Case Study: Development of the Australian Cotton Industry Best Management Practice (BMP) Program

WWF-Australia
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1. INTRODUCTION

1.1 The Australian Cotton Industry

Australia is a relatively small producer of cotton by world standards. Seasonal conditions, particularly the availability of irrigation water has a major bearing on the annual area planted. For example in recent years, the area planted has ranged between approximately 500,000 hectares (00-01 season) and 197,000 hectares (03-04 season), the decline reflecting drought conditions in Australia during that period\(^1\).

Cotton is grown in NSW (65% of the 03-04 crop) and Queensland, predominantly in river valleys that form part of the Murray Darling basin. There are approximately 1,500 cotton farmers in Australia, spread across the 12 cotton growing regions. Farm size varies significantly, from small family farms to large corporate holdings. Average planting is about 400 hectares per farm.

Over 80% of cotton is irrigated, the major exception being the Darling Downs in Queensland. Australian cotton production is highly intensive, with the world’s highest average yields – 1,672 kg/ha in 02-03, more than double the global average of 638 kg/ha\(^2\). Australian cotton production also has high yields per ML of water, producing 227 kg (one bale) per ML of water, compared to 138 kg/ML for Californian cotton and 59 kg/ML for Pakistani cotton\(^3\).

All Australian cotton farms are multi-commodity producers, typically with other irrigated crops as well as dryland farming.

The peak body for the cotton industry in Australia is Cotton Australia\(^4\) who represents the interests of growers through the regional cotton growers associations. Research is undertaken by the Cotton Research and Development Corporation (CRDC)\(^5\) who is also a key partner in the Cotton Cooperative Research Centre (Cotton CRC)\(^6\). Cotton Australia has about eight staff in the cotton regions – Grower Services Managers – whose role is to provide advice and support to cotton growers, particularly with implementation of the Best Management Practice (BMP) program.

Cotton growers pay a voluntary levy (production based levy) to Cotton Australia. The levy enables Cotton Australia to provide services to growers including the extension staff in cotton growing regions.

As well as the BMP program, the cotton industry has established Area Wide Management groups (in each cotton growing region) that provide a forum for cotton growers to coordinate pest management across their region. The Area Wide Management groups enable information about disease and/or pest pressure to be communicate across the region, and for the growers to coordinate their IPM strategies to minimise the need to use pesticides.

The Australian cotton industry is one of only a few agricultural sectors to undertake periodic industry-wide environmental audits. The first industry environmental audit was conducted in 1990, and led to a number of significant initiatives of the cotton industry including the BMP program. The second cotton industry environmental audit was conducted in 2003\(^7\) (conducted by GHD) to which the cotton industry has prepared a public response, setting out where it seeks to improve its environmental performance\(^8\).

1.2 Environmental aspects of cotton production in Australia

Water

It is widely acknowledged that the rivers within the Murray Darling Basin are stressed from over allocation of water for irrigation. In June 2004, the Australian, State and Territory governments (except Western Australia and Tasmania) signed the National Water Initiative...
(NWI) that aims “to improve the productivity and efficiency of our water use, while maintaining healthy river and groundwater systems”\(^9\).

Through the National Water Initiative, the Australian and State governments acknowledged the “imperative of increasing the productivity and efficiency of water use and the health of river and groundwater systems in Australia”\(^10\). One of the outcomes sought from the National is to address over allocation of river systems as quickly as possible.

After dairy, cotton is the largest user of irrigation water in Australia. Approximately 15% of water diverted for agriculture is used for growing cotton, which in 96-97 was 2,314 GL or approximately 7 ML/ha\(^1\). In the Murray-Darling Basin valleys where cotton is grown, it is the major irrigated crop. As well as receiving water from irrigation systems, water is collected on farm (rainfall and overland flows) as well as from bore water. There is a paucity of data as to the percentage breakdown of water by source used by the cotton industry.

Most cotton farms use in-furrow irrigation, with tail water collected and returned to storage dams. This water collection and return substantially changes the surface hydrology of the irrigated section of cotton farms. The benefits of the tail water re-use are that it allows water re-use as well as preventing water borne contaminants leaving the farm. The down side is that the irrigated section of cotton farms is not contributing to the flows of natural waterways as the drainage system captures all rainfall and overland flows.

