

# Extension in the Australian cotton industry - a team approach

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## ABSTRACT

A cohesive, well-focused and coordinated extension team has been established in the Australian cotton industry. It has involved the state government departments of agriculture in New South Wales and Queensland, the Cotton Research and Development Corporation (CRDC) and the growers through the Australian Cotton Growers Research Association (ACGRA) in a strong industry partnership under the leadership of the Cotton Cooperative Research Centres. The national extension team is based on and has emerged from the original extension services delivered by the two state departments – NSW Agriculture and Queensland Department of Primary Industries. Until 1990, there were several extension officers in each department with extension responsibilities to the cotton and grain industries in the cotton production regions of Australia. There was informal cooperation between the extension officers in each department. At that time the industry funded two new extension positions. The Cooperative Research Centre for Sustainable Cotton Production (CRCSCP) that was established in 1993 included an Education and Technology Transfer Program. This program provided for the formation of a team of extension officers in both departments and two new additional extension positions. The CRC program ensured a formal cooperation of extension replacing the earlier informal collaboration that had developed over many years. Today the Australian Cotton Cooperative Research Centre's (Cotton CRC) extension team consists of some 38 professional staff with five national focus teams that target key extension priorities led by a National Cotton Extension Coordinator. Extension methodology has progressed from a linear transfer of technology from research to grower to a model of participative action learning in which growers, extension staff and researchers learn together. The program also includes government subsidized grower focused accredited training in aspects of cotton production such as Integrated Pest Management (IPM). This paper describes the successful development of the current comprehensive extension team under the leadership of the Cotton CRC and the CRDC. Its development was greatly enhanced following an external review of cotton extension in 1995 conducted by James Supak of Texas A&M University and Allan Williams and Bruce Finney of ACGRA coordinated by David Hamilton, a CRDC

Board Director at the time.

## Introduction

The utilization and application of research is vitally important to the sustainability of the cotton industry and is an integral part of the Cotton CRC objectives. The commercial benefits of the research flows to the growers, the region and to Australia through increased productivity and fiber quality; regional development; sustaining the resource base and the environment; reduction in the use of pesticides; and increased export earnings.

Under the leadership of the Cotton Cooperative Research Centres, a cohesive, well-focused and coordinated extension team has been established in the Australian cotton industry. It has involved the state government departments of agriculture - New South Wales Agriculture (NSW Agriculture) and Department of Primary Industries Queensland (DPIQ), the Cotton Research and Development Corporation (CRDC) and the growers through the Australian Cotton Growers Research Association (ACGRA) in a strong industry partnership.

The national extension team has emerged from the original extension services delivered by the two state departments – NSW Agriculture and DPIQ. Until 1990, there were several extension officers in each department with extension responsibilities to the cotton and grain industries in the cotton production regions of Australia. Each department worked independently, without a national focus or direction and with only direct grower involvement at the local level. However, informal cooperation was established between the extension officers in each department during the mid seventies when a series of annual workshops for cotton research and extension officers were initiated. The workshops involved officers from CSIRO, NSW Agriculture, DPIQ and the University of Queensland.

At that time the CRDC funded two new extension positions complementing the existing extension officers with major cotton industry responsibilities in NSW Agriculture and DPIQ.

The Cooperative Research Centre for Sustainable Cotton Production (CRCSCP) that was established in 1993 included an Education and Technology Transfer Program. This program provided an excellent foundation for the formation of a coordinated team of extension officers in both departments. The CRCSCP program provided funding for two new extension positions and ensured a formal cooperation of extension replacing the earlier informal collaboration that had developed over many years.

The development of the extension team was further enhanced following a review of cotton extension

in 1995 commissioned by the CRCSCP and CRDC. It was conducted by James Supak of Texas A&M University and Allan Williams and Bruce Finney of ACGRA and coordinated by David Hamilton from DPIQ, a CRDC Board Director at the time. It involved visits to all cotton producing regions to conduct consultation with growers and key groups associated with extension services in the industry.

