Cotton Management Support Systems Team - Enhancing Product And Service Delivery

DRAFT PLAN

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Prepared by

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1 Introduction

CSIRO Plant Industry's Cotton Management Support Systems Team (CMSST) develops and delivers decision support systems (DSS) to improve the profitability and sustainability of cotton production in Australia. The suite of DSS tools has continually evolved in response to changes in demand, science, technology and extension since the late 1970s.

This report outlines a four year business plan (2007-2010) for the CMSST. The plan focuses CMSST efforts on effectively positioning and delivering DSS tool in cotton R&D and extension to maximise industry outcomes and address these specified issues:

- Identify key user profiles and their respective needs and wants;
- Propose a range of adoption targets for cotton DSS;
- Identify positive and limiting factors influencing adoption (in software graphic user interface (GUI) and for user training) in particular; and
- Outline a strategy to overcome limiting factors in adoption for the broader cotton industry Extension network.

The report consists of three sections:

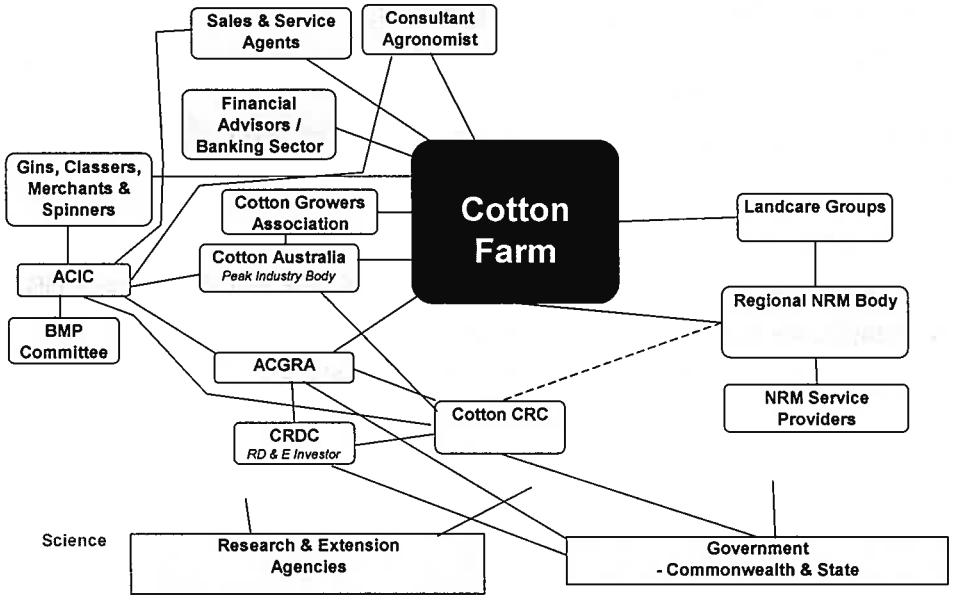
- Situation: analyses industry, R&D and extension context of CMSST and DSS;
- Goals: establishes the team's focus and associated adoption targets;
- Implementation plan: outlines 2007-2010 operational plan.

2 Situation analysis

2.1 Stakeholders and Investors

There are approximately 1,000 farms in the Australian cotton industry located in NSW and Queensland. The provision of advice, information products and services to Australian cotton farmers and public and private service providers (Figure 1) play an important role in improving the profitability and sustainability of cotton production.

Figure 1: Industry and Government Cotton Farm Network



CSIRO Plant Industry (44%), the Cotton Research and Development Corporation (44%) and the Cooperative Research Centre for Cotton Communities (12%) are the major investors in DSS tools for the cotton industry through the CMSST. CSIRO's programs focus on crop management while the CRDC's and CRC's programs have a broader focus (Figure 2).