Cotton is the one of the more profitable of broad acre irrigated commodities, providing a return to growers of $452/ML compared to $94/ML for dairy, $31/ML for rice, and $21/ML for sugar cane\(^12\). Therefore, as new water trading and pricing arrangements are introduced that seek a more ‘profitable use of water and more cost-effective and flexible recovery of water to achieve environmental outcomes’\(^13\), it is possible that Australian irrigators will switch to commodities like cotton where significant efficiency gains in water use can be made whilst maintaining economic viability.

**Pesticides**

The Australian cotton industry has traditionally been a major user of pesticides. Conventional cotton crops have typically 6-12 spray applications per season (depending on pest pressure), compared with 0-4 applications for transgenic and/or Integrated Pest Management (IPM) crops\(^14\).

In 1998, the cotton industry was in crisis following the discovery of endosulfan (an insecticide applied to cotton) residues in export beef. Endosulfan had drifted from cotton farms onto neighbouring properties and entered the food chain.

Although the cotton industry had already released the first edition of the BMP program, the endosulfan crisis provided additional impetus to the cotton industry to address pesticide management.

### 2. The AUSTRALIAN COTTON BMP PROGRAM

#### 2.1 Background

The BMP program is a voluntary tool developed by the cotton industry to guide cotton farmers in improving their environmental practices.

The cotton industry has recognised the importance of broad-scale adoption of the BMP program by cotton growers, and a major focus of their communication to cotton growers is reinforcing the value of the BMP program (see Box 1).
The Australian Cotton BMP program is comprised of seven modules each of which address an aspect of cotton production; pesticide management (five modules), petrochemicals (one module) and land and water management (one module).

WWF-Australia became involved with the Australian cotton industry in 2002, just prior to the development of the land and water module of Australian Cotton BMP program.

Box 1: BMP for Growers

Why should I implement BMP on my farm?

- BMP has been developed to help growers identify areas for improvement on their farms. Whether you are a new grower or an established grower there is always room for improvement. BMP is a tool that can help you improve farm management and productivity.
- We need to ensure the safety and health of our families and employees.
- BMP will help you identify areas of risk on your farm that have the potential to cost you money.
- It's always better to maintain control over our own destiny rather than have someone do it for us. BMP will allow us the flexibility to put in place practices that are uniquely suited to our own farms.
- It's therefore important that the cotton industry as a whole takes up the challenge and implements the BMP program.
- It's hard to argue against using the best available practices, founded on the best research, you will increase the potential for successful crop production and improved safety with minimal impact to the environment.
- By documenting your planning and implementation process you can successfully demonstrate your due diligence.
- Through implementation of BMP, you are increasing your probability of being able to maintain access to new chemicals and biotechnology.
- The industry is also working hard to provide a range of financial incentives to BMP certified growers.

Source: Cotton Australia web site www.cottonaustralia.com.au

2.2 Structure of the BMP

The cotton industry structured the BMP program to minimise impediments to adoption whilst also focussing on improving environmental practices.

The pesticide modules are comprised of worksheets, each of which addresses an aspect of pesticide application. Each worksheet has four levels, from poor to best practice, enabling a grower’s progress to be assessed against best practice. Each worksheet has supporting documentation to assist the grower in making informed decisions about how best to achieve the desired outcomes. After conducting a self-assessment against each worksheet, the grower prepares an action plan that focuses on identifying ways that pesticide application can be improved.

Every cotton grower participating in the BMP Program has a BMP manual. The manual is comprised of the worksheets and supporting documentation to assist the grower in identifying and implementing practical solutions to improving environmental practices. Periodically the BMP manual is revised and when this occurs, each cotton grower receives the new sections.
A task of the Grower Services Managers is on farm visits to check that the BMP manual is up to date.

Module 3 of the BMP program is dedicated to integrated pest management. This is a response to the build up insect resistance to pesticides in the 1980s and 1990s. A number of resources are available to cotton farmers to assist with the implementation of integrated pest management including publications \(^{15}\), cotton industry staff and rural extension staff.

As part of the IPM program, the cotton industry has also implemented an Insect Resistance Management Strategy. The voluntary strategy provides annual advice to cotton growers and agronomists about chemical usage and other techniques to minimise insect pressure and the use of pesticides in cotton crops \(^{16}\). A key component of the Strategy is the segmentation of the cotton season into five stages, and the allocation of different classes of pesticides and other pest control methods to each stage.

