Seizing the Cotton Research Opportunities

Guy Roth
Chief Executive Officer
Australian Cotton Cooperative Research Centre
Locked Bag 59 Narrabri NSW 2390

Abstract

Australian cotton growers have utilised collaborative research, education and extension to aid the development of what is today one of the most innovative rural industries. An independent economic evaluation of some programs of the Australian Cotton CRC investments (March 2004) found a payoff of at least $7 for every dollar invested in research.

Technology and challenges continue to change and research must remain active in helping the industry respond. Research helps to seize opportunities for the future in three key ways:

1) Flexible, rigorous research capability that works with industry to identify and develop ways to manage new challenges as they arise, such as Fusarium wilt or silver leaf white fly.
2) Continually building on the farming system for economic, environmental and social outcomes.
3) "Blue Sky" research that explores new horizons and technology and its application to cotton production.

Collaborative research enables the industry to address community concerns by providing scientific understanding of the interaction between practices and natural environments. Locally relevant science is essential for catchment environmental targets to be achieved and to facilitate development of mutually beneficial partnerships between the cotton industry and regional communities. Research from 'field to fabric' to improve fibre quality by improving production, ginning and processing of cotton will be a high priority.

Cotton's future depends on the capacity of its research and development effort to embrace a whole of industry, integrated approach to farming, including interaction with the catchment and communities, and delivery of product.

Research Highlights – The Triple Bottom Line

Research outcomes should be examined in the economic, environmental and social context, often referred to as the triple bottom line. There are many triple bottom line indicators, however in this paper only some examples are presented. An example of the economic bottom line is the continual improvement in cotton yields, which on average over the last 40 years have increased by 29 kg/lint/ha to around 2.5 times the world average (Figure 1).

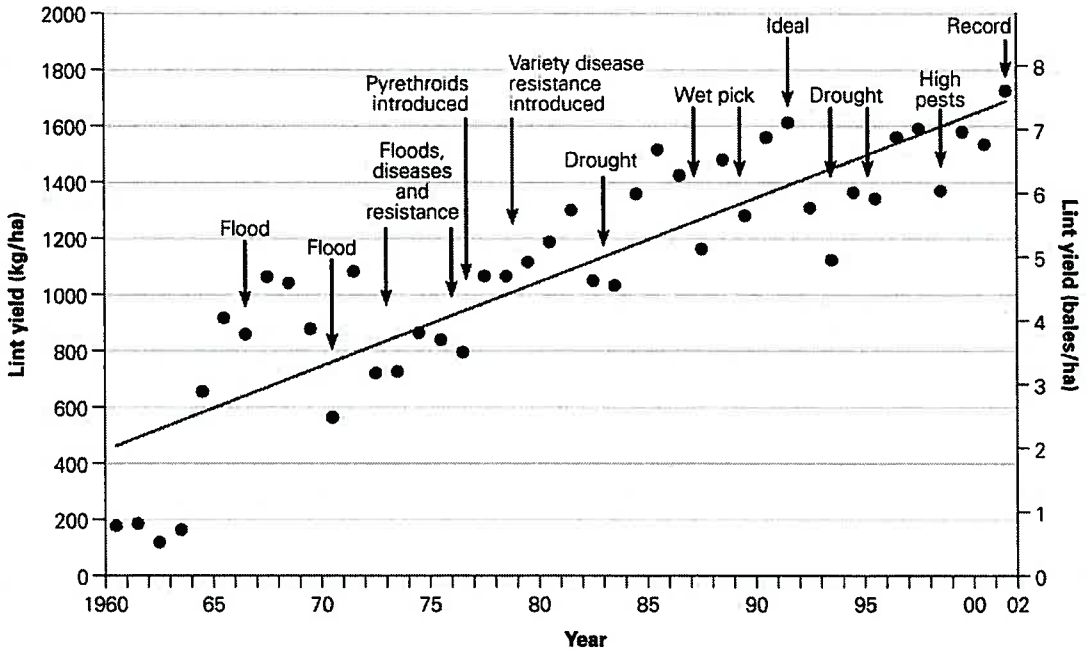

Figure 1: Yield increase of Australian cotton 1960-2002

The question is often raised about how far can cotton yields increase ?. Figure 2 shows the average yield of 1000 cotton fields over five years from the Emerald region. The average yield of these fields was 7.9bales/ha, whilst the range in yields is 4-13 bales/ha. Addressing research challenges such as crop protection, waterlogging, and nutrition should increase the lower yielding fields, whilst improve the performance of high yielding fields.