The review found that the extension officer positions, largely funded by industry and administered by state government departments, played a key role in the process of adoption of improved practices within the industry. This was largely due to their on-farm validation work and the coordination of activities and information across districts. The role was synergistic and complementary to the consultants working in the industry.

The review recommended that:

- Support for these positions be continued;
- New funding mechanisms be explored;
- A cotton extension specialist be appointed to coordinate extension efforts aimed at national priorities and, in particular, integrated pest management approaches;
- An industry wide protocol is developed to ensure that the CRC Technology Resource Centre (TRC) can develop its role of information support to the industry.

Subsequent to the review, the Cotton CRC and CRDC have funded the establishment of extension positions in every major cotton growing region and a National Cotton Extension Coordinator. In 1997, a focus group analysis of Industry Attitudes towards Integrated Pest Management (IPM) in the Cotton Industry (Coutts, 1997) identified a need for clearer information on IPM in cotton systems and training for growers. In response to this, CRDC has supported the development of an accredited Short Course in IPM (Dalton *et al.*, 2003). A full time training coordinator has been employed to develop and deliver this course.

Today the extension team consists of some 38 professional staff with a core group of extension officers, now referred to as Industry Development Officers (IDOs). Water use efficiency officers, specialists in areas such as IPM and spray application and the departments' farming systems extension officers complement their IDO roles. Each member of the extension network contributes to a focus team in insect management, disease and weeds, environment, farming systems or water to target key national extension priorities, which are identified in collaboration with the extension network, the ACGRA, Cotton Consultants Australia (CCA) and researchers. These teams include the grower chair of the corresponding ACGRA committee and some other industry personnel.

The wider extension team works closely with the

Cotton CRC's Technology Resource Centre, CRDC, Cotton Australia, Cotton Consultants Australia and the private seed companies, Cotton Seed Distributors and Deltapine Australia.

## Extension approaches

The objective of the program is to enhance the benefits accruing from research and development through the provision of a coordinated national extension service to the Australian cotton industry. The program strives to use modern techniques and delivery systems and work in partnership with growers and consultants to demonstrate, adapt and adopt new technology by:

- Expanding and enhancing the national cotton extension service within the industry;
- Promoting on-farm demonstrations and field trials with strong grower and consultant participation;
- Acting as a conduit of information to industry;
- Supporting grower based Integrated Pest Management (IPM) and Area Wide Management (AWM) support groups;
- Examining social barriers to technology adoption.

Through a process of continuous improvement extension methodology has progressed from a linear transfer of technology from research to grower to a model of participative action learning in which growers, extension staff and researchers learn together (Figure 1).

Extension programs employ both technology transfer and participative learning approaches, tailored to suit the issue and the local dynamics. They include extension activities in the broad areas of:

- **Information delivery** - regular "Cottontales" newsletters (fax or email), media, information updates, field days, seminars, Cotton CRC website. The IDOs have contributed to and promote the SOILpak, NUTRIpak, WEEDpak, ENTOPak and integrated disease management publications that, along with MACHINEpak, provide a comprehensive, valued reference resource for the industry. Water extension staff will be involved in the development of WATERpak in the next year;
- **Groups** - the extension network supports communication and learning groups of growers and consultants. Grower driven Area Wide Management groups have initially focused on insect management but are now focusing on many other farming system challenges;
- **Benchmarking** - physical trials and financial/management choice comparative analyses allow growers to view their practices on a continuum with their peers. This has been particularly important in building confidence in IPM systems;
- **Trials and demonstrations** - initially the core focuses of the Industry Development Officer roles, trials provides local data, builds confidence in rec-

ommendations and are a focus for some groups. Regional trial books publish both research and grower trials;

- **Computer based decision support systems** - developed by the Cotton CRC and CSIRO to assist with decision making and record keeping are another extension tool supported by the team;
- **Education** - the program includes a government subsidized, grower focused accredited training in Integrated Pest Management (IPM). It is complemented by the Cotton CRC's higher level course in cotton production offered through the University of New England;
- **Evaluation** - is threaded through the extension programs to assist with on-going improvement, priority setting and to identify outcomes of the extension effort.

