

COTTON STRATEGY FORUM ENVIRONMENTAL SCAN

1. Introduction

The Australian cotton industry is mature and sophisticated, with a high level of awareness of what drives performance from within and without the sector. Cotton's story is one of identifying opportunities and adapting to challenges as they arise underpinned by extensive development and application of science and technology. As a result industry's belief in the benefits of science and technology and the associated research¹ model is enormous.

Yet the industry, the research model and the way they align and support each other are continually challenged – by a culture within cotton of seeking continual improvement and by the need to simply adapt to changing circumstances.

This paper outlines some of the key changes that have and will influence the future of cotton's research model and how the Cotton Innovation Network sets out to address them. It was developed by reviewing key documents and discussions with and between individuals from key organisations inside and outside the Network. This included two preceding workshops, the Cotton Futures Forum hosted by CRDC in December 2013 and the Cotton Horizons Workshop hosted by CSIRO in April 2014.

The paper provides the background for the 2014 Cotton Strategy Forum in Brisbane where senior industry and research leaders will:

- review the cotton industry's research **priorities** to ensure they are relevant and clear
- scope improved and new **programs** to deliver the priorities for future consideration
- identify how **linkages** within the research model can be improved to lift performance

2. Cotton industry drivers

Cotton's success is completely dependent on holding a comparative advantage over alternatives in the regions where cotton is grown and there being a demand for lint grown.

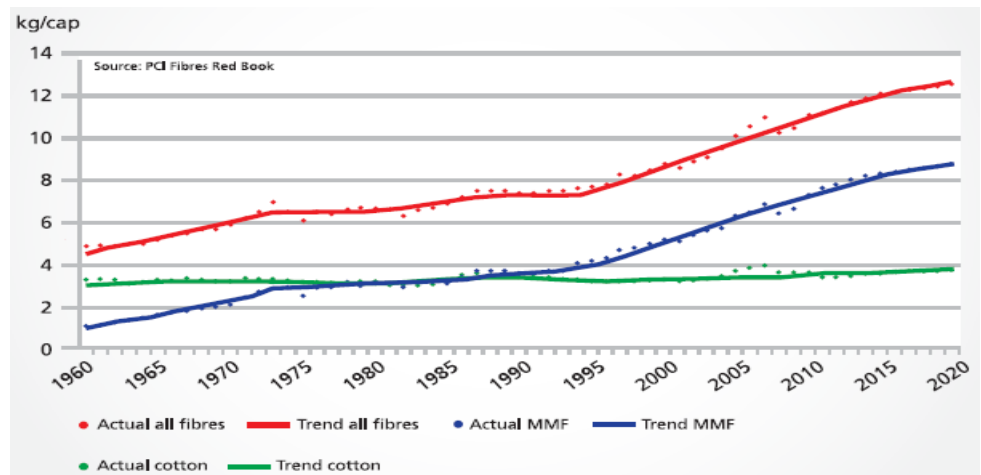
Cotton fibre markets

Australia has the position of being the third largest exporter of high quality cotton while only being 3 per cent of global cotton production. The relatively small size of the industry means Australia has scope to increase exports without necessarily collapsing global markets.

Demand for cotton is growing but at a much slower rate than man-made fibres, leading to a smaller share of the global fibre market (Figure 1). The decline is driven by relative price, supply continuity, and functionality of cotton to man-made fibres.

¹ Research is used rather than research & development (R&D) or research development & extension (RD&E) for simplicity.

Figure 1 World per capita demand for cotton and MMF 1960-2020



Source: PCI Fibres, October 2012 in CRDC Strategic Plan 2014

The price of cotton, as with many agricultural commodity exports, is volatile due to variable supply, stockpiles and demand interactions. In the long-run competition with other exporters and man-made fibres limit the ability to significantly increase the real price of cotton.

Australia has led and supported a wide range of branding strategies and quality systems and environmental assurance frameworks to differentiate (Australian) cotton and meet consumer and market expectations. To date these approaches have been more successful in maintaining markets rather than securing a premium for Australian cotton.

