

Knowledge and Learning in the Australian Cotton Industry

Ingrid Christiansen¹, Victor Callan², Guy Roth³ and Michael Bange⁴

¹ Australian Cotton Cooperative Research Centre & Department of Primary Industries and Fisheries, PO Box 102, Toowoomba, Q 4350 www.cotton.crc.org.au Email Ingrid.Christiansen@dpi.qld.gov.au

² UQ Business School, The University of Queensland Q 4072. www.business.uq.edu.au Email v.callan@business.uq.edu.au

³ Australian Cotton CRC, Locked Bag 59, Narrabri NSW 2390 www.cotton.crc.org.au Email Guy.Roth@csiro.au

⁴ Australian Cotton Cooperative Research Centre & CSIRO Plant Industry, Locked Bag 59, Narrabri NSW 2390 www.cotton.crc.org.au Email Michael.Bange@csiro.au

Abstract

Managing a cotton crop is knowledge intensive and so effective knowledge management strategies are required for the crop to perform well. Recent research shows that cotton growers and consultants are experiential learners who actively seek information and experiences to develop their knowledge. Strategies are needed to aid experiential learning for assisting substantial changes in issues that cannot be easily “learnt by doing”. Knowledge services are moving towards partnerships between growers, consultants, research and extension. This paper describes the situation, challenges and opportunities that exist for improved knowledge systems in the cotton industry.

Media summary

The role of crop science is to generate new knowledge for use by farmers. However due to many challenges, including information overload, this knowledge is not always useful or used. Research highlights opportunities and partnerships to improve the uptake and use of research and industry learnings.

Key Words

Knowledge; Learning; Extension; Cotton; Decision support; Irrigation

Introduction

This conference defines the role of crop science to generate new knowledge for use by farmers. In this context, *how* is knowledge generated, shared and used? Management of a cotton crop requires high levels of knowledge and timely decisions. The Australian cotton industry is typified by a high level of innovation with active seeking and sharing of knowledge within the close industry network and is now one of Australia’s most innovative rural industries (Plowman 2004). However, he cautions us by stating that, as an industry matures, knowledge sharing and risk taking decreases, leading to lower levels of innovation. With this in mind, the nature of knowledge and learning in the cotton industry should be investigated so that strategies can be made to innovate and prepare for the second generation of farmers.

Research has traditionally focussed on contributing to new information for managers. Information has been described as data whilst knowledge or ‘Know-How’ is related to the processes of learning, understanding and applying information (Soo, Devinney *et al.* 2002). Research indicates that cotton growers and consultants actively seek to develop what Soo and her colleagues describe as ‘know-how’ rather than ‘know-what’ (Callan, Christiansen *et al.* 2004). To remain effective, research and extension needs to expand beyond delivering information to augment knowledge systems. This paper describes current knowledge systems being used in the Australian Cotton industry and research being undertaken to improve them.

Knowledge Pathways In the Australian Cotton Industry

Knowledge is the core business of research and extension agencies, consultants and suppliers who service the industry. Knowledge pathways follow a tangled web of many approaches and a multitude of people who access and disseminate information, provide advice, generate ideas and test new concepts (example Table 1). The context of knowledge generation and sharing occurring through social interaction (Brown and Duguid 2000) is strongly evident in all sectors of the Australian cotton industry.

Extension has shifted from being solely a public sector role to a mix of public and private services. There is opportunity for these sectors to effectively partner rather than compete in the knowledge value chain. Most public sector research and extension in the cotton industry is integrated through the Australian Cotton Cooperative Research Centre (Cotton CRC) including:

- Research - fundamental and applied;
- Extension - a mixture of technology transfer and participative learning approaches; regional and specialised roles;
- Computerised decision support systems including CottonLOGIC (pest, nutrient and irrigation management) and internet based technologies;
- Technology Resource Centre – editing, publishing and distribution of information resources.
- Education - A Post-Graduate Cotton Production Course targeted for consultants and a grower-based Short Course in Integrated Pest Management.

