Cotton

RESEARCH & DEVELOPMENT

Final Report

Project code Dan 144C

Cotton Industry Development Officer - Gunnedah

Mark Hickman

NSW Agriculture
PO Box 546
Gunnedah 2380 NSW
Australia. Tel. + 61 2 6741 8379

NSW Agriculture

ISBN 0 7347 1430 0

January, August & Final Reports

REPORTS

Part 1 - Summary Details

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

CRDC Project Number: **Dan 144C**

January Report:	☐	Due 29-Jan-02
August Report:	☐	Due 02-Aug-02
Final Report:	☒	Due within 3 months of project completion

Project Title: Cotton Industry Development Officer - Gunnedah

Project Commencement Date: 01-07-99 **Project Completion Date:** 30-06-02

Research Program: Technology Transfer and Extension

Part 2 – Contact Details

Administrator: Mr Graham Denney, Manager External Funding
Organisation: NSW Agriculture
Postal Address: LMB 21 Orange, NSW 2800
Ph: (02) 6391 3554 **Fx:** (02) 6391 3327 **E-mail:** graham.denney@agric.nsw.gov.au

Principal Researcher: Mark Hickman, Cotton Industry Development Officer
Organisation: NSW Agriculture
Postal Address: PO Box 546, Gunnedah, 2390 , NSW
Ph: 02-67418379 **Fx:** 02-67422940 **E-mail:** mark.hickman@agric.nsw.gov.au

Supervisor: Dallas Gibb, Program Leader Cotton
Organisation: NSW Agriculture
Postal Address: Locked bag 1000, ACRI, Narrabri 2380 NSW
Ph: 02-67991500 **Fx:** 02-67991503 **E-mail:** dallas.gibb@agric.nsw.gov.au

Researcher 2 (Name & position of additional researcher or supervisor).
Organisation:
Postal Address:
Ph: **Fx:** **E-mail:**

Signature of Research Provider Representative: V. Loveridge on behalf of DALLAS GIBB

Part 3 – Final Report Format

The points below are to be used as a guideline when completing your final report.

1. Outline the background to the project.

This final report refers to the position of Cotton Industry Development Officer Gunnedah which was funded under project DAN 144C.

Industry Development Officer (IDO) of Gunnedah is part of the National Extension Service. This position has been successful in increasing technology adoption by local growers. As well as playing a role in national extension activities, the position has also worked with local growers and consultants to develop extension programs focusing on local production issues.

Large scale farm trials / demonstrations, grower groups under the charter of local area wide insect management form a critical component of extension activities. The promotion of BMP to growers and the local community are also key components of this position. The position provides strong links between growers, consultants, researchers and the wider community.

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

Objective 1. To coordinate the adoption of research into sound management practices within the Upper Namoi cotton growing region. As part of the adoption process, the position is to develop a framework of regional trials/demonstrations (in liaison with researchers). The position is also to facilitate better communication between farmers, advisers and researchers from all sectors of the cotton industry including government and agribusiness.

Extent of achievement:
During the past 3 years I have actively participated as a committee member of the Upper Namoi Growers Cotton Growers Association (UNCGA). My main role within this organisation has been to provide technical updates on research issues, coordinate and conduct local research as well as being the primary organisational point for co-ordinating the local annual field day and grower bus tours.

To assist with identifying local research needs I have established an R & D subcommittee within the UNCGA. The subcommittee consist of representatives from across the valley to ensure all production issues are raised. In conjunction to this sub committee, I have established and continued to foster, networks with both regional CCA representative and individual consultants. This is to facilitate the ownership of local research and development activities.

Once both the national (industry wide) and local (valley wide) issues have been identified, I initiate experiments on local properties to address these particular issues. Growers are also encouraged to establish their own demonstration or trial sites if they desire. These sites are then open to the public where suitable as field days, farm walks and grower meetings, to promote the research findings. At the completion of the experiment, the findings are disseminated to the wider community through local field days, regular publications such as The Upper Namoi grower magazine and the publication of a cotton trial booklet.

During the cotton season, I provide extension information through an article I write called "What's happening in R & D". Articles appear regularly in the local bi-monthly grower magazine. In addition to this publication, I write and disseminate a technical newsletter

called the "Upper Namoi Cottontales". Complementing these publications is the continuous "on the job" dissemination that occurs with field visits I make as required.