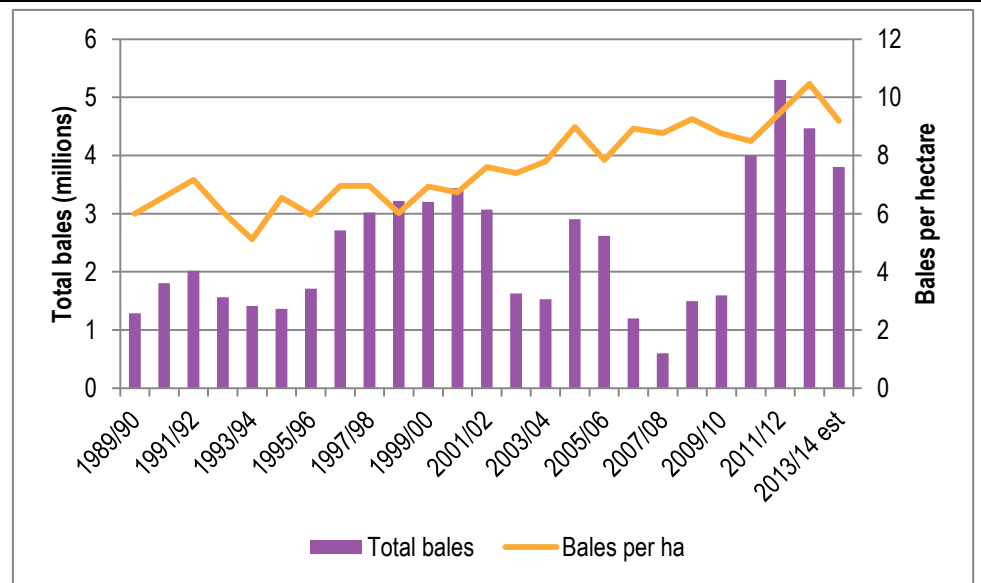
There is scope to develop new and differentiated uses for cotton on its own or as a blended fibre which could increase demand and/or price. Developing such uses will need to draw on expertise and capital from overseas, requiring new partnerships.

Cotton production in Australia

The Australian cotton industry has sustained yield improvements over many decades (Figure 2), providing a source of comparative advantage to alternative crops. Geographically cotton production is concentrated in central-northern NSW and southern-central Queensland. Over the past five years production has significantly expanded in southern NSW as irrigators have sought to maximise returns from available water. Expansion into northern Australia has been promoted, researched and trialled over many decades. Investment, rather than knowledge of where cotton can be grown and what the production systems are, is currently the next major step involved in expanding cotton in the north.

Cotton production is intensely variable - influenced by climatic conditions and water availability. Over the past decade cotton regions experienced a significant if not the worst drought, followed in many areas by extensive flooding. As a result the industry has produced four record high years, immediately preceded by four record low years (Figure 2). Research indicates that climate variability and wet-dry/hot-cold extremes will increase in the future.

Figure 2 Australian cotton production and productivity



Note: 1 bale equals 227 kg

Source: Cotton Australia 2014

Mining is rapidly expanding in many cotton growing regions, creating genuine competition for land many saw as being available for cropping in perpetuity. The change has brought an increased focus on the impact agriculture and mining have on landscapes, catchments and water resources. The efficacy of land-use and environmental planning in managing the competing priorities and mitigating uncertain impacts is also facing greater scrutiny from commerce and the community.

The relative attractiveness of other industries and adoption of labour saving technologies, such as GM cotton and round balers, has reduced both the demand and supply of labour. This has drawn people away from cotton in the regions and more critically away from the regions all together.

Higher variability across these drivers has increased uncertainty and ability of cotton growers to maintain and sustain profitability. When drivers converge, such as when water allocations reduce, drought is followed by flood, electricity costs rise and cotton prices fall, the viability of many growers is severely challenged.

The cumulative effect is that gains from new technologies and practices and better management have allowed the industry to hold rather than escape the relentless cost-price squeeze pressure. There is an expectation that research will continue to not only sustain, but improve the position and performance of the Australian cotton industry into the future.

3. Cotton research model drivers

The Australian cotton research model is also mature and sophisticated, having grown in parallel with the industry itself. The model is actually a domestic and international network of professional disciplines, public institutions, not for profit organisations and private companies bound by legislation and commercial relationships.

