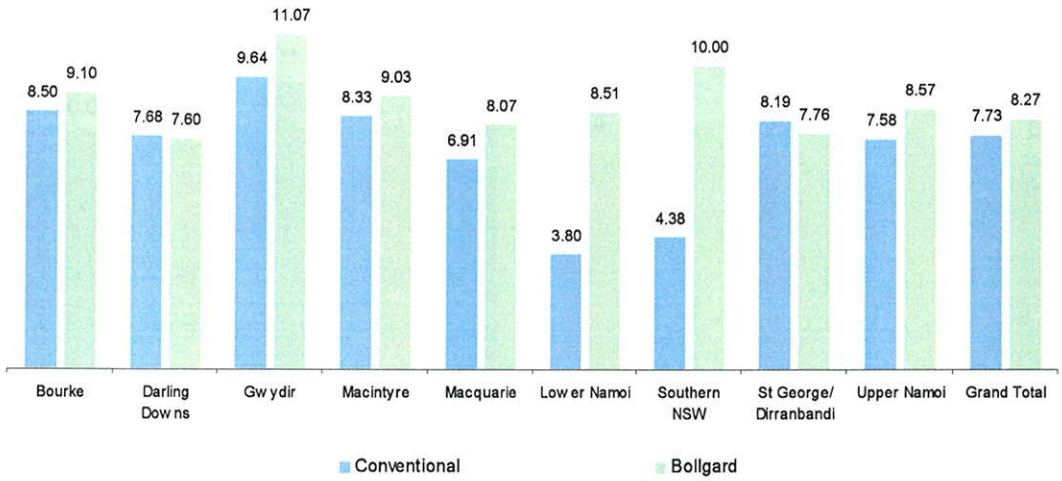
Average Yield - Bales per Hectare - 2003-04



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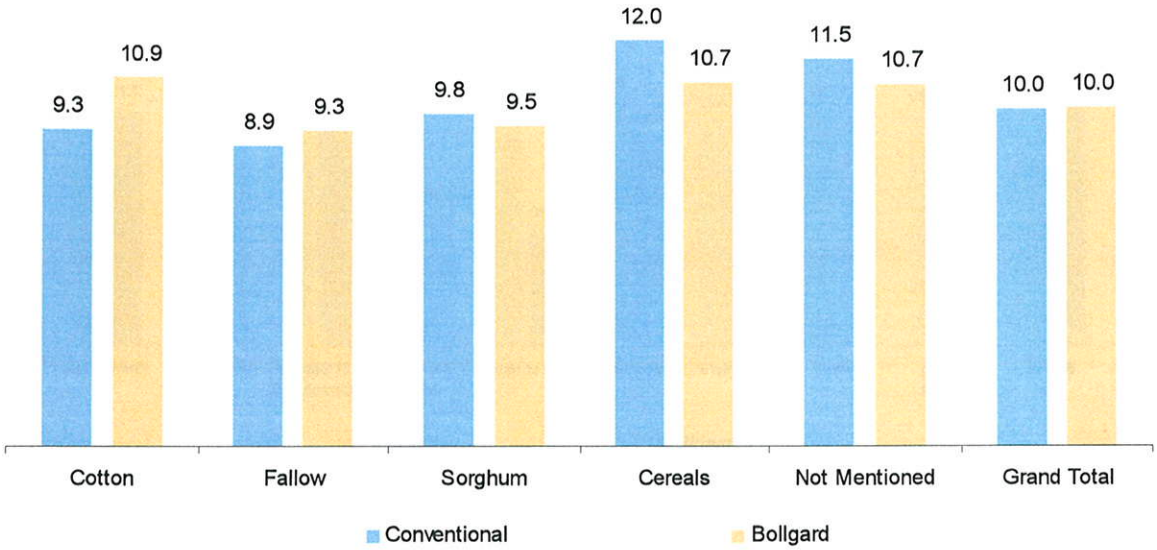
Yield by Previous Cropping History - 2004-05



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Yield by Previous Cropping History 2003-2004

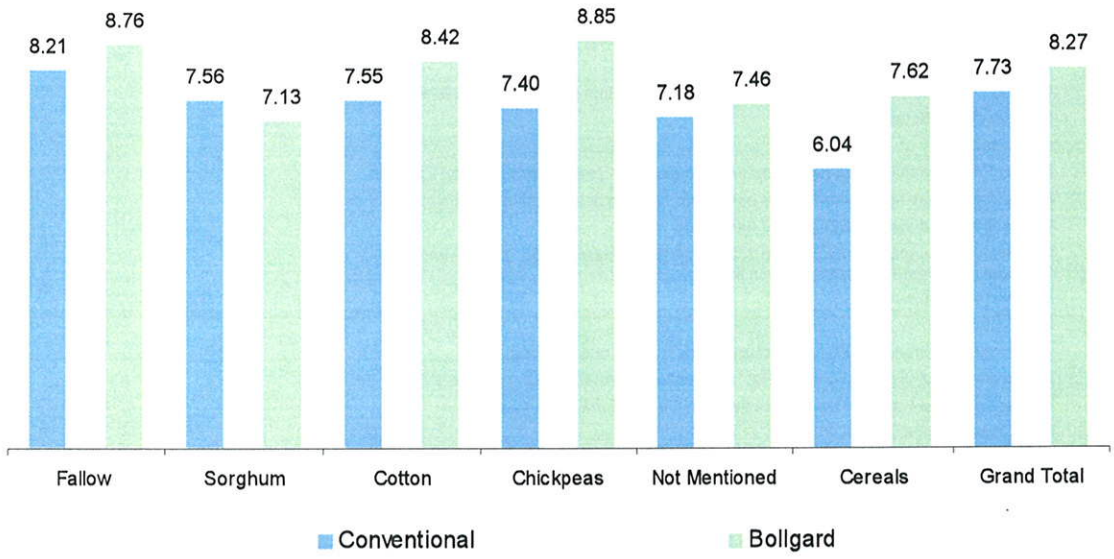

Table 3.1 For your Bollgard area, would you comment on yield compared to Conventional fields? (Grower Responses)

Central	Did not grow Conventional cotton.
Central	Don't know. All Bollgard.
Central	Growing 100% Bollgard.
Central	Half a bale better.
Central	Reasonably comparable. Conventional this year was slightly better - possibly due to variety availability.
Central	0.4 Hale/Ha. Lower.
Central	100% Bollgard.
Central	Conventional 0.5 plus better.
Central	Ginning not complete, but expect Bollgard to yield less than Conventional at this stage.
Central	Only produced Bollgard.
Central	100% Bollgard.
Central	Bollgard better yielding, but more expensive to grow this year, in terms of gross margin.
Central	Bollgard yield was approximately 0.4 bales/acre lower than the Conventional average.
Central	Conventional out-yielded BGII by 0.7 bales/acre.
Central	Conventional out-yielded on average 1.5 bales/Ha, compared to Bollgard II - variety selection of Bollgard II played a part in this.
Central	Have no comparison.
Central	Performed well.
Central	Bollgard approximately 20% higher due to early fruit set and dry finish.
Central	Bollgard average yield 10.73 bales/Ha. Conventional average yield 11.64 bales/Ha.
Central	Bollgard only went about 1 bale/Ha better than Conventional on average.
Central	Bollgard was higher.
Central	I did not have any Conventional fields for comparison.
Central	Only unsprayed cotton grown i.e. refuge.
Central	Similar (last year Bollgard out-yielded).
Downs	About the same.
Downs	Bollgard yielded slightly better.
Downs	I thought it was good on district average.
Downs	Bollgard out-yielded Conventional by 30%.
Downs	Bollgard was in front by 15-20%.
Downs	Similar.
Downs	Seems to be higher. Hard to tell as the Bollgard was given priority.
Downs	The same.
Downs	.4 bale/Ha. Better.
Downs	0 - 10% increase over Conventional - don't tell Monsanto!
Downs	About the same.
Downs	About the same.
Downs	Better.
Downs	Comparable.
Downs	Conventional 10% better.
Downs	Conventional slightly ahead.
Downs	Dryland yields - exactly the same.
Downs	Generally better.
Downs	I have found big yield differences between BGII varieties. The higher yielding BGII varieties

	are on par with Conventional varieties.
Downs	Much better.
Downs	Slightly ahead of Conventional.
Downs	Slightly better.
Downs	Up by about 30%.
Macq & Southern	All BG2.
Macq & Southern	Bollgard yielded slightly better.
Macq & Southern	Bollgard yielded slightly less than Conventional this season.
North Qld	Better.
North Qld	Bollgard performing better. Conventional turnout better. Each year possible variation.
North Qld	Higher.
North Qld	Slightly less in our varieties but not too bad.
North Qld	Conventional a littlew better.
North Qld	I didn't have any Conventional.
Upper Namoi	Only had Bollgard planted.
Upper Namoi	100% Bollgard.
Upper Namoi	Bollgars suits us in short season areas and yields are comparable.
Upper Namoi	Conventional better yield.
West	Bollgard 15% less yield.
West	Bollgard up to 12.5 b. Conventional 8 b.
West	Same.
West	Bollgard had a small yield advantage, but also had a much better start.
West	Bollgard had lower yield.
West	Excellent.
West	No Conventional for the last 2 seasons.
West	All Bollgard II but highest yield average over large area.
West	Bollgard in 2003-2004 approximately .75 bales per acre better. No Conventional grown in 2004-2005.
West	Conventional approximately 10% better.
West	Only grow Bollgard.
West	BGII down by 1 bale/Ha. in some fields but on average down by .76 bale/Ha.
West	Conventional better.
West	Good and getting better.
West	Less.
West	No, only had BG.
West	Similar.
West	Slightly better.
West	Slightly lower in some fields but higher in others.

Table 3.2 Would you say that there was difference in the quality of Bollgard II, lint compared to Conventional lint from your farms? – Grower Response

Central	No.
Central	No.
Central	Ginning incomplete but don't expect any differences.
Central	Length will be a problem with the best Conventional variety available.
Central	Depends on variety but BGII was probably better quality.
Central	No.
Central	None to date, except 546BG with seed coat fragment issues.
Central	Not from the seed company trials.
Central	Same quality - very good.
Central	Yes.
Central	Bollgard was longer staple. Conventional - later crop set fruit in drought conditions.
Central	I did not have any Conventional fields for comparison.
Central	No - but some Deltapine Bollgard did have a lot lower turnouts.
Central	No difference.
Central	Some short staple on Conventional.
Downs	N/A. Our Conventional lint has been very good - mostly premium.
Downs	No.
Downs	No.
Downs	No.
Downs	No.
Downs	Yes but only in dryland.
Downs	Certain varieties better.
Downs	Yes, some higher micronaire in Bollgard.
Downs	About the same.
Downs	Bollgard had low mike discount and short staple.
Downs	Conventional slightly ahead.
Downs	No, except for 16B.
Downs	No.
Downs	No.
Downs	No.
Downs	No.
Downs	No.
Downs	No.
Downs	Perhaps better fibre length.
Downs	Possibly - can't prove.
Downs	Same.
Downs	Yes, higher micronaire.
Downs	Yes.

Macq & Southern	Bollgard was better quality.
Macq & Southern	Yes - shorter fibres and lower TO's.
North Qld	Yes.
North Qld	Higher.
North Qld	No.
North Qld	Very similar, though ginning not finished this year. New varieties this year.
North Qld	I didn't have any Conventional.
North Qld	No.
Upper Namoi	Bollgard shorter.
Upper Namoi	No.
West	No.
West	No.
West	No.
West	Some discounts on Bollgard.
West	Yes - but it was also a perfect cotton growing season in 04/05. Need a few more years to comment.
West	Yes.
West	No.
West	No.
West	No.
West	Don't know yet.
West	Nil.
West	No difference.
West	No.
West	No.
West	Not much.
West	Slightly lower quality in Bollgard.

3.2. *Reduction in Chemical Applications*

The performance of Bollgard on Helicoverpa is summarised in table 3.3. Generally, Bollgard was judged to have performed to the expectations of consultants, always or mostly. Similarly, consultants advise that they followed industry thresholds and allowed 2 consecutive checks prior to spraying always or mostly. Where industry thresholds were not strictly adhered to, the alternative thresholds are listed in table 3.4.

Table 3.3 - Consultant Ratings of Bollgard Performance

	Always	Mostly	Rarely	No
Bollgard II performed to my expectations	80%	20%	0	0
I followed industry thresholds	71.9%	25%	0	3.1%
I allowed 2 consecutive checks before spraying	70%	26.7%	0	3.3%

Table 3.4 - List the thresholds you used if they were not industry recommendations:

Bourke	Use retention to gauge when we should spray. Mainly top 5 retention plus fruiting factors.
Gwydir	Just sprayed to control the moths thus reducing the egg numbers and hence the number of young grubs having a "chew before they die". Threshold was approx 65% fruit retention
Namoi	Mirid thresholds were based on numbers of Mirids and damage (stung bolls) i.e. once 2+ Mirids/metre and over 20% fresh sting bolls were noted - spray.
Namoi	Worked with retention levels more than pest numbers.
Namoi	Assessing damage.
Namoi	Lower tolerance of Mirids.
Upper Namoi	G.V. Bug. Will spray after they reach thresholds.
Upper Namoi	Constant high egg pressure in Dec/Jan sprayed at 50-60% retention
Macintyre	We used industry thresholds for BG spraying. What concerns me is that implicit in the threshold is a rigor with regard to the sampling. You can find a threshold most times if you really want to. The sampling must be disciplined.
Macintyre	Sometimes we reduced the Mirid threshold to 0.5 - 110/m at peak square and peak flower.
St George / Dirranbandi	We didn't spray any BG crops for Heliothis. Used lower GVB thresholds than industry standards, due to patchy distribution in crops and level of damage.
St George / Dirranbandi	If for grubs, we never checked for them.
St George / Dirranbandi	Slightly lower thresholds if a combination of pests were present.
Capricorn	At high egg pressure i.e. 70-80, use of prophylactic spray.
Capricorn	Used industry thresholds, allowed 2 consecutive checks before spraying. Bollgard performed to my expectations.

In the 2004-05 production season, Bollgard varieties received an average of three sprays as opposed to an average of 11.4 sprays on conventional cotton, a reduction of 8.4 sprays on average. In the previous production season, there was a slightly higher average number of sprays on Bollgard crops where 3.4 sprays occurred, and slightly less on conventional with 11.1. The distribution of sprays is include in the following figures for the two seasons.

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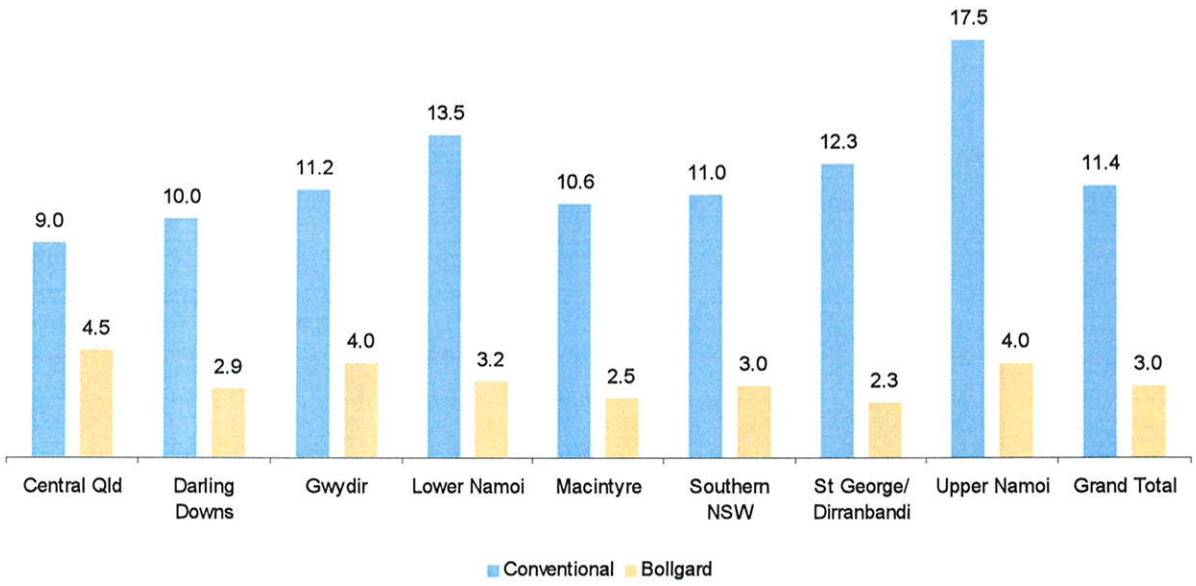
Average Number of Sprays - 2004-05



Australian Government
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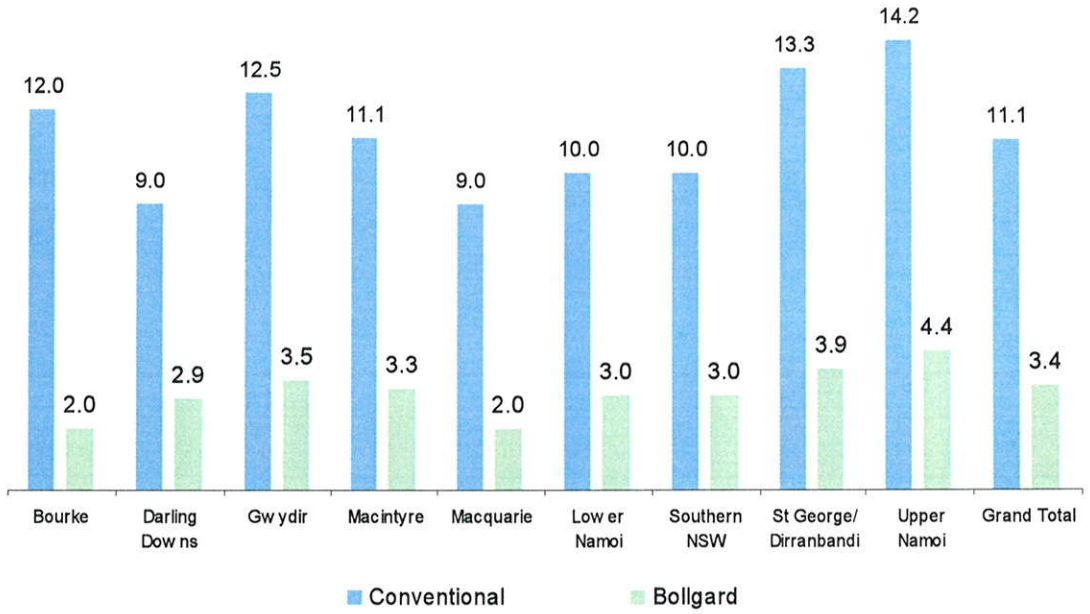
Average Number of Sprays by Valley - 2003-04



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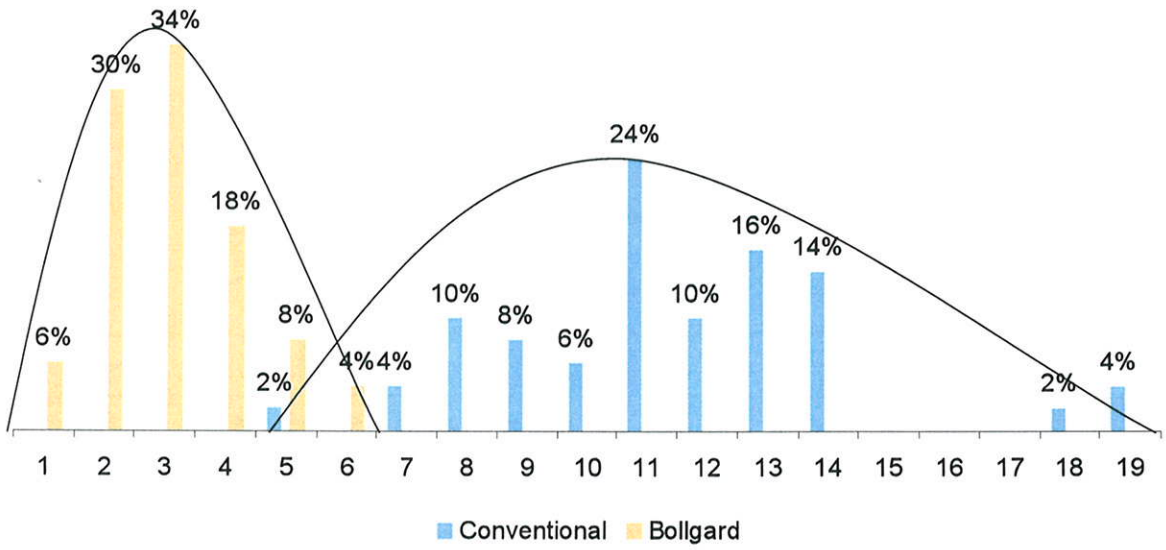
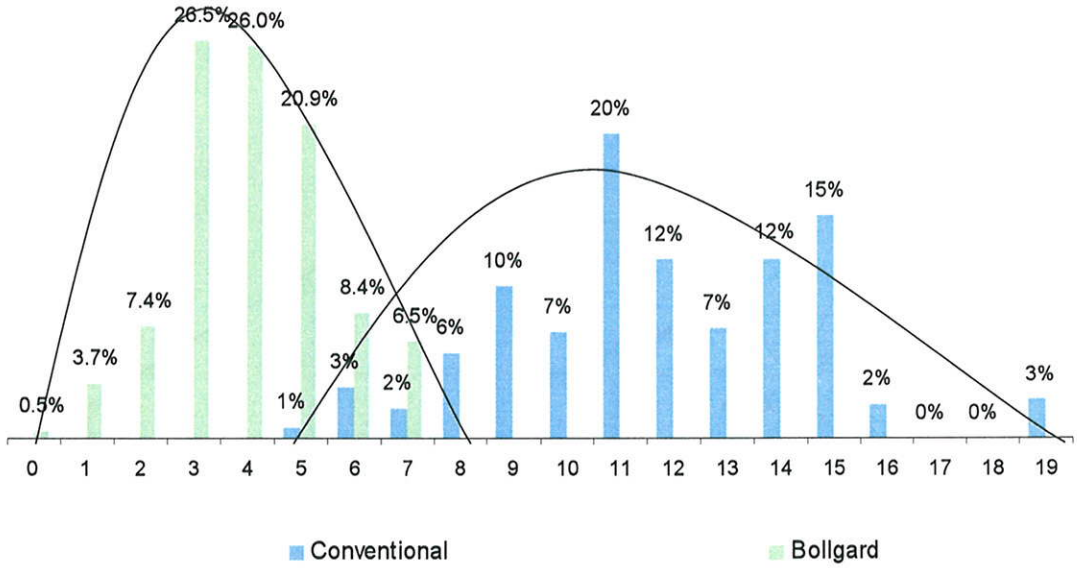
Cotton Research and Development Corporation

Number of Sprays - All Valleys 2004-05



Australian Government
Cotton Research and Development Corporation

Number of Sprays - All Valleys 2003-04



3.3. *Secondary Pests*

Bollgard fields were sprayed for green mirids up to four times by only three per cent of respondents to the survey who had sprayed for green mirids. 23 per cent of respondents sprayed green mirids three times, while nearly half of the respondents sprayed twice. Approximately 8 per cent of respondents listed four sprays for green vegetable bug, all other secondary pests were sprayed a maximum of two times. Table 3.5 highlights the relevant frequencies. Comments in relation to secondary pests are available in Table 3.6. The complete listing of sprays by pest by valley by stage are presented in appendix 1.

Table 3.5 On average, how many times did you spray Bollgard for the following pests in the 2004-05 season?

	1 Spray	2 Sprays	3 Sprays	4 Sprays	5 Sprays	6 Sprays	7 Sprays
Helicoverpa	90%	10%	0	0	0	0	0
Wireworm	83.3%	16.7%	0	0	0	0	0
Thrips	75%	25%	0	0	0	0	0
Tipworm	100%	0	0	0	0	0	0
Aphids	78.8%	21.2%	0	0	0	0	0
Mites	87.5%	12.5%	0	0	0	0	0
Green Mirids	25.6%	48.7%	23.1%	2.6%	0	0	0
Green Vegetable Bug	75%	16.7%	0	8.3%	0	0	0
Whitefly	60%	40%	0	0	0	0	0
Other	50%	50%	0	0	0	0	0

Table 3.6 Could you comment on secondary pest pressure in Bollgard II fields compared to Conventional fields?

Southern NSW	All fields were sprayed for Mirids and Aphids. 40% of the area required a Mite spray.
Southern NSW	Secondary pest pressure was higher in Bollgard fields than Conventional. However, they were not that much greater than Conventional fields. For example, Mirids were found in lower numbers in Conventional fields and Thrips were found in high numbers in Conventional fields, similar to that of Bollgard.
Macquarie	Mite sprays are necessary more in BG than Conventional, possibly due to Green Mirid chemical options.
Macquarie	Secondary pest pressure was slower to build, due to the beneficial insect populations keeping the pest numbers lower. Mite numbers were higher in Bollgard, but did not quickly flare like they would normally do in Conventional.
Macquarie	Low secondary pressure in 04-05. No real difference in pressure, though Mirids had to be specifically controlled in BGII crops whilst they were controlled with Heliothis sprays in Conventional.
Bourke	Slightly higher Mirid and Aphid pressure, but no significant difference.
Bourke	Secondary pests were more prevalent within the BGII crops that we grew, due to reduced exposure to broad spectrum chemistry.
Gwydir	Very low, except for Mirids.
Gwydir	Not having to treat for Heliothis has shown an increase in both Green Mirids and GVB this season. Also, in areas within the Namoi, Mites have needed treatment in Bollgard II crops more than in Conventional crops. Aphid treatment was required in both crops at similar times.
Gwydir	Secondary pest pressure was higher in Bollgard II.
Gwydir	Secondary pest pressure in Bollgard tended to be slightly heavier than in Conventional.
Gwydir	GVB was definitely higher, especially in crops which are near creeks or rivers or mungbeans.
Gwydir	GVB and Green Stink Bug are a problem. These pests have adapted to BG very well.
Gwydir	More in BG, as conventional chemistry takes care of them in Conventional cotton.