Objective 2. To help the Upper Namoi Cotton Grower Association direct and respond to gaps in the current research base as well as adapting existing technology to local trends.

Extent of achievement:
During the term of the project there have been numerous field experiments dealing with a wide range of issues identified by either the national extension team or the grower / growers association. A local, grower dominated research and development subcommittee was established as a mechanism to prioritize and identify extension activities.

An example of a knowledge gap identified by this research and development committee was the desire to map the extent of salinity within the irrigated Breeza plains. I assisted the UNCGA successfully apply for external funds from the National Heritage Trust to employee Dr John Triantifilis (Cotton CRC / University of Sydney). Dr Trifanilis funds were to evaluate the current status and potential risk of salinity under the irrigation country on the Breeza Plain. This project was still in the laboratory analysis stage at the time this final report was being compiled.

Objective 3: To assist in the implementation of the cotton industry's " BMP" (best management practice) program.

Extent of achievement:
During the term of this project I have continued to provide technical support to Cotton Australia to assist in the implementation of BMP. This has involved the production of a one page flier outlining what was required in a spray drift management plan. Conducting one on one farm visits to assess the farms BMP compliance on various topics. As well as assisting the local Cotton Australia representative to conduct grower group meetings to help growers complete their BMP manual. This role of technical support to Cotton Australia in the BMP process will continue into the future.

Objective 4: To assist in the development and implementation of IPM practices for the management of pests and diseases.

Extent of achievement:
Integrated pest management has been a strong focus of my position over the past three seasons. IPM projects, have included the collection and coordination the heliothis egg for insecticide resistance testing and whitefly population identification. Results were faxed to consultants and growers, as they become available. In conjunction with these collections, I have maintained a series of pheromone traps across the valley to monitor moth flights. These results are also disseminated within the production area.

A wide range of applied research experiments were conducted during the term of this project focusing on IPM. Experiments included small plot experiments assessing the plants ability in a cool season area to compensate for early season insect damage. Treatments included stand-alone treatments, which involved the physical removal of growing points at 4,10 and 4+ 10 nodes. As well as leaves being defoliated at node 4. With the final treatment being the most severe where plants were tipped and defoliated at node 4 and re-tipped at node 10, photo 1. Only this treatment and

the defoliation of leaves resulted in a significant yield penalty as see by figure 1. In previous seasons only the full combination treatment resulted in a decline.

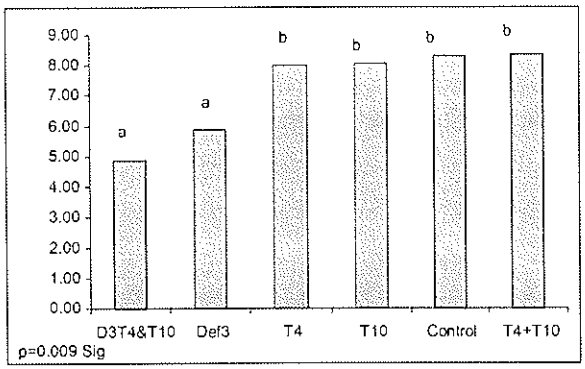

Figure 1: Breeza 2000-01

Photo 1: Planted defoliated at node 4 and tipped at node 4 and 10

Several larger scale IPM focused experiments were conducted over the three year period. These experiments consisted of various heliothis threshold experiments, validation of crop oils as a possible component in IPM systems, and the assessment of early and late season trap crops for the Upper Namoi.

A farming system experiment was conducted which focused on the concept of crop "earliness". The aim of the "earliness" experiment was to assess what components of a cotton production system contribute towards a crops "earliness". This site was run in conjunction with Grant Roberts, Cotton CRC / CSIRO farming systems researcher. Results indicated that varietal selection was a significant factor in a short season area. A satellite experiment of late season pix applications was also conducted with results revealing no benefit in yield or maturity due to this practice.

Experiments that assessed trap cropping options for the Upper Namoi, validated chickpeas as a suitable option early season and pigeon peas planted in late December as a late season trap crop. Pigeon peas planted into triticale stubble at Boggabri on the 14-12-00, commence flowering in late February. At the peak flowering period of early April the maximum pressure recorded was 59 total larvae per metre. With cotton fields closer to the pigeon peas recording lower pressure, closest cotton field 6.51 vs the furthermost cotton field 21.5larvae/m. Both cotton fields were attractive at the time.