This range of activities are planned to be complementary to achieve overall objectives.

Effective extension programs are being, and will continue to be developed to communicate research findings to individual cotton growers and to industry.

### **The national cotton extension network**

The extension and adoption process established by the CRC Sustainable Cotton Production continues, under the Cotton CRC to provide for the development and coordination of the extension team including extension officers in NSW Agriculture, DPIQ and CRDC. It has a national focus on major industry issues and a prioritized list of regional problems. The Cotton CRC funds two officers in the extension team and provides the leadership and coordination of a team through the Cotton CRC Extension Coordinating Committee. This committee comprises representatives from New South Wales Agriculture (NSWAg), Department of Primary Industries Queensland (DPIQ), Cotton Research and Development Corporation (CRDC), Cotton CRC and the Australian Cotton Growers Research Association (ACGRA).

The National Cotton Extension Coordinator has ensured a coordinated focus on national extension priorities and the development and implementation of the most effective delivery methods. The development of extension skills in the team and the establishment of industry wide linkages are key objectives for the coordinator. Evaluation of activities and outcomes has been increased to assist with on-going improvement and for staff to identify the relative value of different activities.

The establishment of two, CRDC funded trainee Industry Development Officer positions provides the opportunity for extension staff to develop skills in the team and work closely with a senior extension officer before taking on the responsibilities of a region. The trainee positions have been particularly beneficial in allowing

the flexibility within the program to ensure continuity of service following resignation of staff or whilst staff have taken maternity leave. The immediate extension team now includes:

- Twelve IDOs including the two trainees and seven Water Use Efficiency extension officers located strategically throughout the industry;
- One Extension Technical Officer;
- Five farming systems extension officers and five irrigation extension officers in NSW Agriculture and DPIQ who contribute part of their time to cotton industry extension activities;
- Two spray application development extension officers;
- The IPM Training Coordinator in DPIQ.

The extension team has cooperated with extension staff in other programs and the Area Wide Management (AWM) Development Extension officer in DPIQ.

### **Balancing local and national activities**

The IDOs have a strong regional role, particularly in small, regional centers where they are the contact point for cotton research, development and extension activities. They work closely with regional grower associations and maintain strong links with research programs. Priorities for local extension activities are developed in collaboration with regional reference groups of growers and consultants. One of the particular benefits the industry has gained by developing the IDO network is the capacity to respond to emerging industry needs in a timely manner. For example, the outbreak of whitefly in central Queensland required an immediate response in 2002.

In the early years, the core activity of the program was centered on regional field trials and demonstrations in collaboration with researchers, consultants and growers to field test, evaluate and adapt the findings of research. The trials are still an important component of the activities but the role has evolved in collaboration with local industry and the IDOs now coordinate a range of activities and groups and act as a conduit for information.

The extension team has supported Cotton Australia and growers in the implementation of the industry Best Management Practice (BMP) program by providing technical resource support for growers developing and implementing management plans. Cotton Australia BMP facilitators and area managers manage the process and auditing procedures. BMP provides an effective vehicle for the delivery of new and advanced technical information and management strategies.

The extension programs are primarily directed to industry clients – growers, consultants and agribusiness. However, IDOs also contribute signifi-

cant support to community and environmental groups by providing information and by participating in educational activities often in collaboration with Cotton Australia. Liaison and communication with the broader community and environmental groups at a national level is primarily a function of Cotton Australia and includes activities coordinated by the Cotton CRC.

In addition to this local role, the participation of IDOs in focus teams provides a national focus, reduces duplication of effort, enhances technical skills and provides an easy contact for the researchers. Table 1 provides a summary of the time spent by IDOs on each of these national focus issues. There is also a substantial commitment to water management extension from the full time water use efficiency and irrigation officers.

