FINAL REPORT

Part 1 - Summary Details

Cotton CRC Project Number: : **1.03.05**

Project Title: Enhancing Cotton CRC Crop Nutrition Group Activities

Project Commencement Date: 24/4/2006 **Project Completion Date:** 30/6/2008

Cotton CRC Program: **Program 1 – The Farm**

Part 2 – Contact Details

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Part 3 – Final Report Guide (due within 3 months on completion of project)

Background

The primary aims of this project were to contribute to the CRC strategy to improve the efficiency of applied nutrients by 15 percent by facilitation to co-ordinate the public and private nutrition research and extension effort for the cotton industry. A research component was principally to oversee the conduct and management of Incitec Pivots Ltd's collaborative cotton research program with a particular focus on the development of new products and diagnostic programs. The broader role also extended into ensuring effective two-way communication of information between the public and private sectors and in helping setting mutually beneficial standards of information, practice and training.

To meet these objectives and to provide operational flexibility the project was divided into 4 major areas of responsibility, Co-ordination/ Administration, Research Proposal Review, Extension and Training, Decision Support Information Integration

Objectives and Methods

1. Administration/Co-ordination - Quarterly communications sessions between key research, extension personnel were to be implemented through;
    a. Establishment of a core group of key personnel, agenda and agreement on timing of communication sessions to achieve agreed objectives.
    b. Distribution of minutes and actions from the meetings at agreed times.
2. New Project Review - To provide a link between private crop nutrition and soil fertility research, and public research to ensure research gaps and overlaps are minimised and that research outcomes and recommendations are adopted by private sector extension. This was to be implemented through;
    a. Awareness of private fertiliser, and publically funded nutrition research projects in new project review process
    b. Ensure that where appropriate privately collected data is available for inclusion in research projects
3. Extension and Training – To provide a standardised verifiable science-based approach to nutrient management training in cotton.
    a. Draft report outlining structure and recommendations for development of an integrated soil fertility and cotton nutrition training program in involving all levels of advisers and decision makers in the private and public sectors of the industry.
    b. Availability as presenter at industry forums and training that involve crop nutrition and soils issues as requested.

4. Decision Support Information Integration and Introduction
   Co-ordinating development of pre existing and current research science into functional units that can be used as part of decision support software of extension packages.

   a. Review of science available for the redevelopment of soil and plant analysis DSS.

   b. Provide functional relationships for nutrient decision making to interested parties providing fertiliser DSS.

   c. Development of a regular questionnaire to explore nutrient use, crop nutrition and soil fertility issues among growers and consultants

Results

1. **Administration/Coordination** – Assessment of the success of this objective was to be determined by the number of session held on time versus plan, and successful implementation of the actions arising.

   The initial scoping meeting was held on 14 June 2006 in Moree where the agenda for future meetings, short and long term outcomes were discussed agreed. Project communication meetings were to be held at least twice per year preferably at a suitable time to implement activities in the coming crop and review outcomes post crop. At this meeting it was decided that the prime focus was the need to measure nutrient efficiency ASAP to provide a baseline against which to measure progress against the 15 % improvement targeted by the program. Nitrogen was the key nutrient targeted in line with on-farm cost and potential environmental benefits of improving efficiency. Stakeholders represented at the initial meeting and most subsequent meetings included Incitec Pivot, NSW DPI, CSIRO, CRDC, AGGRA, UNE, and University of Sydney. The action items from the coordination meetings became key deliverables for the project.

   Other further meetings and key action items included

   - 12 December 2006
     - Standardisation of DSS criteria
     - Nutrilogic press release
     - N efficiency article by Rocky
     - Editorial Managing N for Production and the Environment by C Dowling (May 2007)
   - 3 May 2007
     - N management option in the face of increasing N costs
     - Noted that there was a considerable amount of unco-ordinate P research being conducted across the grains and cotton industries that would most likely benefit from a joint, well focus program.
     - New chapters for Nutripak required - sodium, chloride
     - Progress on crop nutrition research results compendium