The main IPM focus for the last 2 seasons has been the establishment and development of 4 area wide insect management groups (upper and lower Breeza plain, Carroll and Harparary). Established goals included limitations on the use of disruptive chemistry such as organophosphates and pyrethroid. All four groups are operating at different levels of involvement. The Harparary group is the most dynamic, with growers in this region reporting on a fortnightly basis the level of beneficial insect activity which is faxed to myself and redistributed to the group members. This exercise provided the group with a large degree of confidence when they were aware of the neighbour's situation. Other activities undertaken by the group include spray application workshops using models for banding of herbicides (photo 1) and with fluro dye for ground rig applications of insecticides (photo 2).

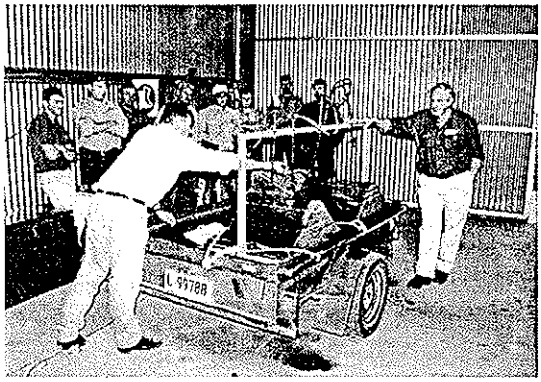

Photo 2 : Banding herbicide demonstration

Photo 3: Mullaley spray Application workshop

Benchmarking of the area wide groups has been an exercise that has provided a strong catalyst for bringing the groups together. Figure 2 indicates the trend that has been found both in the Upper Namoi Valley and other valleys. The more disruptive the chemistry applied (higher BDI) then the lower the gross margin to the grower. This trend is the same for either conventional or Ingard cotton and was not a reflection of sowing date. The next 3 year project will continue the benchmarking exercise and attempt to incorporate or adjust for insect pressure.

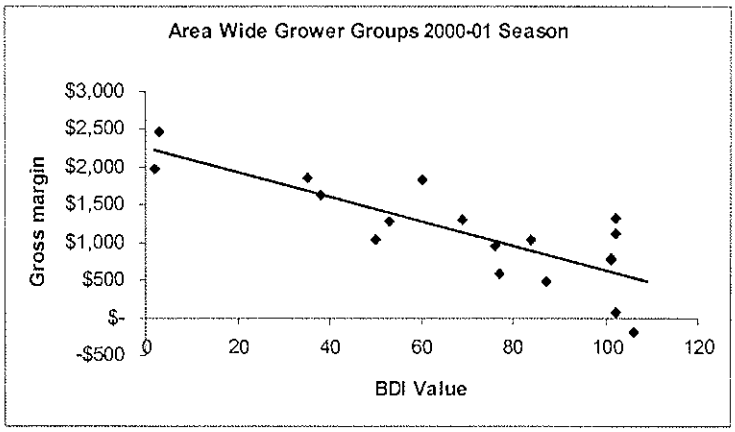

Figure 2: *Gross Margin Vs BDI Total*

Diseases:
In conjunction with the local grower association, a community awareness campaign has been conducted both prior to and after the first case of Fusarium was identified. Once Fusarium was confirmed in the Upper Namoi a series of public meetings were called to disseminate information about the disease, entry on farm, delivery routines and wash down areas. The service industries strongly supported this extension campaign, however, grower adoption of adequate wash down bays and protocols has been slow. More activities addressing this area will be planned for the 2003-05 project. To date the Upper Namoi Valley has 3 cases of fusarium wilt confirmed.

In addition, the incidence of Black root rot has continued to increase at an alarming rate, the extension campaign will continue with the new project. Unfortunately, the grower community place a lower status on the Black root rot in comparison to fusarium wilt.

Objective 5: To promote decision support systems such as SOILpak, SPRAYpak and COTTONlogic.