Namoi	Similar.
Namoi	Generally, secondary pest pressure was higher in BG. Specifically Mirids and GVB pressure was higher. Mite levels were mostly higher in BG fields also.
Namoi	Mirid were higher but overall not a big concern.
Namoi	Mirids needed to be controlled in the Bollgard, Aphid control was similar in Bollgard and Conventional, Mites didn't need to be controlled in either crops.
Namoi	Secondary pests present in Bollgard - Mites built up probably because there was no Agrimec/Affirm used in Bollgard crops. Mites that were treated early with Agrimec were well controlled, while fields treated later with Comite did not control the Mites as well as one would hope. Aphid numbers built up towards the end of the season, and needed treatment - treated okay with Intrepid and Dimethoate. There were plenty of predators in the Bollgard fields all season so the secondary pest build up was a little surprising. Conventional fields had secondary pests but they were generally controlled with the Heliothis sprays - it was only towards the end of the season that a few fields needed to be treated for Mites and Aphids.
Namoi	Mirids and Jassids are a concern.
Namoi	More Aphids noted through the canopy of Bollgard crops, and Mirids are more of an issue. Mites were also noted through Bollgard II fields at higher levels than Conventional crops (Affirm used in Conventional).
Namoi	More Mirid pressure, less Aphid and Mite pressure.
Upper Namoi	Much better balance on field.
Upper Namoi	No difference this season.
Upper Namoi	Appeared in Bollgard before Conventional.
Macintyre	Secondary's controlled in Conventional with Helicoverpa.
Macintyre	Secondary pest pressure was higher in BG because we were not getting the level of suppression that we were in Conventional whilst spraying Heliothis.
Macintyre	Similar or lower in general.
Macintyre	It is hard to determine damage, and is easier to check with a beat sheet, but just needs more beats. Same time spent in Bollgard as Conventional.
Macintyre	Approx. 40 days after first Regent application, Mites were evident in BGII crops. We didn't really have any issues with secondary pests in Conventional, due to spraying for Heliothis.
St George / Dirranbandi	Green Mirids and mites are more common due, to significantly less spraying and no coincidental control from Heliothis sprays as none is needed. Green Vegetable Bugs were becoming quite common late season in Bollgard crops, whilst there were none in Conventional crops. Many of my sprays were combined for two pests, therefore the average total number of sprays on Bollgard was in the vicinity of 1.5 to 2 sprays/crop.
St George / Dirranbandi	Mites were higher, and Aphids were also present in greater numbers. Mirids were also higher.
St George / Dirranbandi	Much higher Jassids, Mirids, and Aphids.
St George / Dirranbandi	Mite, Thrips, Jassids & Mirid numbers were higher, while the rest were similar.
Darling Downs	Lower.
Darling Downs	Similar, due to lower Heliothis pressure.
Darling Downs	Mirids and GVB were higher, as less other chemistry was used. Aphids: more spraying in Conventional (1 extra).
Darling Downs	Obviously, more secondary pests in the Bollgard II crops, as these usually get cleaned up in the Conventional fields by chemicals used to control Heliothis.
Capricorn	The only real difference is that Mirids, Jassids etc were being controlled by Heliothis sprays. I don't think numbers infesting the fields were any different.
Capricorn	Higher.
Capricorn	Mirid and Jassid and Thrip numbers were higher, while Aphid and Whitefly numbers were similar.

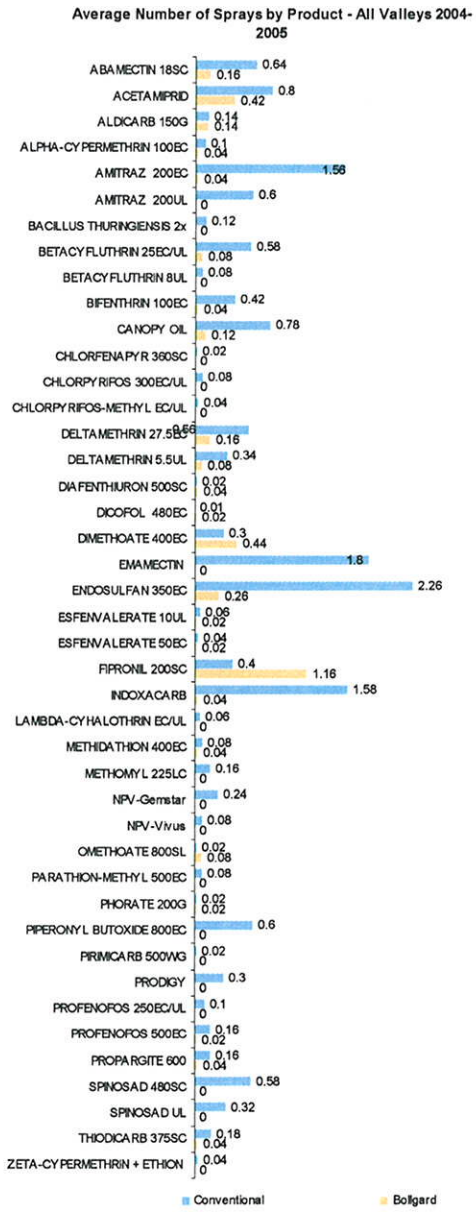
3.4. *Active Ingredients*

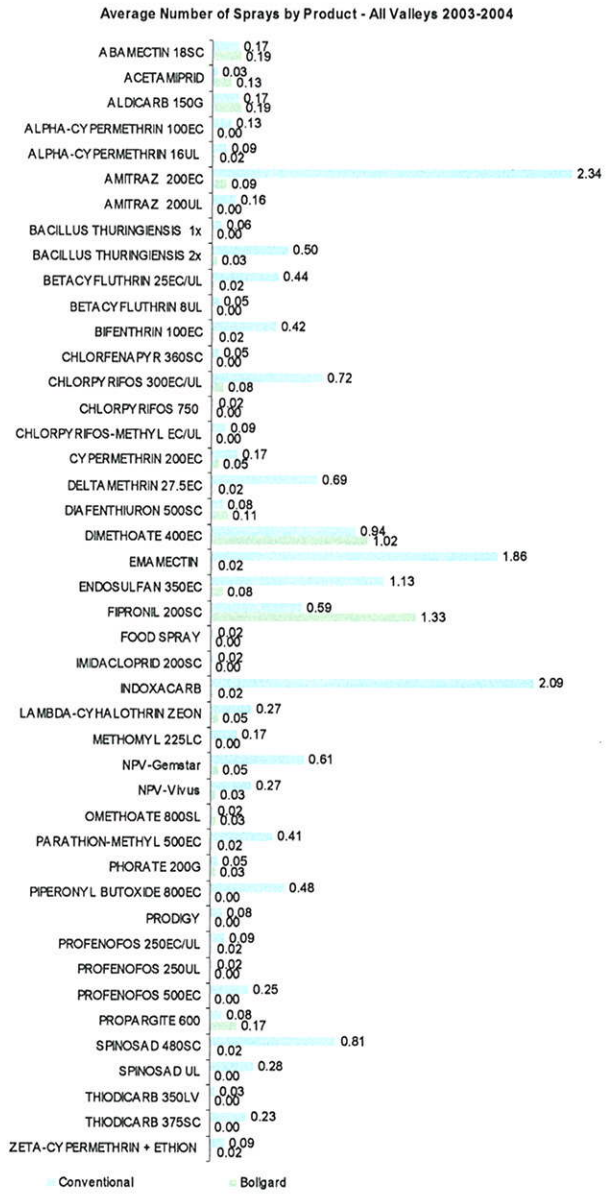
The following three figures show the difference in average number of sprays on conventional and Bollgard cotton by active ingredient over the last three seasons.

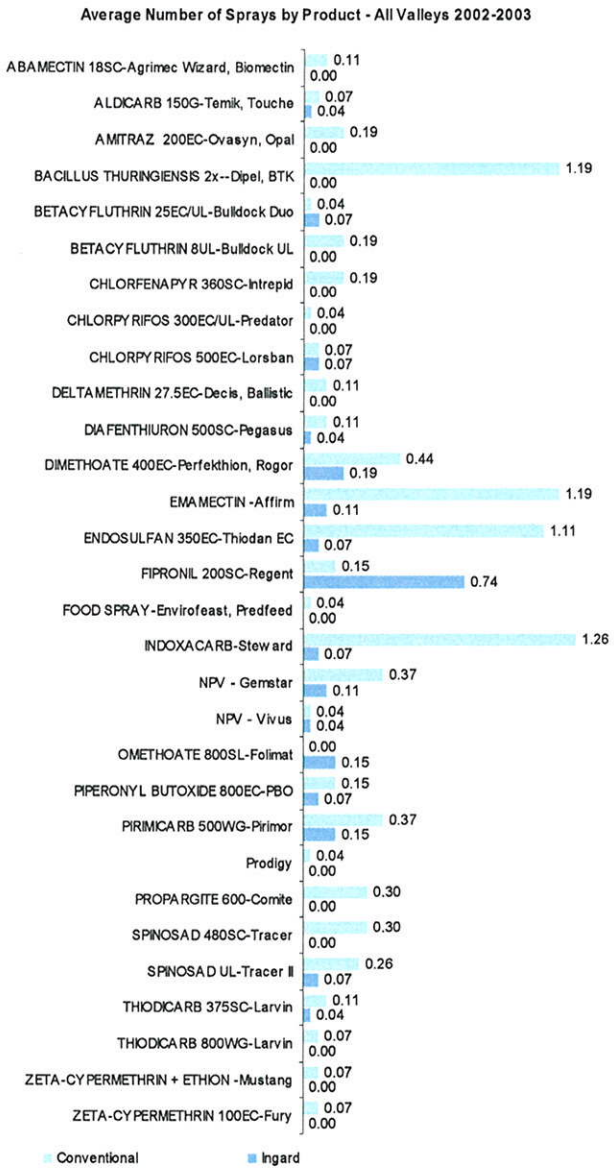
The figures show those products that are dominant for each crop type; an example of a product that is used more on Bollgard crops than conventional is Fipronil in 2004-05 where the average number of sprays on Bollgard 1.16 as compared to 0.4 sprays on average on conventional cotton.

The average reduction in sprays on Bollgard by active ingredient for these seasons follows. Again using Fipronil as an example, it is listed as a negative reduction (an increase) of 190 per cent on Bollgard crops over conventional

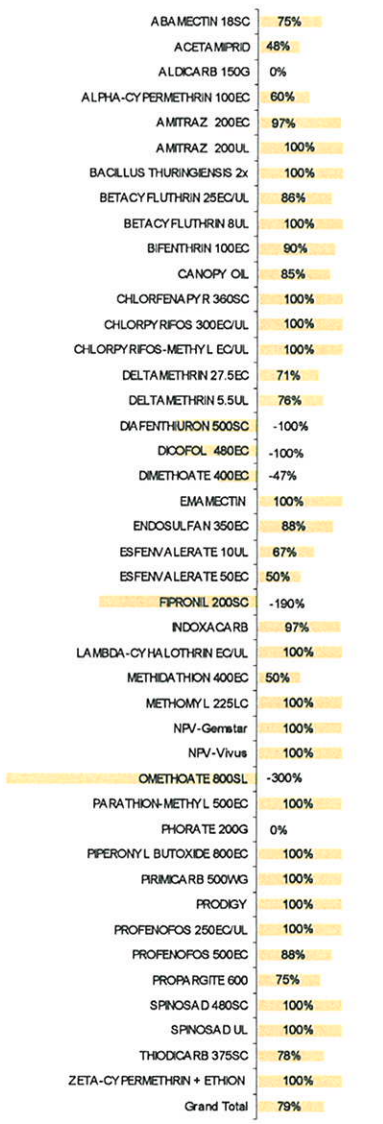
Appendix 2 lists the average number of sprays by active ingredient by valley.


Average Number of Sprays by Product - All Valleys 2004-2005
ABAMECTIN 18SC 0.64 0.16
ACETAMIPRID 0.8 0.42
ALDICARB 150G 0.14 0.14
ALPHA-CYPERMETHRIN 100EC 0.1 0.04
AMITRAZ 200EC 1.56 0.04
AMITRAZ 200UL 0.6 0
BACILLUS THURINGIENSIS 2x 0.12 0
BETACYFLUTHRIN 25EC/UL 0.58 0.08
BETACYFLUTHRIN 8UL 0.08 0
BIFENTHRIN 100EC 0.42 0.04
CANOPY OIL 0.78 0.12
CHLORFENAPYR 360SC 0.02 0
CHLORPYRIFOS 300EC/UL 0.08 0
CHLORPYRIFOS-METHYL EC/UL 0.04 0
DELTAMETHRIN 27.5EC 0.56 0.16
DELTAMETHRIN 5.5UL 0.34 0.08
DIAFENTHIURON 500SC 0.02 0.04
DICOFOL 480EC 0.01 0.02
DIMETHOATE 400EC 0.3 0.44
EMAMECTIN 1.8 0
ENDOSULFAN 350EC 2.26 0.26
ESFENVALERATE 10UL 0.06 0.02
ESFENVALERATE 50EC 0.04 0.02
FIPRONIL 200SC 0.4 1.16
INDOXACARB 1.58 0.04
LAMBDA-CYHALOTHRIN EC/UL 0.06 0
METHIDATHION 400EC 0.08 0.04
METHOMYL 225LC 0.16 0
NPV-Gemstar 0.24 0
NPV-Virus 0.08 0
OMETHOATE 800SL 0.02 0.08
PARATHION-METHYL 500EC 0.08 0
PHORATE 200G 0.02 0.02
PIPERONYL BUTOXIDE 800EC 0.6 0
PIRIMICARB 500WG 0.02 0
PRODIGY 0.3 0
PROFENOFOS 250EC/UL 0.1 0
PROFENOFOS 500EC 0.16 0.02
PROPARGITE 600 0.16 0.04
SPINOSAD 480SC 0.58 0
SPINOSAD UL 0.32 0
THIODICARB 375SC 0.18 0.04
ZETA-CYPERMETHRIN + ETHION 0.04 0
Conventional
Bollgard

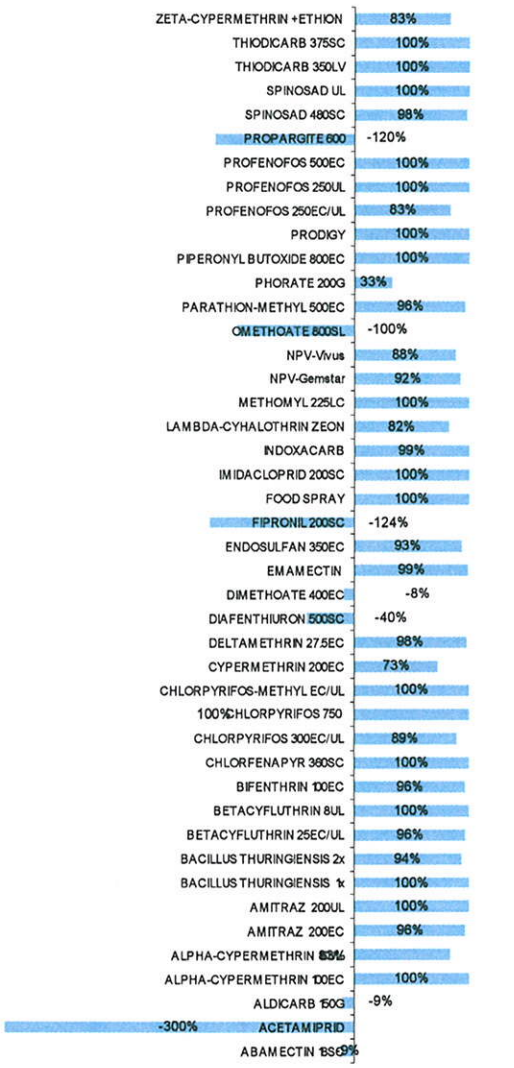

Average Number of Sprays by Product - All Valleys 2003-2004
ABAMECTIN 18SC 0.17 0.19
ACETAMIPRID 0.03 0.13
ALDICARB 150G 0.17 0.19
ALPHA-CYPERMETHRIN 100EC 0.00 0.13
ALPHA-CYPERMETHRIN 16UL 0.02 0.09
AMITRAZ 200EC 0.09 2.34
AMITRAZ 200UL 0.00 0.16
BACILLUS THURINGIENSIS 1x 0.00 0.06
BACILLUS THURINGIENSIS 2x 0.03 0.50
BETACYFLUTHRIN 25EC/UL 0.02 0.44
BETACYFLUTHRIN 8UL 0.00 0.05
BIFENTHRIN 100EC 0.02 0.42
CHLORFENAPYR 360SC 0.00 0.05
CHLORPYRIFOS 300EC/UL 0.08 0.72
CHLORPYRIFOS 750 0.00 0.02
CHLORPYRIFOS-METHYL EC/UL 0.00 0.09
CYPERMETHRIN 200EC 0.05 0.17
DELTAMETHRIN 27.5EC 0.02 0.69
DIAFENTHIURON 500SC 0.11 0.08
DIMETHOATE 400EC 0.94 1.02
EMAMECTIN 0.02 1.86
ENDOSULFAN 350EC 0.08 1.13
FIPRONIL 200SC 0.59 1.33
FOOD SPRAY 0.00 0.02
IMIDACLOPRID 200SC 0.00 0.02
INDOXACARB 0.02 2.09
LAMBDA-CYHALOTHRIN ZEON 0.05 0.27
METHOMYL 225LC 0.00 0.17
NPV-Gemstar 0.05 0.61
NPV-Vivus 0.03 0.27
OMETHOATE 800SL 0.03 0.02
PARATHION-METHYL 500EC 0.02 0.41
PHORATE 200G 0.03 0.05
PIPERONYL BUTOXIDE 800EC 0.00 0.48
PRODIGY 0.00 0.08
PROFENOFOS 250EC/UL 0.02 0.09
PROFENOFOS 250UL 0.00 0.02
PROFENOFOS 500EC 0.00 0.25
PROPARGITE 600 0.17 0.08
SPINOSAD 480SC 0.02 0.81
SPINOSAD UL 0.00 0.28
THIODICARB 350LV 0.00 0.03
THIODICARB 375SC 0.00 0.23
ZETA-CYPERMETHRIN + ETHION 0.02 0.09
Conventional
Bollgard


Average Number of Sprays by Product - All Valleys 2002-2003
ABAMECTIN 18SC-Agrimec Wizard, Biomectin 0.11 0.00
ALDICARB 150G-Temik, Touche 0.07 0.04
AMITRAZ 200EC-Ovasyn, Opal 0.19 0.00
BACILLUS THURINGIENSIS 2x--Dipel, BTK 1.19 0.00
BETACYFLUTHRIN 25EC/UL-Bulldock Duo 0.04 0.07
BETACYFLUTHRIN 8UL-Bulldock UL 0.19 0.00
CHLORFENAPYR 360SC-Intrepid 0.19 0.00
CHLORPYRIFOS 300EC/UL-Predator 0.04 0.00
CHLORPYRIFOS 500EC-Lorsban 0.07 0.07
DELTAMETHRIN 27.5EC-Decis, Ballistic 0.11 0.00
DIAFENTHIURON 500SC-Pegasus 0.11 0.04
DIMETHOATE 400EC-Perfekthion, Rogor 0.44 0.19
EMAMECTIN -Affirm 1.19 0.11
ENDOSULFAN 350EC-Thiodan EC 1.11 0.07
FIPRONIL 200SC-Regent 0.15 0.74
FOOD SPRAY-Envirofeast, Predfeed 0.04 0.00
INDOXACARB-Steward 1.26 0.07
NPV - Gemstar 0.37 0.11
NPV - Vivus 0.04 0.04
OMETHOATE 800SL-Folimat 0.00 0.15
PIPERONYL BUTOXIDE 800EC-PBO 0.15 0.07
PIRIMICARB 500WG-Pirimor 0.37 0.15
Prodigy 0.04 0.00
PROPARGITE 600-Comite 0.30 0.00
SPINOSAD 480SC-Tracer 0.30 0.00
SPINOSAD UL-Tracer II 0.26 0.07
THIODICARB 375SC-Larvin 0.11 0.04
THIODICARB 800WG-Larvin 0.07 0.00
ZETA-CYPERMETHRIN + ETHION -Mustang 0.07 0.00
ZETA-CYPERMETHRIN 100EC-Fury 0.07 0.00
Conventional
Ingard

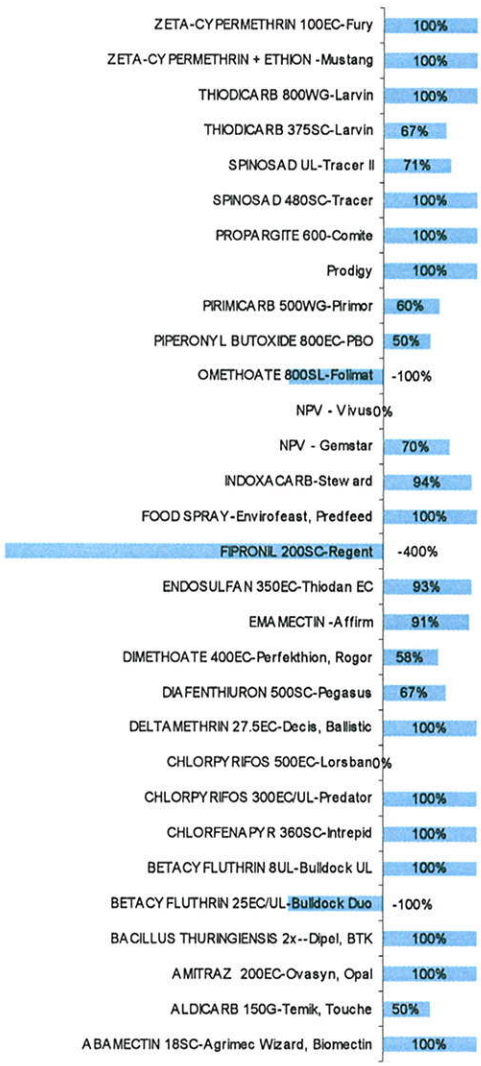
Average Reduction in Spray Applications on Bollgard by Product - All Valleys 2004-05



Average Reduction in Spray Applications on Bollgard by Product - All Valleys 2003-2004



Average Reduction in Spray Applications on Ingard by Product - All Valleys 2002-2003



3.5. *Economic Outcomes*

In this section, the economic result for individual comparisons is displayed. This result is calculated by subtracting from the total revenue (Yield x Price) the spray cost for each of the fields in a paired comparison and subtracting the net result for the Ingard/Bollgard field per hectare from the result achieved by the paired conventional field, per hectare.

Assumptions for the analysis are outlined in table 3.7 below, pricing for chemical inputs are arrived at annually using data from a cross-section of agricultural re-sellers.

Table 3.7 Assumptions for the Economic Analysis

	2002/03	2003/04	2004/05
Net price per bale of cotton	$400.00	$400.00	$400.00
License Fee	$170.00	$170.00	$250.00
Aerial spraying	$11.50	$11.50	$12.50
Ground Rig Spraying	$10.50	$10.50	$9.50

Next are paired graphs for the 2003-04 and 2004-05 seasons outlining:
Total Spray Costs per Hectare in total and by region
Insecticide cost per bale in total and by region
Average cost per spray in total and by region

These are followed by the following charts for 2002-03, 2003-04 and 2004-05 seasons for;
The distribution of paired comparisons falling within an economic benefit or cost,
The economic result for comparisons, and
Plots of total spray costs per hectare and yield.

The financial result for Bollgard when considering variable input costs resulted in 66 per cent of comparisons ending in an economic benefit from growing Bollgard. This is a declining trend where the result for the first year of Bollgard was 84 per cent of comparisons showing a benefit and in the last year of Ingard, 2002-03, 89 per cent of comparisons favoured the technology.

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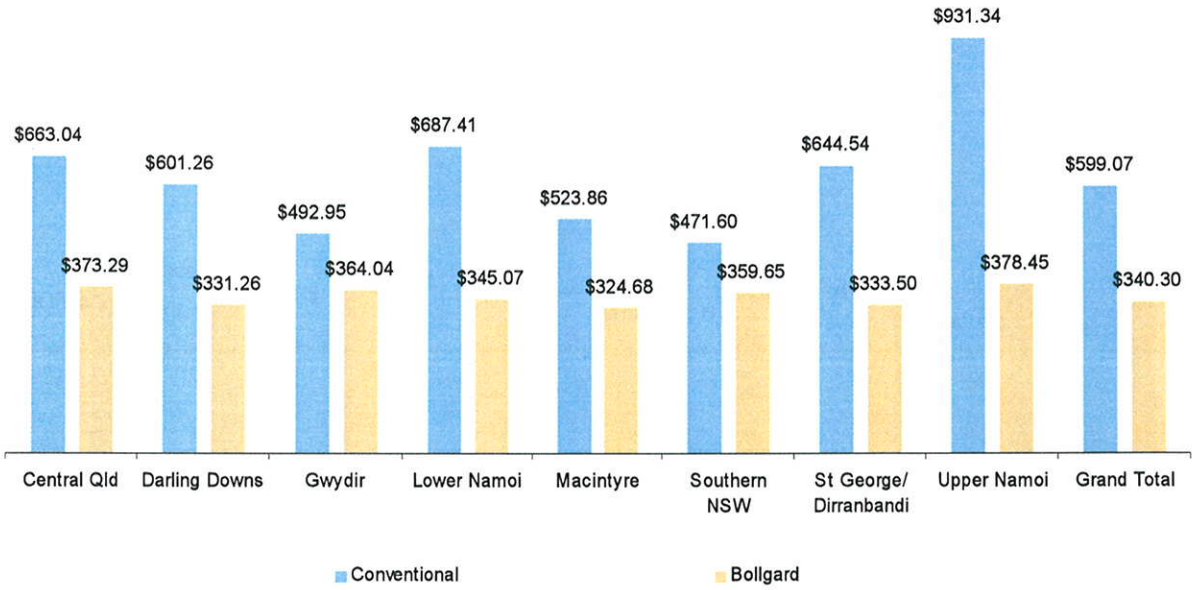
Total Spray Costs per Hectare - Including Bollgard License - 2004-05



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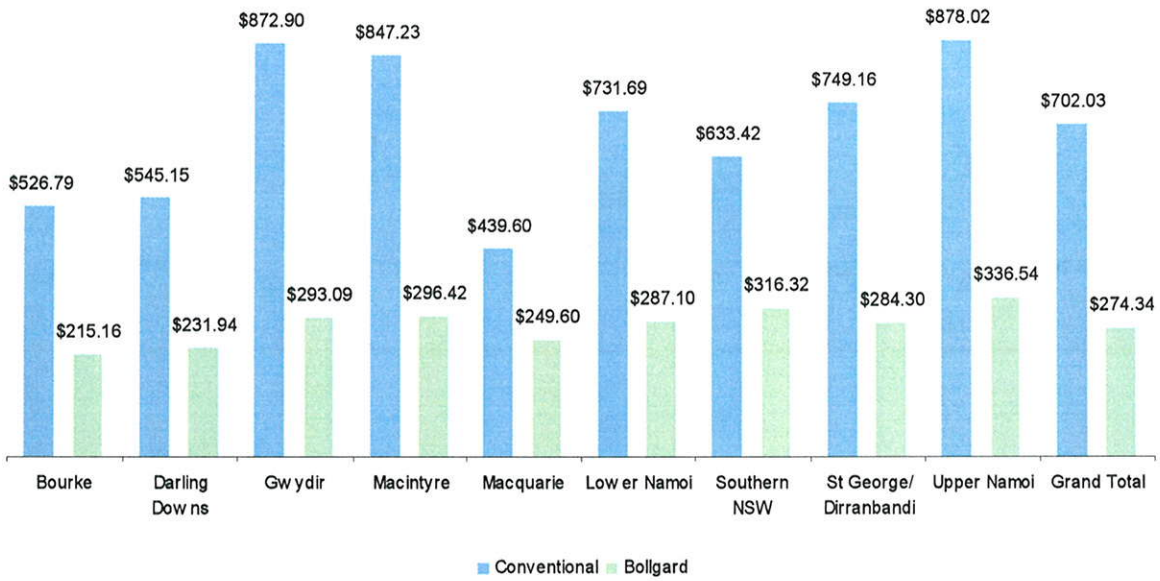
Total Spray Costs per Hectare - Including Bollgard License - 2003-04