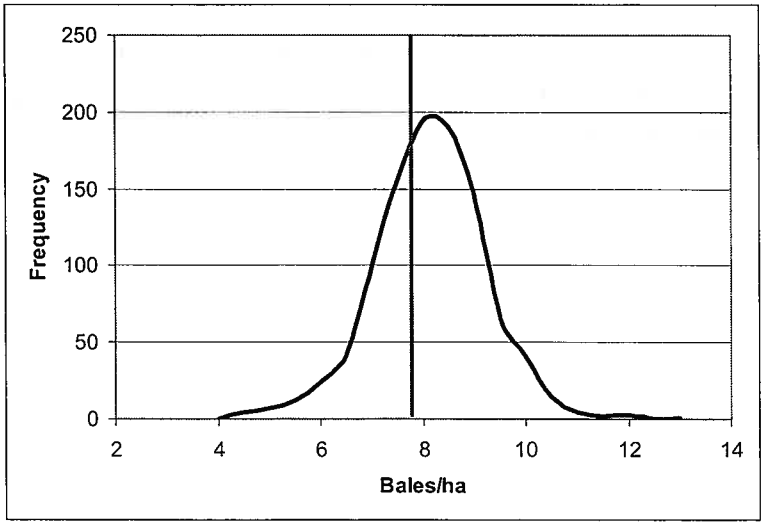

Figure 2: Frequency distribution of 1000 cotton field yield averages from Emerald

Figure 3 shows the reduction in pesticide use over the last 10 years in both conventional and transgenic systems. Corresponding to this reduction in pesticide use has been a social outcome of fewer complaints to the EPA