Extent of achievement:
Extension activities related to SOILpak involved a soil pit field day with growers and their consultants. Increase awareness of the manuals contents and experience in identifying soil problems were the main achievements of the field day. Subsequent discussions with growers revealed an adoption of soil pits as an assessment tool on many enterprises.

SPRAYpak was addressed through a series of spray application workshops either associated with area wide grower groups or as stand alone functions. Issues such as endosulfan application, minimisation of ground rig drift and targeting sprays to improved biological insecticide effectives were some of the topics used to promote the Spraypak manual. Fluorescence dye workshops formed the basis of the extension activities.

CottonLOGIC had an extension campaign that included grower support workshops that occur annually, the use of cottonLOGIC to record all insect trial data. This data was then promoted through trial booklets. Finally, the palm pilot system of cottonLOGIC was used in the summer of 2001, to show local consultants the benefits of the system and provide feed back to the CottonLOGIC team on that softwares development. The adoption of CottonLOGIC in the Upper Namoi increased dramatically with the promotion of the Best management guidelines. CottonLOGIC was seen as a very appropriate data record keeping package.

Objective 6: Collaborative research into Ultra Narrow Row Cotton; Project DAN 131C

Extent of achievement:

Project Dan 131C involved the evaluation of Ultra Narrow cotton as an alternative production system for cool season areas. At Breeza I coordinated and evaluated this possibility, in collaboration with Dr Jack Cooper (NSW Agriculture Trangie). Field results were extremely encouraging, with 14 - 21 days earliness and increased yields. Figure 3 outlines the yields assocaited with various UNR populations when harvested with a commercial harvester as shown in photo 3. However, harvesting equipment currently used on a commercial scale was not acceptable. With the current harvesting technique marketing organisation have concerns over trash and quality issues. In the evaluation at Breeza, this concern was not an issue. Of the two commercial growers in the Upper Namoi, one had a similar experience to the Breeza experiment and the second suffered major trash penalties. Weather conditions and a timely defoliation are extremely critical to ensure quality issues are avoided.

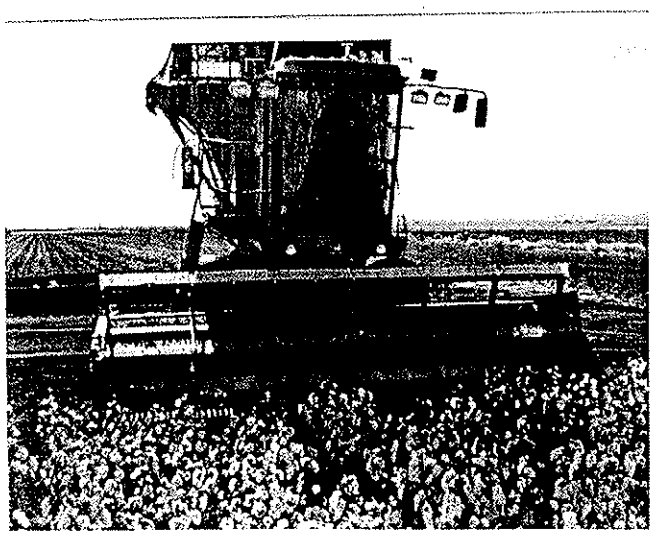

Figure 3: UNR Cencorp harvest front

During this project, I shared my acquired knowledge from field experiments and a USA study tour (1999) through various regional field days, as a UNR cotton speaker at the 10th Australian Cotton Conference (Brisbane, QLD 1999) and co-

organiser of / speaker at the 2nd Australian UNR Cotton Conference (Griffith NSW , 2000).

Additional Activities

1. National Extension Team (Farming Systems)

Over the past three seasons, I have been the team leader of the National Cotton CRC Farming System Extension Team. During this period I have coordinated and encouraged the development of extension material relating to the Australian cotton farming system. The teams main achievement has been the collaborative effort with members of the CRDC organisation in producing the "Cotton Rotation Guide - Advantages and Disadvantages". This guide is focused on the impacts of various rotational crops on the following cotton crop. It outlines the advantages and disadvantages of each , in a wall planner style colour coded chart. This chart hs melted research findings from a wide range of sources.

Additionally, I have written paper and presented on behalf of the farming system team at various workshops and seminars. Some of the workshop papers are listed in the publication section of this report.