### 2.3 Audit procedure

The BMP program has a three step audit process, commencing with a self assessment. The grower can then request an industry audit – or pre-certification audit - conducted by one of the cotton industry’s Grower Services Managers. The purpose of this audit is to provide the grower with a second opinion of their progress against best practice. This is a service provided by the cotton industry at no cost to the grower. The grower can then opt to undergo a full certification audit, undertaken by independent auditors accredited by the Cotton BMP program. Cost to the grower is approximately AU$500.

### 2.4 BMP adoption by cotton growers

The Australian cotton industry has high levels of adoption of the BMP by cotton growers and is one of the success stories of the BMP program.

Despite being a voluntary tool, the cotton industry has secured a high participation rate in the BMP program and growers progressing to independent audits, with 50% of all cotton growers progressing with the BMP program, 20% ready for an independent audit, and 18% independently audited; 60% of the 2003-2004 crop grown on BMP audited farms \(^{17}\).

### 2.5 Benefits from the pesticide modules of the BMP program

Cotton growers first started implementing the pesticide modules of the BMP program in 1997, and since then the industry has acknowledged the BMP program to be the principles driver for on-farm environmental improvements. A number of benefits or outcomes have arisen from the BMP program.

**Grower participation**

A number of factors have contributed to the high level of participation in the BMP and grower progress through to independent audit.

**Low entry point**

The BMP program has been structured to so that it has minimal impediments for growers to participate. That is, there are no up-front requirements to be met before a grower commences on the BMP program. The cotton industry provides all the manuals and supporting documentation and a grower commences by undertaking a self-assessment of their farm management and practices. The grower then decides when they are ready to participate in the industry pre-certification audit and subsequent independent audit.
Outcome focus

The BMP focuses on improving environmental practices, rather than taking a systems-based approach. The structure of the BMP reinforces this through segmenting each worksheet in four levels (from low to best practice). The levels within each worksheet enable growers to assess how they rate against best practice.

Industry outreach to growers

The cotton industry has a significant outreach program to growers to assist with the uptake of the BMP. The industry funded Grower Services Managers in each cotton growing region assist growers with implementing the BMP, provide updates and advice, and conduct the industry pre-certification audits.

Grower attitudes to environmental and risk management

A 2004 survey of cotton growers found overall, the cotton growers have a positive attitude to the BMP program. Of the growers surveyed, 94% rated the BMP as either very effective or effective in changing on farm practices for the better.

There was also strong support amongst audited growers for the BMP audit process, with approximately 80% of growers believing there was value in the audit process. This was substantially more than the 53% of growers (audited and non-audited) who saw value in the audit process, indicating that for many growers, the value of the audit process is only evident on completion of the audit.

The survey found that the greatest benefit nominated by growers arising from the BMP was its value as a risk management tool.

Improved management practices

In the 2004 survey of growers, a number of improvements in management practices have arisen since the introduction of the BMP. These include:

- Over 97% of farmers surveyed have a pesticide management plan, up from 29.7% of farmers in 1999. Of these, 75% of farmers have implemented the pesticide management plan for all pesticides, despite this only being a requirement for endosulfan;
- 94% of growers surveyed monitored weather conditions during pesticide application, up from 36.1% in 1999; and
- integrated pest management is now widely in place with cotton farmers, with nearly all farmers surveyed following the voluntary insecticide resistance management strategy and incorporating beneficial insects in their IPM strategy. Over 70% of growers are involved in area wide management groups, up from about 28% five years ago.

Environmental outcomes

Environmental outcomes arising from the BMP program are more difficult to detect, in part because of inadequate monitoring since the BMP was established. Where monitoring has been conducted, some environmental outcomes have been measured, and these are summarised in the Second Cotton Industry Environmental Audit conducted in 2003, including:

- the quantity of insecticide/miticide applied per hectare in the cotton industry has decreased from approximately 7 kg active ingredient/ha in 97/98 to about 2kg active ingredient/ha in 02/03. This decrease reflects the broad adoption of integrated pest
management in the cotton industry, the uptake of transgenic cotton such as INGARD and Bollgard II, and the introduction of new generation of insecticides; and

- The NSW Department of Land and Water Conservation (DLWC)\textsuperscript{20} has monitored over 20 sites for water quality since 1991. There has been a substantial decrease in endosulfan levels in water, whilst other pesticide levels used more broadly across agricultural sectors, have increased significantly. This led the DLWC to recommend that “the best management practices adopted by the cotton industry must be made applicable to the whole agricultural sector to address the rise of chemicals such as diuron, fluometuron, metolachlor and prometryn, which have all risen sharply of the last decade”.