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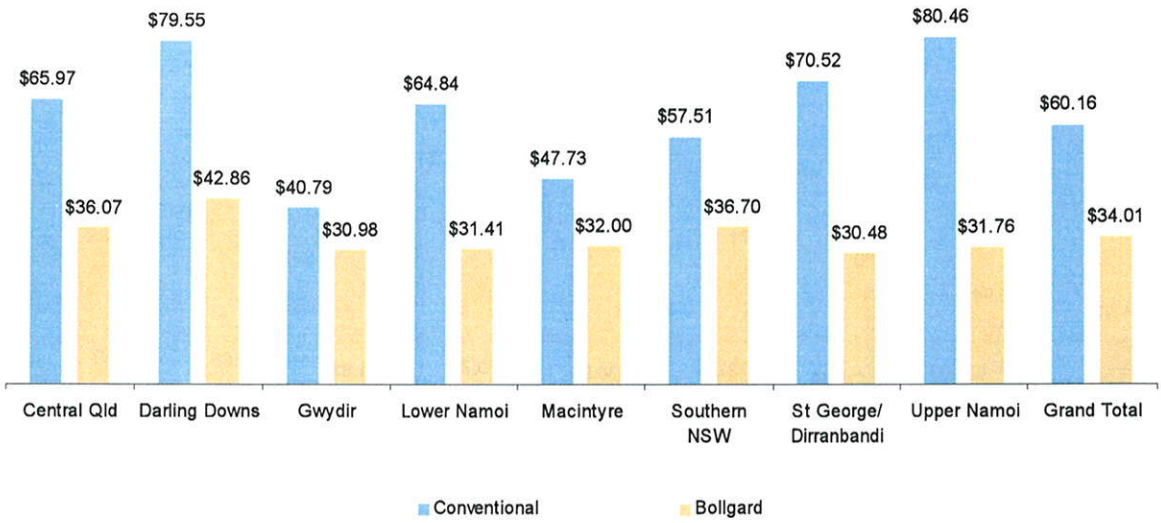
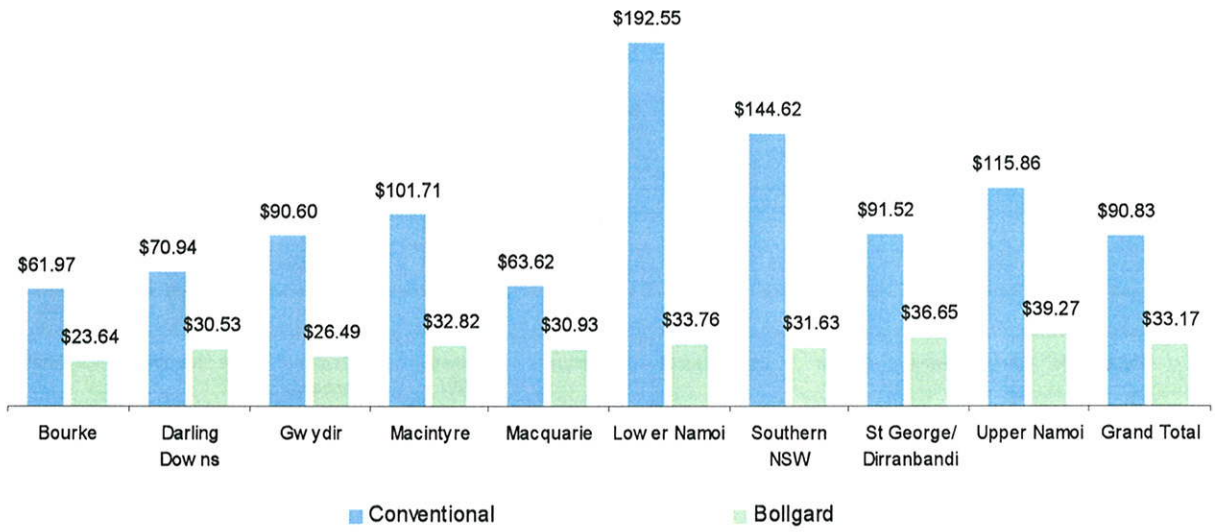
Insecticide Cost per Bale - Including Bollgard License Fee - 2004-05



Insecticide Cost per Bale - Including Bollgard License Fee - 2003-04



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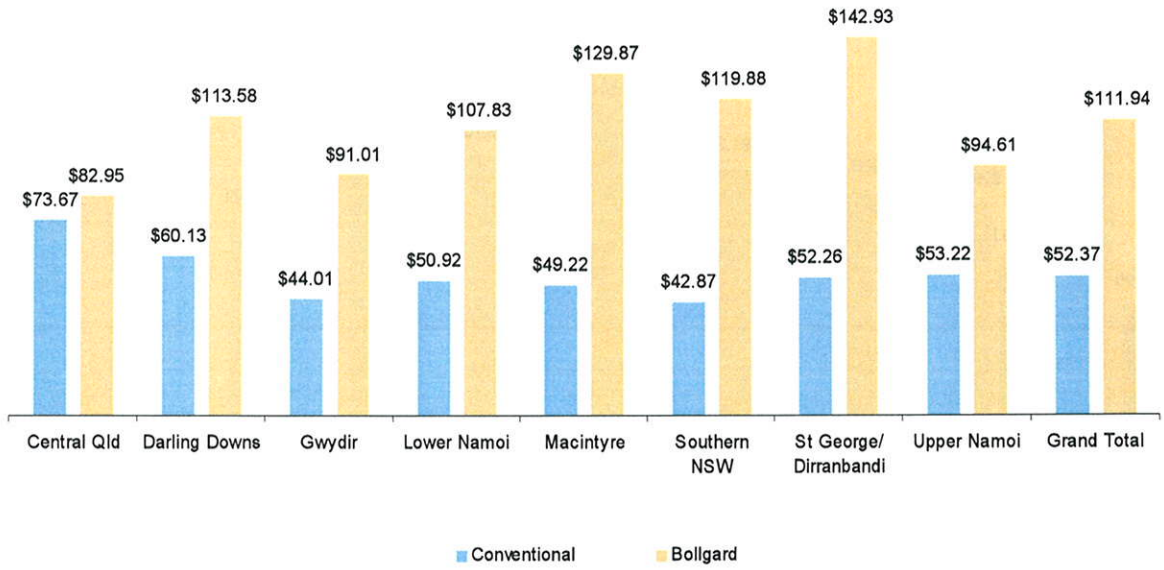
Average Cost per Spray - Including Bollgard License - 2004-05



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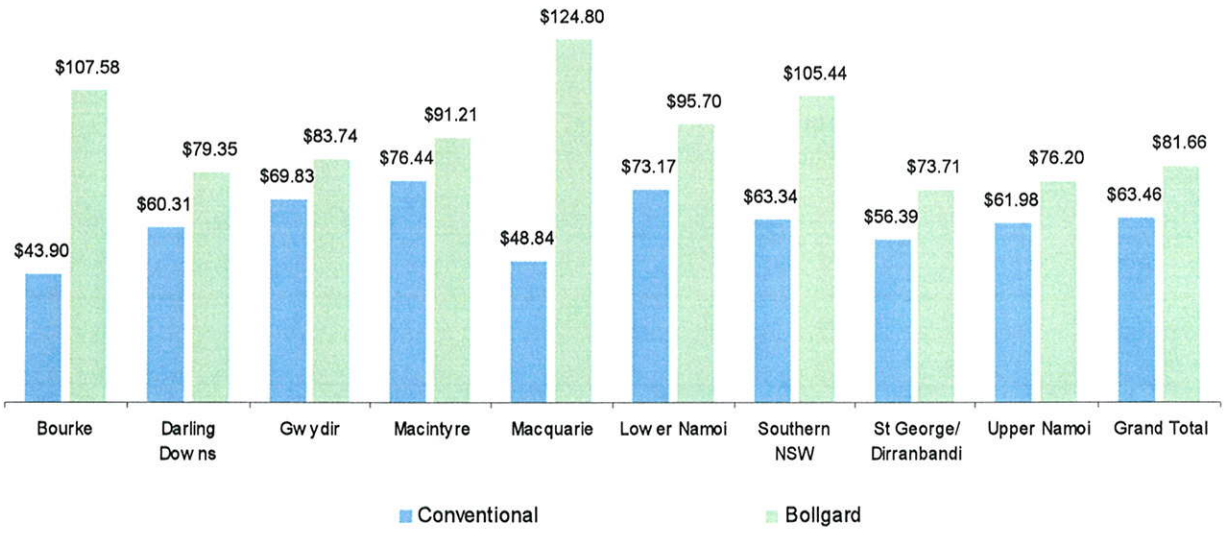
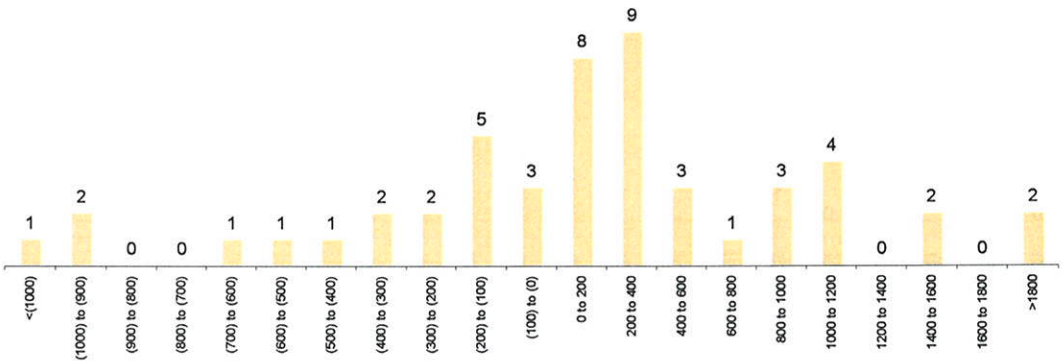
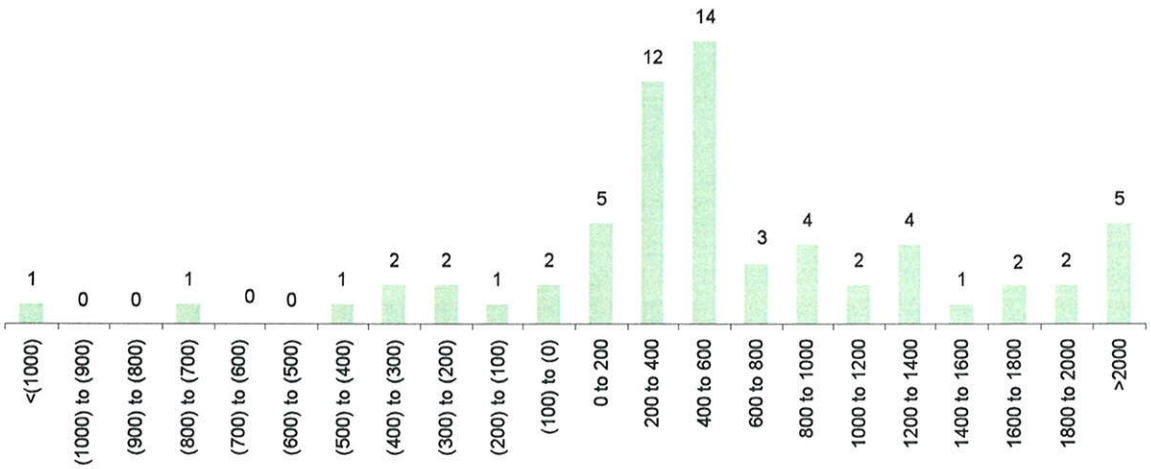
Average Cost Per Applied Spray Including Bollgard License Fee - 2003-04



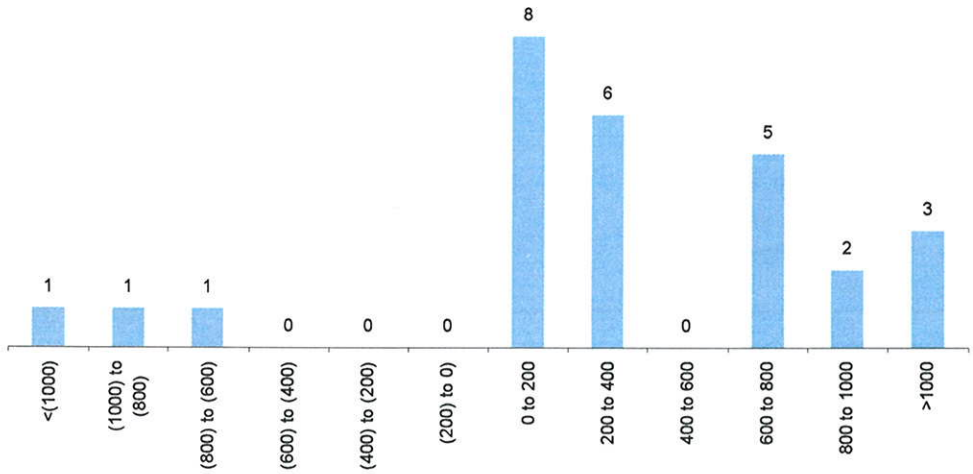
The Number of Paired Comparisons falling Within an Economic Benefit or Cost as a Result of Growing Bollgard 2004-05



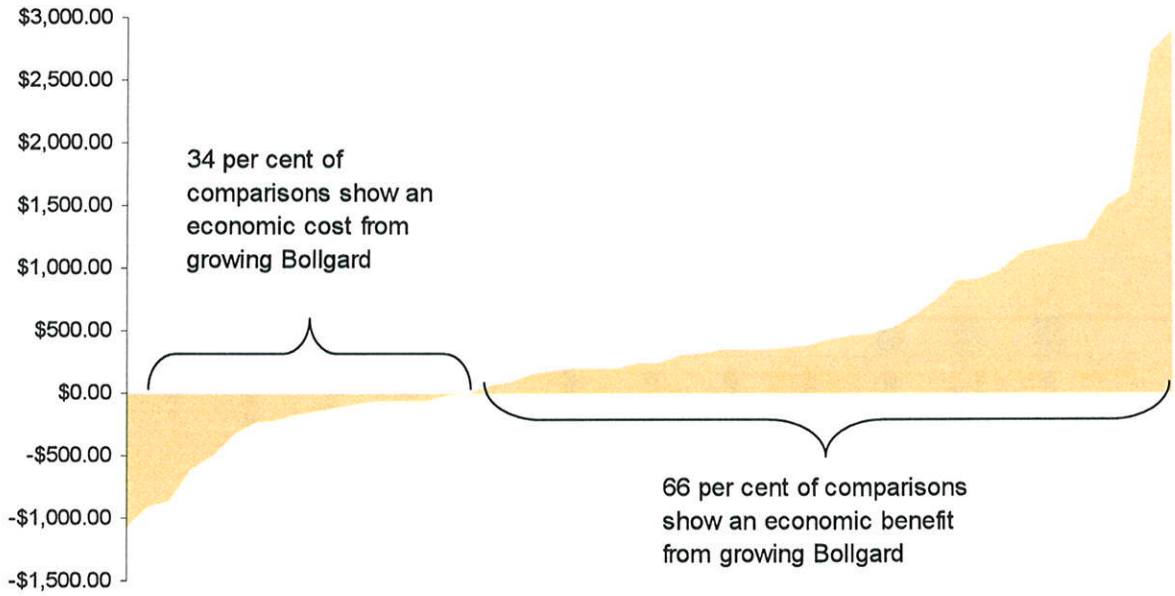
The Number of Paired Comparisons Falling Within an Economic Benefit or Cost as a Result of Growing Bolgard 2003-2004



The Number of Paired Comparisons Falling Within an Economic Benefit or Cost as a Result of Growing Ingard 2002-2003

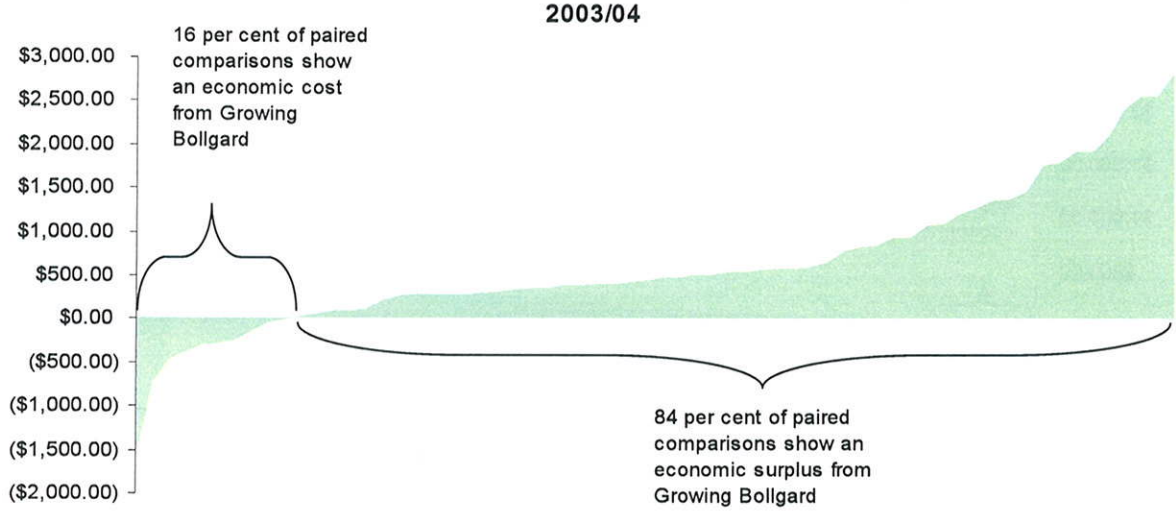


Economic Result for Bollgard and Conventional Field Comparisons - 2004/05

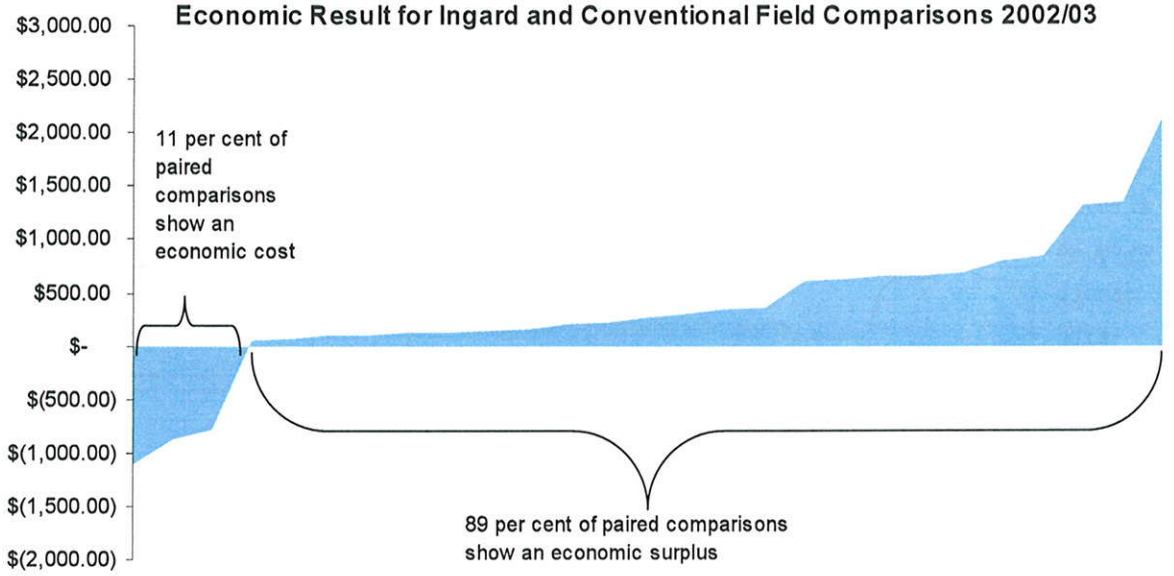


Australian Government
Cotton Research and Development Corporation

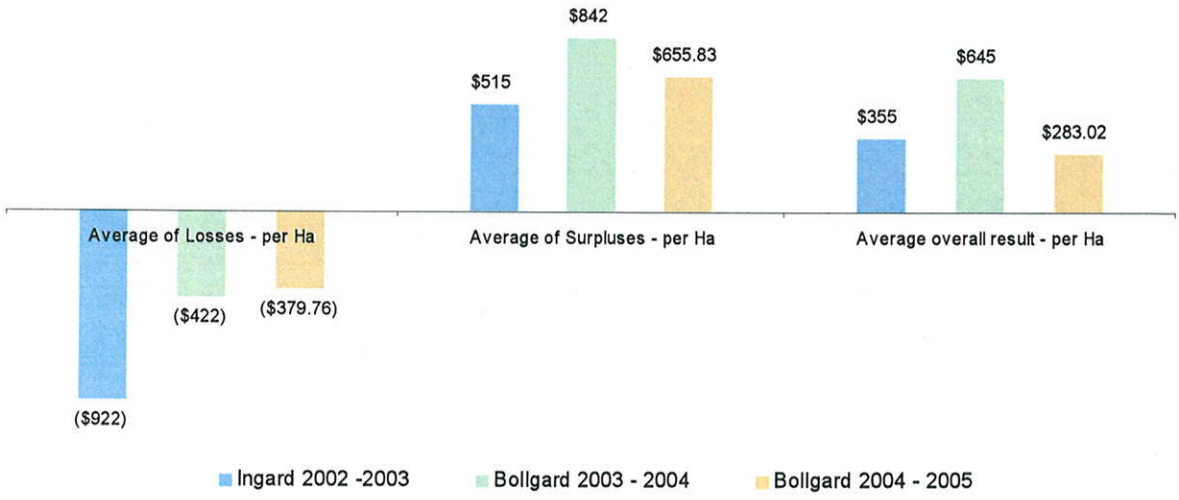
Economic Result for Bollgard and Conventional Field Comparisons 2003/04

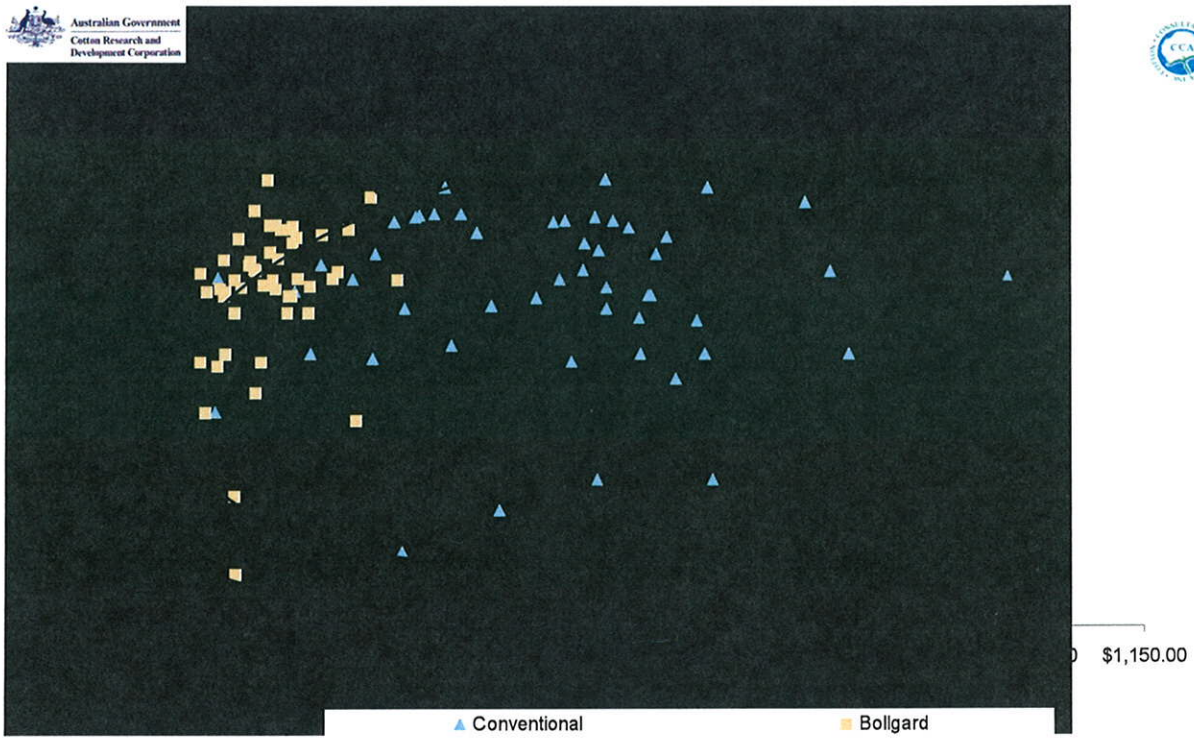


Australian Government
Cotton Research and Development Corporation

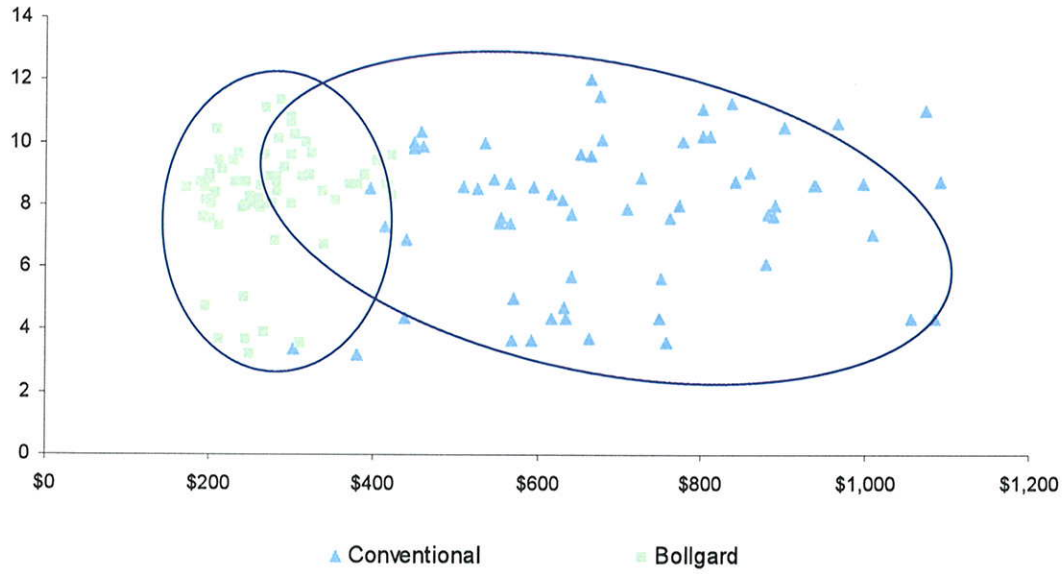


Comparison of Economic Outcomes* for Ingard in 2002/03 and Bollgard in the 2003/04 Seasons



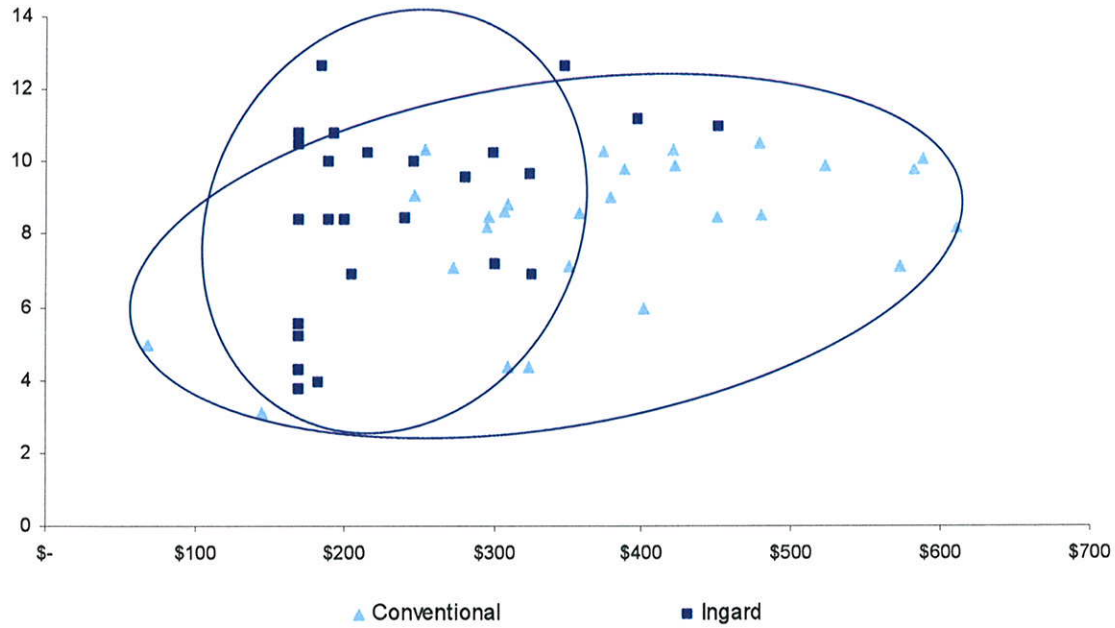

Australian Government
Cotton Research and Development Corporation
CCA
$1,150.00
Conventional
Bollgard