2. Water Use efficiency Workshop

Water reform developed into a strong focus within the Upper Namoi Valley over the last year of this project. In response, I conducted in association with the local water use efficiencies officer two major water use efficiency days and a commercial scale replicated experiment investigating irrigation deficits.

The first workshop focused on the tools that are available to best measure water use efficiency at the farm and field level. Various soil monitoring equipment was demonstrated along with simple techniques for flow rate calculations using a stop watch and bucket, as seen in figure 4.

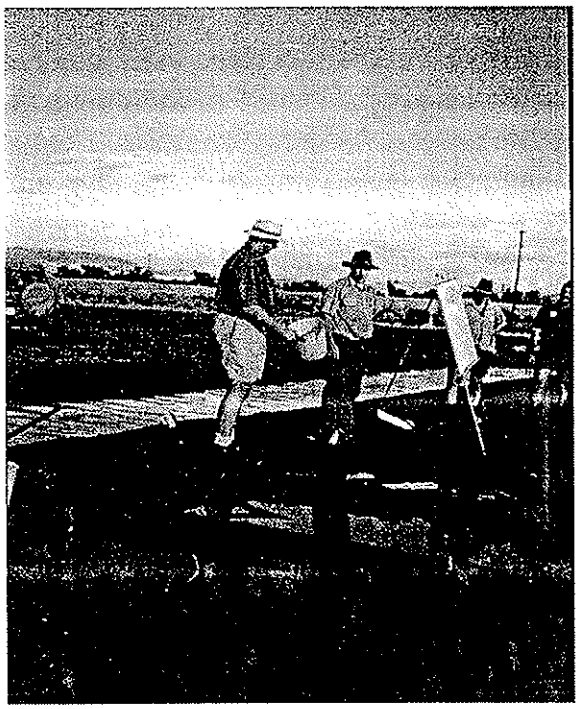

Figure 4: Simple WUE Calculations

The second workshop was a seminar / field trip to explain the current status of subsurface drip irrigation and potential role in the cotton industry. Again this was done in partnership with the local water use efficiency officer. This whole day event covered all the commercial suppliers, technical support and grower feedback from people that have used it under lucerne.

3. Herbicide damage trials.

As a consequent of producing cotton in a truly mix farming community, there is always off target drift of non cotton herbicides onto near by cotton fields. As a result, I established in conjunction with Dr Andrew Storrie and Dr Tony Cook , both of NSW Agriculture, Tamworth, a simulated herbicide drift experiment. The site was commercially grown and yield and quality data was collected. Results of the experiments are written in the industry magazine the "Australian Cottongrower" and 2002 Australian Cotton Conference proceedings.

The site was used for numerous field days that educated local growers, consultants and the wider community on the leave symptoms and potential hazard of chemical drift. Rates of the simulated drift were as low as 0.001% and as high as 30% of product that would be commercially recommended. Yield impacts and leaf damage was remarkable different for the various rates and products tested.

3. How has your research addressed the Corporations three outputs: Sustainability, profitability and international competitiveness, and/or people and community?

All three key ouputs were addressed by the project. Sustainability of natural resources; was addressed by extension of research outcomes in the areas of soil and water and nitrogen management. Profitability sustainability and competitiveness; are addressed by the improved adoption of IPM stratgeies for insect, weed, disease and nitrogen management.

People and/or communities; outcomes are addressed through working with Cotton Australia, local schools and non cotton producers in promoting the industries BMP program as well as the core industry's focus on sustainable management.

4. Detail the methodology and justify the methodology used.

All experiments that were conducted during this 3 year project were commercial scale replicated sites. Results from these activities are published in the Upper Namoi Cotton Trial booklet as a record for the whole cotton industry to utilise. Extension methodology used during this project included group facilitation, one on one grower activities, small and large field days on a variety of topics, and benchmarking activities. A series of extension articles in the form of either an Australian Cottongrower article, Cottontales or contributions to the Upper Namoi bimonthly newsletter were produced to disseminate the research that was locally conducted.

5. Detail results including the statistical analysis of results.

Results from the various research experiments conducted in the Upper Namoi can be found in the Upper Namoi Valley Cotton Trial booklet of 1999 and 2001. These experiments were all statistically analysed.

6. Discuss the results, and include an analysis of research outcomes compared with objectives.

Refer to Part 3 , question 2 for details.