### 2.6 Land & Water Module of the Cotton BMP Program

**Development of the land and water module**

Cotton Australia was one of 15 primary industries funded by the Australian Government’s Environmental Management Systems (EMS) Pilot Program. The aim of the pilot program is to evaluate the effectiveness of EMS as a tool to improve natural resource management in primary industry. The focus of the pilot program are agricultural sectors, either through industry associations (such as Cotton Australia) or through catchment management groups.

Cotton Australia received funding to develop a land and water module for their BMP Program, building on the existing pesticide and petrochemical modules. With the land and water module, the BMP Program will address all environmental aspects on cotton farms.

The Cotton EMS Pilot commenced in April 2003 and is schedule for completion in March 2006. The Steering Committee for the development of the land and water module are Cotton Australia, the Cotton Research and Development Corporation, the Australian Cotton Cooperative Research Centre and WWF-Australia.

Key milestones during the three year development and implementation of the land and water module are:

- Conduct review of the content and process of the existing BMP program;
- Undertake consultation with key stakeholders to ensure thorough coverage of important natural resource management issues in the land and water module;
- Draft land and water module;
- Trial the land and water module in three cotton growing regions and amend draft module accordingly;
- Develop training resources and undertake training and awareness with extension staff and auditors; and
- Land and water module introduced to cotton growers for uptake and implementation.

**Structure and Content of the Land and Water Module**

The structure of the land and water module follows that of the pesticide modules. The land and water module is comprised of worksheets (17 in total), with each work covering a particular aspect of land and water management (see Table 2). Each worksheet is segmented into four ranks or levels (rank 4 = low level of management, to rank 1 = best practice). Each rank is supported by a series of descriptive comments that provide guidance during an assessment as to where the on-farm practices align against the four ranks on the worksheet.
The descriptive comments are a combination of:

- **management actions** such as mapping, measuring, planning and monitoring; and

- **management practices** that are deemed to be consistent with that level on the worksheet eg ‘filter strips in place’, ‘native vegetation retained (minimum of 10 metres along top of bank) and protected, natural regeneration actively promoted.’

The **management actions** and **management practices** become more detailed and prescriptive as growers progress from rank 4 to rank 1 (best practice). Figure 1 provides an example of a worksheet from the land and water module.

### Table 2: Land and Water Module worksheets

<table>
<thead>
<tr>
<th>Worksheet</th>
<th>Objective</th>
<th>Action/s</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Assess the farm’s resources</td>
<td>• Develop a farm map</td>
</tr>
<tr>
<td>2</td>
<td>Assess the farm’s resources</td>
<td>• Record resource and property information</td>
</tr>
</tbody>
</table>
| 3         | Assess the farm’s resources | • Review catchment plans  
• Assess risk of landscape (catchment) scale issues |
| 4         | Good soil management | • Maintain good soil structure |
| 5         | Good soil management | • Maintain good soil nutrition |
| 6         | Good soil management | • Salinity and sodicity management |
| 7         | Good soil management | • Implement practices to minimise erosion |
| 8         | Efficient irrigation | • Maximise storage and distribution efficiency |
| 9         | Efficient irrigation | • Maximise application efficiency |
| 10        | Efficient irrigation | • Monitor water use and calculate efficiencies |
| 11        | Efficient furrow irrigation | • Aim for uniform application |
| 12        | Efficient drip irrigation | • Develop a plan before installation of drip irrigation system  
• Installation of drip system  
• Operation of drip system |
| 13        | Efficient centre pivot & lateral move irrigation | • Develop a plan for installation of a centre pivot or lateral move system  
• Installation of centre pivot or lateral move system  
• Operation of centre pivot or lateral move system |
| 14        | Good vegetation management | • Assess and map native vegetation  
• Manage native vegetation |
| 15        | Good riparian management | • Riparian vegetation and weed management  
• Regional considerations |
| 16        | Good riparian management | • Stock management |
| 17        | Good riparian management | • Water quality management  
• Bank stability management |
Training and Grower Awareness

The cotton industry has incorporated a major training and awareness program into the roll-out of the land and water module.

In November 2004, Cotton Australia organised a three day workshop attended by approximately 30 participants comprised of the industry’s extension staff (Grower Services Managers), industry’s accredited auditors and State Government (QLD & NSW) Natural Resource Management staff. The purpose of the workshop was to provide training to staff and auditors on the land and water module, prior to the roll-out of the module to growers in 2005.