Figure 2: DSS Tools' Research Programs

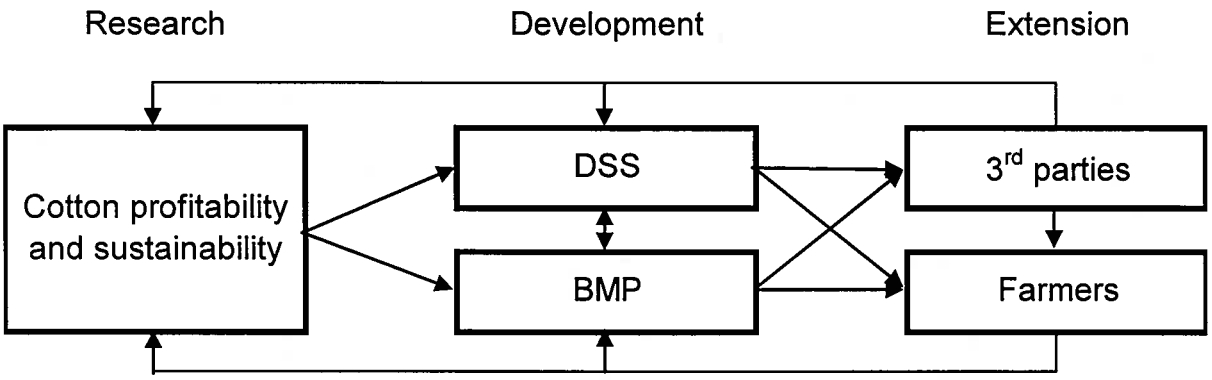
CSIRO (44%)[1]	CRDC (44%)	Cotton Communities CRC (12%)
• Cotton Breeding • Cotton Fibre • Cotton Management • Cotton Pests	• People & Knowledge • Integrated NRM • Crop Protection • Farming Systems • Value Chain	• Internationally competitive cotton farming systems. • Best practice cotton enterprises delivering sustainable ecosystems and reduced impacts on catchments • Mutually beneficial interactions between industry and regional communities. • High quality consumer preferred cotton • Increased skills and knowledge of people

These organisations require ways to develop research programs and translate research outcomes into practice across the industry. Two key mechanisms are DSS tools and best management practices (BMP) which can be extended **directly** to farmers or **indirectly** through third parties (Figure 3). Third parties include other public agencies such as NSW

[1] Proportion of CMSST funding.

and Queensland Departments of Primary Industries and private consultants and suppliers. BMP is important to industry because it is both an improvement and assurance mechanism.

Figure 3: Decision Support Systems in Research Development and Extension



2.2 Decision Support Systems

The CMSST's suite of DSS tools aim to support decision making in managing cotton crops. They use computer based industry developed models derived from research. The suite expanded from pest management in the late 1970s to more than a dozen tools currently (Figure 4).

2.3 Key Users

The traditional target audiences for DSS tools are **farmers** and cotton **consultants/suppliers**, i.e. the users who make on-ground crop management decisions. Farmers more likely to use DSS tools are younger, more educated, users of consultants and/or have larger operations.

An important user of cotton DSS tools are organisations focused on **research, policy and/or extension**. DSS tools provide a structured framework for researchers to communicate their research to farmers and consultants and receive feedback. From a policy perspective DSS provides a tool to understand on-farm implications of policy and resource changes. DSS tools can also provide an integral element of extension programs.

An emergent and on-going user for DSS tools is cotton **Best Management Practice** which the industry uses to improve performance and provide assurance. BMP requires structured decision making and documentation of practice that aligns with DSS approaches.

2.4 Performance and barriers to adoption

The performance of the CMSST is discussed in the context of its mission, which is to:

> *Validate and deliver to the cotton industry up-to-date and scientifically grounded decision tools and extension information packages that are accepted as the benchmark for improving the profitability and sustainability of cotton production.*

Tools

From a DSS tool perspective, the CMSST has developed and expanded the suite (Figure 5) to cover plant, water, nutrition and insect aspects of cotton crop management through:

- Broadening DSS coverage of cotton crop cycle stages;
- Increasing the number of DSS tools to address specific crop management issues;
- Incorporating user feedback and information technology developments.