7. **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 and future research needs.**

The extension activities associated with this project have contributed significantly to the following main areas. The successful implementation of area wide insect management, and IPM practices for insect control. The application of insecticides within the valley has improved through these projects extension activities. Local EPA representatives commented on a reduction of pollution hotline complaints over the last three seasons. BMP adoption has increased through a combined extension effort with Cotton Australia. In 2000 there was 98% of growers introduced to the manual with that figure resulting in 11% undergoing an external audit, 16% of growers ready for an audit, 36 % progressing through an audit and 35 % have yet to start the process.

In relation to the UNR cotton production system, there is grower support for the system locally. This support is based on the research proving both a yield and maturity advantage can be achieved within the Upper Namoi Valley. However, the major limitation that is preventing this system being widely adopted is the harvesting equipment that is commerically available and the associated discounting of returns due to trash. While my experiments showed that this was not an issue if the production was done correctly and in a very timely fashion. Several commercial growers did achieved higher yields and maturity benefits, however they also incurred extremely high trash discounts. Focusing them to abandoned the system for now. Unless the harvesting equipment is improved the system will not be adopted.

Describe the project technology (eg. commercially significant developments, patents applied for or granted licenses etc).

Not applicable

8. **Provide a technical summary of any other information developed as part of the research project. Include discoveries in methodology, equipment design, etc.**

Not applicable

9. **Detail a plan for the activities or other steps that may be taken;**

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

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

   Project DAN 168C is a continuation project of DAN 144C. Future information dissemination and develop of project technology is to be covered by this new project.

10. List the publications arising from the research project.

Conference papers

Hickman, M.A. (2000) "Issues for Ultra Narrow Row Cotton In Australia: Agronomy , Machinery and Ginning.", *10th Australian Cotton Conference* , Convention Centre Brisbane, August 15-18th .

Hickman, M.A. (2001)"Growth Regulator Strategies for UNR Cotton", 2nd Australian Narrow Row Cotton Conference, Griffith, March 5-6th.

M. Hickman 2002 Area Wide Management Of Helicovpera "Using the Cotton Industry As An Example" *NSW Agriculture District Agronomist Conference 2002, 5th - 7th February 2002, University of Sydney, Orange Proceedings* 83-86

Seminar papers

M. Hickman (2000) "WUE and the Cotton Industry", Irrigation Technical Working Committee, NSW Agriculture Orange , December 2000

M. Hickman, (2000)"Extension activities in the area of Farming System", Farming system Forum 2000: Proceedings, Dalby , December 2000

Hickman, M.A. (2001)"Extension activities in the area of Farming System", CRC 2nd Year Review , Narrabri July 2001

M. Hickman, 2001 "The principles of Integrated Pest Management using the Cotton Industry as an example", *Train the Trainers Forum,* TOCAL Maitland, 31st May 2001.

M. Hickman (2001),"Crop Management in Cool / Warm season areas", IPM Pilot Short Course Program Trangie (October) and Narrabri (December) 2001.

M. Hickman 2001 Extension, Incorporating new practices effectively into Farming Systems Farming system Forum 2001: Soil Health Workshop Proceedings, Australian Cotton Research Institute, December 6th and 7th 2001

Journal or Magazine Article

Roberts, G. and Hickman, M. (2000) "Herbicide Options for Unwanted Cotton", *Australian Cottongrower* July-August 2000, p8-10.

M. Hickman 2001 Upper Namoi Valley District Report *Australian Cottongrower Magazine* 23 No2 March -April 2002 86-87

M. Hickman 2001 Upper Namoi Valley District Reports *Australian Cottongrower Magazine* 22 No 6 November -December 2001 107

M. Hickman 2002 Upper Namoi Valley District Report *Australian Cottongrower Magazine* 23 No 1 January - February 2002 95

M. Hickman 2002 Upper Namoi Valley District Report *Australian Cottongrower Magazine* March - April 2002

Miscellaneous reports and other standalone publications

Hickman M, Gibb D, (1999), "Plant growth matrix", Integrated pest management guidelines support article No. 12.

