



Australian Government
**Cotton Research and
Development Corporation**

NEC9 FINAL REPORT

Part 1 - Summary Details

Please use your TAB key to complete Parts 1 & 2.

CRDC Project Number: NEC9
Annual Report: Due 30-September
Progress Report: Due 31-January
Final Report: Due 30-September
(or within 3 months of completion of project)

Project Title: R & D to Support the Adoption of Centre Pivots and Lateral Moves in the Australian Cotton Industry - 1 year \$50,000

Project Commencement Date: 01/07/03 **Project Completion Date:** 30/06/04
Research Program: 1 People and Knowledge

Part 2 - Contact Details

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Part 3.3 – Final Reports (due 3 months after completion of project)

1. Outline the background to the project.

In 2000/01, the cotton industry was irrigating approximately 5300 ha with centre pivots and lateral move machines (CP&LMs). Since the publication of the cotton industry scoping study into centre pivots and lateral move machines, grower interest has risen and the area irrigated by these machines increased by more than 2000 ha in 2001/02 and has grown further in the last year. The benefits associated with adopting centre pivots and lateral moves include high application efficiency and uniformity, low labour requirements, improved crop management flexibility, and the potential for fertigation and chemigation. However, disadvantages compared to existing surface irrigation include the increased capital cost and crop management skill required. With the increasing economic and political pressure for improvements in water use efficiencies, it seems likely that, by the year 2015, up to 30% of the cotton irrigated in Australia will be produced using CP&LMs.

Existing problems with the design and management of CP&LMs in the cotton industry have been identified and are continuing to arise as growers adopt this technology. Many existing machines have inadequate machine capacities and inappropriate sprinkler and application system packages for cotton production. Similarly, growers often struggle to develop the necessary machine and crop management skills required for successful irrigation during the first 2-3 years after machine purchase. These problems are often found to have a dramatic effect on the commercial viability of the operation during this period and have been found to be a leading reason for the previously negative perception of CP&LMs within the industry.

The development of a range of training and extension/information resources will provide a greater understanding of CP&LM machines to growers, consultants and extension personnel. This project aims to deliver this range of educational and extension resources for the industry.

2. List the project objectives and the extent to which these have been achieved.

1. Promotion/Information Delivery

This objective has been achieved through the production of an article in Australian Cotton Grower magazine and presentations delivered at a number of field days including the very successful hands-on workshop sessions at the 2004 Australian Cotton Conference. In addition a considerable number of grower contacts have occurred throughout the life of the project via phonecalls and interaction with growers at field days and conferences.

2. Educational Resource Development

This objective involved the preparation of material for inclusion in the CRDC WaterPak publication, which has now gone to print, and the production of a comprehensive CP&LM training package, available for delivery by Industry Extension Personnel. Initial WaterPak chapters have been included within the WaterPak manual, whilst additional 'Pocket Guides' have been developed and delivered. The CP&LM training package has been forwarded with this report and will be delivered to extension personnel in the near future. This training package

is a significant industry resource for the future development of grower and industry skills in the design, operation and management of CP&LMs.

3. Interview Leading Practitioners

Several leading CP&LM operators were interviewed to gain an understanding of recently developed innovative management practices being implemented in the operation of this equipment. Novel machine setups and opportunities for further equipment development have been noted based on the unique requirements of the cotton industry. This information has been compiled into seven case studies and is subsequently available for inclusion in extension materials, such as WaterPAK, Australian CottonGrower articles and for use by water extension personnel.

4. Develop Extension Tools

Extension tools developed during this project include an interactive worksheet for calculating CP&LM system capacity.

3. Detail the methodology and provide a project summary.

This project was concerned with the delivery of a 1-year CP&LM extension plan. The extension plan was based primarily upon the production of extension materials for use by members of the Cotton Industry Extension Network. Some additional extension work in the form of magazine articles and field day presentations by the principal researcher was also included. The extension plan consisted of the production of:

1. An article in Australian Cotton Grower magazine
2. Presentations at industry field days
3. Development of fact sheets or similar materials
4. Preparation of 2 chapters and ancillary materials for WaterPak
5. Development of a CP&LM training package – seven modules
6. Interviews of leading practitioners
7. Development of an interactive worksheet to determine system capacity
8. Compilation of seven case studies based around important CP&LM extension topics

The largest components of this project in terms of time resource have been the production of the two WaterPAK chapters and a substantial CP&LM training package. The resulting training package is a significant step forward for the potential expansion of understanding and use of CP&LM machines in the Australian Cotton industry, and represents a significant proportion of the outputs of this project. Delivery of this training package will present the industry with a substantially greater understanding of CP&LM machines.

Many of the other outputs from this project have been aimed at increasing awareness or providing a base of appropriate reference material. As such, many of these outputs are already in use throughout the industry. Such outputs not specified above include:

- A series of three CP&LM seminars for McCracken's across cotton growing regions
- Australian Cotton Conference Hands-on Sessions 2004 – highly successful and in strong demand
- Moree Cotton Tradeshow Presentations with Jim Purcell on Innovative Irrigation

The reference material produced as part of this project has also been quite extensive, and has included the principal WaterPak chapters, including both CP&LM machines as well as flow metering. WaterPak 'pocket guide' chapters have also been produced as well as a spreadsheet for system capacity calculations which can be used by extension staff or growers.