Figure 4: Decision Support System Tools available from the CMSST in 2006

Name	Purpose	Web	Supported
SILO Day Degree Calculator	Calculates current day degrees for cotton developmental phases and returns historical analysis using the SILO patched point database	✓	✓
Last Effective Flower Tool	Estimates the time when the last effective flower is present that contributes to yield using day degrees and a user-defined end of season.	✓	✓
HydroLOGIC	Assists in the effective and timely application of irrigations for furrow irrigated cotton crops. It is able to provide information to help growers assess the consequences of different irrigation strategies on crop growth, yield and water use. OZCOT is the simulation engine in HydroLOGIC.	×	✓
Water Use Efficiency Calculator	Utilises a simple water balance with in-field measurements of soil water to calculate a range of efficiencies associated with crop water use and irrigation practice.	×	×
Water Quality Calculator	Determines the resultant water quality from mixing water of different qualities	✓	✓
NutriLOGIC Online	Recommends the amount of nitrogen required to achieve an optimum yield from soil and leaf petiole test.	✓	✓
Crop Development Tool	An online tool to compare in field measurements (node, fruit numbers and vegetative growth rates) with potential crop development. This tool is linked to the SILO day degree calculator.	✓	✓
CottonLOGIC	Desktop software last released in 2002 that assists collation and analysis of field operations, crop and insect data. It also uses models of pest development to assist with timing of spray decisions. Includes EntomoLOGIC, NutriLOGIC and CottonLOGIC for Palm OS.	×	×
CottonLOGIC support suite website	A dedicated website to support the CottonLOGIC suite of decision tools	✓	✓
Pest and Beneficial, and Weed Guides	Online guides showing pictures and descriptions of the common pests of Australian cotton. For insect pests it incorporates the published pest and beneficial guide as well as those contained in the CottonLOGIC software released in 2002.	✓	✓
Diapause Emergence Tool	An online pupae diapause and emergence prediction tool to assist growers and consultants decide when to destroy *Helicoverpa* pupae to prevent problems in following seasons.	✓	✓
Scenario Generator	An interface to enable multiple simulations using the OZCOT crop simulation model. This is a research tool.	×	✓
Industry Database Tool	Software to assist collation and analysis of an industry database of participant	×	✓

Figure 5: Decision Support Systems Tools for Managing Cotton Crops

Name	Plan >	Prepare >	Plant >	Manage >	Harvest
CottonLOGIC suite	✓			✓	
Cotton Logic Handheld				✓	
Pest and Beneficial, and Weed Guides				✓	
SILO Day Degree Calculator	✓			✓	
Crop Development Tool				✓	
Diapause Emergence Tool				✓	✓
Last Effective Flower Tool				✓	✓
HydroLOGIC	✓	✓	✓	✓	
Water Use Efficiency Calculator	✓			✓	
Water Quality Calculator	✓			✓	
NutriLOGIC Online	✓	✓	✓	✓	

The ability of the CMSST to develop, maintain and extend the suite of tools is influenced by:

- Their ability to maintain each DSS tool at a level where it includes the latest research and has been appropriately developed with industry;
- Rapid developments in information technology and the user added functionality of record-keeping to the tools increasing development and maintenance costs; and
- A tendency to undertake direct farmers extension, rather than leveraging 3rd parties.

Farmers and Consultants

Adoption of DSS tools can be described in terms of reach, value and on-going use. Access data (web hits, inquiries and event participation) indicate that seasonality and level of extension are the key influencers of how many farmers and consultants DSS tools reach. While self evident, the statement is important in highlighting that active and timely extension will have a greater impact than simply providing the tools passively over the web.

The DSS features most valued by farmers and consultants are providing insect and weed guides (>50% indicate some usefulness), decision support (<50%) and record keeping (>25%). Overall consultants use DSS tools more than farmers. Where farmers make high use of consultants, use of DSS tools increases, indicating they play a communication role between the two.

Moves towards providing tools targeted at specific issues (eg early season diagnosis) are welcome and maintains interest. However lower benefits and shorter life-cycles compared to earlier tools create confusion about the value of DSS tools, CMSST and LOGIC brand.