An annual cotton extension planning workshop provides the opportunity for the extension team, researchers and consultants to identify and prioritize national issues. Technical training has been provided in other workshops during the season. These forums provide not only planning and training outcomes but also help to develop a cohesive national network despite the 18 centers and the vast distances over which the extension network is spread (approximately 1600 km from Emerald in Central Queensland to Griffith in Southern New South Wales). Major activities of the program have included:

- Increased establishment of IPM and area wide management grower groups;
- A series of insect management, agronomy and farming systems trials in collaboration with research officers and growers;
- Detailed development and implementation of disease management extension;
- A large number of pesticide application workshops for growers;
- Continuing support of regional grower groups and demonstration trials in the Rural Water Use Efficiency (RWUE) project;
- Cotton Tales newsletters published at various intervals in all major cotton growing valleys;
- Publication of regional trial books;
- Publication of the Crop Rotation Chart;
- Completion of the second industry benchmarking study following the first three years ago;
- Evaluation of a range of extension activities and program outcomes including a focus group evaluation of IPM and AWM and a survey evaluation of grower use of information resources.

The extension team has direct linkages with ACGRA nationally through the ACGRA Chairman and the Research Committee chairpersons who link directly with each of the focus teams. Regionally, all extension officers are active participants in the regional Cotton Grower Association and their RD&E technical sub-committees. They also work closely with Cotton Consultants and a range of industry associations.

Local grower consultant groups assist IDOs with the planning the annual RD&E activities. These activities are linked to broader national issues prioritized by the industry. A review of key extension methods used by extension staff in 2000 showed that, on a time commitment basis, field trials and demonstrations are one of the major extension methodologies being used by the officers (Table 2). Group processes are most important for insect and water management in accordance with project plans. Extension officers are expected to increase commitments to grower group activities over the next three years as more and more growers become involved in regional area wide and IPM groups.

Extension plans are developed to address key issues identified by the industry. These priorities are gathered in a range of ways – through regional reference groups, group consensus, consultation by the National Extension Coordinator, input from ACGRA and the Cotton Consultants Australia and reference to existing industry priorities such as the Cotton CRC and CRDC strategic plans. Table 3 maps a snapshot of extension activities against the core strategies of CRDC.

Implementation of strategies for IPM and AWM of insects continues as a high priority for the extension team with a program focused on the establishment of IPM and AWM grower groups and the application of the IPM guidelines. It is supported by the IPM Training Coordinator who has coordinated the development and delivery of a grower focused training program and by a project undertaking the economic assessment of IPM and insecticide resistance management (IRM) strategies. The assessment is based on data sets from IPM grower groups during the last two seasons and has demonstrated conclusively that fewer insect sprays can be associated with higher profit margins whilst deriving significant environmental benefits.

### **Response to the program**

The program is strongly supported by the industry, with many growers taking active roles in extension planning. New IDO roles have been established in response to industry demand.

IDOs in promoting research outcomes to growers use a range of techniques. Results from the cotton industry benchmarking survey (McIntyre *et al.*, 2002) demonstrate grower's preferred methods of improving knowledge of technology in ranked order are:

1. Mini field days and farm walks;
2. Grower groups;
3. Field days;
4. Farm visits;
5. District trial books;
6. Training workshops;
7. Newsletters and product information sheets;
8. Rural press;
9. Radio and TV.

and that the five most important topics are:

1. Soft options for insect management – AWM and IPM;
2. Water use efficiency;
3. Disease management;
4. Crop nutrition;
5. Ground sprays application and drift reduction.

Up to 68% of growers indicated a willingness to participate in nationally accredited training courses related to insect, disease, soil and farming system management.

The more recent CRC Cotton Information Resources Survey (Christiansen *et al.*, 2002) has indicated that currently 90% of growers have access to the internet and 38% use the CRC website.