The private consultancy sector is also a critical part of the cotton industry knowledge system. On almost every farm crops are checked 2-3 times per week by a crop consultant, most of whom are tertiary trained. Consultants provide advice on pest management, nutrition, disease, rotations and irrigation. Suppliers and manufacturers also provide support for agronomic decision making. Merchants, gins and marketing consultants provide marketing advice. Services and training are also available for business management, risk management and for other issues. Clearly it is a highly serviced knowledge system.

Table 1 Key sources of information for water management in the Australian Cotton Industry – as perceived by growers, consultants had similar perceptions.

Resource	Most Important	Somewhat Important	Less Important
People	Own experience Researchers Consultants – irrigation, crop, other Other growers	Farm staff Bankers Water suppliers Other farmers	Family Grower groups Extension staff Resellers Chemical representatives Spray contractors
Resources	Trial data Field days Cotton Tales Grower experience Case Studies	Benchmarking Legislation Magazines COTTONpaks	Soil characteristics Soil monitoring Weather bureau Decision support systems Media World Wide Web Formal courses Cotton conference Knowledge research directory BMP manual

The Nature of Knowledge and Learning in the Australian Cotton Industry

Recent research has highlighted that, at least in relation to water management most growers are: 'change ready'; are active seekers of information; actively share knowledge; and willing to experiment and

continuously learn (Callan, Christiansen *et al.* 2004). This research also identified that cotton farmers, and other sectors of the industry, are highly experiential learners who have many different mechanisms by which they prefer to learn and seek information. Their own experience was clearly the dominant influence on decision making with particular focus on economic and practical implications of the information. *“I build up my self-confidence about the value of changes to how I manage water by talking to my consultants and other farmers. I won’t change unless I see it working elsewhere...I need good advice and consultants, using research and other farmers and their experience guides me a lot.”*

This research also found that experience is developed through application on farm, observations and discussion with peers, field days, participation in research trials, benchmarking and personal networks. Grower learning groups also play a role in the knowledge systems for many growers and consultants. These groups, which resemble communities of practice (Plaskoff 2001), are voluntary, driven by the participants (often with the coordination help of the extension officer or a consultant) and are founded on communication to share experiences and in some cases develop plans for a regional approach. Area Wide Management groups that formed to address pest management concerns are one example of this in the industry, however, other communities of practice exist, often very informally, such as: the clients of a common consultant, social groups, neighbours, past participants in training courses, regional grower groups and the events and activities of the small regional communities. The research identified that knowledge flows between regions through personal networks, forums and research and extension communication.

Trust in information, and the source of it, is important to growers. Many growers and consultants see the “honest broker” an important part of the public extension role and lament the high turnover of extension staff that makes it difficult for them to build relationships.

Motivations for learning and change

A variety of factors motivate people to expand their knowledge about an issue or to implement change. Cotton growers and consultants have been found to have a culture of actively seeking information and knowledge, as described above, but this may not always follow through to changed practices. A diversity of enablers and barriers to change in the cotton industry were identified, including crisis, economics, community perception, practicality of fit within the farm systems, labour, resources, etc. and uncertainty about future water allocations. It should be noted that the research was based on some 90 interviews of growers, consultants and R&D leaders. Future research could explore how these ‘self reports’ link to actual behaviours and evidence of new or revised practices.

An evaluation of the Best Management Practices program (the cotton industry’s environmental management system) found that BMP “believers”, tend to have one or more of the characteristics: larger farms; Higher workplace health and safety and public liability risk profile; Committed to the cotton industry; Industry leader; Individuals prepared to put the industry good ahead of individual good; and/or See advantage in having an external party look at their business (Macarthur-Agribus 2004).

Information Overload

Whilst cotton growers and consultants are active seekers of information, many find that there is simply too much information at their fingertips or a few mouse-clicks away to be able to make sense of it all. Extension was seen to have a knowledge brokering role in accessing, validating and digesting information that could be made available in “short dot-points” in a timely manner (eg CottonTales newsletters) with linkages to more detailed information.