Plot of Total Spray Costs per Hectare and Yield in Bales per Hectare - 2003-2004

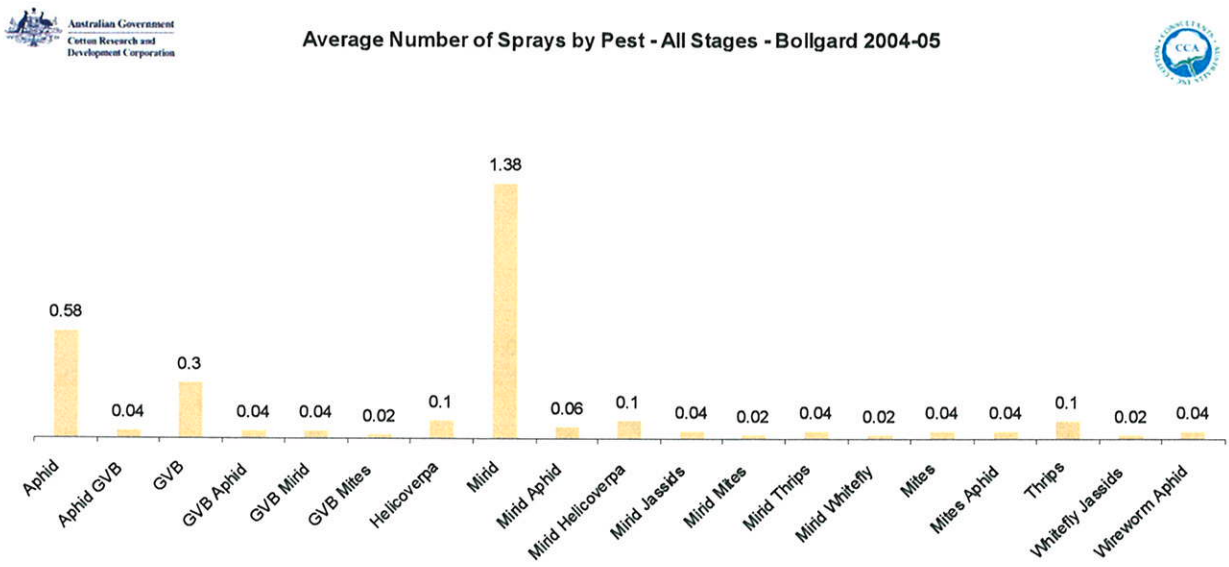


Australian Government
Cotton Research and Development Corporation

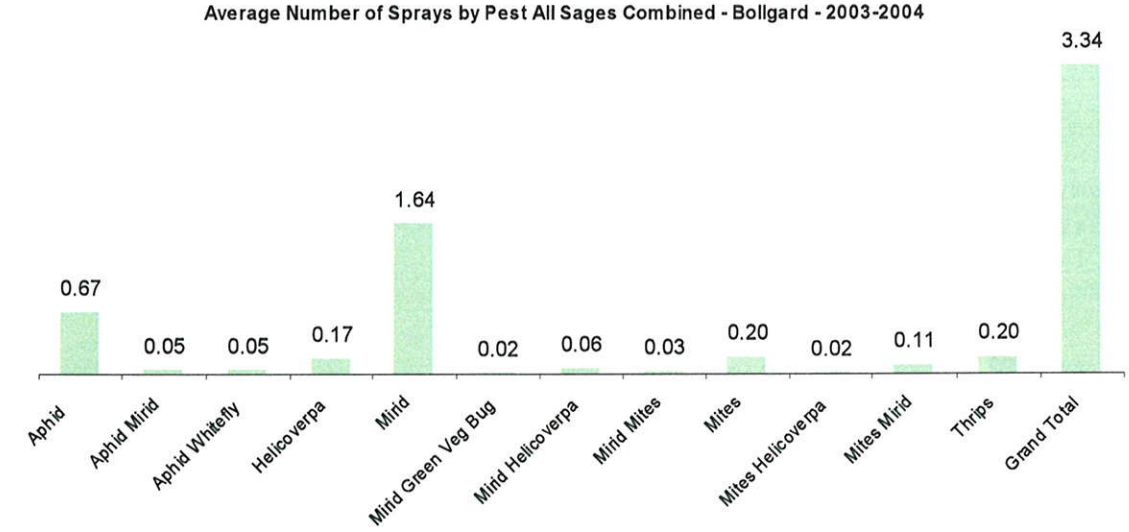
Plot of Total Spray Costs per Hectare and Yield in Bales per Hectare - 2003-2004



4. APPENDIX 1 – NUMBER OF SPRAYS BY PEST

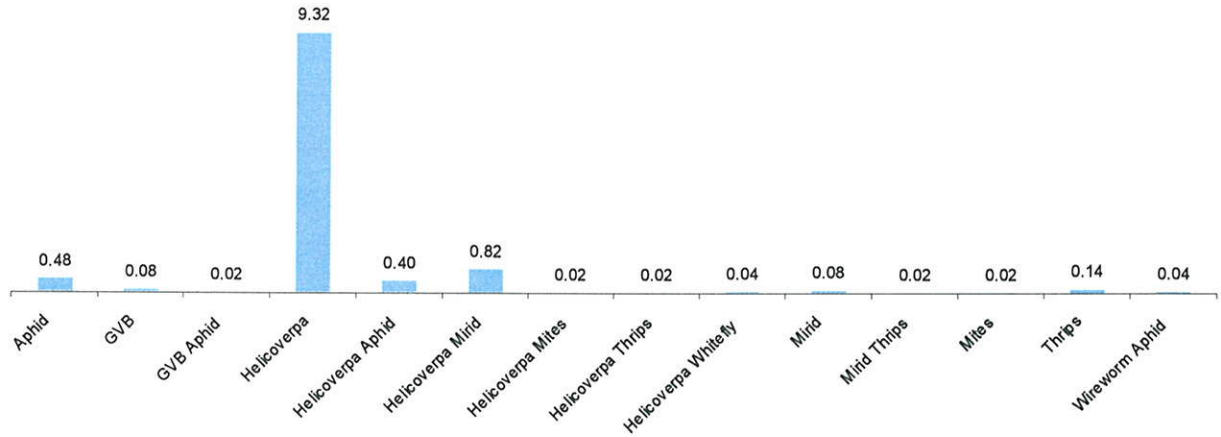


Australian Government
Cotton Research and Development Corporation

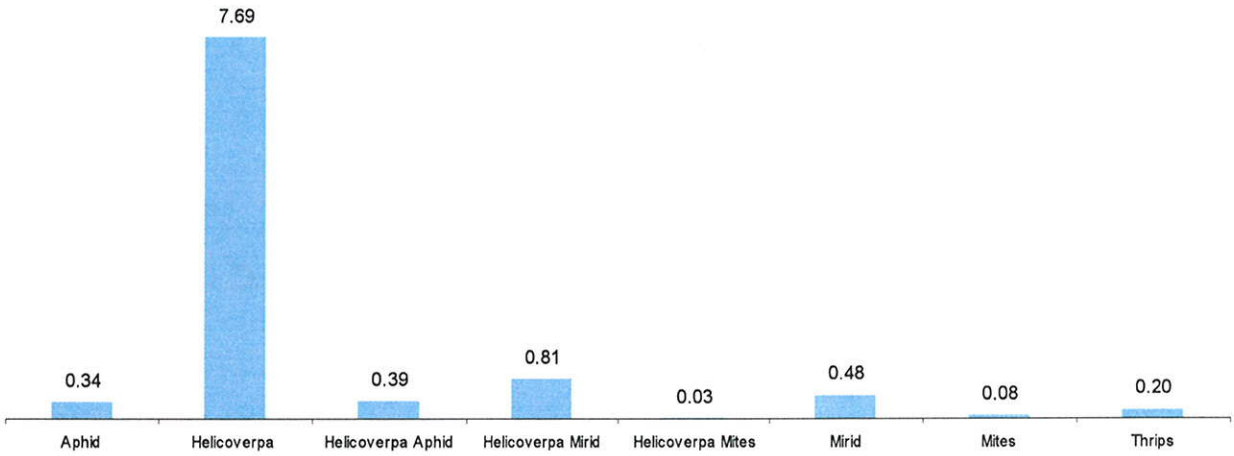


Australian Government
Cotton Research and Development Corporation

Average Number of Sprays by Pest All Sages - Conventional - 2004-05

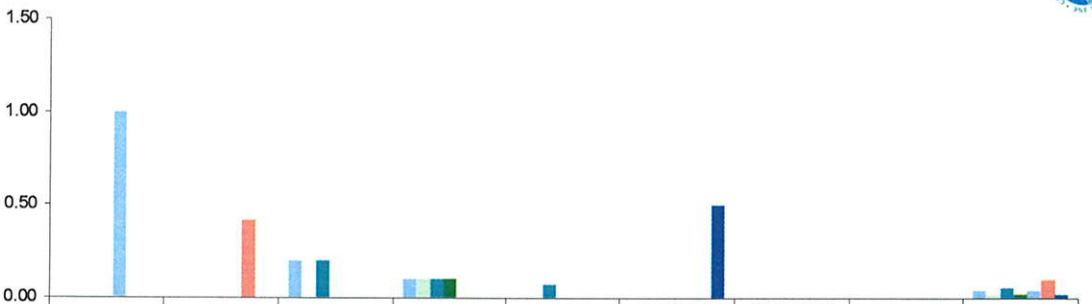


Average Number of Sprays by Pest All Sages - Conventional - 2003-04



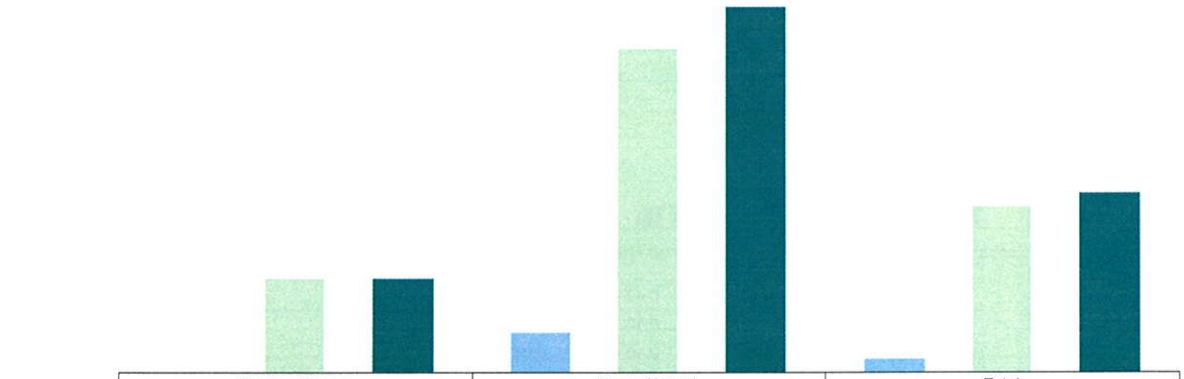
Australian Government
Cotton Research and Development Corporation

Average Number of Sprays - Plant to First Flower - Bollgard - 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
GVB			0.20	0.10					0.04
Helicoverpa Mirid				0.10					0.02
Mirid			0.20	0.10	0.07				0.06
Mirid Mites				0.10					0.02
Mirid Thrips	1.00								0.04
Thrips		0.42							0.10
Wireworm Aphid						0.50			0.02

Average Number of Sprays - Plant - 1st squares - Bollgard 2003-04



	Darling Downs	Upper Namoi	Total
Mites		0.08	0.03
Thrips	0.19	0.67	0.34
Grand Total	0.19	0.75	0.37

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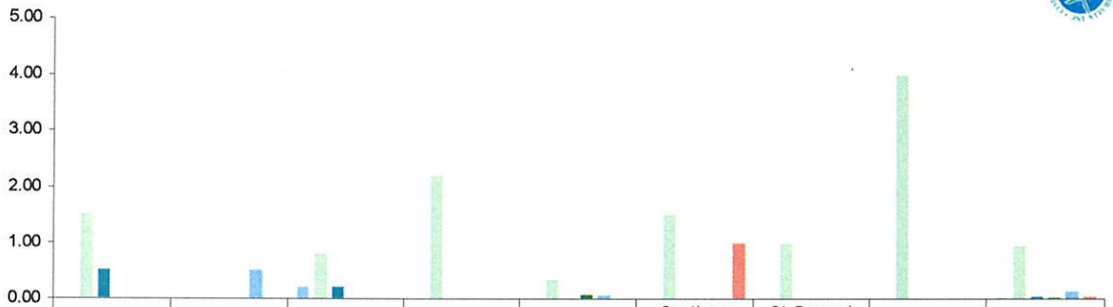
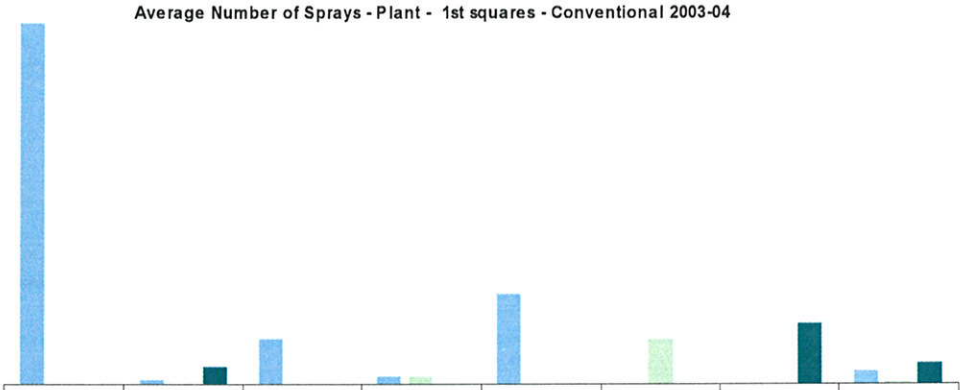
Average Number of Sprays - Plant - First Squares - Conventional 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid			0.20						0.02
Helicoverpa	1.50	0.00	0.80	2.20	0.36	1.50	1.00	4.00	0.96
Mirid	0.50		0.20						0.04
Mites					0.07				0.02
Thrips		0.50			0.07				0.14
Wireworm Aphid						1.00			0.04

Average Number of Sprays - Plant - 1st squares - Conventional 2003-04



	Bourke	Darling Downs	Gwydir	Macintyre	Macquarie	Lower Namoi	Upper Namoi	Grand Total
Helicoverpa	4.00	0.04	0.50	0.08	1.00			0.14
Mirid				0.08		0.50		0.04
Thrips		0.19					0.67	0.23

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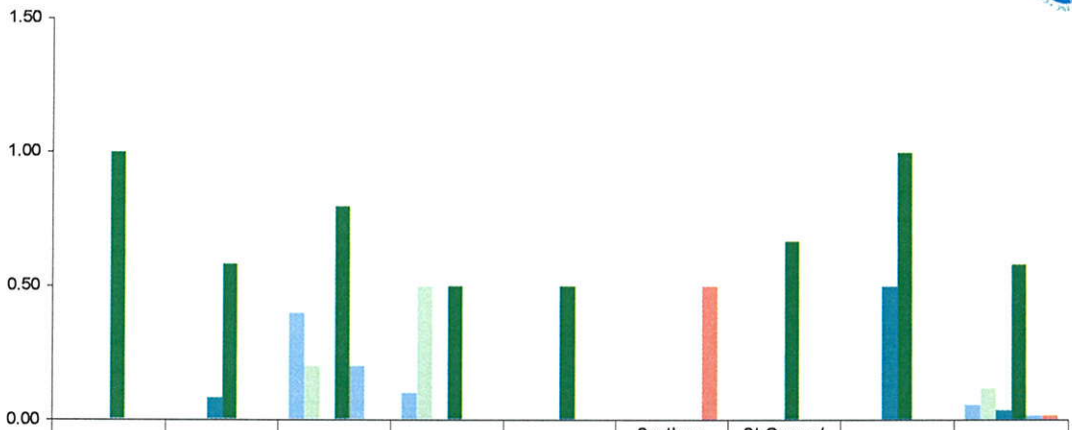
Cotton Research and Development Corporation

Average Number of Sprays - Squaring to First Flower - Bollgard - 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid			0.40	0.10					0.06
GVB			0.20	0.50					0.12
Helicoverpa		0.08						0.50	0.04
Mirid	1.00	0.58	0.80	0.50	0.50		0.67	1.00	0.58
Mirid Aphid			0.20						0.02
Wireworm Aphid						0.50			0.02

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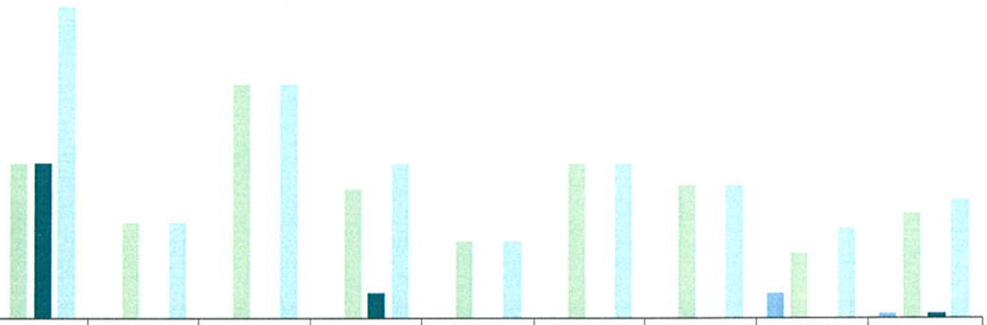
Cotton Research and Development Corporation

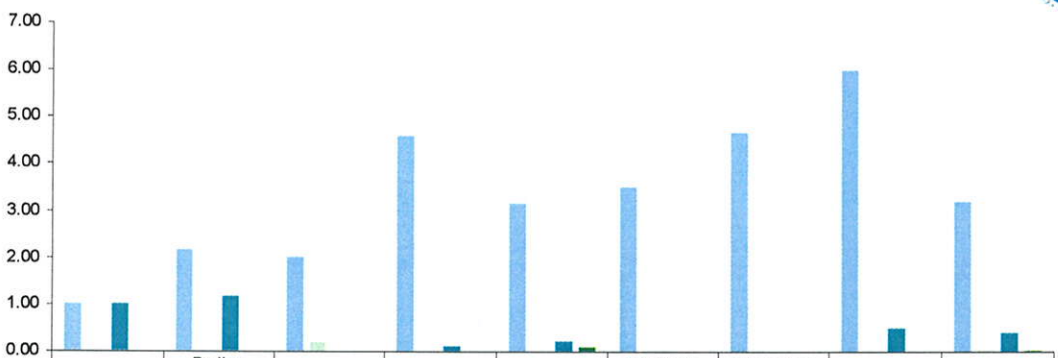
Average Number of Sprays - Squaring -1st flowers - Bollgard 2003-04



	Bourke	Darling Downs	Gwydir	Macintyre	Lower Namoi	Southern NSW	St George/ Dirranbandi	Upper Namoi	Total
Helicoverpa								0.17	0.03
Mirid	1.00	0.62	1.50	0.83	0.50	1.00	0.86	0.42	0.68
Mirid Helicoverpa	1.00			0.17					0.03
Grand Total	2.00	0.62	1.50	1.00	0.50	1.00	0.86	0.58	0.76

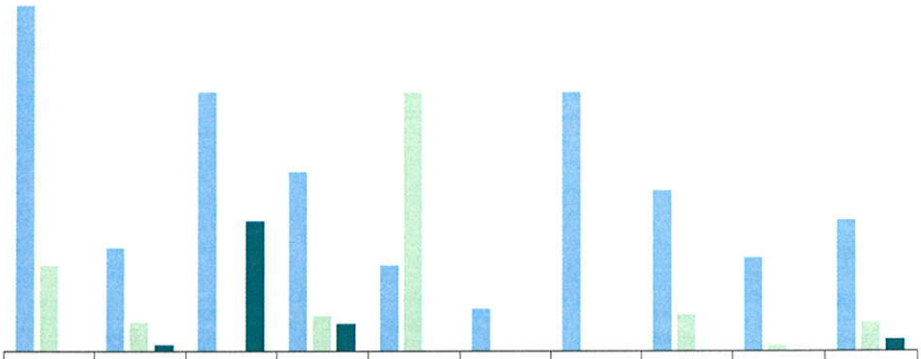
Australian Government
Cotton Research and Development Corporation

Average Number of Sprays - Squaring to First Flower - Conventional 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Helicoverpa	1.00	2.17	2.00	4.60	3.14	3.50	4.67	6.00	3.22
Helicoverpa Aphid			0.20						0.02
Helicoverpa Mirid	1.00	1.17		0.10	0.21			0.50	0.42
Helicoverpa Thrips					0.07				0.02

Average Number of Sprays - Squaring -1st flowers - Conventional 2003-04



	Bourke	Darling Downs	Gwydir	Macintyre	Macquarie	Lower Namoi	Southern NSW	St George/ Dirranban	Upper Namoi	Grand Total
Helicoverpa	4.00	1.19	3.00	2.08	1.00	0.50	3.00	1.86	1.08	1.52
Helicoverpa Mirid	1.00	0.35		0.42	3.00			0.43	0.08	0.34
Mirid		0.08	1.50	0.33						0.14

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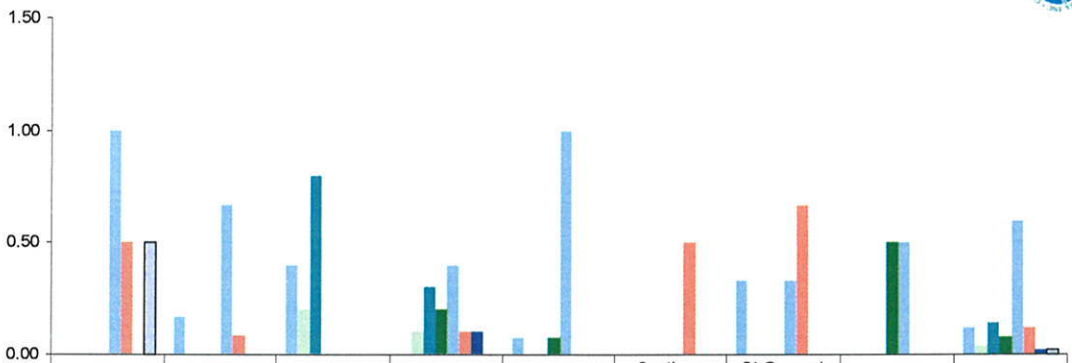
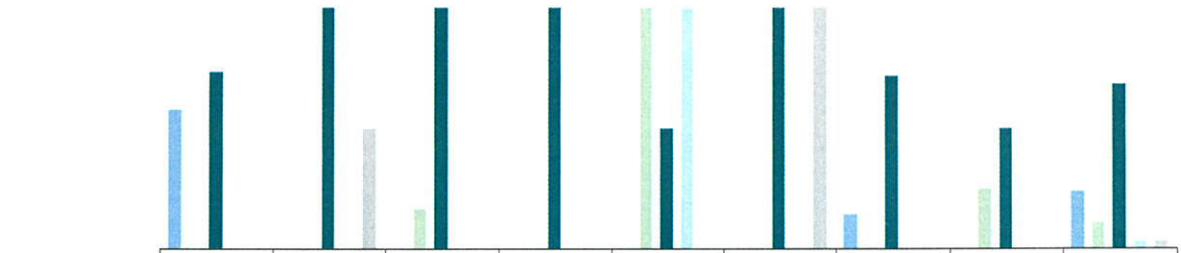
Cotton Research and
Development Corporation

Average Number of Sprays - First Flower to First Open Boll - Bollgard - 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid		0.17	0.40		0.07		0.33		0.12
Aphid GVB			0.20	0.10					0.04
GVB			0.80	0.30					0.14
Helicoverpa				0.20	0.07			0.50	0.08
Mirid	1.00	0.67		0.40	1.00		0.33	0.50	0.60
Mirid Aphid	0.50	0.08		0.10		0.50	0.67		0.12
Mites				0.10					0.02
Whitefly Jassids	0.50								0.02

Average Number of Sprays - 1st Flowers - 1st open boll - Bollgard 2003-04

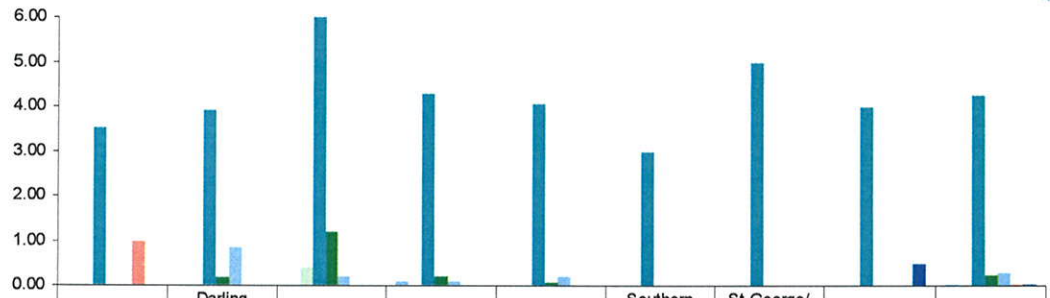


	Darling Downs	Gwydir	Macintyre	Macquarie	Lower Namoi	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid	0.58						0.14		0.24
Helicoverpa			0.17		1.00			0.25	0.11
Mirid	0.73	1.00	1.00	1.00	0.50	1.00	0.71	0.50	0.68
Mirid Mites					1.00				0.03
Mites		0.50				1.00			0.03

Aphid Helicoverpa Mirid Mirid Mites Mites

Australian Government
Cotton Research and Development Corporation

Average Number of Sprays - First Flower to First Open Boll - Conventional -2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid				0.10					0.02
GVB			0.40						0.02
Helicoverpa	3.50	3.92	6.00	4.30	4.07	3.00	5.00	4.00	4.26
Helicoverpa Aphid		0.17	1.20	0.20	0.07				0.22
Helicoverpa Mirid		0.83	0.20	0.10	0.21				0.30
Helicoverpa Whitefly	1.00								0.04
Mirid								0.50	0.02

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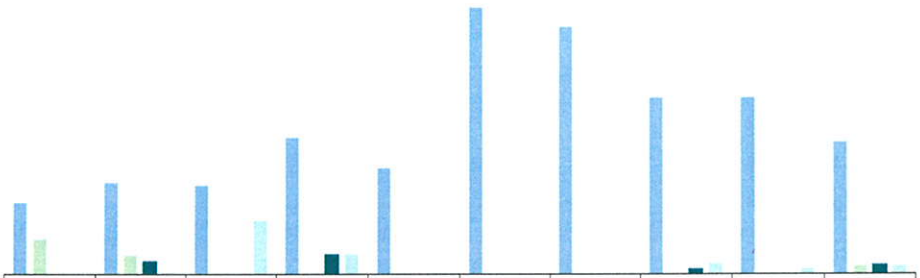
Cotton Research and Development Corporation