The evaluation of IPM and AWM has demonstrated a wide level of acceptance throughout the cotton industry with a high level, broad understanding of IPM principles and practices evident across all industry sectors. This represents a significant change from 1997 where there appeared to be a lack of understanding and confidence in IPM systems amongst both growers and consultants.

Evaluation of the use of key CRC extension publications by growers and consultants has been shown that local one page weekly newsletters such as 'Cotton Tales' are an effective method of providing information to the industry (Figure 2). CRC publications in pest management are also well recognized across the industry.

The Cotton CRC through DPIQ delivered the cotton and grains adoption project that is part of the Rural Water Use Efficiency Initiative of the Department of Natural Resources and Mines in Queensland as an integral part of the extension program (McIntyre and Goynes, 2003). Its objective is to improve water use efficiency in the cotton and grains industries in Queensland. This four-year program provides for an adoption project managed and delivered by the project coordinator and five extension officers in DPIQ. A mid term review of the project has demonstrated good progress toward the achievement of the objectives. The CRC has continued to ensure the maintenance of effective linkages with a similar NSW Agriculture initiative that is also associated with the CRC.

The extension team has provided significant contributions to decision support packages NUTRIpak, DiseasePAK and WEEDpak, DISEASEpak, ENTOPak and SPRAYpak and will be involved in the development of WATERpak in the next year. Advances in the user-friendly crop simulation model, OZCOT has continued throughout 2001/02. The use of this model will provide an important extension tool in aspects of insect management, fertilizer use and water management. It will also allow growers to run a range of simulations to

assist in risk management, particularly during periods of limited water, delayed planting or hail damage. The extension team also provides local support for the CottonLOGIC decision support program, MACHINEpak and SOILpak.

The IDOs collaborate with all research officers to ensure strong linkages between the CRC research and extension programs and with researchers in many other research organizations.

## Conclusions

Improving the skills base of growers and support staff working in the cotton industry is essential if the industry is to grow and survive into the future. New technology and practices for crop and natural resource management are being developed every year. To keep pace with this change, effective educational and training programs need to be in place particularly for extension staff so that they are aware of new technology and practices as they are developed.

Prior to the establishment of the Cotton CRC extension services in the cotton industry were uncoordinated and staff lacked effective training and linkages. Educational programs developed and coordinated by the Cotton CRC have helped develop a highly skilled extension service with support from a centralized informational resource center (TRC) and a national coordinator. Today specific extension staff work within groups and activities are coordinated on a national level in partnership with industry.

A key aspect contributing to the success of the CRC educational and extension programs is the direct involvement of research staff and the development of decision support packages. These packages form an integral part of all training and support for extension staff as well as supporting the industry's BMP program in crop and resource management. Extension services have expanded their focus to include the traditional grower demonstration trials along with are specialized training courses for growers, supporting grower groups, conducting benchmarking activities and providing a range of information services.

The cotton industry is seeing benefits through supporting a strong, nationally coordinated extension network. The activities and skills of the extension program have developed in response to changing industry needs and issues. Through close industry links, evaluation and national coordination, the extension network is able to assist the industry to develop in the face of new challenges. The extension program will continue to evolve in partnership with the research community and the dynamic industry that it services.

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**Table 1.** Estimated time spent on key national objectives.

National Focus	Time Spent
Insect Management	44%
Farming Systems	20%
Disease Management	19%
Weed management	9%
Environment	6%
Water	2%