There is a significant amount of feedback on the usability of the DSS tools. Integration of the DSS tools with current IT standards and compatibility with common software applications (e.g. Microsoft and PAM) is seen as a barrier. This is important because there are record keeping functions associated with DSS tools that users wish to seamlessly share across applications. Remote and wireless application of the tools is seen as a means of increasing usability and anticipating future demand.

Farmers and consultants indicate that once they understand the critical relationships behind their decisions, there is little benefit in "formally using" the tools. This highlights the need to evaluate adoption rates of DSS tools and overall performance of the CMSST in a learning rather than participation context.

Research, Policy, Extension and BMP

DSS tools provide technical and record-keeping underpinnings for elements of the Cotton BMP (Figure 6). Structural similarities between the two mean that DSS tools are an important mechanism to integrate research outcomes into BMP on an on-going basis.

Figure 6: DSS Tools in Cotton BMP

BMP	CottonLOGIC	NutriLOGIC	HydroLOGIC
Application of Pesticides	✓		
Integrated pest management	✓	✓	
Farm Design and management			✓
Farm Hygiene	✓		
Risk Management		✓	✓
Land and water management	✓	✓	✓

All cotton farms must follow the pesticide BMP and Queensland cotton farms must follow the land and water BMP indicating certain parts and principles of DSS tools have been adopted. Adoption of accredited Cotton BMP is low due a lack of perceived benefit in formal adoption and diffuse drivers.

BMP is being positioned in the industry as a key on-farm improvement process and industry assurance. Therefore aligning DSS tools with BMP will provide a practical focus for the CMSST and stronger links to the drivers of on-farm change.

Research, Policy and Extension

CMSST must balance research outcomes (push) with user needs (pull) to provide relevant and useable DSS tools which improve decision making associated with profitable and sustainable cotton production. A clear and productive relationship between CMSST and researchers, policy and extension (private and public) networks is crucial to achieving this.

Tight circumstances across the sector have limited this interaction in recent years. Changes in focus and size of public extension and less work for consultants (due to less production) decreased opportunities for the CMSST to effectively leverage these networks. The fiscal outlook in the immediate future remains tight, although there are indications that there will be greater investment in the public extension network.

3 Goals for the CMSST

3.1 Rationale and mission

The rationale behind CSIRO, CRDC and CRC investing in the CMSST is that developing and extending DSS tools will improve the quality of decision making in cotton production to achieve profitable and sustainable outcomes at a farm level.

In particular DSS is seen as a tool to link research outcomes to practices and increase the rate at which they are adopted. This is reflected in the CMSST's mission, which is to:

> *Validate and deliver to the cotton industry up-to-date and scientifically grounded decision tools and extension information packages that are accepted as the benchmark for improving the profitability and sustainability of cotton production.*

3.2 Adoption targets

The scope of the DSS tools currently covers aspects of crop, insect, water-climate and nutrient management in cotton production. Increased demand and on-going research outcomes provide a basis to strengthen existing tools and develop new ones in areas such as water management and cotton fibre quality.

There are three target user groups for DSS tools:

- Cotton farmers – as on-ground decision makers;
- Cotton consultants and suppliers – as advisers and on-ground decision makers; and
- Best management practice – as the integrating framework for improvement and assurance across the industry.

Adoption targets for each user group needs to be measured on three levels (Figure 7). Level 1 focuses on tool quality in terms of whether they are up to date and fit within the industry's frameworks. Level 2 focuses on how well the tools reach their target audiences in terms of awareness. Level 3 focuses on the impact by measuring consequences of using the tools.