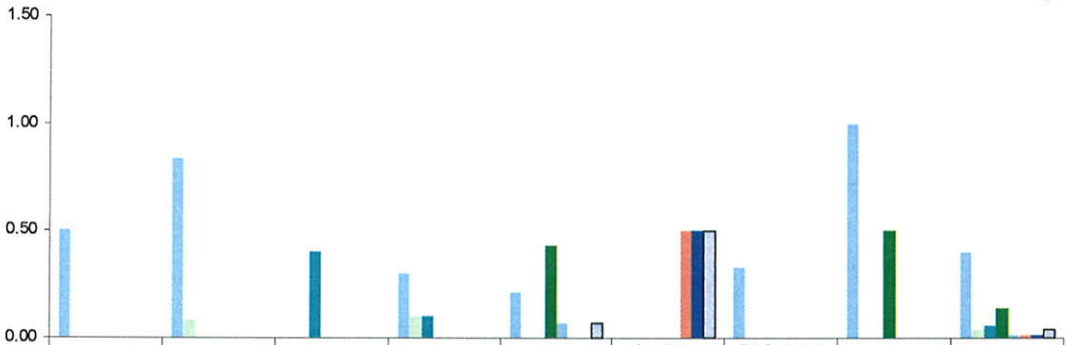
Average Number of Sprays - 1st Flowers - 1st open boll - Conventional 2003-04



	Bourke	Darling Downs	Gwydir	Macintyre	Macquarie	Lower Namoi	Southern NSW	St George/ Dirranban	Upper Namoi	Grand Total
Helicoverpa	2.00	2.58	2.50	3.83	3.00	7.50	7.00	5.00	5.00	3.75
Helicoverpa Aphid	1.00	0.54								0.23
Helicoverpa Mirid		0.38		0.58				0.14		0.28
Mirid		0.04	1.50	0.58				0.29	0.17	0.23

Australian Government
Cotton Research and Development Corporation

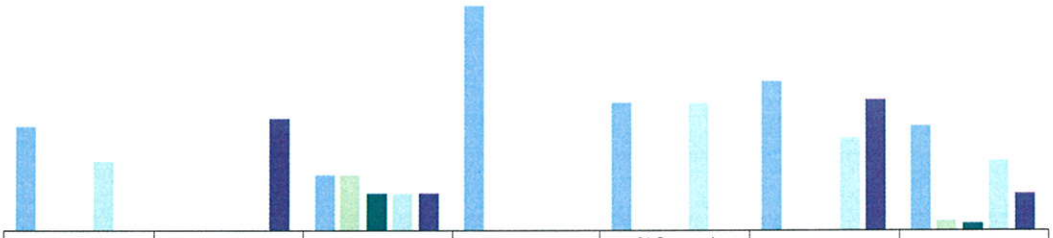
Average Number of Sprays - Open Cotton - Bollgard - 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid	0.50	0.83		0.30	0.21		0.33	1.00	0.40
GVB		0.08		0.10					0.04
GVB Aphid			0.40	0.10					0.06
Mirid					0.43			0.50	0.14
Mirid Aphid					0.07				0.02
Mirid Helicoverpa						0.50			0.02
Mites						0.50			0.02
Mites Aphid					0.07	0.50			0.04

Australian Government
Cotton Research and Development Corporation

Average Number of Sprays - Open Cotton - Bollgard 2003-04

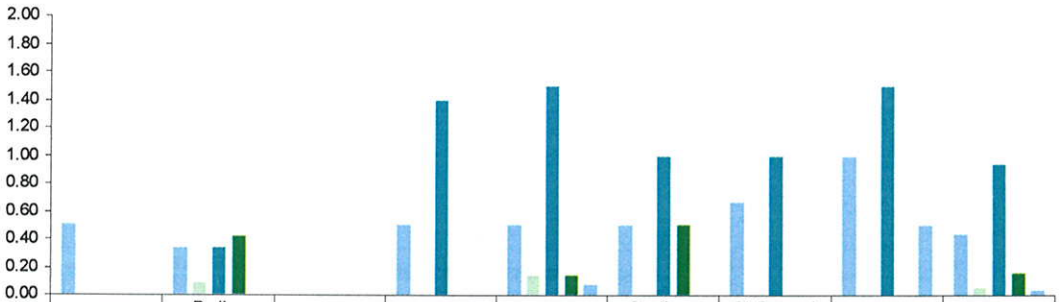


	Darling Downs	Gwydir	Macintyre	Macquarie	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid	0.46		0.25	1.00	0.57	0.67	0.47
Aphid Whitefly			0.25				0.05
Helicoverpa			0.17				0.03
Mirid	0.31		0.17		0.57	0.42	0.32
Mites		0.50	0.17			0.58	0.17

Aphid Aphid Whitefly Helicoverpa Mirid Mites

Australian Government
Cotton Research and Development Corporation

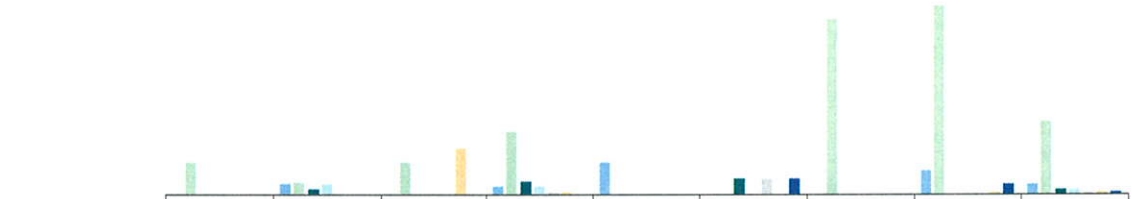
Average Number of Sprays - Open Cotton - Conventional - 2004-05



	Central Qld	Darling Downs	Gwydir	Lower Namoi	Macintyre	Southern NSW	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid	0.50	0.33	0.00	0.50	0.50	0.50	0.67	1.00	0.44
GVB	0.00	0.08	0.00	0.00	0.14	0.00	0.00	0.00	0.06
Helicoverpa	0.00	0.33	0.00	1.40	1.50	1.00	1.00	1.50	0.94
Helicoverpa Aphid	0.00	0.42	0.00	0.00	0.14	0.50	0.00	0.00	0.16
Mirid	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.50	0.04

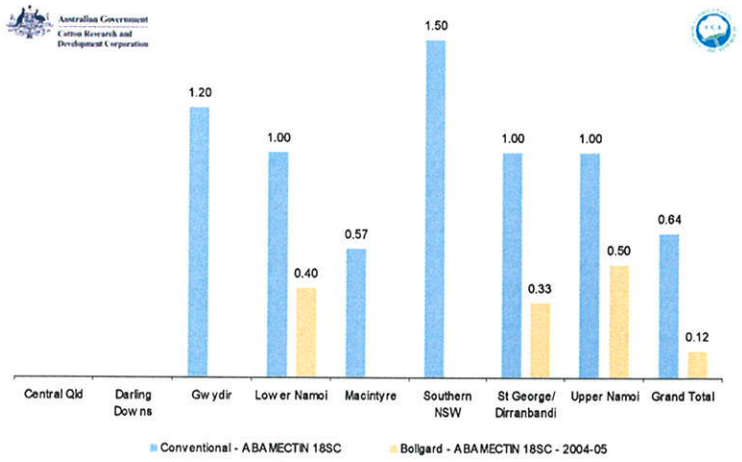
Australian Government
Cotton Research and Development Corporation

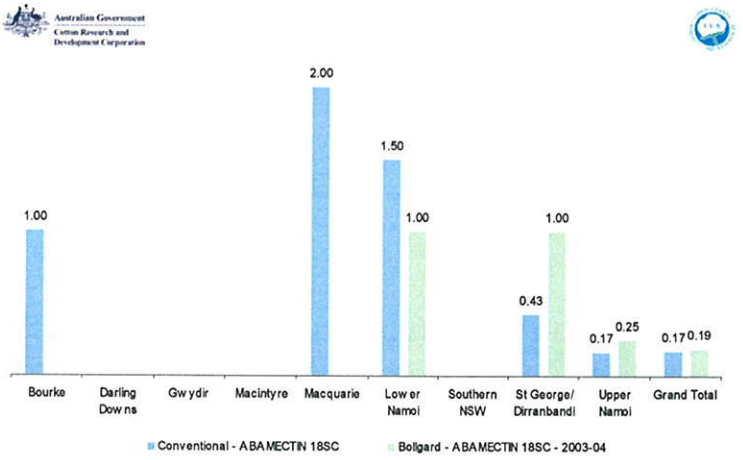
Average Number of Sprays - Open Cotton - Conventional - 2003-04

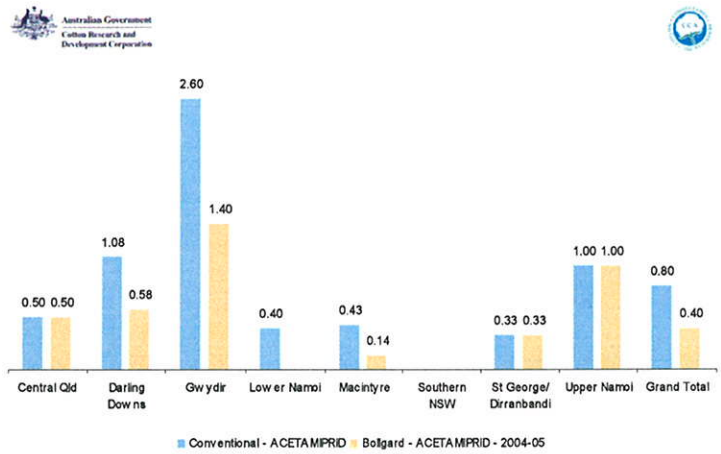


	Bourke	Darling Downs	Gwydir	Macintyre	Macquarie	Lower Namoi	St George/ Dirranbandi	Upper Namoi	Grand Total
Aphid		0.35		0.25	1.00			0.75	0.35
Helicoverpa	1.00	0.38	1.00	2.00			5.57	6.00	2.33
Helicoverpa Aphid		0.15		0.42		0.50			0.16
Helicoverpa Mirid		0.35		0.25					0.19
Helicoverpa Mites				0.08		0.50			0.03
Mirid			1.50	0.08				0.08	0.08

5. APPENDIX 2 - DETAILED CHEMICAL APPLICATIONS BY ACTIVE INGREDIENT






Australian Government
Cotton Research and Development Corporation
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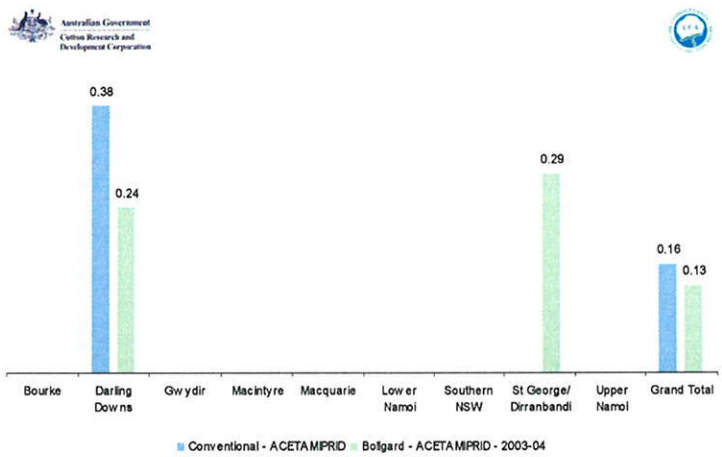
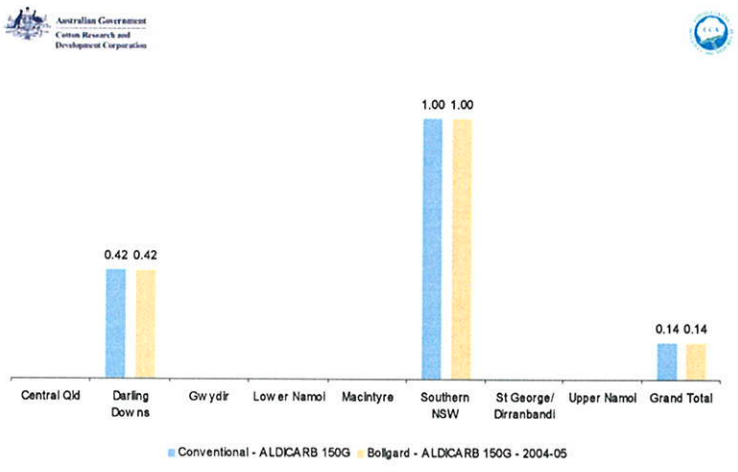
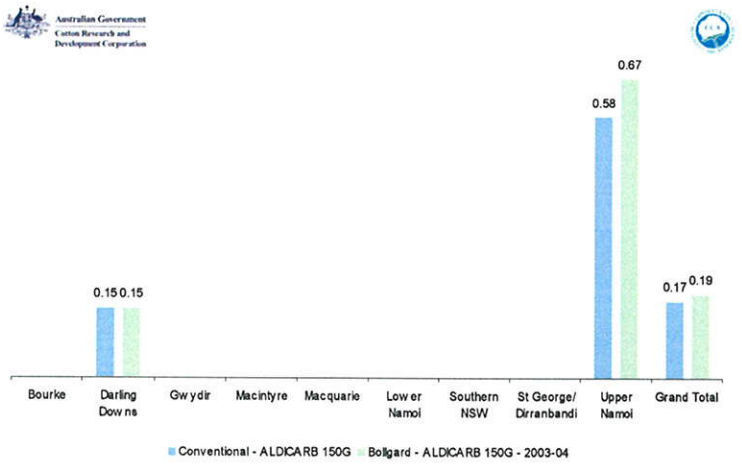
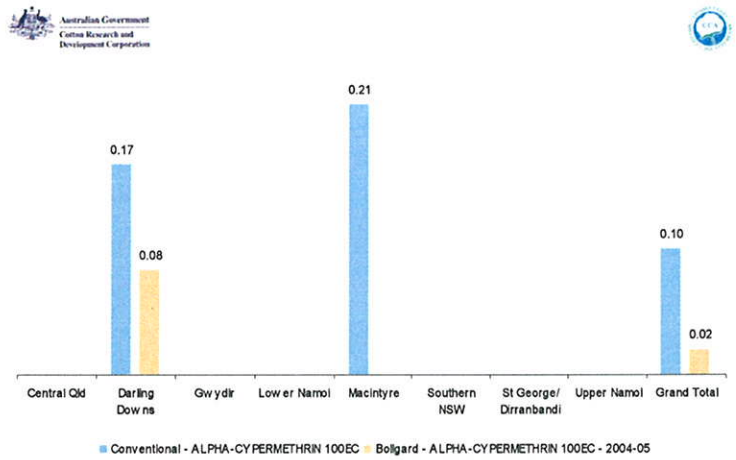
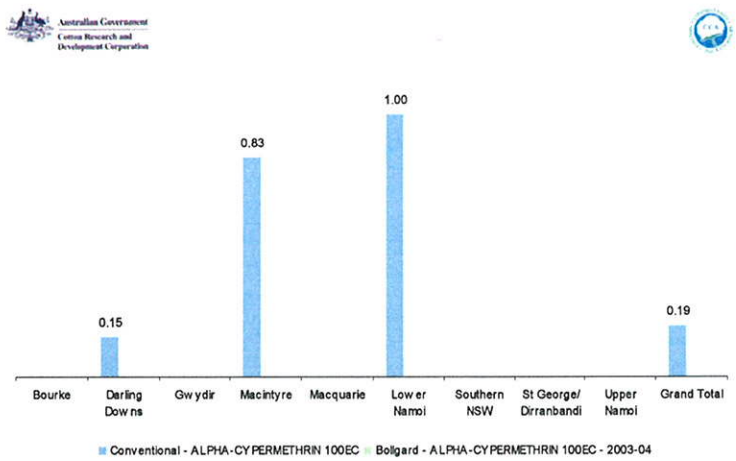
1.40
1.08
0.58
0.50 0.50
0.40
0.43
0.14
0.33 0.33
1.00 1.00
0.80
0.40
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ACETAMIPRID
Bollgard - ACETAMIPRID - 2004-05

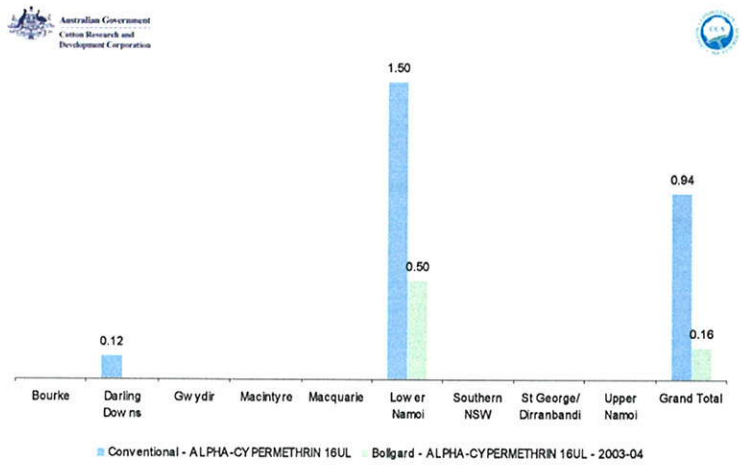

Australian Government
Cotton Research and Development Corporation
0.38
0.24
0.29
0.16
0.13
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ACETAMIPRID
Bollgard - ACETAMIPRID - 2003-04

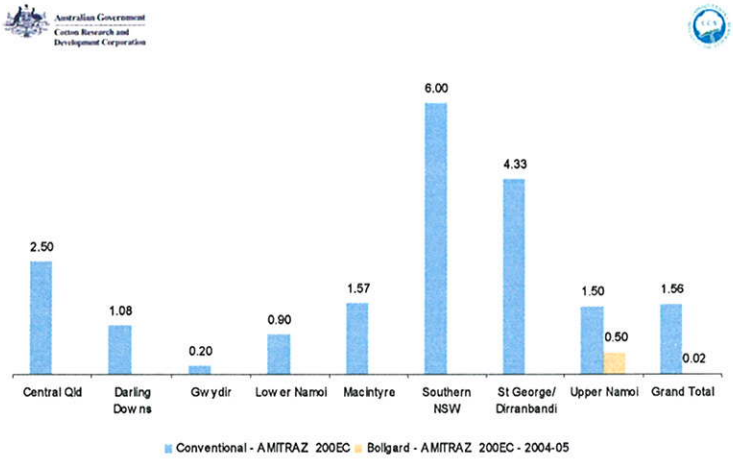

Australian Government
Cotton Research and Development Corporation
1.00 1.00
0.42 0.42
0.14 0.14
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ALDICARB 150G
Bollgard - ALDICARB 150G - 2004-05

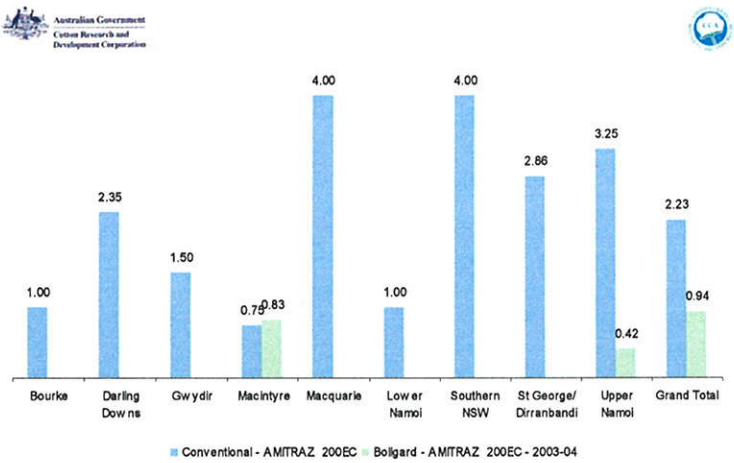

Australian Government
Cotton Research and Development Corporation
0.67
0.58
0.15 0.15
0.17 0.19
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ALDICARB 150G
Bollgard - ALDICARB 150G - 2003-04


0.17
0.08
0.21
0.10
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ALPHA-CYPERMETHRIN 100EC
Bollgard - ALPHA-CYPERMETHRIN 100EC - 2004-05


0.15
0.83
1.00
0.19
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ALPHA-CYPERMETHRIN 100EC
Bollgard - ALPHA-CYPERMETHRIN 100EC - 2003-04


Australian Government
Cotton Research and Development Corporation
1.50
0.94
0.50
0.12
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ALPHA-CYPERMETHRIN 16UL
Bollgard - ALPHA-CYPERMETHRIN 16UL - 2003-04


Australian Government
Cotton Research and Development Corporation
6.00
4.33
2.50
1.57
1.50
1.56
1.08
0.90
0.50
0.20
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - AMITRAZ 200EC
Bollgard - AMITRAZ 200EC - 2004-05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Cotton Research and Development Corporation
4.00
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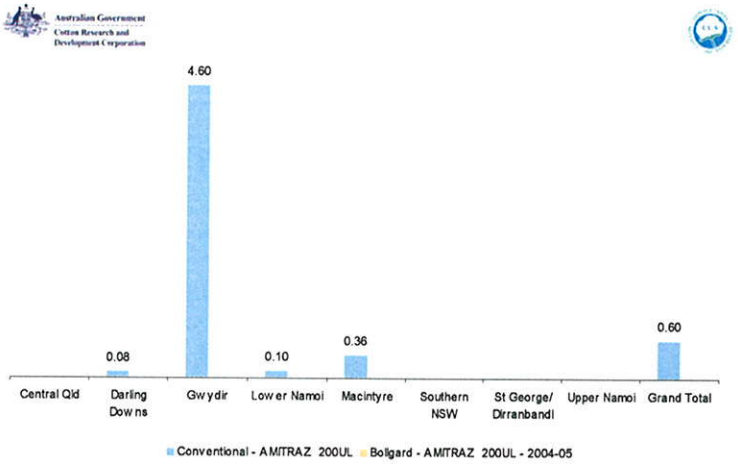
3.25
2.86
2.35
2.23
1.50
1.00
1.00
0.94
0.83
0.42
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - AMITRAZ 200EC
Bollgard - AMITRAZ 200EC - 2003-04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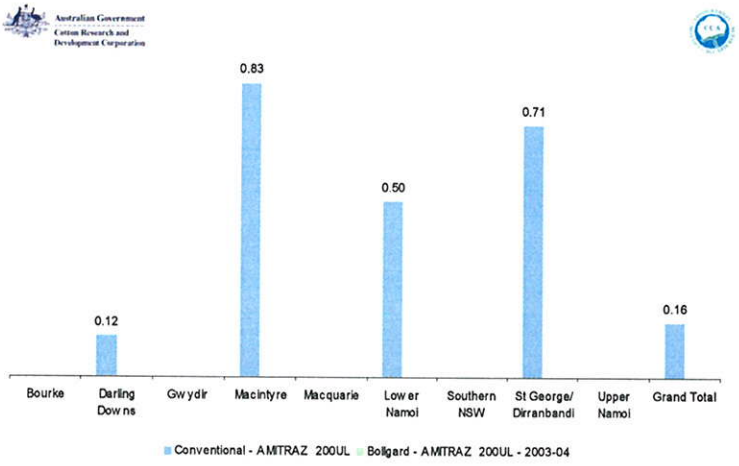
0.60
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - AMITRAZ 200UL
Bollgard - AMITRAZ 200UL - 2004-05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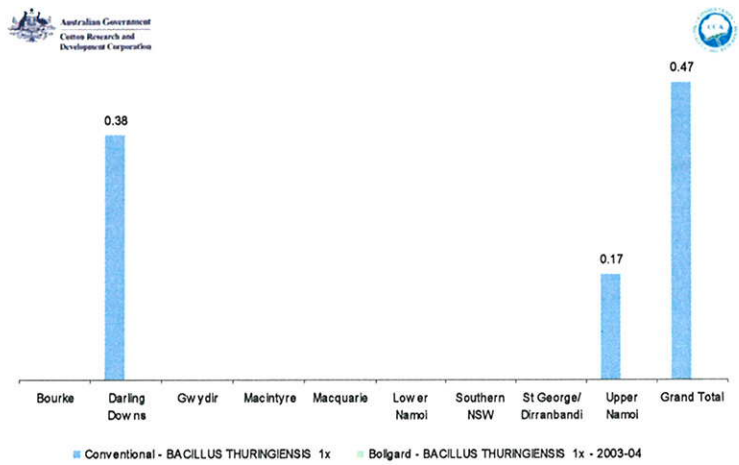
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - AMITRAZ 200UL
Bollgard - AMITRAZ 200UL - 2003-04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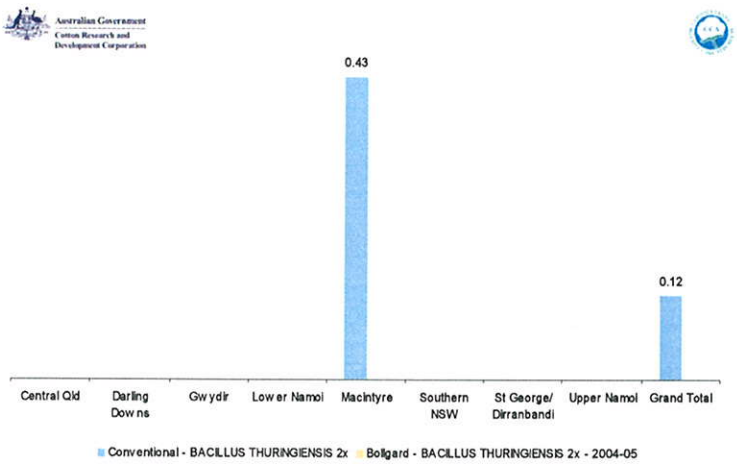
Cotton Research and
Development Corporation
0.38
0.17
0.47
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BACILLUS THURINGIENSIS 1x
Bollgard - BACILLUS THURINGIENSIS 1x - 2003-04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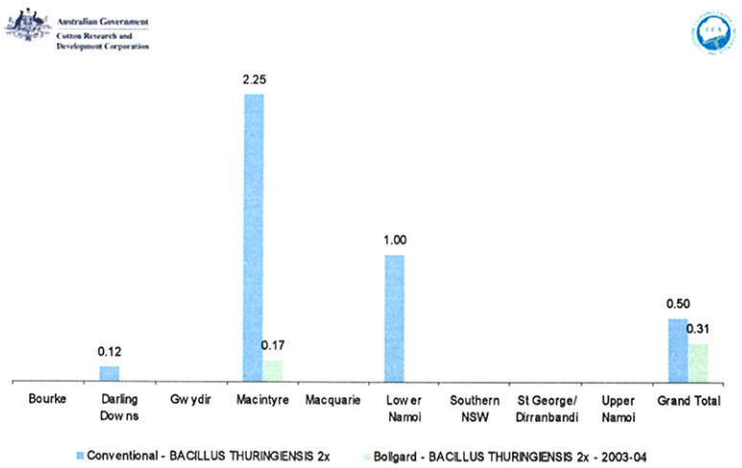
Cotton Research and Development Corporation
0.43
0.12
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BACILLUS THURINGIENSIS 2x
Bollgard - BACILLUS THURINGIENSIS 2x - 2004-05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Cotton Research and Development Corporation
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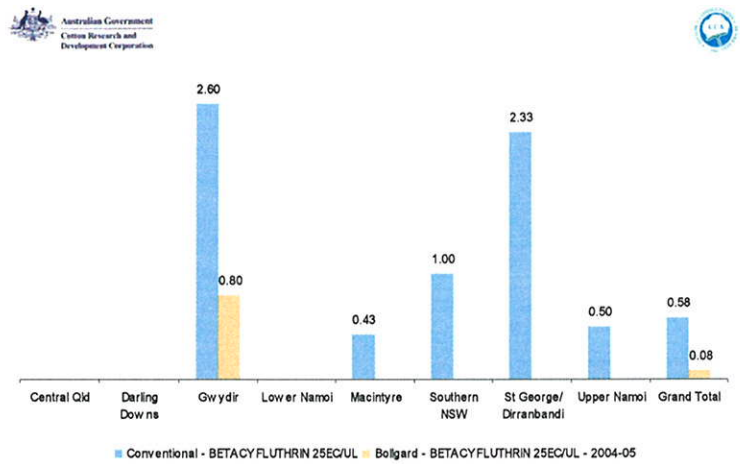
0.50
0.31
0.12
0.17
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BACILLUS THURINGIENSIS 2x
Bollgard - BACILLUS THURINGIENSIS 2x - 2003-04