**Table 2.** Time spent on key extension methods.

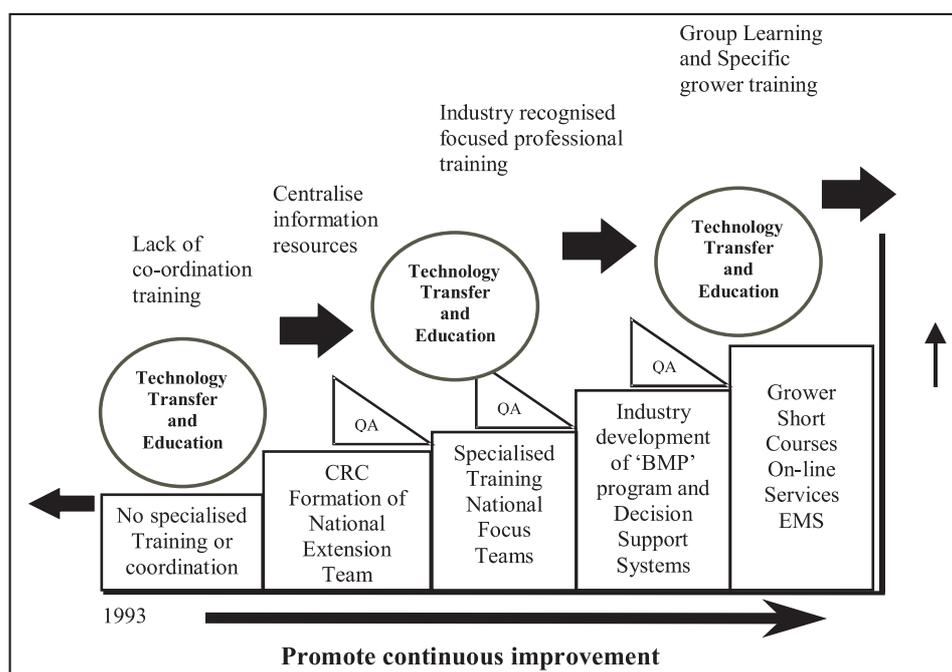
Extension Activity	% Time spent
Trials / Demonstrations	30%
Meetings/ field days	27%
General Information exchange (newsletters, grower inquiries)	26%
Grower Groups	18%

**Table 3.** Core strategies of Cotton Research and Development Corporation and some examples of related extension activities.

Strategy	Example of some Extension and Research activity
Improve chemical and non-chemical management of insects	<ul style="list-style-type: none"> <li>▪ Support for Area Wide Management Groups</li> <li>▪ Early season damage trials</li> </ul>
Improve chemical and non-chemical management of diseases and weeds.	<ul style="list-style-type: none"> <li>▪ Farm hygiene – Come Clean – Go Clean</li> <li>▪ WEEDpak</li> </ul>
Environmental management systems encompassing relevant catchment management strategies	<ul style="list-style-type: none"> <li>▪ Water Use Efficiency trials and extension</li> </ul>
Improve farm management strategies	<ul style="list-style-type: none"> <li>▪ Rotation options and impacts</li> <li>▪ NUTRIpak</li> <li>▪ Herbicide drift damage trials</li> </ul>
Improve potential for returns throughout the production chain and assist in development of market opportunities	<ul style="list-style-type: none"> <li>▪ Fibre quality trials and communication of information – Neps, Micronaire</li> </ul>
Assess economic, environmental and social impacts on regional communities and the nation; identify and develop appropriate involvement opportunities.	<ul style="list-style-type: none"> <li>▪ Community education – including school visits and public events.</li> </ul>
Involve industry personnel in regional adaptation of research and effectively transfer new techniques, strategies and discoveries.	<ul style="list-style-type: none"> <li>▪ Key focus of all extension activities                             <ul style="list-style-type: none"> <li>- Information transfer, Reference groups, AWM groups, WUE groups, Regional trials</li> </ul> </li> <li>▪ Computerized Decision Support tools</li> </ul>
Develop and engage creative, innovative and highly trained human resources.	<ul style="list-style-type: none"> <li>▪ Cotton Production Course</li> <li>▪ IPM Short Course</li> <li>▪ Trainee Industry Development Officers</li> </ul>

(Christiansen and Cotton Extension Network 2002)

**Figure 1.** Progression of extension methodology.



**Figure 2.**  
Percentage of  
respondents  
using resources.