The cotton industry has also been finalising with the Queensland Government the use of the BMP program, including the land and water module, as sufficient assurance to satisfy QLD Government requirements for land and water management plans. Under the proposed arrangement, cotton growers meeting an agreed minimum standard in the BMP that has been independently audited, would satisfy the QLD Government requirements for land and water management plans.
Resources to assist growers to implement the land and water module

The BMP program is supported by other resources to assist cotton growers to make informed decisions about cotton production and environmental management.

a) Resource Kits

The cotton industry has developed nine resource kits that provide detailed information on aspects of cotton production to assist growers in making informed decisions about environmental management. Each cotton grower has a copy of these kits. The kits provide detailed, technical information on spray application, nutrient management, soil management, weeds, insect pests, water application, dryland farming, managing riparian vegetation and integrated pest management.

The kits can be downloaded from the Cotton CRC website - www.cotton.crc.org.au

b) Extension Staff

Cotton Australia has eight Grower Services Managers covering the major cotton producing valleys in Eastern Australia. A core function of the GSMs is to assist cotton growers with the implementation of the BMP program. With about 1,500 cotton growers in Australia, this equates to approximately one Grower Services Manager for every 200 growers.

c) Consultants

The cotton industry is well supported by consultants. During the growing season, a cotton farm is typically visited about every three days to check for disease and pest pressure. This provides an early warning of pest or disease presence that can be addressed prior to it becoming widespread.

Implementation of the land and water module

The land and water module was introduced to cotton growers during 2005. The roll-out is through group and on-farm meetings between growers and the industry’s extension staff. As the land and water module forms an integral part of the BMP program, growers already certified to the BMP will need to be audited against the land and water module over the next 18 months if they want to keep the certified BMP status. The target for the cotton industry is that by March 2006 the land and water module will be introduced to 30% of Australia’s cotton growers.

During 2005, the cotton industry agreed to undertake a benchmarking study, to assess the current status of land and water management by the industry. This data will enable the industry to measure the longer-term effectiveness of the BMP program as it provides a baseline against which on-going monitoring can be compared.

3. WWF Assessment of the Australian Cotton BMP program

The Australian Cotton BMP program provides important lessons for agricultural sectors developing voluntary tools and for WWF where it is seeking the use of voluntary tools to deliver environmental outcomes in agriculture.

3.1 Strengths of the BMP

Industry commitment and leadership
The Cotton industry has made a significant commitment towards the BMP program. The cotton industry has shown commitment and leadership with the BMP program by:

- developing a single, practical, comprehensive and ‘easy to adopt’ on-farm tool;
- providing extension staff and other resources (information kits) to support the uptake of the BMP;
- clearly stating to industry and stakeholders that the BMP is the delivery tool for improving on-farm management, and flagging that BMP participants will receive ongoing industry support; and
- undertaking accreditation of auditors and ongoing training of independent auditors.

Structure and Content

The BMP program has been structured such that it has few impediments for growers to get involved, whilst also focussing on improving environmental practices. Positive aspects of the structure and content include:

- a practical, tool that does address all major aspects of environmental management;
- low entry point. All cotton growers can readily participate in the BMP program. There is no minimum performance requirements or financial requirements to participate;
- a whole of farm approach. As such it addresses native vegetation management and riparian land management, which for most cotton farms, are management issues for areas of the farm where cotton is not grown;
- incorporating levels (or rankings) into the worksheets. This means growers can assess determine how their practice compares against best practice. The levels also provide the potential for a minimum standard to be applied to the BMP;
- more outcome focussed than an EMS, although allowing in most cases for growers to decide how to achieve a particular outcome; and
- staged approach to assessment. Growers commence with a self assessment, then seek a industry pre-certification audit, and can then opt to proceed with an independent audit. This approach builds grower comfort with the BMP and the prospect of external assessment of their farming practices.

3.2 Lessons Learnt and Limitations of the BMP program

Lessons Learnt

Patchy baseline assessment and inadequate monitoring

The cotton industry did not adequately collect data on pesticide management to provide a baseline data on their performance and practice at the time of the introduction of the pesticide module (1997). Whilst the data it has points to the effectiveness of the BMP Program in improving pesticide management, the industry could have significantly benefited from a baseline assessment.