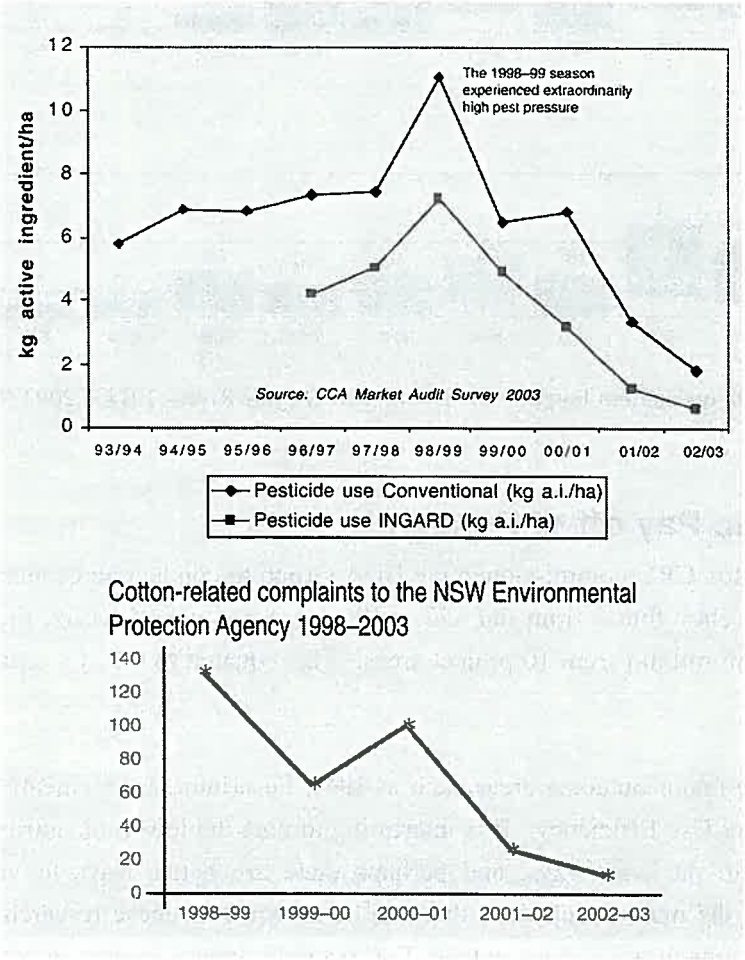

Figure 3: Reduction in cotton pesticide use (Source CCA 2003) and cotton related complaints to the NSW EPA

Through the implementation of research and the cotton industry's Best Management Practices Program pesticide levels in the river systems, such as Endosulfan have declined over the last 10 years (Figure 4).

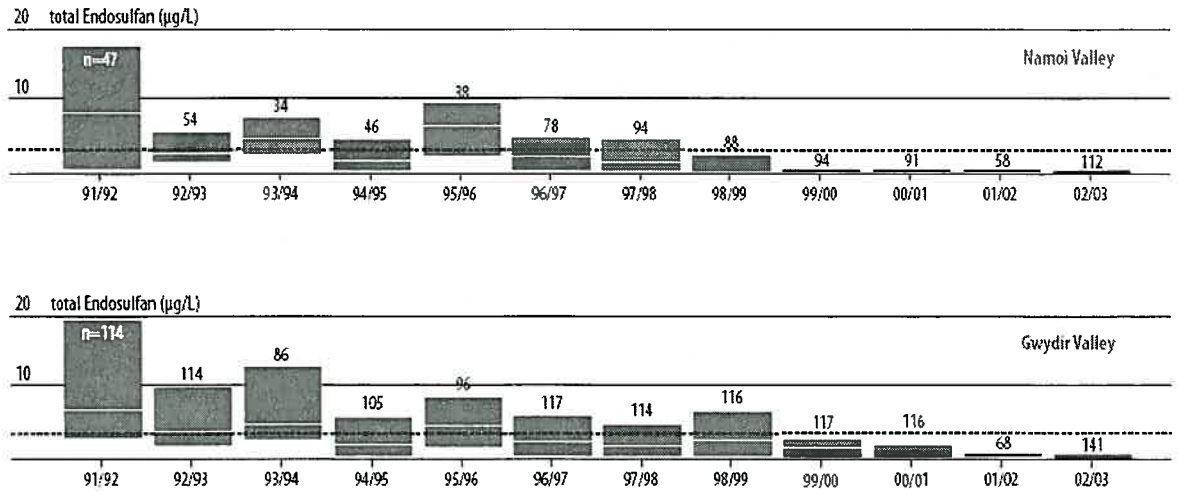

Figure 4: Reduction in endosulfan levels in the Namoi and Gwydir Rivers 1991 – 2003 (Source Mawhinney 2004).

The Economic Pay off of Research

The Australian Cotton CRC commissioned the BDA Group to conduct an economic analysis of its research portfolio. They found from the $72 million invested over 5 years, the industry benefit generated were $586 million from 10 project areas. This equated to a $7.08 return for each dollar invested.

Figure 5 shows the major outcome areas such as IPM, Fusarium Management, delayed pesticide resistance and Water Use Efficiency. It is interesting to note the low value attributed projects like reduced pesticide in the waterways, and perhaps there are better ways to value public good outcomes. One of the main conclusions that can be drawn from these research outcomes is that research and development accelerates uptake. For example, improvements in water use efficiency should eventually be achieved by growers over a decade due to technology, however research and extension considerably accelerates this adoption process.