In 2011 the key cotton research organisations formed the Cotton Innovation Network to coordinate research in the Australian cotton industry to address a number of key drivers. The genesis of the Network is an initiative of the R&D Sub-committee of the Primary Industries Standing Committee now called the National Primary Industries RD&E

Framework (NPIRDEF). The initiative requires a national RD&E strategy for each major sector (e.g. cotton, grains) and cross sector (e.g. water use and soils) to be developed and implemented.

The Cotton Sector RD&E Strategy was developed by a Working Group of representatives from the CRDC, Cotton Australia, CSIRO, NSW DPI, QDAFF and ACDA in 2010. The Cotton Innovation Network was established to implement the strategy. For the cotton industry the NPIRDEF provided the opportunity to formalise and improve governance of the industry's research model.

The Australian cotton industry has always asked the question on where to focus the research model? Should it focus be resource sustainability, on-farm profitability, industry resilience, national prosperity or international competitiveness?

In 2009 the industry started a process of working out what the focal points for the industry research model should be. The first step was to provide an overarching context for research by creating an industry vision.

Australian cotton, carefully grown, naturally world's best.

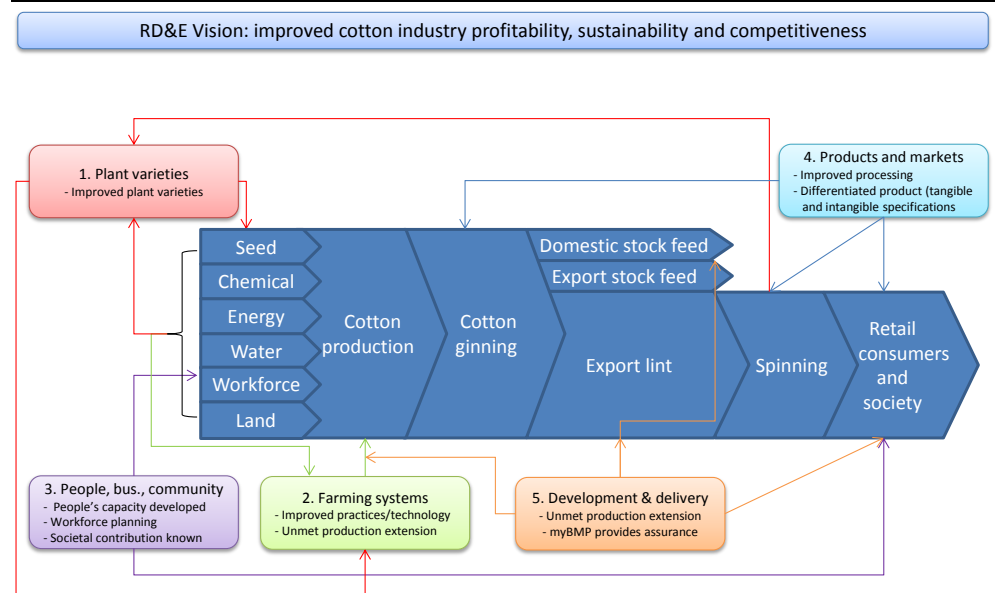
The vision elements are differentiated, responsible, tough, successful, respected and capable.

Vision 2029

The next step was to collate one set of national priorities that clearly articulated where the research model should focus its efforts over the next 20 years (Figure 3). The priorities were expanded in 2011-2012 by defining the pathways - problem definition, applicable research and required capability - for each one (Attachment 1).

The importance of the priorities and pathway is not that they are new or absolute. Rather their significance stems from having the industry's, as opposed to one organisation's, priorities described to act as a reference and guide to everyone.

Figure 3 **Australian cotton industry research (RD&E) priorities**



Source: Cotton Innovation Network 2013

Australian cotton research is financed through a complex set of public and private funding arrangements. There is a visible trend of declining public funding through contraction of government services and less access to specific purpose programs, such the Cooperative

Research Centre and Caring for our Country initiatives. While naturally concerning, there are a number of reform initiatives embedded in the trend.

The move toward *beneficiary pays* means governments increasingly question whether public funds should be directed towards research directly benefiting individual businesses. Joint Commonwealth and industry funding of the CRDC and public providers, such as NSW DPI, QDAFF, CSIRO and universities, delivering programs with a public benefit address this issue to some degree. None the less every review covering rural research over the past few decades have questioned whether the distribution of public-private benefits aligns with government-industry contributions? The 2010 Productivity Commission review of RDCs and 2014 Commonwealth Commission of Audit both raise the option of reducing or changing the governance of government contributions to RDCs to increase public benefits. This trend of scrutinising and seeking reduce public funding will continue.