- 10 December 2007
    - Economic value of legume N – need for economist to do full review of experiments.
    - Increase in on farm reach activity by co-ordinating through consultants. Quality and confidence to be improved by providing research technique training.
    - Relaunch NutriLogic now upgrade through press
- 5 February 2008
    - Need to develop protocol for on farm assessment of N efficiency to provide benchmarking against 2011/12
    - Investigate seed N a possible shortcut to NUE
    - Develop 1 day course on running on farm trials to increase research volume and quality
    - Need for research effort to get better understanding of P decline, role of PBI in modifying response and rate and P, K, Na interactions
    - Review research priorities

2. New Project Review

- Contribution to the CRDC project selection was made as requested with formal involvement in the selection process provided in 2006. In all other years' feedback was provided on prospective projects as requested.
- An informal survey of interested consultants for research priorities was undertaken in most years through various levels of contact. This information was provided to the Nutrition Co-ordinating Group or where requested assistance was provided to develop protocols, treatments, field layout or interpretation of data.
- Provided a conduit between the "informal" QDPI, QDNRM, and UNE working party on P in vertosols and Nutrition Co - ordination Group.
- The combination of low production due to lack of irrigation water and change in Incitec Pivot research funding priorities during the first 18 months of the project saw little achieved in research projects from IPL. In the last 12 months of the project a new staff appointment by IPL specifically to manage technical support and research management the northern grain and cotton segments saw IPL cotton research being conducted internally rather than co-operatively through CRC researchers as was planned in the original project proposal. The IPL researcher was seconded into the Nutrition Co-ordination Group Meeting to ensure activities and opportunities for collaboration were not missed.
- Where requested made available time to help nutrient supply companies (e.g. Nipro) and consultants (ICMS) develop research protocols and design file research.

3. Extension and Training

- To ensure more seamless and consistent provision of soil fertility and crop nutrition across the industry discussions were held with Dr John Stanley (UNE) about the incorporation of materials from workshop into the Postgraduate Certificate in Rural Science (**Cotton** Production) and the recognition of prior learning for attendees for certified workshop units that relate to the UNE course. Inconsistencies in recognition of prior competency (RPC) between the TAFE and university system were identified as a potential limitation to integration of training. Exchange of training materials for consistency across similar courses was identified as the next most important process to ensure industry training goals.
- Collaboration in development of the Information Sheet "Nutrient sampling guidelines for cotton" and article for the Australian Cottongrower to promote standardisation of soil and plant tissue sampling procedures for the cotton industry.
- Prepared a chapter on chloride in cotton for Nutripak
- Presentation and paper for Nitrous oxide /Nitrogen management 2006 workshops – St George, Goondiwindi, Moree
- Article prepared for and submitted for "Spotlight" based on nitrous oxide workshop paper
- Presented paper "Why should we measure and monitor soil health " at Soil Health Regional Forums –October 2006 - Narrabri, Dalby and Hillston
- Development of course content and competency mapping of the 1 day workshop "Understanding soil tests".
- Delivery of "Understanding soil test" workshop to growers and consultants at Moree, Dalby, Emerald and Theodore. Negotiations commence to deliver to consultant and growers in Hay and St George Sept – Oct 2008).
- Promotion of NutriLogic through use as an example of a decision support system at "Understanding Soil Testing" workshops.

4. Decision Support Information Integration and Introduction

- Provided insight into the operations of currently available commercial nutrient management DSS to researchers and discussed the compromise between accuracy and useability require for useability. Functionality for plant tissue DSS used in NutriLogic made available to commercial plant tissue analysis providers.
- Facilitated the incorporation of common approach to nutrient requirement of soil interpretation in Nutrient Advantage Advise (Incitec Pivot), Nutriwise (Landmark) and NutriPlanner (Elders).
- Contributed feedback about the upgrade of P and K modules in NutriLogic

- Promotion of NutriLogic Plant Tissue DSS across industry through direct contact with advisers and through training workshops.

Outcomes

Through this project common approaches such as soil test value/ application rate relationships residing in NutriLogic have been provided to, and introduced into commercial fertiliser management decision support software. Plant tissue interpretation methodology has also been provided but the down-turn in crop area has seen the role out of the module in commercial DSS stalled. Better alignment of the outputs from NutriLogic and commercially used nutrient management DSS such as those used by advisers supplied by Incitec Pivot, Landmark and Elders will end sure that base nutrient use guidelines are consistent across the industry, thereby reducing the risk of over-fertilisation or inappropriate application strategies. This is particularly the case with nitrogen management where the most frequent method of determining N rate was by inflexible recipe of set rate.