As part of WWF’s engagement with the cotton industry since 2002, WWF has recommended the following:
a) *Baseline data assessment of land and water management*

The cotton industry has accepted WWF’s recommendation for the collection of data on land and water management, as part of the roll-out of the land and water module of the BMP. This will occur during late 2005 and 2006.

This information should provide the baseline data against which BMP Program can be assessed; and

b) *Tracking uptake and progress with the BMP Program*

Whilst the cotton industry does have records of the BMP audits, there is no central register of this data and consequently the industry is not adequately collating, checking and reporting on grower progress with adopting and implementing the BMP Program. The cotton industry is currently reviewing these arrangements with the aim of better managing the program records.

**Stakeholder consultation**

The cotton industry has communicated BMP to growers, neighbours, some regional communities and other agricultural sectors. It has been not engaged with the general public about BMP. Consequently the Australian public have a low opinion of the cotton industry, largely on grounds of their perception of poor environmental performance.

The Australian community are largely unaware of efforts made to date by the cotton industry to improve their environmental performance, and likely to be disbelieving of industry messages about better practices. Come the day that the cotton industry seeks to make environmental claims on the basis of BMP, the Australian public are unlikely to be aware of any change from the status quo.

**Appropriateness of growing cotton**

The Cotton BMP Program does not evaluate whether intensive, irrigated agriculture is an appropriate land use. Consequently, BMP cotton is grown on farms and in regions, where under a better planning regime, it may be deemed to be an inappropriate land use.

**Limitations**

Like all voluntary tools, the BMP Program has its limitations. These include:

**Industry contribution to regional and catchment environmental outcomes**

Whilst it is highly likely that the cotton industry will be able to demonstrate on-farm improvements, ultimately the goal is for voluntary tools such as BMPs to contribute to off-farm environmental outcomes, particularly improvements in environmental flows and water quality.

With good uptake and monitoring, the BMP Program will hopefully demonstrate water savings and other improvement in practices, however with water becoming a highly tradeable commodity, water savings that could be made through efficiency gains by the cotton industry could end up being trade to other agricultural sectors rather than contributing to improved environmental flows.

**On-farm expansion of irrigation**

The BMP does not address the possibility of on-farm expansion of irrigation. Should the cotton industry secure water use efficiency gains, these could lead to on-farm expansion of...
Cotton. This could occur as many farms that grow cotton are only partially irrigated. Water use efficiency gains could allow the water to be more widely applied ie a larger irrigation footprint.

Cotton expansion into new areas

The BMP program is silent on expansion of cotton into new areas. The BMP program focuses on how cotton is grown, not where it is grown. It is conceivable that BMP cotton could be grown in areas only recently opened up for irrigation. WWF could be faced with opposing the irrigation development, yet providing in-principle support for the cotton because it is responsibly grown.

3.3 Applicability of the Australian BMP Program to other countries

The Australian BMP program has been tailored for the Australian cotton industry. In summary, the BMP program is more likely to be appropriate for adoption in countries with similar conditions and industry characteristics top those prevailing in Australia. These include:

- progressive, highly intensive, relatively well-resourced industry sector;
- extensive outreach to growers, including one-on-one guidance and advice, and technical support;
- relatively small (1,500 growers), homogenous and therefore manageable industry; and
- high percentage of growers who are long-term cotton growers ie self identify as cotton growers are therefore committed to the industry.

Furthermore, the cotton industry has received Australian Government funding for the development of the land and water module of the BMP Program, and for another initiative that is evaluating linking BMP cotton with the marketplace.

The Australian industry is highly cognisant that environmental conditions may be a factor in customer purchasing policies. Consequently the industry is highly motivated to address environmental issues so that it can advantageously position itself in a global market-place.

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End Notes

1 Cotton Yearbook 2004, The Australian Cottongrower, Greenmount Press, 2004  
3 Cotton Australia website, www.cottonaustralia.com.au
For further information on Cotton Australia, go to www.cottonaustralia.com.au
For further information on the Cotton Research and Development Corporation, go to www.crdc.com.au
For further information on the Australian Cotton Cooperative Research Centre, go to www.cotton.crc.org.au
A number of IPM publications, including Integrated Pest Management Guidelines for Cotton production in Australia are available from the Cotton CRC website, www.cotton.crc.org.au
the Insect Resistance Management Strategy is available for download from the Cotton CRC website WWW.cotton.crc.org.au
DLWC NSW(2002), The North West Water Quality Monitoring Program, DLWC