At the same time public providers are required to pursue *cost-reflective pricing* for contracted services. The aim is to cover actual costs and foster a *competitive market* that does not crowd out other providers, particularly in the private sector. In practice the small and concentrated nature of the Australian cotton research market means there are limited alternative providers available. This can lead to “capacity shuffling” between providers as contracts are won and lost and significant lags before new entrants emerge.

There are duplications in services and capabilities between providers and some lack economies of scale-scope to be efficient and effective. This is simply a function of having a small industry requiring specialist services provided by a number of government and industry entities, each with their own governance arrangements. The cotton research model already implements many of the obvious things that can be done to improve efficiency. Core capabilities are clustered in Brisbane, Toowoomba, Narrabri and Black Mountain allowing infrastructure to be shared, staff to be co-located and cross partner programs to be delivered. Future opportunities may lie around shared administrative services between Network members and greater collaboration with other sectors. For cotton this means collaboration with the other sector and cross sector RD&E strategies, particularly in grains, water use, soils and plant biosecurity.

The cotton research model is exposed to considerable risk from variable income. CRDC, Cotton Australia, CSD, CSIRO and CBA, are all reliant on industry for a significant proportion of their revenue. As the industry expands and contracts with seasonal and market conditions, so does their revenue. Last decade’s extended drought was so severe that research services were reduced, non-core capabilities shed, and organisations themselves faced considerable viability challenges. Fortunately the subsequent boom years have allowed the reserves to be replenished. But the low income years will return.

Finally the cotton research model has a unique feature, the industry owned seed company CSD. Through careful stewardship by the Australian cotton industry CSD receives a significant proportion of the returns from GM cotton seeds for future industry development. CSD has a long-standing breeding joint venture with CSIRO, Cotton Breeding Australia to develop new varieties. In 2012 CSD partnered with CRDC and Cotton Australia to invest in the CottonInfo Team to reinvigorate cotton extension. There is scope for CSD to expand its role in cotton research, while recognising that this only one of several options it can pursue.

It is clear from recent developments that government is looking to continue its long-term partnership with rural industries as one of the national economic pillars. They are also looking for different ways to partner with rural industries. The Minister for Agriculture is developing a white paper on agricultural competitiveness by the end of the year. The 2014

Commonwealth budget has made additional funds available for rural research but is requiring RDCs to pay industry's membership costs to international commodity organisations. The additional funds will be provided through competitively selected grants to collaborative initiatives rather than individual industries. The Queensland government has set a goal of doubling agricultural production to align its services and partnerships. While the NSW DPI has sought to secure core capabilities and reinvigorate its research agenda to drive productivity and market development. CSIRO is currently restructuring to increase its level of innovation while retaining its strong industry focus. All these changes are happening in an environment of tight fiscal constraint.

It is also clear that the market-consumer-society research agenda is just as, if not more important to the cotton industry than the on-farm research agenda. Product and market develop features strongly in the new CRDC and Cotton Australia strategies released in 2013 and are an important consideration in CSIRO and CSD strategies currently being formulated. This is not an area where existing cotton providers hold all the required capability. Therefore new capabilities, providers and partnerships will need to be introduced into the research model. In the short-run increasing post-farm gate investment will effect on farm research and capability. In the long-run it may lead to new sources of finance and provide additional on-farm research knowledge/capabilities, such as infomatics and robotics.

Overall industry and research leaders are reasonably *aware* of the opportunities and challenges associated with the drivers discussed above and summarised in Table 1 below. The leaders are not as sure that the industry is properly *prepared* to respond to some or all of them.

The Cotton Innovation Network was established to improve coordination in the cotton research model so that the industry is prepared and can respond. While there is no immediate crisis the model will need to adapt - significantly and probably sooner rather than later.