Whilst fact sheets were highlighted as potential outputs regarding practical aspects of CP&LMs and scheduling options with CP&LM machines, this resource has been combined into case studies to provide the information on a more practical basis.

4. Detail and discuss the results including the statistical analysis of results.

N/A

5. Provide a conclusion as to research outcomes compared with objectives. What are the "take home messages"?

1. A significant CP&LM training package is now available for delivery to growers, consultants and extension personnel within the cotton industry.
2. A significant CP&LM reference resource is now available within the WaterPak publication as separate chapters.
3. Various awareness and information sharing activities have been undertaken.
4. Various miscellaneous information resources have been produced (worksheets, case studies, etc.)
5. Interviews of innovative CP&LM operators have been undertaken and case studies have been produced for use by industry extension personnel.

6. Detail how your research has addressed the Corporation's three Outputs - Economic, Environmental and Social?

This project has provided the people of the Australian Cotton Industry with a broad range of resource and learning materials to help improve the efficiency and effectiveness of irrigation practices under CP&LM machines. In particular, the project has provided information that can assist cotton growers to make decisions to potentially increase productivity, water use efficiency and profitability as well as decrease water use, decrease runoff and deep drainage and maximise farming system inputs.

7. Provide a summary of the project ensuring the following areas are addressed:

- a) **technical advances achieved (eg commercially significant developments, patents applied for or granted licenses, etc.)**
- b) **other information developed from research (eg discoveries in methodology, equipment design, etc.)**
- c) **are changes to the Intellectual Property register required?**

N/A, Summary provided above.

8. Detail a plan for the activities or other steps that may be taken:

(a) to further develop or to exploit the project technology.

The materials produced from this project comprise a basic resource that needs expanding as both new research findings are produced and the level of information demand from end users increases. Familiarisation of these materials by extension officers will allow effective use and provide a channel for feedback regarding the future resource needs.

(b) for the future presentation and dissemination of the project outcomes.

The materials produced from this project were designed for use by extension personnel within the cotton industry. It is essential that these materials be used so the information contained within is available to growers, agronomists, consultants and other industry personnel. The training materials, in particular, have been designed to be basically self contained and can be delivered by any extension officer. It is likely that the future deliverers undertake the training from an irrigation specific extension officer before subsequent delivery.

(c) for future research.

The understanding of many facets of CP&LM operation within the cotton farming system still requires additional research. Of particular importance to growers is the relationship between CP&LM water application and soil-water infiltration and redistribution. CRDC project NEC10 aims to address these issues over the next 2 years.

An additional major research requirement is for a greater understanding of the management of crop growth under these machines. Many growers have found that excess vegetative growth is common, even when applying substantially less water than adjacent furrow irrigated fields. This is likely to be due to a constant high availability of water as growers tend to operate these machines near field capacity. An understanding of the crop response and machine capabilities for irrigating at different water deficits is required.

9. List the publications arising from the research project and/or a publication plan. (NB: Where possible, please provide a copy of any publication/s)

- Australian Cotton Grower article – “System capacity the key for overhead irrigators”, Australian CottonGrower pp 24-27, December 2003 – January 2004, Vol. 24, No. 7.
- WaterPAK chapters – Ch 4.6 “Centre pivot and lateral move machines” AND Ch 2.8 “Metering irrigation water”
- *Centre Pivot and Lateral Move Training Package*, National Centre for Engineering in Agriculture, USQ, and Cotton Research and Development Corporation.

10. Have you developed any online resources and what is the website address?

N/A

11. Provide an assessment of the likely impact of the results and conclusions of the research project for the cotton industry. Where possible include a statement of the costs and potential benefits to the Australian cotton industry or the Australian community.

The outcomes of this research project provide a significant resource base for the adoption and successful operation of CP&LM machines within the Australian cotton industry. At this stage, the project outputs provide information to growers and consultants to enable them to make improved decisions regarding the selection, design and operation of CP&LM machines. If implemented and used to their potential, these machines offer the ability to make *significant* improvements to the production, performance and water use efficiency of the Australian cotton industry.

Part 4 – Final Report Executive Summary

Centre Pivot and Lateral Move (CP&LM) irrigation machines are gaining popularity within the Australian cotton industry, as they can provide high application efficiency and uniformity, low labour requirements, improved crop management flexibility, and fertigation and chemigation potential. Growers and consultants who have not yet had experience with these machines can be daunted by the choice and design considerations available whilst those individuals using CP&LM machines often struggle with the increased level of management required over their previous furrow irrigation operations.

This project has developed a number of extension, adoption and training tools to allow end users to increase their understanding of CP&LM machines. These tools form a resource of information that can be readily accessed as stand alone materials or delivered in a structured manner.

The information resource developed consists of a number of articles and case studies to provide opportunities for awareness raising and increasing adoption. In addition, a significant training package has been developed that can be delivered to growers, consultants or extension personnel to increase their understanding of the design and management considerations and practicalities involved with CP&LM machines. Finally, chapters have been contributed to the WaterPak manual and provide a readily accessible reference source for information as required.

Much of this information has been developed including practical tips obtained from a series of interviews of seven leading and innovative CP&LM users to incorporate the experience that these practitioners have gained.