M.Hickman 2001 Cotton Tales No1: Registered Herbicides for Pigeon Peas Cotton Tales No1 NSW Agriculture / Australian Cotton CRC

M. Hickman 2001 Cotton Tales No2: Seedling diseases 26-10-01 Cotton Tales No2 NSW Agriculture / Australian Cotton CRC

M. Hickman 2001 Upper Namoi Valley Cotton Tales No3: New BDI Table (5-11-01) Cotton Tales No4 NSW Agriculture / Australian Cotton CRC

M. Hickman 2001 Upper Namoi Valley Cotton Tales No4: Subsurface drip irrigation (13-11-01) Cotton Tales No4 NSW Agriculture / Australian Cotton CRC

M. Hickman 2001 Upper Namoi Valley Cotton Tales No5: Ingard Management (5-12-01) Cotton Tales No5 NSW Agriculture / Australian Cotton CRC

M. Hickman 2001 Upper Namoi Valley Cotton Tales No6: Field to fabric (21-12-01) Cotton Tales No6 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No7: Green Vegetable Bugs (8-1-02) Cotton Tales No7 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No8: Heliothis and Whitefly resistance data (29-1-02) Cotton Tales No8 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No9: Premature Senscesence in cotton (27-2-02) Cotton Tales No9 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No10: Causes of Sticky Cotton (21-3-02) Cotton Tales No10 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No11: Heliothis and Whitefly

Resistance Data (4-4-02) Cotton Tales No11 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No12: 2002-03 Resistance Management Strategy version 1 (17-4-02) Cotton Tales No 12 NSW Agriculture / Australian Cotton CRC

M. Hickman 2002 Upper Namoi Valley Cotton Tales No13: Resistance Management Strategy Version 2 (13-6-02) Cotton Tales No16 NSW Agriculture

M. Hickman 2002 Upper Namoi Cotton Growers Association Inc Newsletter: February 2002 " Whats Happening In R & D " UNCGA

M. Hickman 2001 Upper Namoi Valley Cotton Trials 2001 ISSN 1445-9264 CRDC, Australian Cotton CRC, UNCGA, NSW Agriculture

M. Hickman, S. Deutscher, VJ Wigney 200 Integrated Pest Management: Focus Group with the St. George Cotton Growers (31-10-01) Australian Cotton CRC

S. Deutscher, VJ Wigney, M. Hickman 2001 Integrated Pest Management : Focus Group with the Mungindi Cotton Growers (31-10-01) Australian Cotton CRC

M. Hickman 2001 Upper Namoi Cotton Growers Association Inc Newsletter: October 2001 "Whats Happening in R & D" UNCGA

Report to Funding body

M. Hickman CDRC January, August Report Project No CRC12C and DAN 144C Industry Development Officer- Gunnedah

M. Hickman (1999), United States of America Cotton Study Tour (Final Report) Dan 132C

11. Are changes to the Intellectual Property register required?

Not applicable

Part 4 - Final Report Plain English Summary

Provide a half to one page Plain English Summary of your research that is not commercial in confidence, and that can be published on the World Wide Web.

The Gunnedah Industry Development Officer position has played an integral role in the development of community attitudes, farming practices within the Gunnedah region. Issues such as resource allocation to improve production and the continual reduction of environmental exposure to pesticides were of priority. This has been achieved through extension programs addressing the adoption of best management practices, control of insects using a group approach through area wide management and the adoption of integrated pest management practices. Various spray application workshops were conducted using the fluorescence dye technique to illustrate to the grower community how to minimise off target drift and improve in crop efficacy. In addition water use efficiency experiments and workshops were conducted. Alternative production systems such Ultra Narrow Row or Twin row cotton were assessed for viability.

My role in the UNCGA association was a liaison role. As the local IDO I provided a communication channel with the research and development funding bodies and local state agencies such as EPA and NSW Agriculture. Communication channels were also established with local industry representatives, ranging from Cotton Australia, commercial resellers and local private consultants.

In summary this role was an applied research and liaison role within the Upper Namoi Community. Growers see this position as a source of unbiased independent advice that assists them in the areas of production and environment management .

Part 5 – January Supervisor Report (Scholarships Only)

The Scholarship Recipient's Supervisor is to provide a brief statement on the Recipient's progress and achievements during the relevant year and whether the Recipient is fulfilling the requirements of the postgraduate or undergraduate course in which the Recipient is enrolled.