Table 1 **Key cotton industry and research drivers**

Cotton markets	Cotton production	Cotton research model
Increasing expectations driver		
<ul style="list-style-type: none"> ▪ Functionality central to cotton as fibre and product of choice ▪ Quality and ethical certification condition of entry 	<ul style="list-style-type: none"> ▪ Generating enough wealth to attract people and capital ▪ Continually improving environmental stewardship 	<ul style="list-style-type: none"> ▪ Research asked to address more and more problems ▪ Industry to fund increasing proportion of research
Ability to grow driver		
<ul style="list-style-type: none"> ▪ Emulating functionality of synthetics ▪ Potential to provide more high quality cotton 	<ul style="list-style-type: none"> ▪ Maintaining comparative advantage over other crops ▪ Attracting investment to expand growing regions 	<ul style="list-style-type: none"> ▪ Public funding increasingly contested and contingent ▪ Significant capacity to develop new partnerships
Managing variability driver		
<ul style="list-style-type: none"> ▪ Cotton price fluctuations ▪ Demand subject to fashion if cotton narrows to and "authentic" fibre niche 	<ul style="list-style-type: none"> ▪ Climate variability and biosecurity risk ▪ Adapting to higher variability and uncertainty 	<ul style="list-style-type: none"> ▪ Core revenue streams vary with industry revenues ▪ Key public roles uncertain through long reform process
Getting more from less driver		
<ul style="list-style-type: none"> ▪ Improved quality and ethical assurances increase costs and don't influence the price of high quality cotton 	<ul style="list-style-type: none"> ▪ Less resource access and increasing competition ▪ Maintaining yield growth and limiting input cost increases 	<ul style="list-style-type: none"> ▪ Demand to generate internal and collaboration efficiencies ▪ New methods, disciplines & partners lifts performance

Source: ACIL Allen analysis of cotton industry sources, 2014

4. Cotton RD&E Strategy and the Cotton Innovation Network

The Cotton Innovation Network started in early 2012 to implement the Cotton Sector RD&E Strategy, developed the year before, through better coordination of four key functions:

- coordinating strategy and investment across cotton and with other sectors
- facilitating sound, coordinated research pathways to achieve the cotton RD&E priorities
- coordinating development and delivery (i.e. extension) of research to industry
- ensuring the required capability is maintained and developed

The Cotton Innovation Network approaches coordination from a strategic-oversight rather than operational perspective in line with the National Primary Industry RD&E Framework principles.

Implementation progress

The Cotton Innovation Network has focused on coordinating strategy-investment and research pathways functions in its first two and half years of operation.

During that time all of the Network members have or are close to completing new strategic plans related to cotton research. The Network embarked on a program of mapping current research investment and determining future research requirements (pathways) to support members in developing their new strategies and align them with the Cotton Sector RD&E strategy (Attachment 1). The program has also deepened members understanding of what each organisation contributes and how the cotton research model operates.

The Network has become a channel for members and other research organisations to raise challenges and promote opportunities for improved R&D coordination. The presence of the channel and wider communication of the Network's analysis will help researchers to understand how their work fits into the research model and industry priorities, leading to better results for cotton growers.

The Network has begun the process of linking to other national sector and cross sector RD&E strategies. Initial activities have focussed on building relationships and understanding through establishing contact, participating in other strategies' planning activities and attending NPIRDE Framework forums. It is apparent that co-investment, resource sharing and joint delivery will be between research and industry organisations, given the bodies implementing the strategies (e.g. Cotton Innovation Network) are not legal entities with resources. In addition strategies are at different stages of development. Sectoral strategies (e.g. grains) are more advanced and have higher levels of support than the cross sectoral strategies (e.g. water use and soils) which influences their willingness and ability to collaborate with the Cotton Sector RD&E Strategy. None the less cotton is well positioned to link given the Cotton Sector RD&E Strategy is being implemented, the Network is supported and the members are implementing new strategies.

The Cotton Innovation Network could start considering whether links to other organisations are needed. The importance and expansion of the post-farm gate research agenda means that new capabilities outside of the Network will be needed. This creates opportunities for refining procurement (e.g. CRDC's project selection process) and establishing new joint ventures.

At the same time Network membership could be expanded to private companies. This is particularly pertinent given the increasing importance of private investment and capabilities to cotton research. An obvious example is exploring whether Monsanto or Bayer should be members given their importance to GM cotton and broader research capabilities.

Coordinating the development and delivery (i.e. extension) function became a lower strategic priority once the Network was established. When the strategy was written, cotton extension had declined as the industry concentrated around core research capabilities during the drought. There was also concern that extension would decline further once the third Cotton CRC ended in 2012. However the CottonInfo joint venture between CRDC, Cotton Australia and CSD was established just as the Network commenced. Therefore Network continues to liaise with the joint venture's governance structure but there is no need for active involvement at present.