Output Area	Industry Outcome	Benefits
IPM	1. Reduced pesticide use	$250m
	2. Control of Whitefly	$10m
	3. Delayed Resistance	$53m
	4. Pesticides in water ways	$2m
	5. Pesticide spray drift	-
Weeds	6. Adoption of Round up Ready® cotton	$18m
Diseases	7. Fusarium Wilt	$184m
	8. Export cotton seed market	$4m
Water	9. Water use efficiency	$64m
	10. Deep drainage	$1m
	TOTAL [a]	**$586m**

Figure 5: Economic Benefit of research industry outcomes (Source BDA Group 2004)

Research Future Directions

Despite past adoption of new technologies and strategies developed by the current Australian researchers, the industry still faces significant challenges to its economic viability. It is confronted with increased global competition, high input costs, and calls for greater environmental and water efficiency focus, with prices (in relative terms) declining. To secure a long-term future for the industry it needs to be supported by a strong, co-ordinated public and private commercial research effort.

Past research programs have developed technologies and practices contributing to significant reductions in pesticide use and considerably improved water use efficiency, yet community and government concern remains. Genetically modified varieties have contributed substantially to improvements in the sustainability of cotton production, with significantly reduced environmental impact, but again community concerns persist, placing pressure on the industry to demonstrate benefits.

In regard to biodiversity and native vegetation management, while the area of irrigated and dryland cotton production is small, cotton farms occupy some of the most critical riparian and floodplain areas of the catchments in which it is grown. By occupying these areas cotton farmers have a primary influence on the vegetation, biodiversity and water quality of inland rivers and associated floodplains. Cotton growers are therefore in a unique position to influence the conservation of some of Australia's most endangered ecosystems and species, as well as the quality of downstream waterways. While the protection of riverine ecosystems and biodiversity in catchments is seen as important, as recognised under the National Action Plan for Salinity and Water Quality, the difficulty for growers is to recognise direct benefits to their productivity from conservation.

There is an opportunity for cotton research to partnership with Catchment Management Authorities, to lead research and develop educational programs that clearly establish and demonstrate the link between on-farm natural resource management and conservation, grower profits and catchment health.

Environmentally responsible, sustainable and integrated farming systems R&D will continue, particularly in areas such as chemicals, nutrients, soil health, pests, disease, weeds, water use efficiency and transgenic crop management systems. These programs need to be complemented by embracing precision agriculture, decision support tools and simulation modelling techniques, as well as an off-farm emphasis on innovative technologies all through the value-adding segment of the product pipeline.

Proactive research to prevent rising water tables and salinity in cotton growing areas, including bio- and enzymatic remediation of contaminated farm water for re-use in cotton production, and concentration on other enterprises such as aquaculture can add value to the farms overall productivity. Adding value to cotton seed should also be examined.

On-farm, catchment and regional issues research is irrelevant unless the cotton fibre produced is internationally competitive and profitable to all participants along the textile pipeline. Increased emphasis on objective measurement of fibre characteristics, and establishing a better understanding of agronomic, harvesting and ginning systems that minimise fibre damage and contamination, delivering higher returns to industry participants is needed. Eco-labelling of Australian cotton through the Industry's Best Management Practice (BMP) initiative that secures access of Australian cotton to future markets, especially in Europe, remains an imperative needs to be explored.

Research is also irrelevant unless results are communicated quickly and efficiently, hence renewed emphasis on delivering innovative education, extension and knowledge management systems that provide all levels of the cotton industry and communities with access to the skills, knowledge and capacity for more rapid adoption of research outcomes. Into the future, more targeted short courses on nutrition, water etc for cotton growers and consultants are likely. This will be coupled with innovative information delivery systems and decision support tools to facilitate rapid adoption of research outcomes. It is hard to predict what the computer and web style technologies could be like in 5 years time, especially if you think back that it was less than 10 years ago when most of us were introduced to the world wide web, email, GPS etc.

Transforming technologies and other influences such as water reforms can rapidly alter the relationships between an industry and its communities. There is some evidence of this with, for example, herbicide tolerant cotton crops and the reduced demand for manual weed control, which in turn was a large employer of indigenous people and other casual workers. The social role of transforming technologies needs to be addressed so that fluctuations in the industry due to seasonal, global, structural and technological influences can be planned for to ensure the continuity of the skills base and services essential for cotton production.