Incremental and Substantial Change

“How people like to learn is not necessarily how they do” was commented at a recent industry forum about knowledge management and is a concept also widely established in extension literature.

Sometimes growers like to learn by gradually assimilating information, observing others and testing new approaches, but sometimes changes are stimulated rapidly in response to a crisis.

Research exploring knowledge systems in irrigated cotton management show that cotton growers are experiential learners and make incremental changes by sourcing information, consulting peers, attending field days attended, generating ideas and testing many of these to make improvements to the management system. If this works it may be then used across the whole farm. This approach works well for making incremental changes such as improving the efficiency of a furrow irrigation system.

More challenging are the substantial change decisions that involve infrastructure and capital expenditure such as investing in a centre pivot irrigator or trickle irrigation. Some innovative growers have been able to apply the usual experiential learning model by partnering with equipment suppliers who are keen to undertake trial on the property of a leading cotton grower identity whose experience will influence his or her peers. However, in many cases we need to rethink the knowledge system where substantial investments are required in order to improve a management system. Some of these mechanisms for building experience were identified in the irrigation knowledge research:

- Use of case studies – practical examples of how other growers have implemented a changed practice – including economics and practicalities;
- Use of computer simulation models and decision tools – scepticism about computer models is being replaced with a view of them as a useful tool to stimulate thinking about options.
- Leveraging knowledge through learning groups – grower groups may form or adapt to focus on issues relevant to people at the time. Some of this occurs now.

A role for Decisions Support Systems

Computerised decision support systems have been widely used in the Australian cotton industry for pest management decisions for over twenty years (Hearn and Bange 2002). These systems have largely served in aiding immediate pest management decisions by recording and compiling information on pest populations and drawing together the wealth of science about pest management into a readily accessible decision tool. Reporting functions associated with these tools are also used to review and reflect on strategies used through the past season.

DSS can continue to play a key role in knowledge systems by providing a learning avenue that is based on simulated rather than actual experience. Through this experience of simulated scenarios, DSS can help deliver a knowledge pathway for complex, major investment decisions where incremental change is not possible and financial risk is high. For water and irrigation management HydroLOGIC, part of the CottonLOGIC suite of DSS, offer significant opportunities to assist with knowledge system delivery. The appropriate means of delivering these technologies is subject to ongoing research in the cotton and grains industry (Carberry and Bange 1998). DSS can also provide frameworks for action research involving researchers, consultants and growers (Carberry, Hochman *et al.* 2002).

Case Study: Integrated Pest Management

One of the most significant changes in the industry has been a shift towards Integrated Pest Management (IPM) systems that reduce the reliance on insecticides. IPM has been a major area for investment of research and extension efforts and a focus for growers and consultant IPM champions. IPM is now widely accepted throughout the industry as an integral part of farm management. Adoption of IPM principles in the cotton industry was matched with a shift towards growers taking increasing responsibility for insect control decisions (Coutts, Christiansen *et al.* 2001). Decision making had moved towards a partnership between growers and consultants with reference to research and increased communication with peers.

Continued and increasing pressure concerning pesticide use (eg Endosulfan) and the introduction of Ingard² technology (genetic modification of plants for improved pest management) triggered growers' and consultants' interest in learning about and applying IPM principles. Innovators played a key role in testing, developing and applying the IPM system and encouraging their peers. Research, extension and educational activities focussed on IPM, including learning groups, research and demonstration trials, field

days, seminars, and a Short Course in IPM. IPM Guidelines were developed with practical information about IPM (Mensah and Wilson 1999). Positive economic returns identified from benchmarking were influential.

Conclusion

The cotton industry is a knowledge thirsty and highly knowledge serviced industry. Growers and consultants actively seek to learn and improve their systems when issues are important to them. This is the finding of some qualitative research, it could be followed up with further qualitative and quantitative studies. Understanding the mechanisms that motivate the need for knowledge acquisition and that accommodate the varied learning styles of different people in the industry are needed. Further research needs to continue to understand these processes to better enable research and extension services, in partnership with the private industry sector, to support, research and promote future innovation and change necessary for sustainable Australian cotton systems.

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