Coordinating capability management was and remains a critical issue for the Network and its members. CRDC, Cotton Australia and CSD have increased their capability in response to expanding operations and revenues. NSW DPI, QDAFF and CSIRO have and continue to face budgetary contractions and restructures which challenge their ability to sustain cotton research capability. The Network's capability coordination efforts have focused on creating and strengthening its role as a channel for members to raise concerns and identify opportunities relating to capabilities.

A key lesson from developing the Cotton Strategy was that the priorities and investment information available were too coarse to develop a shared and useful capability management framework for cotton research. The subsequent work of mapping current investments at a project level and determining future research pathways provides the required granularity. This can be used to design a more targeted capability audit from which a framework can be designed.

Overall the Cotton Innovation Network has been active and made considerable progress in the strategy-investment and research pathways strategic coordination functions. This foundational work has created the platform to start increasing strategic coordination of capability management. The key challenge of reinvigorating development and delivery was addressed prior to commencement and is a lower priority. The initial set of performance measures for monitoring and reviewing the Cotton Sector RD&E strategy have been mostly achieved (Table 2) and need to be updated.

Table 2 Cotton Sector RD&E strategy critical success factors and KPIs

Critical success factor	Key performance indicator	Assessment
PISC agencies commit to the Strategy	Sign-off by PISC agencies	100% sign-off
	PISC accepts Strategy	PISC accepted strategy
Formation of Cotton Innovation Network	Agencies agree to terms of reference	Terms of reference agreed (2012) and reviewed (2013)
	Members actively participate and support Network	All members have a nominated representative High (but not 100%) meeting attendance Members support Network
Network functions effectively	Cotton RD&E improves	Improved member coordination Key strategic challenges not fully resolved Impact framework to be developed
	Members value Network	Members agree Network should continue and see potential for greater value in the future

Source: Cotton Sector RD&E Strategy, 2010 and Cotton Innovation Network minutes

Future assumptions and options

The Cotton Sector RD&E Strategy and Cotton Innovation Network is predicated on series of assumptions that shape how the cotton research model should evolve. They include:

- there is on-going growing demand for Australian cotton
- the cotton industry is commercially viable and can manage variability into the future
- the cotton industry retains resource access and social licence
- productivity gains in cotton production and research will offset rising input costs and/or static prices/revenues
- on-farm research will develop industry at similar or greater rates than in the past
- post-farm gate research will develop the industry at a greater rate than in the past
- the research model will continue as an incremental evolution of its current form
- all current public and private organisations will continue to invest in and deliver research
- current levels of public research investment will be sustained
- industry can replace public investment
- cotton can attract and sustain the required research capabilities and critical mass
- collaboration with other sectors and overseas researchers is effective and efficient

It is highly unlikely all these assumptions will hold to 2029, the planning horizon for the industry vision and Cotton RD&E sector. It is also uncertain as to if, when, how and to what degree these assumptions might change.

The cotton industry is well positioned to deal with the risks and realise opportunities arising from changes to these assumptions. The clear set of research priorities and pathways, long-term partners, significant capability and access to both public and private funds that make up the cotton research model are central to this.

The challenge for the Cotton Innovation Network, member organisations and senior industry and research leaders is to evolve the cotton research model so that it is prepared for the future. To that end the Cotton Strategy Forum will explore three questions to design options which the Network can scope and potentially implement in the cotton research model.

Question 1: What should be added to the research pathways?

In order to provide a clear outline on the **types of RD&E, capabilities and outcomes** required to deliver on the national RD&E priorities that will ultimately improve the profitability, sustainability and competitiveness of the Australian cotton industry?

Question 2: What new programs should be created?

That will ensure an **on-going supply of innovations** that can be **adopted earlier** by industry while improving the **efficiency** of research?

Question 3: How can cotton research model strengthen linkages?

To **gain and sustain access** to knowledge, capabilities and funds that will improve the effectiveness and efficiency of the cotton research model. This may include improving information **sharing**, developing new **partnerships**, changing the way research is **funded** and **allocated** and **combining** groups and organizations to build critical mass and sustain **capability**.