Australian Government
Cotton Research and Development Corporation
2.60
0.80
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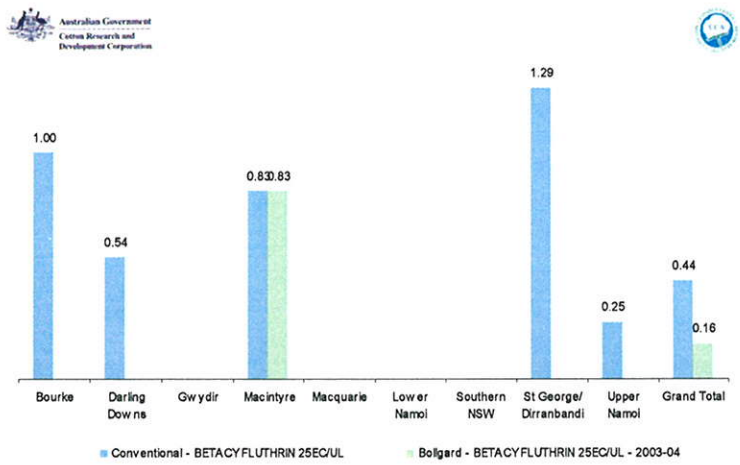
1.00
2.33
0.50
0.58
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BETACYFLUTHRIN 25EC/UL
Bollgard - BETACYFLUTHRIN 25EC/UL - 2004-05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Cotton Research and Development Corporation
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0.83
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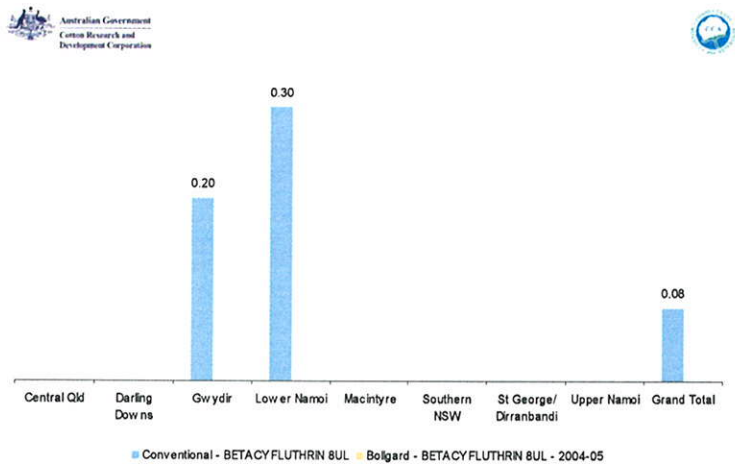
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BETACYFLUTHRIN 25EC/UL
Bollgard - BETACYFLUTHRIN 25EC/UL - 2003-04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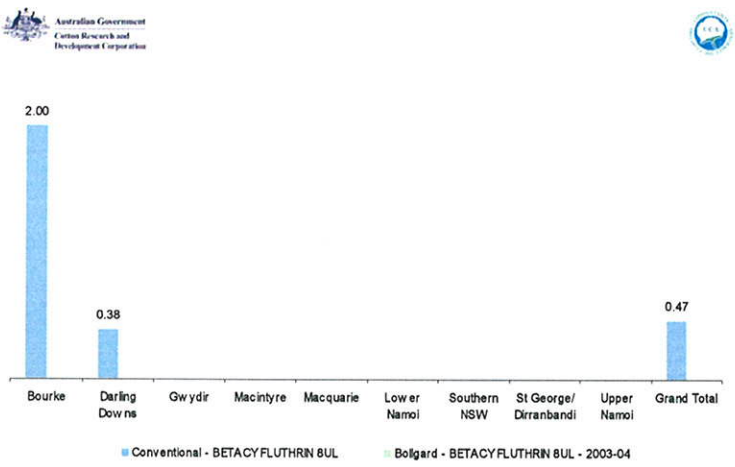
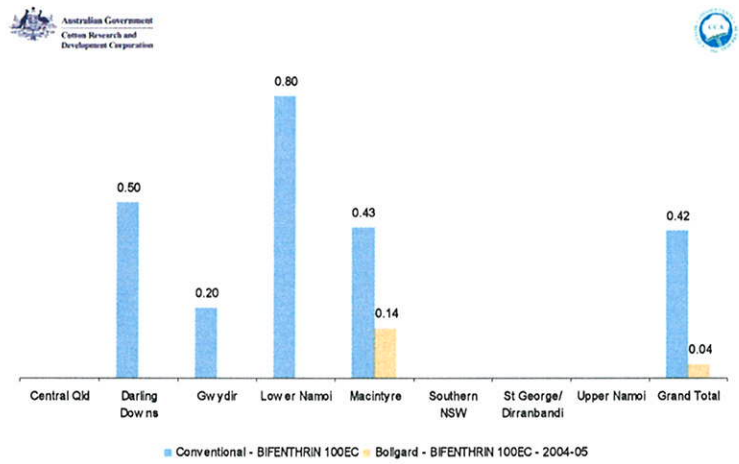
0.20
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BETACYFLUTHRIN 8UL
Bollgard - BETACYFLUTHRIN 8UL - 2004-05


2.00
0.38
0.47
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BETACYFLUTHRIN 8UL
Bollgard - BETACYFLUTHRIN 8UL - 2003-04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0.50
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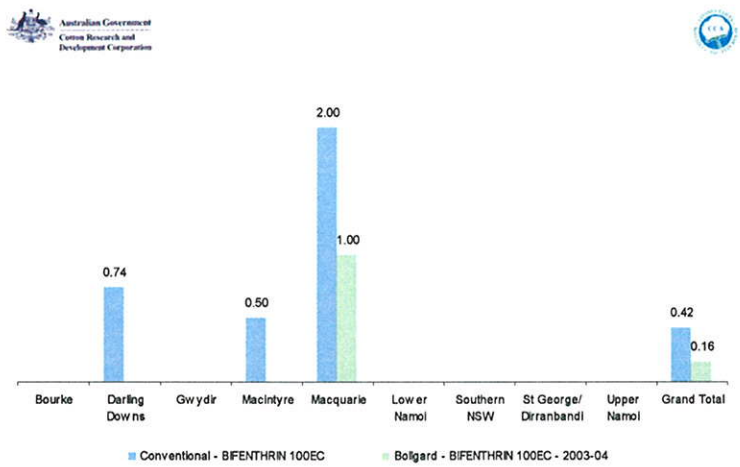
0.20
0.14
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BIFENTHRIN 100EC
Bollgard - BIFENTHRIN 100EC - 2004-05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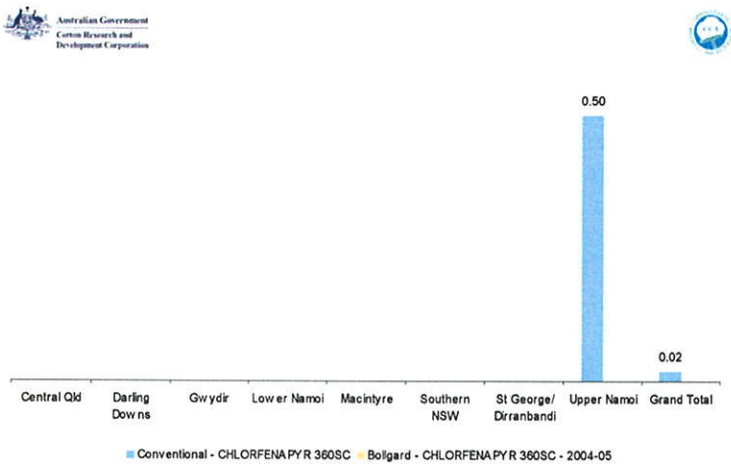
1.00
0.74
0.50
0.42
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - BIFENTHRIN 100EC
Bollgard - BIFENTHRIN 100EC - 2003-04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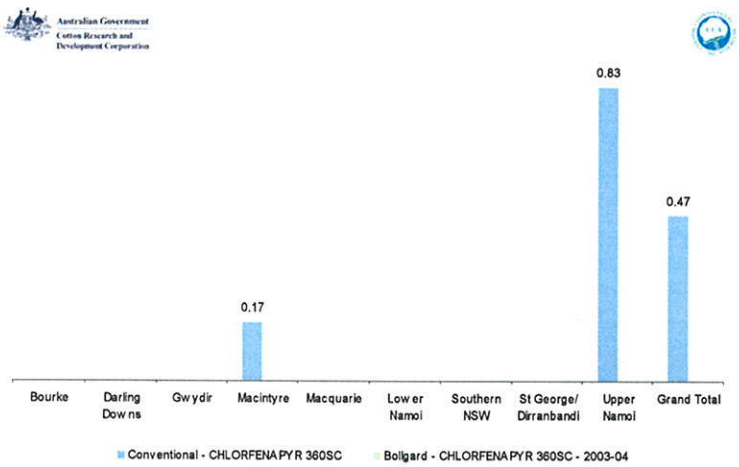
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORFENAPYR 360SC
Bollgard - CHLORFENAPYR 360SC - 2004-05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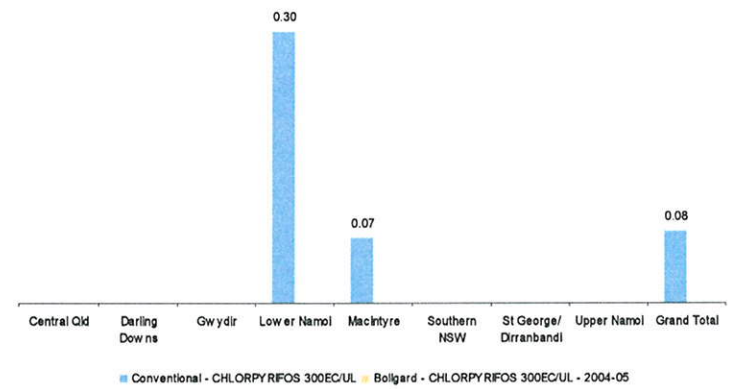
0.47
0.17
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORFENAPYR 360SC
Bollgard - CHLORFENAPYR 360SC - 2003-04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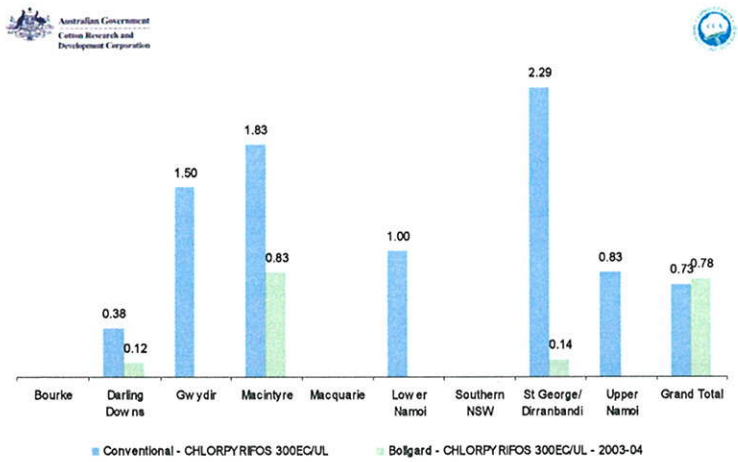
0.07
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORPYRIFOS 300EC/UL
Bollgard - CHLORPYRIFOS 300EC/UL - 2004-05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1.00
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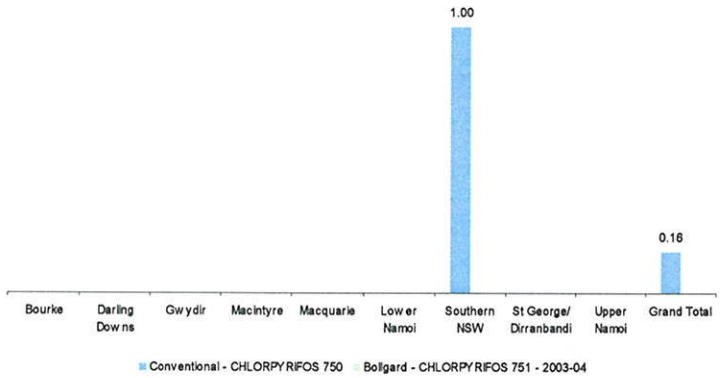
0.38
0.12
0.83
0.14
0.73
0.78
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORPYRIFOS 300EC/UL
Bollgard - CHLORPYRIFOS 300EC/UL - 2003-04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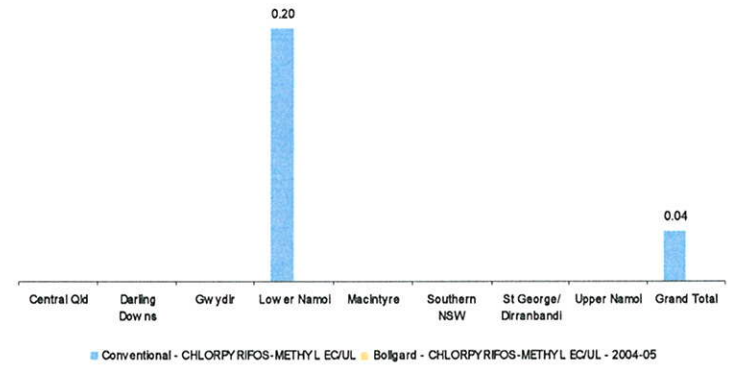
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORPYRIFOS 750
Bollgard - CHLORPYRIFOS 751 - 2003-04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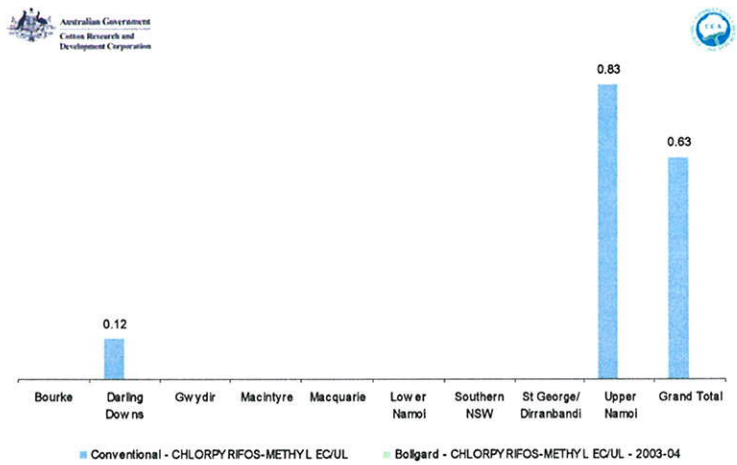
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORPYRIFOS-METHYL EC/UL
Bollgard - CHLORPYRIFOS-METHYL EC/UL - 2004-05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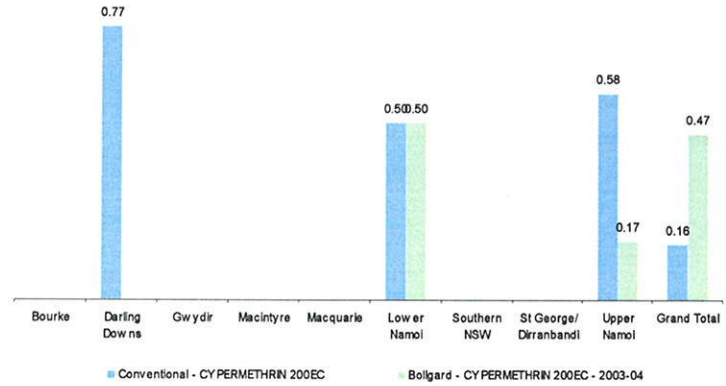
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CHLORPYRIFOS-METHYL EC/UL
Bollgard - CHLORPYRIFOS-METHYL EC/UL - 2003-04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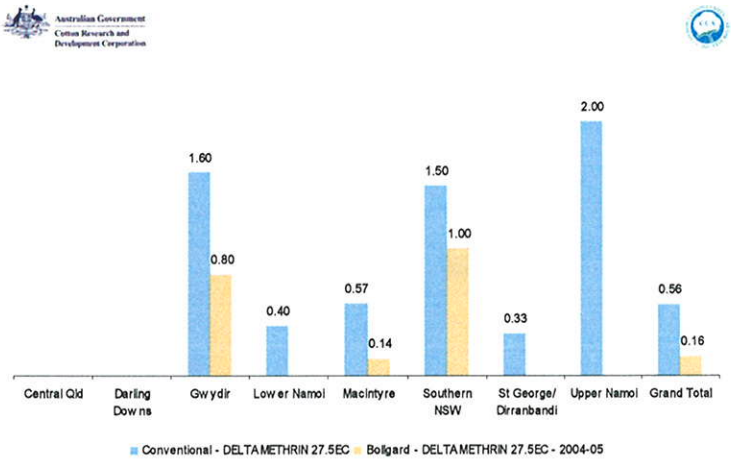
0.17
0.16
0.47
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - CYPERMETHRIN 200EC
Bollgard - CYPERMETHRIN 200EC - 2003-04


Australian Government
Cotton Research and Development Corporation
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1.50
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0.57
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0.40
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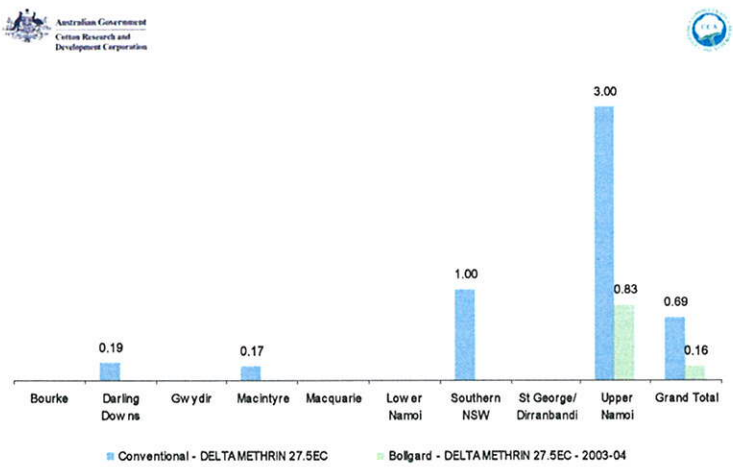
0.14
0.16
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DELTAMETHRIN 27.5EC
Bollgard - DELTAMETHRIN 27.5EC - 2004-05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Cotton Research and Development Corporation
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1.00
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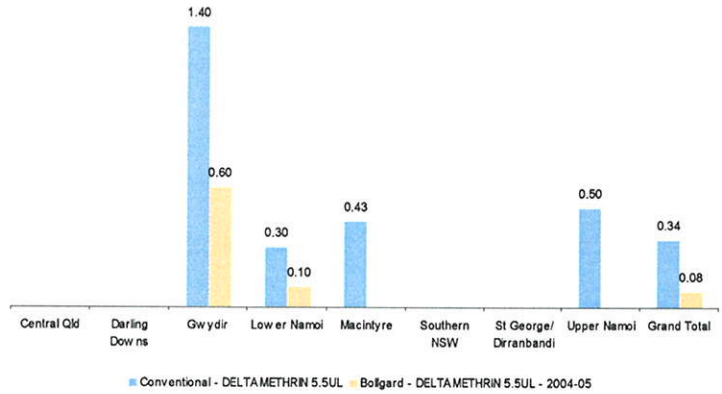
0.19
0.17
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DELTAMETHRIN 27.5EC
Bollgard - DELTAMETHRIN 27.5EC - 2003-04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0.43
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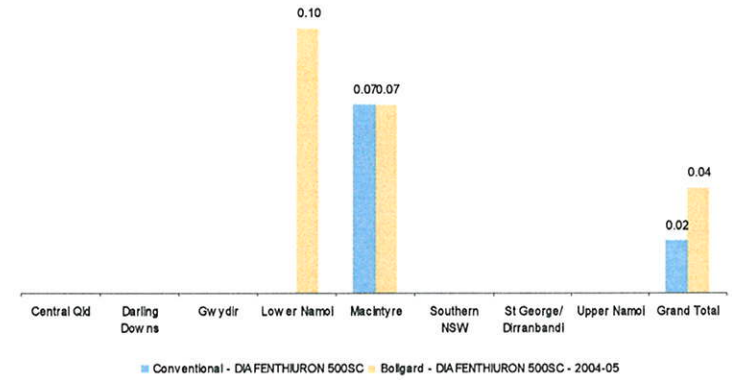
0.34
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DELTAMETHRIN 5.5UL
Bollgard - DELTAMETHRIN 5.5UL - 2004-05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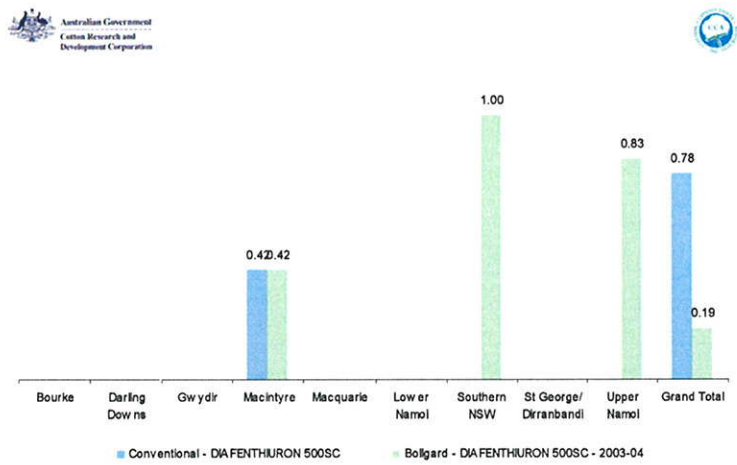
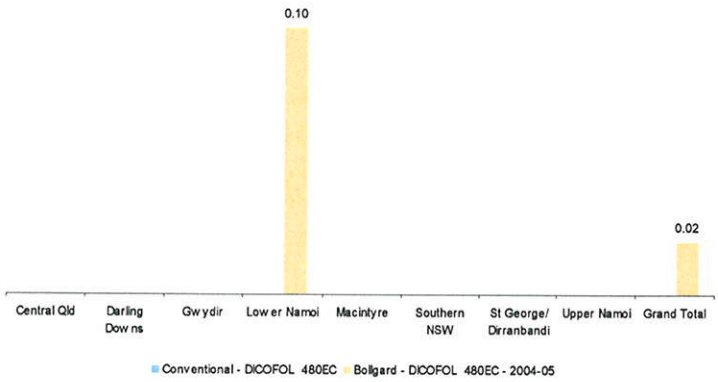
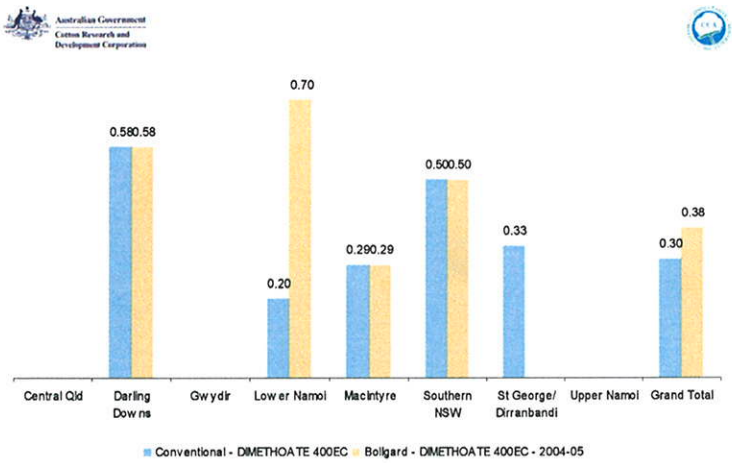
0.070.07
0.04
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DIA FENTHIURON 500SC
Bollgard - DIA FENTHIURON 500SC - 2004-05


1.00
0.83
0.78
0.42 0.42
0.19
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DIA FENTHIURON 500SC
Bollgard - DIA FENTHIURON 500SC - 2003-04


0.10
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DICOFOL 480EC
Bollgard - DICOFOL 480EC - 2004-05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Cotton Research and Development Corporation
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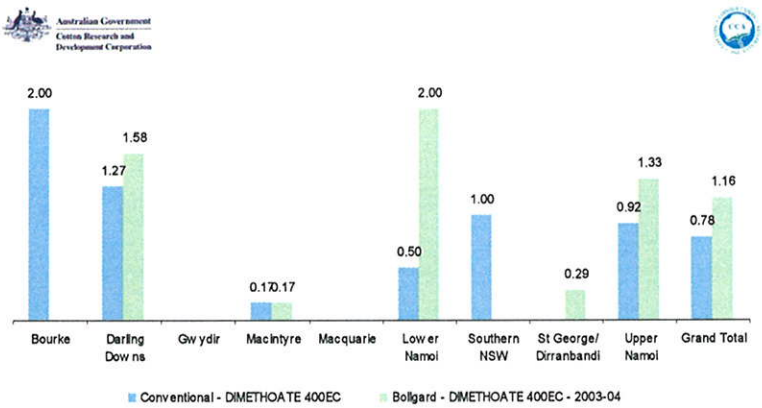
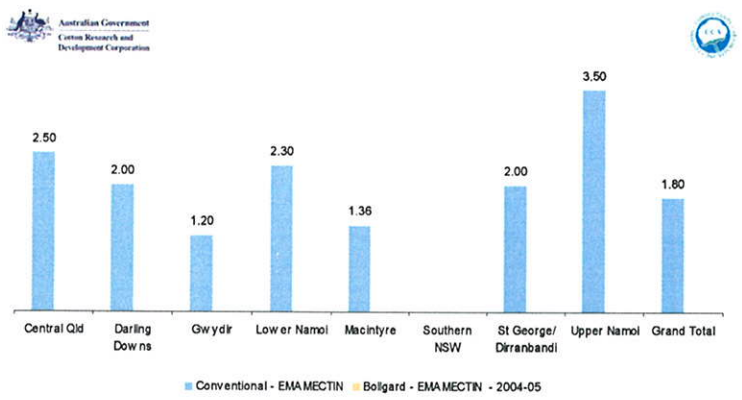
0.500.50
0.38
0.33
0.290.29
0.30
0.20
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DIMETHOATE 400EC
Bollgard - DIMETHOATE 400EC - 2004-05


Australian Government
Cotton Research and Development Corporation
2.00
2.00
1.58
1.27
1.33
1.16
1.00
0.92
0.78
0.50
0.29
0.170.17
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - DIMETHOATE 400EC
Bollgard - DIMETHOATE 400EC - 2003-04