Figure 7: DSS Tool Adoption Targets

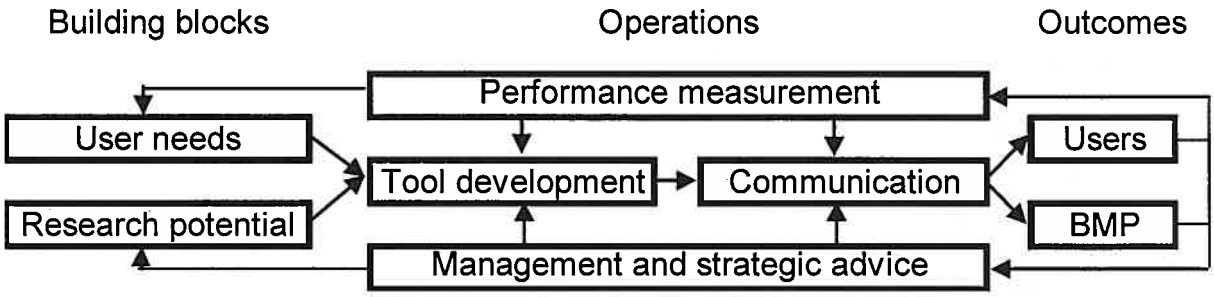
Level 1: Tools	Pessimistic	Realistic	Optimistic
All tools available and updated every 4 years	33%	66%	100%
4 new tools (1 major, 3 small) released every 4 years	0%	50%	100%
All DSS tools used in and improve quality of BMP	33%	66%	100%
Consultants services and extension programs acknowledge >2 DSS tools	25%	50%	75%
Reach	**Pessimistic**	**Realistic**	**Optimistic**
Cotton farmers aware of DSS tools and their benefits	50%	75%	100%
Consultants/supplier aware of DSS tools and benefits	50%	75%	100%
Consequence	**Pessimistic**	**Realistic**	**Optimistic**
Cotton farmers regularly use >4 DSS tools (follow principles)	25% (50%)	50% (75%)	75% (100%)
Consultants/supplier regularly use >4 DSS tools (follow principles)	33% (50%)	66% (75%)	100% (100%)
Active partnerships between CMSST - consultant/ suppliers – public extension network in using DSS tools	25%	50%	75%
Benefits of using DSS tools determined and reported for each target audience	33%	66%	100%

4 Implementation Plan

Implementing a target focused plan requires a proactive and strategic approach in a flexible framework given the CMSST's changing environment.

This can be achieved by adopting a framework which grounds the teams on what DSS tool users need and what research can actually provide at any given point in time (Figure 8). This provides the building block to focus four operational elements on servicing user needs and strengthening the industry's BMP.

Figure 8: CMSST Framework



4.1 Building blocks

The success of DSS tools rests on the understanding the key building blocks of user needs and research potential. **User needs** must be understood through defining what decisions they require support on; how a DSS tool can assist and what features and preferences do they have. **Research potential** involves developing an understanding of what research outcomes are available and suitable for use in a DSS tool in any given timeframe.

The CMSST needs to systematically analyse the cotton industry research pipeline and user needs annually using Figure 9 to build a strategic view of what the DSS tools can be built on. This will allow the CMSST to move away from a single user, tool or research issue to an outcomes perspective in line with the adoption targets that investors are seeking.

Figure 9: Framework for Analysing User Needs and Research Potential

User needs	DSS Tool	Research potential
User 1 - decision - required support - preference/features	Potential tool	Research outcome 1 - availability - applicability

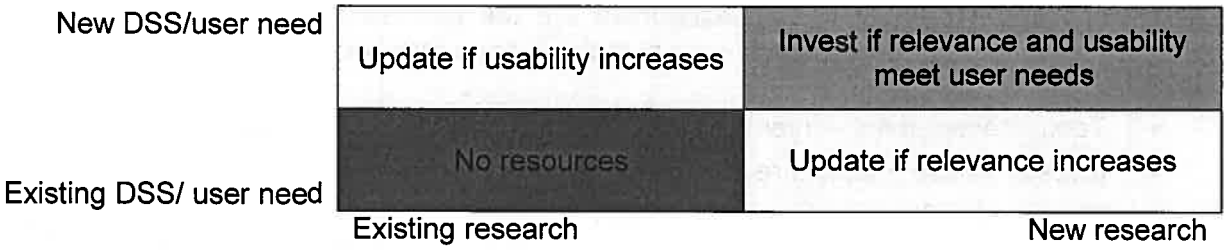
4.2 Operational Elements

The key operationally elements are developing and communicating DSS tools to the target audiences (Figure 8). The performance measurement and team management elements provide the strategic direction and decision making.