Personal and anecdotal experience indicated that there is a significant incidence of farmers having soil analysis done and then ignoring the high soil N found in the soil when determining the seasonal rate of application. In these cases substantial quantities of N fertiliser were used in situations where lesser quantities or no preplant N was justified. This appeared to stem from the inconsistent messages about the accuracy and value of soil analysis in crop nutrition and soil fertility management. The outcome of this was undoubtedly higher potential greenhouse gas emission from denitrification and economic losses from over-fertilisation. A two pronged approach to this situation was discussed and decided at the Nutrition Group Co-ordination Meeting. This consisted of developing programs to highlight current nutrient use efficiency (particularly N) and making available training to improve awareness of strengths/ weaknesses and technique to ensure most reliable outcomes from soil analysis. The NUE program was developed, co-ordinated and reported by Dr Ian Rochester (CSIRO) and Julie O'Halloran (NSW DPI).

The second part of the two pronged approach was to develop, test and implement full competency mapped and RTO aligned 1 day workshop ("Understanding Soil Testing- Cotton"). This workshop designed to improve the understanding of how to get the best out of soil and plant tissue analysis was developed, tested and rolled out to 4 grower and adviser groups by Dr Chris Dowling (NMS) and Helen Squires (NSW DPI) during the project and in parallel with the Healthy Soils Project. Feedback forms collected at the workshops and ongoing demand for the workshop provides insight into the value obtained from attendees at the workshop.

Conclusion

There still appears to be a wide variation in the understanding, skill and ability to manage nitrogen nutrition across the cotton industry despite significant effort over a considerable time span in the life of the industry. This appears to have been a result of lack of economic consequence for "getting it wrong", mixed messages from

research, lack of a risk x economic framework for crop nutrition decision making. In the last 12 months of the project significant increases in the cost of nitrogen and phosphorus supplementation from manufacture N products, greater potential penalties faced for poor nutrient use efficiency and the decline in the cotton price/fertiliser price ratio compared to other crop option has see grower who have had the water to continue to grow cotton reassess their approach to nutrient management. More rapid response to change will need to be a component of future crop nutrition extension. This will only be possible with greater efficiency in dissemination of information to remain relevant in rapidly changing physical and economic environment. The underlying fundamentals required to meet this challenge is to raise and standardise base skills. This will require all those who interact with cotton growers about soil fertility management and crop nutrition to be up-skilled using the latest verifiable and endorsed information. In this project progress was made in this direction with standardisation of sampling procedures, development of workshops on soil testing and updates to Nutripak, however the as the pace of change of input costs and environment imperative increases so too does the importance and complexity of decision making.

Work on the compendium of research results was severely hampered as a consequence of low commercial product research activity across the cotton industry resulting from a lack of irrigation water and planted area. It is also possible that a lack of "enthusiasm" for this activity among private companies may have also stemmed from the perceived "historical" associations of the project leader. As the prices of mainstream fertiliser continues to increase the is an rapidly increasing availability of alternate and fringe "fertiliser "products being introduced to the market there are now far too many to contemplate field testing so another approach to "warning and informing " would be at an appropriate time to relaunch the compendium approach.

Although due to industry downturns during the project period the impacted of the project was less than planned and objective were realigned, there will be enduring legacies of the project. Support for the continuation operation of the Nutrition Co-ordinating Group through voluntary association or with minimal financial support is recommended to help maintain consistency and focus around this key product input.

Extension Opportunities

The major extension opportunities to arise from the project have been the provision of the development of the common approach to DSS and the development of a standardised approach to measuring nitrogen use efficiency and training modules on soil testing. Both of these can contribute positively to the 15 % increase in nutrient use efficiency through increase confidence to manage soil fertility, crop nutrition and fertilisers on the basis of objective measurement and sound science.

Part 4 – Final Report Executive Summary

The primary aims of this project were to contribute to the CRC strategy to improve the efficiency of applied nutrients by 15 percent by facilitation to co-ordinate the public and private nutrition research and extension effort for the cotton industry. To meet these objectives and to provide operational flexibility the project was divided into 4 major areas of responsibility, Co-ordination/ Administration, Research Proposal Review, Extension and Training, Decision Support Information Integration.

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