Australian Government
Cotton Research and Development Corporation
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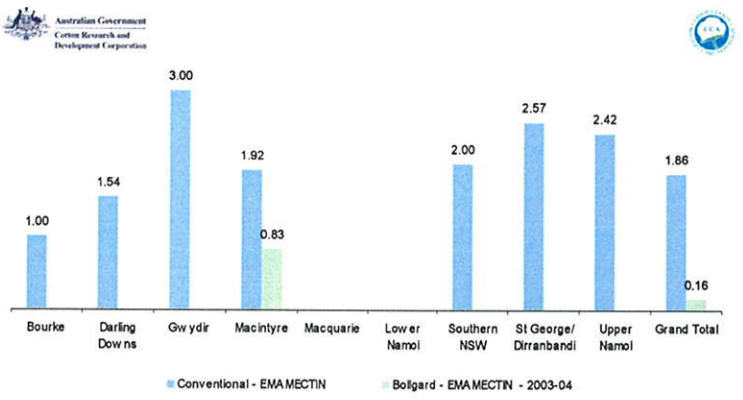
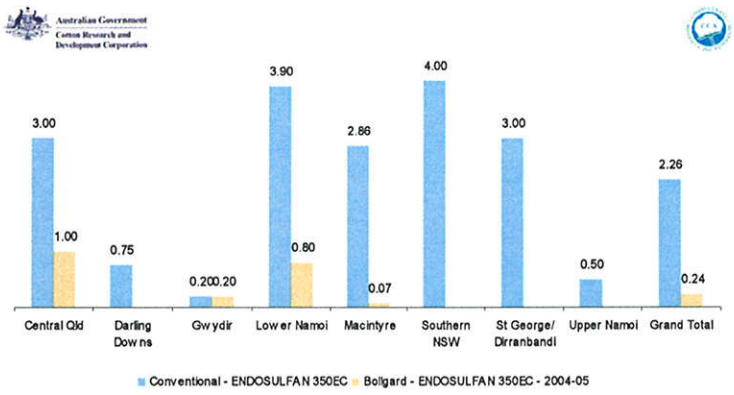
2.00
1.20
2.30
1.36
2.00
3.50
1.80
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - EMAMECTIN
Bollgard - EMAMECTIN - 2004-05


Australian Government
Cotton Research and Development Corporation
1.00
1.54
3.00
1.92
0.83
2.00
2.57
2.42
1.86
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - EMAMECTIN
Bollgard - EMAMECTIN - 2003-04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Cotton Research and Development Corporation
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1.00
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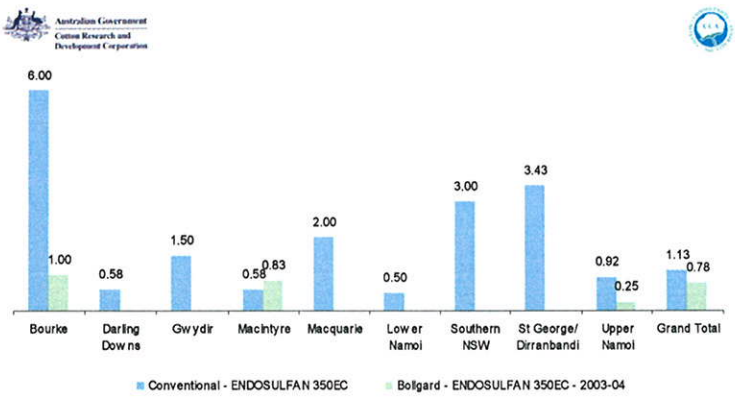
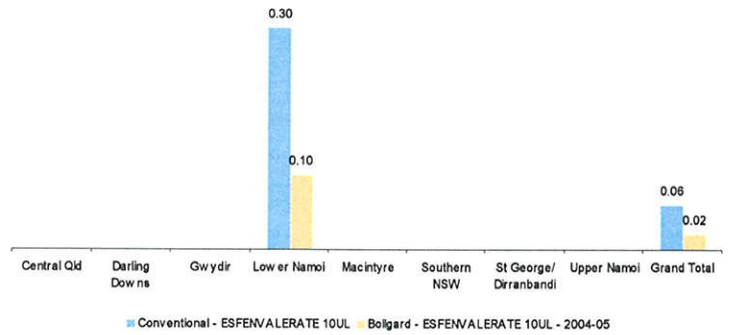
0.20
3.90
0.80
2.86
0.07
4.00
3.00
0.50
2.26
0.24
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ENDOSULFAN 350EC
Bollgard - ENDOSULFAN 350EC - 2004-05


Australian Government
Cotton Research and Development Corporation
6.00
1.00
0.58
1.50
0.58
0.83
2.00
0.50
3.00
3.43
0.92
0.25
1.13
0.78
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ENDOSULFAN 350EC
Bollgard - ENDOSULFAN 350EC - 2003-04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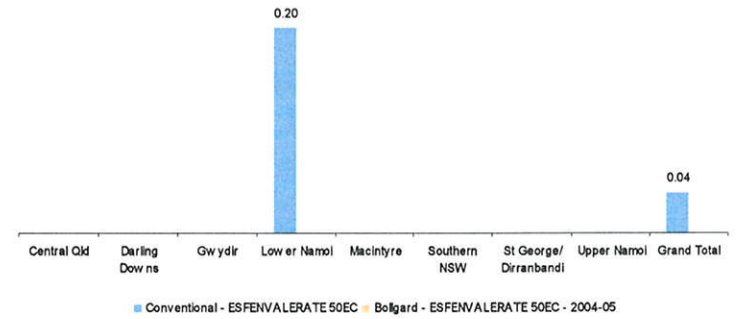
0.10
0.06
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ESFENVALERATE 10UL
Bollgard - ESFENVALERATE 10UL - 2004-05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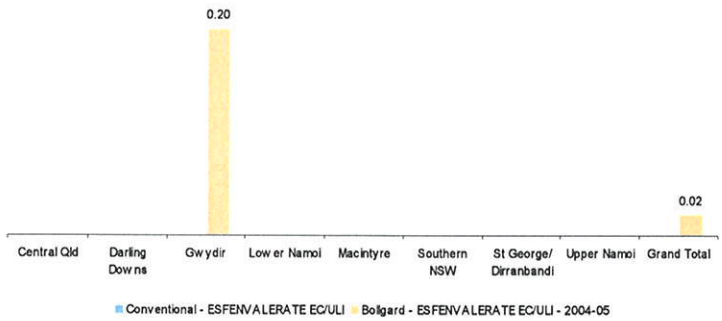
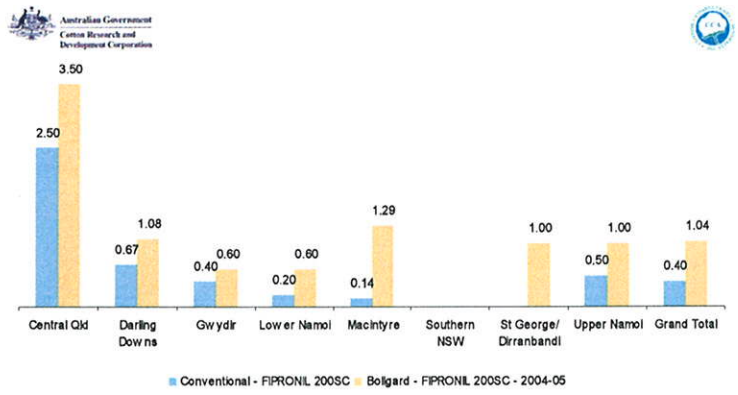
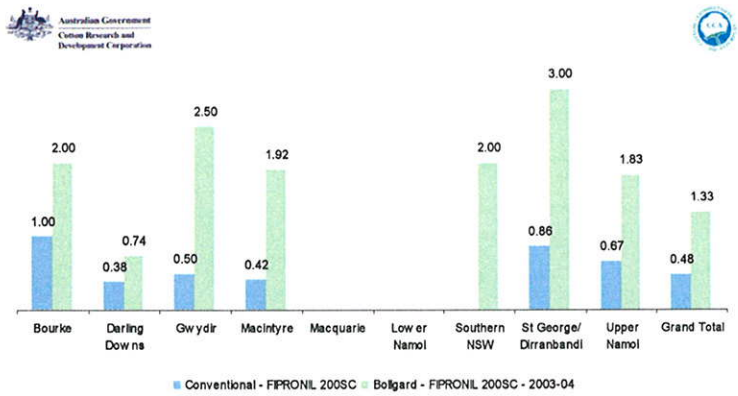
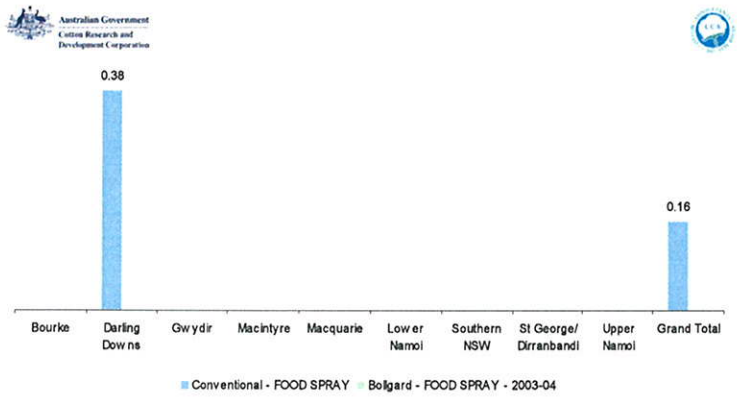
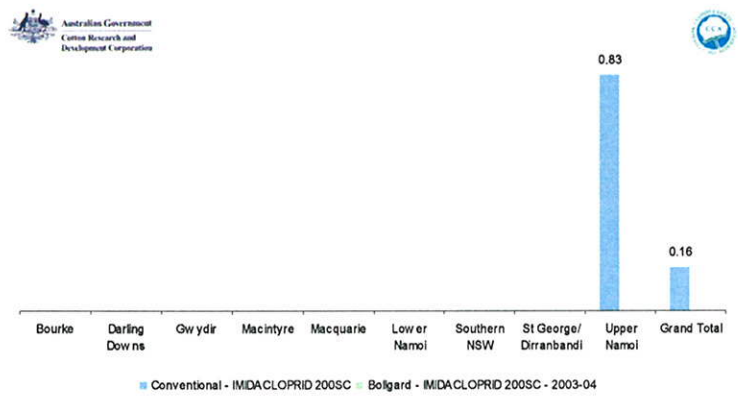
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ESFENVALERATE 50EC
Bollgard - ESFENVALERATE 50EC - 2004-05

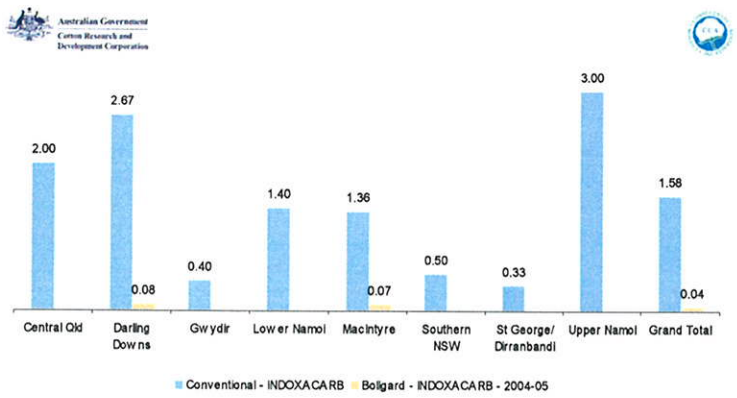

0.20
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ESFENVALERATE EC/ULI
Bollgard - ESFENVALERATE EC/ULI - 2004-05

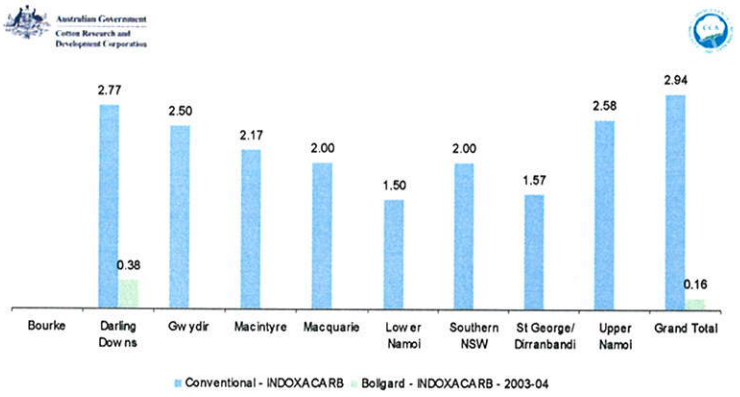

Australian Government
Cotton Research and Development Corporation
3.50
2.50
1.08
0.67
0.60
0.40
0.60
0.20
1.29
0.14
1.00
1.00
1.04
0.50
0.40
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - FIPRONIL 200SC
Bollgard - FIPRONIL 200SC - 2004-05

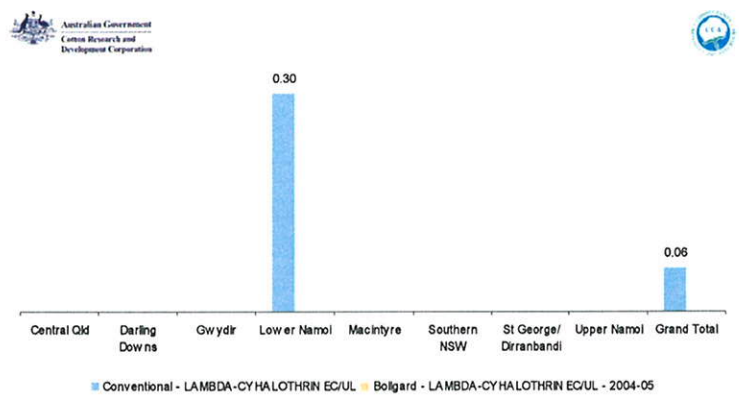

Australian Government
Cotton Research and Development Corporation
3.00
2.50
2.00
2.00
1.92
1.83
1.33
1.00
0.74
0.38
0.50
0.42
0.86
0.67
0.48
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - FIPRONIL 200SC
Bollgard - FIPRONIL 200SC - 2003-04

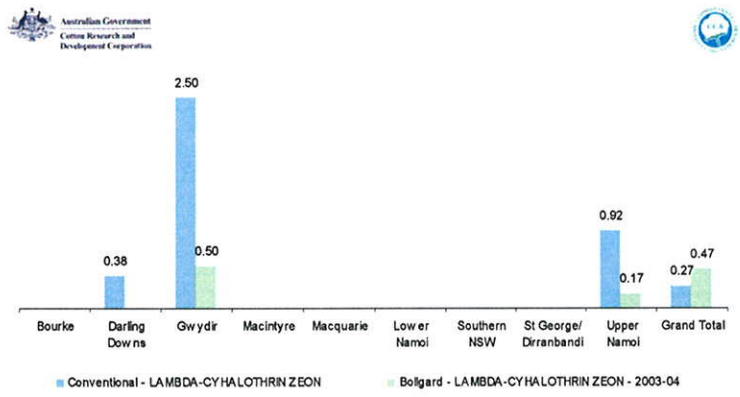

Australian Government
Cotton Research and
Development Corporation
0.38
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - FOOD SPRAY
Bollgard - FOOD SPRAY - 2003-04

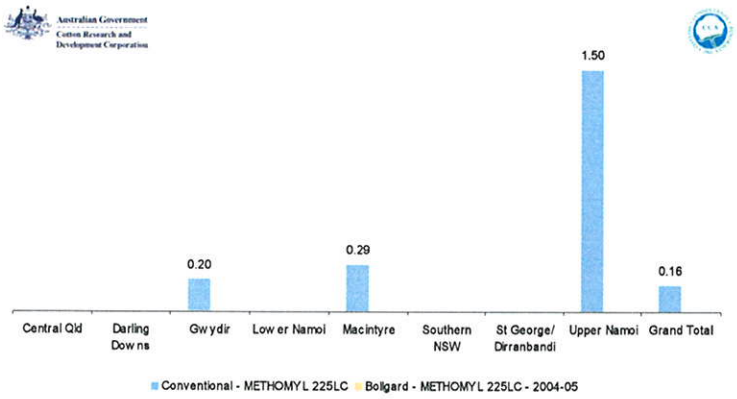

Australian Government
Cotton Research and
Development Corporation
0.83
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - IMIDACLOPRID 200SC
Bollgard - IMIDACLOPRID 200SC - 2003-04

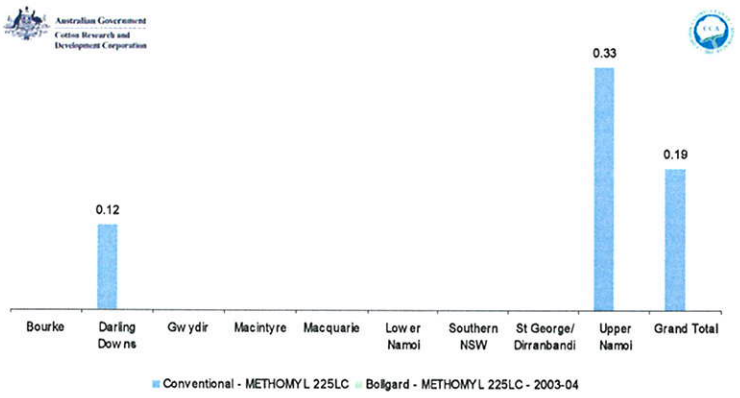

Australian Government
Cotton Research and Development Corporation
2.00
2.67
0.08
0.40
1.40
1.36
0.07
0.50
0.33
3.00
1.58
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - INDOXACARB
Boligard - INDOXACARB - 2004-05


Australian Government
Cotton Research and Development Corporation
2.77
0.38
2.50
2.17
2.00
1.50
2.00
1.57
2.58
2.94
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - INDOXACARB
Boligard - INDOXACARB - 2003-04


0.30
0.06
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - LAMBDA-CYHALOTHRIN EC/UL
Bollgard - LAMBDA-CYHALOTHRIN EC/UL - 2004-05


2.50
0.38
0.50
0.92
0.17
0.27
0.47
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - LAMBDA-CYHALOTHRIN ZEON
Bollgard - LAMBDA-CYHALOTHRIN ZEON - 2003-04


Australian Government
Cotton Research and Development Corporation
1.50
0.20
0.29
0.16
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - METHOMYL 225LC
Bollgard - METHOMYL 225LC - 2004-05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Cotton Research and Development Corporation
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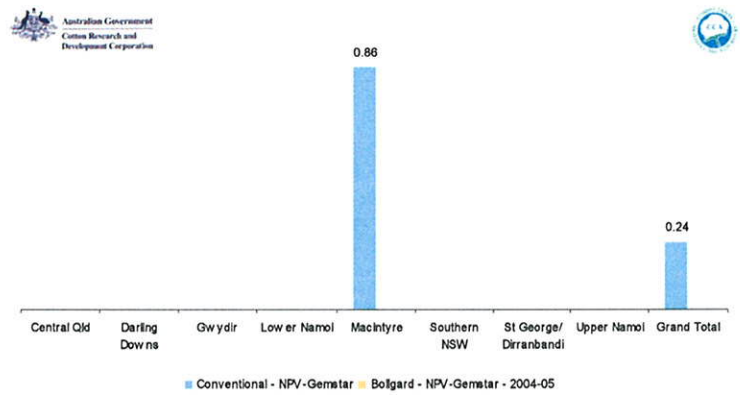
0.19
0.12
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - METHOMYL 225LC
Bollgard - METHOMYL 225LC - 2003-04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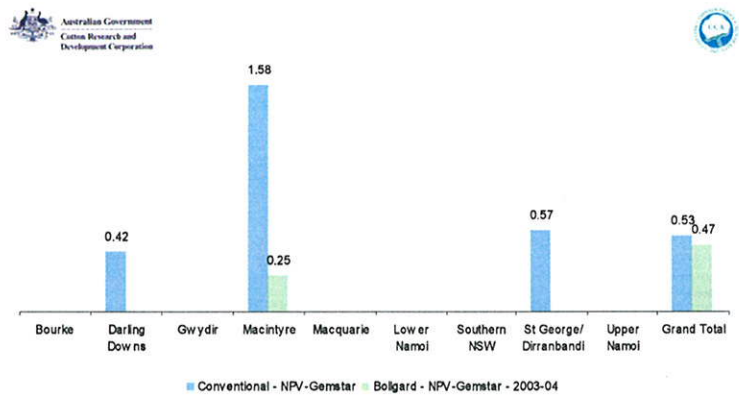
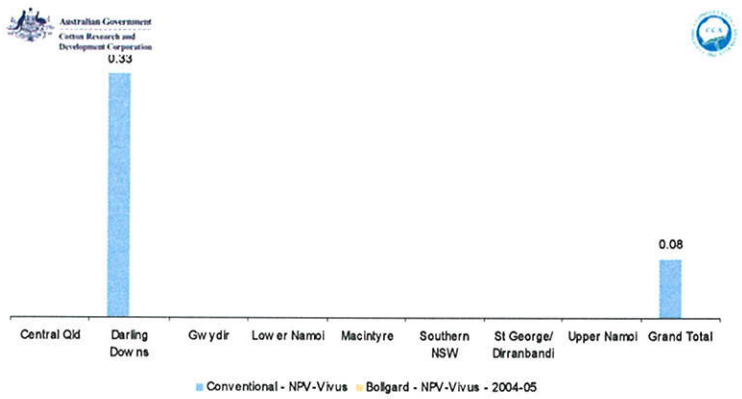
Cotton Research and Development Corporation
0.86
0.24
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - NPV-Gemstar
Bollgard - NPV-Gemstar - 2004-05


Australian Government
Cotton Research and Development Corporation
1.58
0.42
0.25
0.57
0.53
0.47
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - NPV-Gemstar
Bollgard - NPV-Gemstar - 2003-04


Australian Government
Cotton Research and Development Corporation
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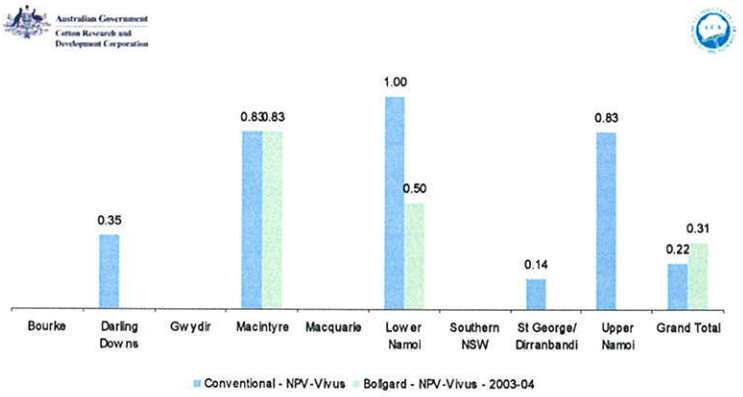
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - NPV-Vivus
Bollgard - NPV-Vivus - 2004-05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Cotton Research and Development Corporation
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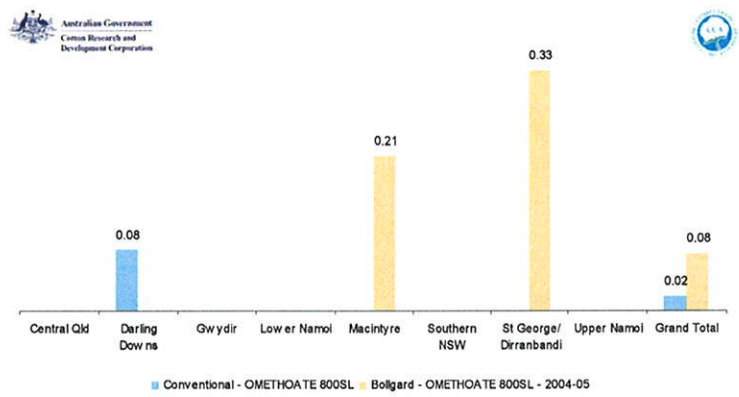
0.83
0.83
0.50
0.35
0.14
0.31
0.22
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - NPV-Vivus
Bollgard - NPV-Vivus - 2003-04


Australian Government
Cotton Research and Development Corporation
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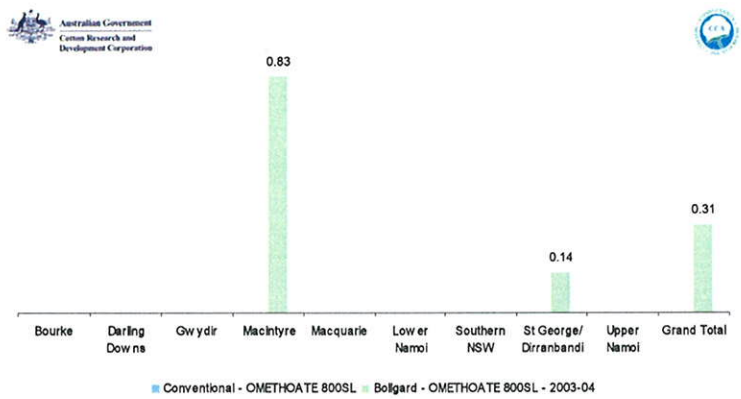
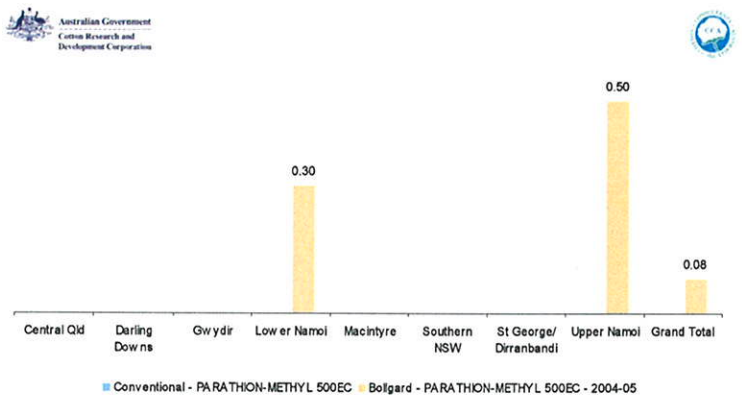
0.21
0.08
0.08
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - OMETHOATE 800SL
Bollgard - OMETHOATE 800SL - 2004-05