Thus, a new element of cotton research should include working with the community and local governments to deliver improved commercial and economic conditions in regional communities. For example, it could assess the impacts of seasonal, technology and structural change on the skills base, employment opportunities and demographics of these communities. This will ensure community values and aspirations can be better recognised and business conditions and opportunities maximised.

Knowledge should be treated as valuable capital. There is a global shift from material based to knowledge based capital such as people, information, skills and R&D. The cotton industry will need greater diversity in its knowledge base. This diversity will bring new skills, innovation and creativity. Local scientists and knowledge brokers are needed with skills in agriculture and the environment in cotton regions. At the moment we have agricultural scientists in the bush and environmental scientists in the cities.

Another likely trend is greater partnering of the public and private sectors. There will be co investment in research with Intellectual Property shared on an equity basis. Figure 6 shows the

relative roles of the public sector, which raises awareness and creates demand along with the private sector that delivers the specialised one to one advice.

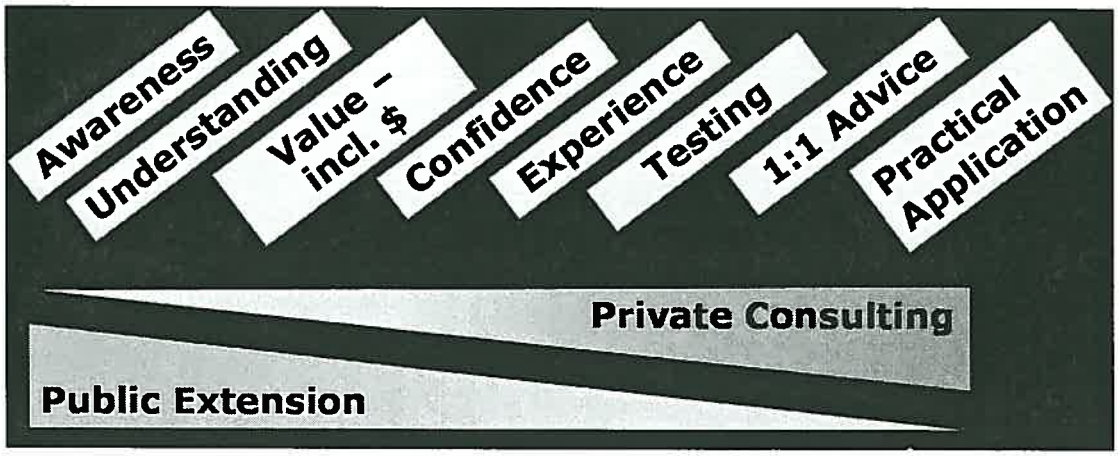

Figure 6: Public and private sectors roles in knowledge delivery (Source: Christiansen, I.H. pers com)

The Cooperative Research Centre model of the Federal Government which encourages joint ventures between research providers, universities, industry and private sector is the way the Australian cotton industry is trying to seize its research opportunities. Hence, a new Cotton Catchment Communities CRC is being proposed.

Summary

In summary, in the future cotton research will need to broaden its breadth and depth of intellectual capital. Cotton production, cotton product, catchment and landscape, and community social research will all be needed. Higher levels of intellectual capital and knowledge will require education and training. Acceleration of research adoption will require a multitude of appropriate and integrated pathways. Cotton - Catchment - Communities – you cannot have one without the other.

Acknowledgements

I would like to acknowledge all my research and industry peers who have contributed to the Cotton Catchment Communities CRC proposal. David Kelly provided the field yield data for Figure 2.

References

BDA 2004, Economic outcomes of the Australian Cotton CRC. Report for the Australian Cotton CRC, March 2004 by BDA Group, Melbourne.

CCA 2003, Cotton Consultants Association Annual Pesticide Survey, Cotton Consultants Association, Narrabri.

Mawhinney, W, 2004, A case study - Catchment water quality and cotton: northern NSW, DIPNR, Tamworth. *In* WATERpak, published by the Cotton Research and Development Corporation and the Australian Cotton CRC., Narrabri.