Tool development

Tool development requires significant invest of the CMSST resource to provide tools that are both relevant and usable to users. Figure 10 provides a framework to assess whether the CMSST should invest in maintaining or developing a particular tool.

Figure 10: DSS Tool Development Criteria



Communication

When developed, the CMSST's Communication Plan will:

- identify and reach the target audience and stakeholders;
- assist the target audience and stakeholders to understand the tools the DSS offers;
- encourage the target audience and stakeholders to recall key messages and its 'call to action; and
- Then, where relevant, take on the adoption model (two way communication, participation, completion of activities and adoption of new behaviours, practices, or business opportunities offered by the DSS Tools) in line with the adoption targets.

The key steps in developing the communication plan are identifying target audiences and influencers; determining key messages; set goals and developing strategies/mechanics.

The target audiences and influencers step uses the building blocks and tool development analysis to identify the target segments for each tool and the suite overall. Forming the basis of determining key offering and messages and communication goals to each segment.

The proposed strategies for the communication plan are a brand audit, extension partnerships and marketing with the final mix depending on what unfolds during implementation.

The DSS suite of tools requires a brand audit. Iterative development over many years and significant changes in the extension network, PAK series and emergence of BMP means the DSS and LOGIC brand is fractured and poorly understood. A brand audit will combine the DSS tools and user needs to develop a brand that clearly positions the team in the sector and informs what the communication plan needs to focus on.

Consultants and suppliers are a key user group in their own right as well as a key third party in broadening the reach of the CMSST beyond its own resources. The public extension network has similar potential. Therefore the CMSST requires open two way communication and ideally partnerships which develop shared understanding, mutual support and joint action where appropriate.

The final component is the individual marketing by the CMSST including advertising, printed materials, advocacy and the teams own extension efforts.

4.3 Management and Performance Measurement

Management and performance measurement are the elements of the framework which ensure the CMSST remain strategic in approach. From a management perspective CMSST requires three structures:

- Team management – internal CSIRO process operational management;
- Investor liaison – a mixture of informal discussion and formal reporting; and
- Stakeholder Steering Group – to provide strategic perspectives of key stakeholders and build common understanding and support for the role and benefit of DSS tools.

These structures are in place and require information from the performance measurement to assist the CMSST and its stakeholders in maintaining a strategic rather than operational focus. Performance management needs to focus on measuring outcomes at three levels:

- Tools – are the tools usable, relevant and integrated?
- Reach – are the target audiences aware of the tools and their benefits?
- Consequence – are the tools being used and providing benefit to users?

Figure 7 sets preliminary adoption targets for each level. The CMSST will need to implement qualitative and quantitative monitoring activities such user logs and surveys, focus groups, investor briefings to measure performance.

4.4 Staging and sequencing

The framework is designed to be progressively implemented in three phases. The framework is sufficiently flexible scale efforts within elements to match available resources. The initial phase to June 2007 will require significant effort by the CMSST because planning and implementation progress needs to be made on all elements (Figure 11). The second phase covers implementation over two years and includes annual planning activities, where if additional investment is made or partnerships made, the tool development and communication elements can be scaled up. In the final phase reporting and analysis increases to inform strategic directions post June 2010.

Figure 11: CMSST 2007-2010 Timeline

Element	Phase 1				Phase 2								Phase 3	
	2006-07				2000-08				2008-09				2009-10	
	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun
Analyse building blocks														
- annual stocktake	■				■				■				■	
Tool development														
- prioritisation	■				■				■				■	
- develop tools														
Communication														
- ID segments/message		■				■				■				■
- Brand audit	■	■				■				■				■
- Extension partnerships	■	■				■				■				■
- Extension/marketing	■	■				■				■				■
Performance														
- Establish system		■	■											
- Monitor, analyse, report				■				■				■		■
Strategic Management														
- Team planning														
- Investor liaison														
- DSS steering group														

■ Plan Implement