Australian Government
Cotton Research and Development Corporation
0.83
0.31
0.14
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - OMETHOATE 800SL
Bollgard - OMETHOATE 800SL - 2003-04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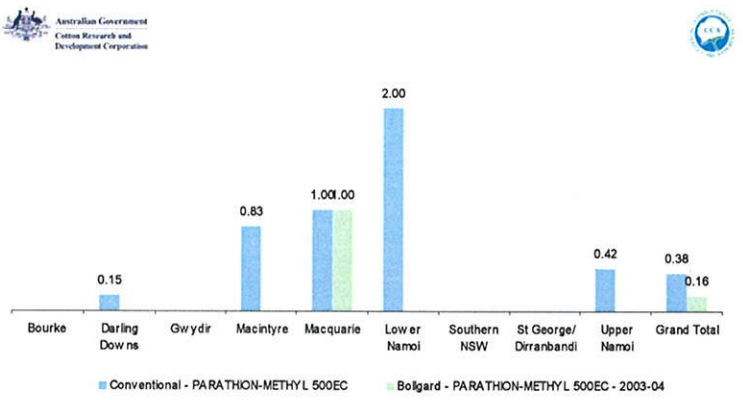
0.30
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PARATHION-METHYL 500EC
Bollgard - PARATHION-METHYL 500EC - 2004-05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1.00
1.00
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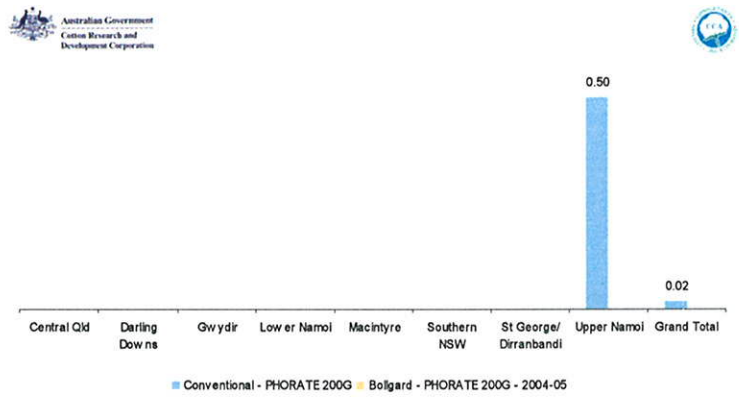
0.38
0.16
0.15
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PARATHION-METHYL 500EC
Bollgard - PARATHION-METHYL 500EC - 2003-04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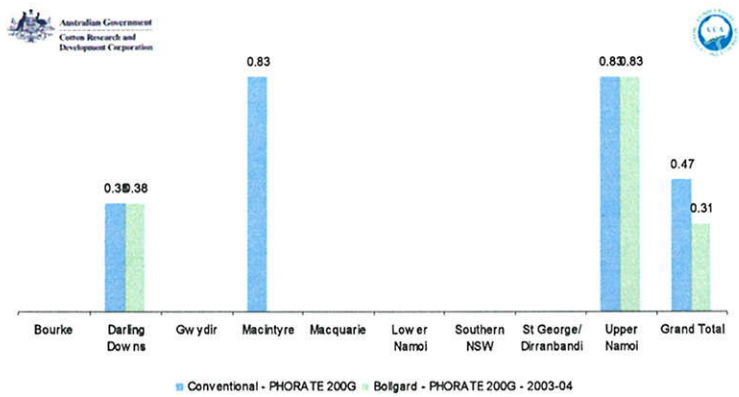
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PHORATE 200G
Bollgard - PHORATE 200G - 2004-05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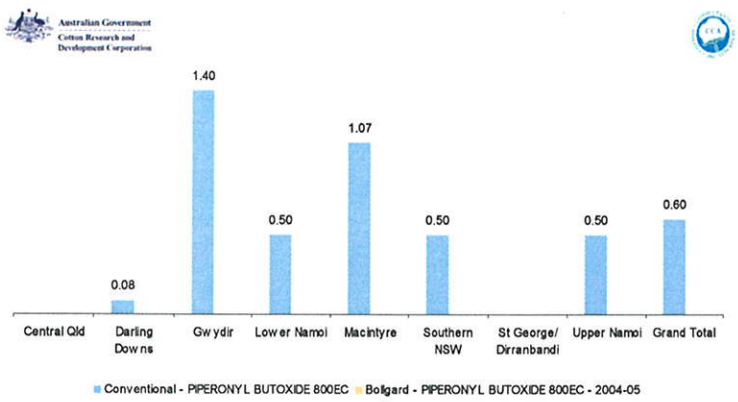
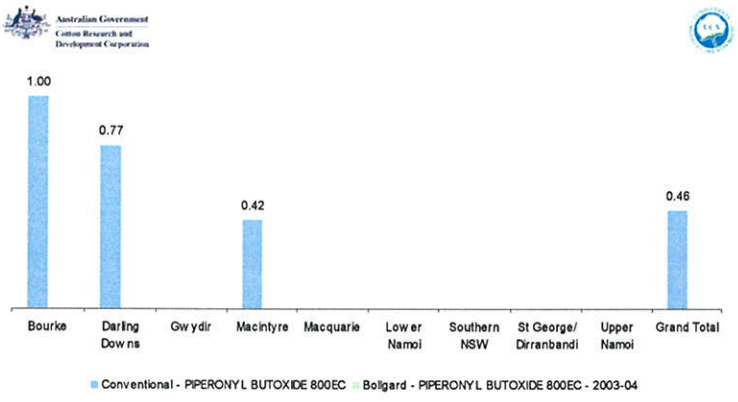
0.38
0.83
0.83
0.47
0.31
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PHORATE 200G
Bollgard - PHORATE 200G - 2003-04


Australian Government
Cotton Research and Development Corporation
1.40
1.07
0.50
0.50
0.50
0.60
0.08
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PIPERONYL BUTOXIDE 800EC
Bollgard - PIPERONYL BUTOXIDE 800EC - 2004-05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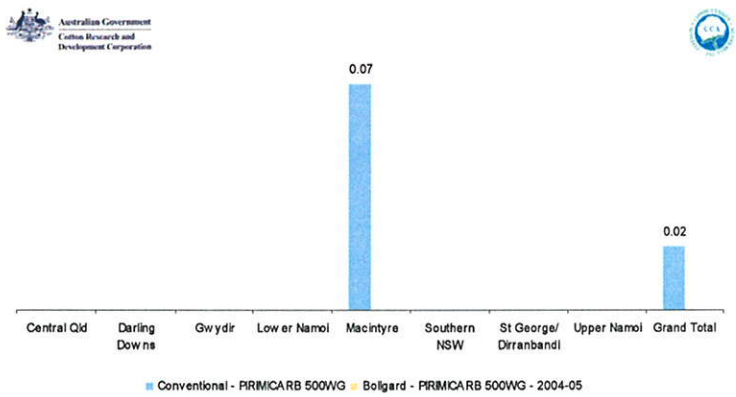
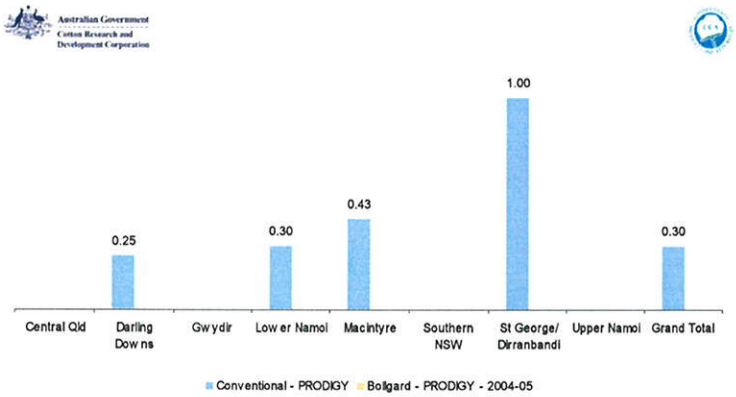
Cotton Research and Development Corporation
1.00
0.77
0.42
0.46
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PIPERONYL BUTOXIDE 800EC
Bollgard - PIPERONYL BUTOXIDE 800EC - 2003-04


Australian Government
Cotton Research and Development Corporation
0.07
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PIRIMICARB 500WG
Bollgard - PIRIMICARB 500WG - 2004-05


Australian Government
Cotton Research and Development Corporation
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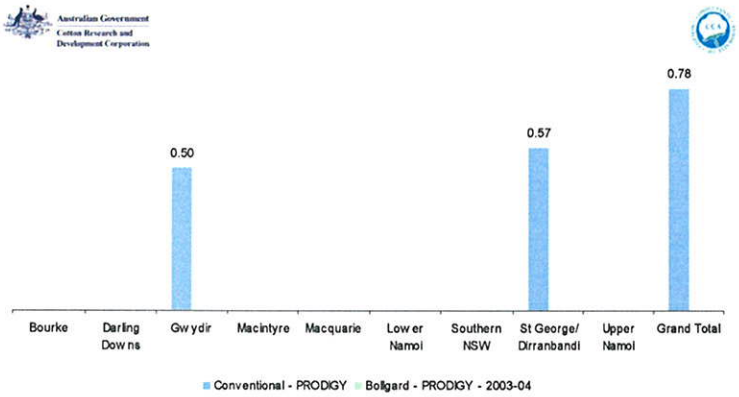
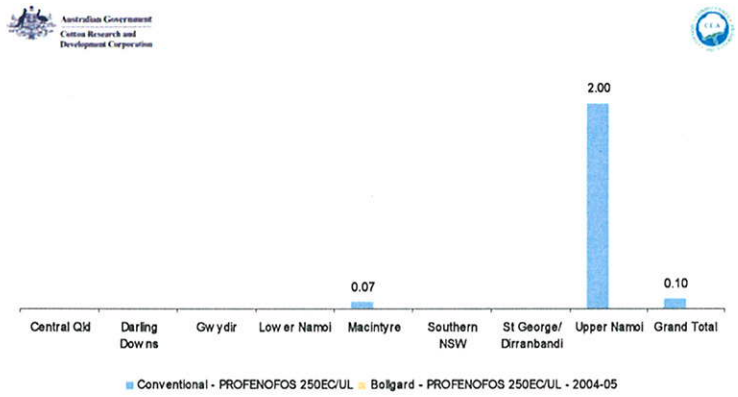
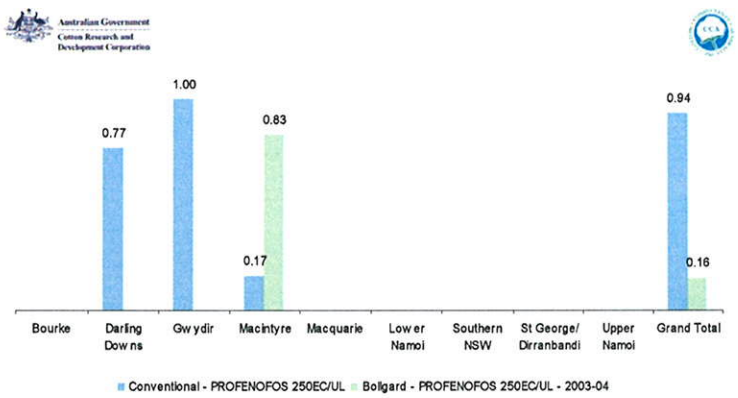
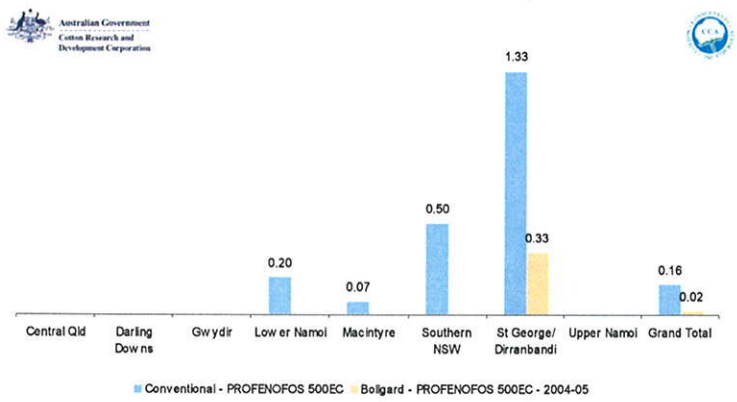
0.43
0.30
0.25
0.30
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PRODIGY
Bollgard - PRODIGY - 2004-05


Australian Government
Cotton Research and Development Corporation
0.78
0.57
0.50
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PRODIGY
Bollgard - PRODIGY - 2003-04


2.00
0.07
0.10
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROFENOFOS 250EC/UL
Bollgard - PROFENOFOS 250EC/UL - 2004-05


1.00
0.77
0.83
0.94
0.17
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROFENOFOS 250EC/UL
Bollgard - PROFENOFOS 250EC/UL - 2003-04


Australian Government
Cotton Research and
Development Corporation
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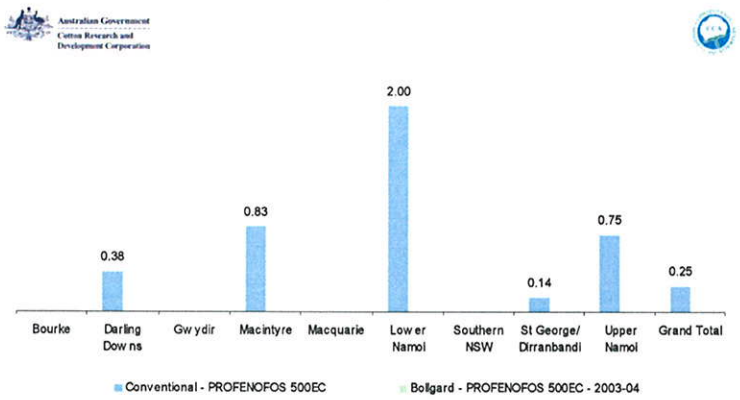
0.50
0.33
0.20
0.07
0.16
0.02
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROFENOFOS 500EC
Bollgard - PROFENOFOS 500EC - 2004-05


Australian Government
Cotton Research and
Development Corporation
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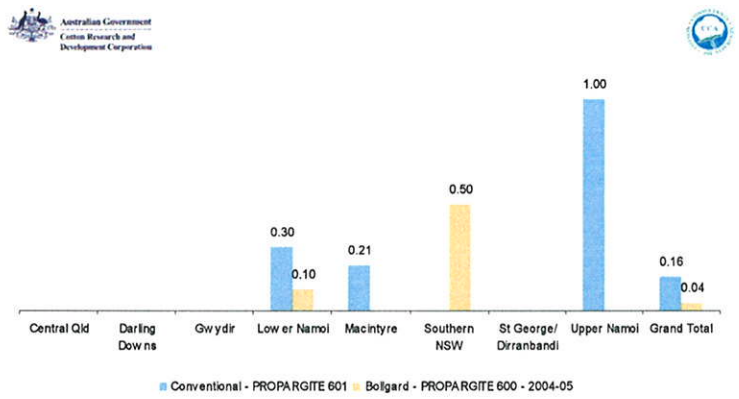
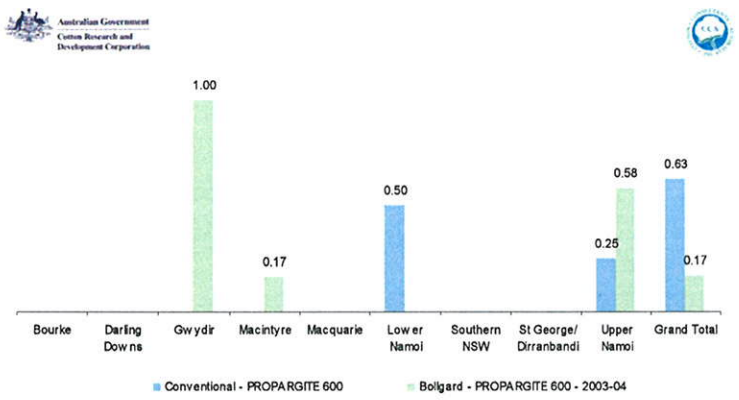
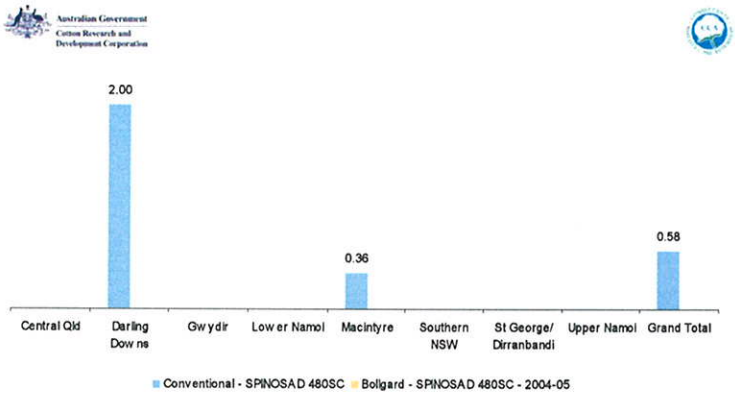
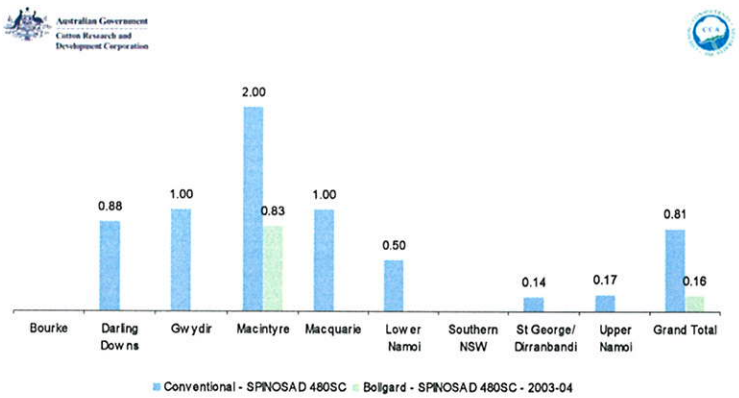
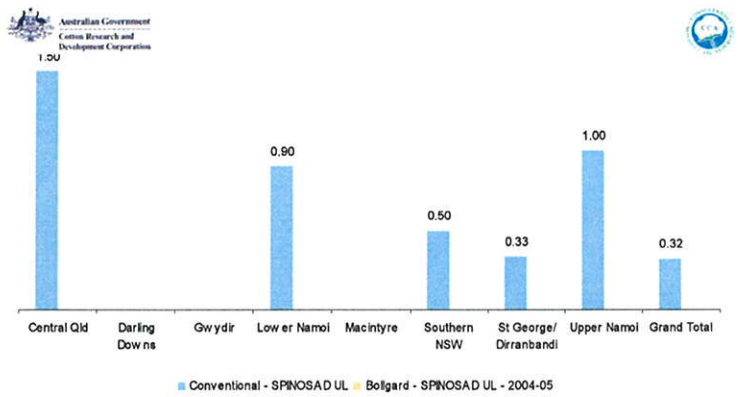
0.83
0.75
0.38
0.14
0.25
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROFENOFOS 500EC
Bollgard - PROFENOFOS 500EC - 2003-04

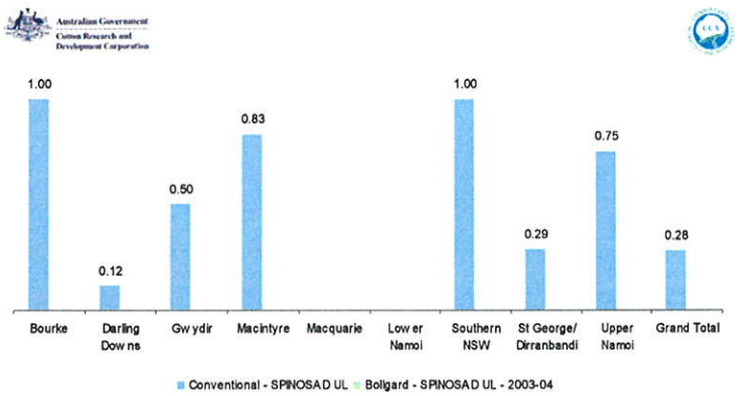

Australian Government
Cotton Research and Development Corporation
1.00
0.50
0.30
0.10
0.21
0.16
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROPARGITE 601
Bollgard - PROPARGITE 600 - 2004-05

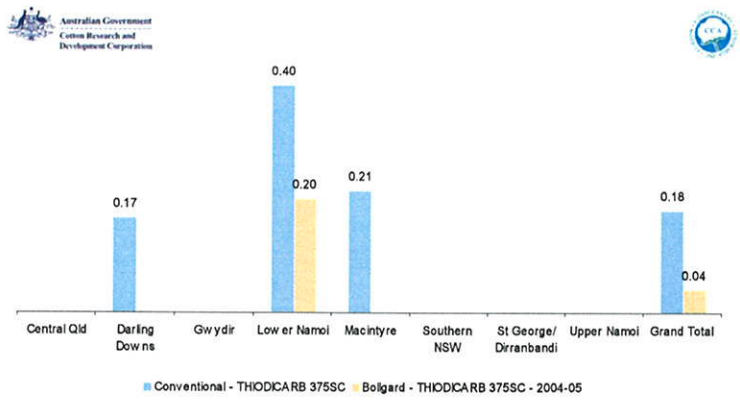

Australian Government
Cotton Research and Development Corporation
1.00
0.50
0.17
0.25
0.58
0.63
0.17
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - PROPARGITE 600
Bollgard - PROPARGITE 600 - 2003-04

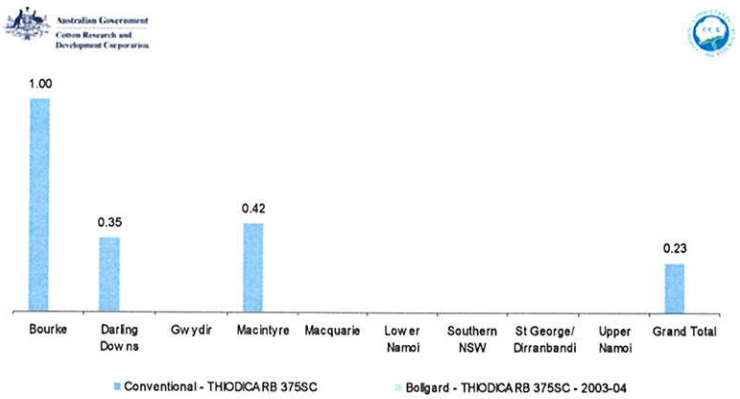

Australian Government
Cotton Research and Development Corporation
2.00
0.36
0.58
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - SPINOSAD 480SC
Bollgard - SPINOSAD 480SC - 2004-05

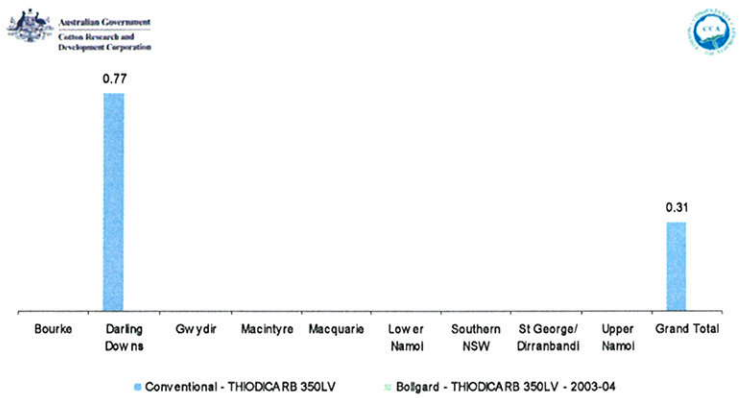

Australian Government
Cotton Research and Development Corporation
2.00
0.88
1.00
0.83
1.00
0.50
0.14
0.17
0.81
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - SPINOSAD 480SC
Bollgard - SPINOSAD 480SC - 2003-04

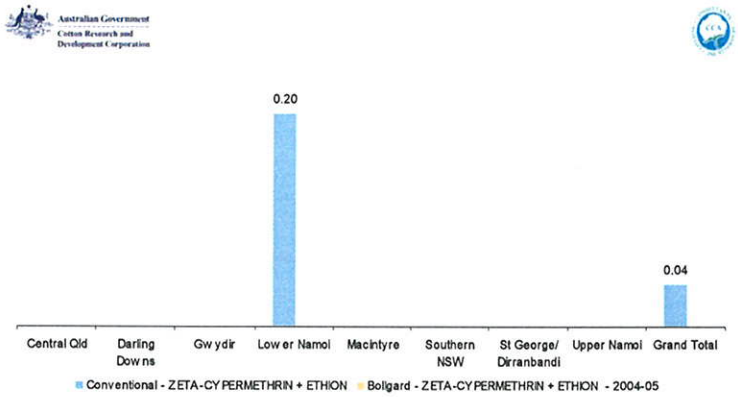

Australian Government
Cotton Research and Development Corporation
1.00
0.90
0.50
0.33
1.00
0.32
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - SPINOSAD UL
Bollgard - SPINOSAD UL - 2004-05

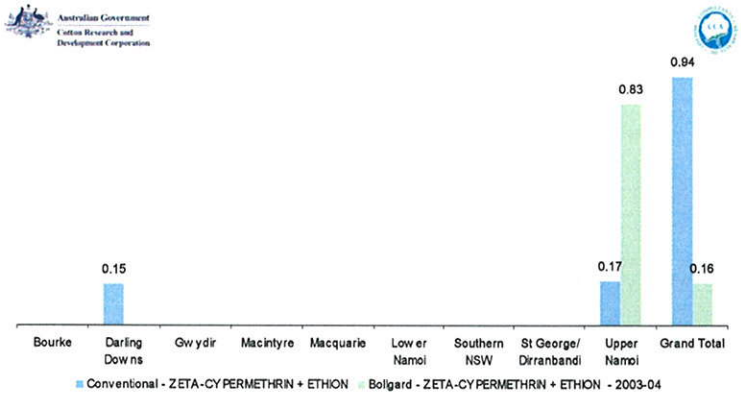

Australian Government
Cotton Research and Development Corporation
1.00
0.12
0.50
0.83
1.00
0.29
0.75
0.28
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - SPINOSAD UL
Bollgard - SPINOSAD UL - 2003-04

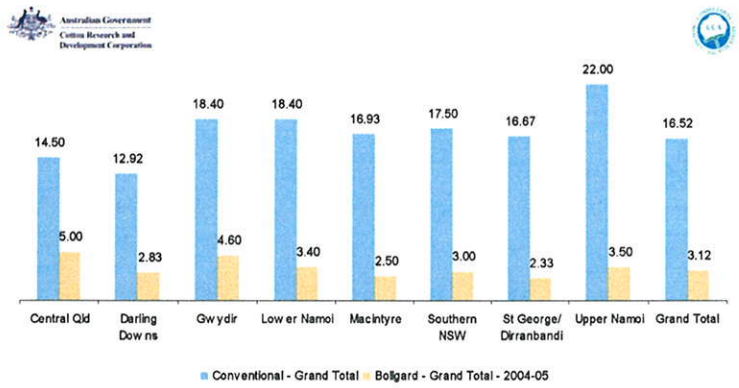

0.40
0.20
0.21
0.17
0.18
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - THIODICARB 375SC
Bollgard - THIODICARB 375SC - 2004-05

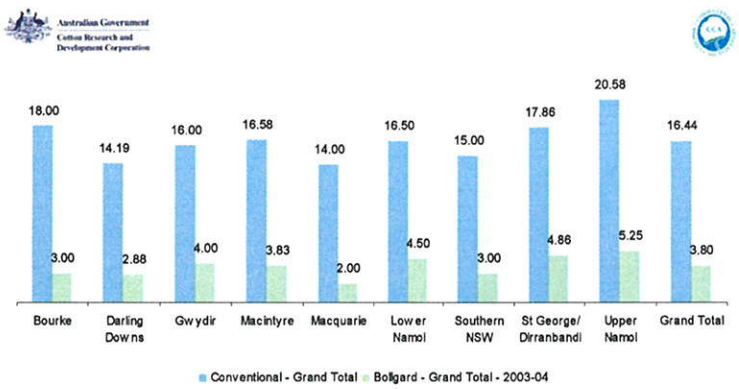

1.00
0.35
0.42
0.23
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - THIODICARB 375SC
Bollgard - THIODICARB 375SC - 2003-04


Australian Government
Cotton Research and Development Corporation
0.77
0.31
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - THIODICARB 350LV
Bollgard - THIODICARB 350LV - 2003-04


0.20
0.04
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ZETA-CYPERMETHRIN + ETHION
Bollgard - ZETA-CYPERMETHRIN + ETHION - 2004-05


0.94
0.83
0.15
0.17
0.16
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - ZETA-CYPERMETHRIN + ETHION
Bollgard - ZETA-CYPERMETHRIN + ETHION - 2003-04


Australian Government
Cotton Research and Development Corporation
14.50
5.00
12.92
2.83
18.40
4.60
18.40
3.40
16.93
2.50
17.50
3.00
16.67
2.33
22.00
3.50
16.52
3.12
Central Qld
Darling Downs
Gwydir
Lower Namoi
Macintyre
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - Grand Total
Bollgard - Grand Total - 2004-05


Australian Government
Cotton Research and Development Corporation
18.00
3.00
14.19
2.88
16.00
4.00
16.58
3.83
14.00
2.00
16.50
4.50
15.00
3.00
17.86
4.86
20.58
5.25
16.44
3.80
Bourke
Darling Downs
Gwydir
Macintyre
Macquarie
Lower Namoi
Southern NSW
St George/ Dirranbandi
Upper Namoi
Grand Total
Conventional - Grand Total
Bollgard - Grand Total - 2003-04

Notes

Notes