January, August & Final Reports

Part 1 - Summary Project Details **REPORTS**

Please use your TAB key to complete parts1,2,4 & 5

CRDC Project Number:
Dan125C

January Report:	☐	Due 29-Jan-01
August Report:	☐	Due 03-Aug-01
Final Report:	☒	Due within 3 months of project completion

Project Title:

Part 2 – Project Contact Details

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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.**
   The initiation of the purchase of the high clearance applicator was derived after the research officer (Grant Roberts) conducted experiments at seven different field sites in 1997/1998 from Carol in NSW to Bowenville in Queensland. In conducting these experiments it became obvious that a major limitation to managing these experiments was the ability to quickly apply herbicides to experimental plots in the field. At that time the researcher and assistant prepared herbicides the previous day and applied herbicides to trial plots using a 4m hand boom. Where large scale field trials were necessary it was nearly impossible to apply all the required treatments in the same week, which was necessary to maintain the integrity of the experimental design.

2. **List the project objectives and the extent to which these have been achieved.**
   1. To purchase and construct a high clearance herbicide applicator vehicle for herbicide, insecticide, foliar fertilizer and pix applications. A purpose built high clearance applicator was constructed primarily for use in experimental plots designed to evaluate different weed management strategies utilising herbicides. The applicator was delivered to the Research Officer (Grant Roberts) in November 1998. The performance of the applicator satisfied the design parameters. However, the cost to design and build the applicator was greater than originally anticipated. This resulted in the project having insufficient funding to install the DGPS system originally planned. The speed measuring device used in the high clearance applicator, while adequate for some applications, could possibly be improved with the additional purchase of a more sophisticated ground radar system. A new Cotton CRC Research Officer (Ian Taylor) was appointed to replace Grant Roberts as a weed scientist in July 2000. It was decided, that to gain the maximum benefit from the applicator a Dickey John spray controller using radar to provide the speed input be fitted to the High Clearance Applicator. The benefit of this was two fold. Firstly, the radar based speed detector potentially eliminated inaccuracy of the previous system and secondly, a small hand held GPS could be connected to the controller via an RS232 cable. The inclusion of the spray controller and hand held GPS provided GPS referencing for the High Clearance Applicator, although at a limited accuracy. (Not sub meter as was originally proposed) The inclusion of a GPS allows broad site referencing at individual trial sites for return applications in future years.

   2. To purchase and evaluate a Differential Global Positioning System(DGPS) which when attached to the high clearance applicator will remove the need for field pegs.

   Due to higher than expected production costs this component of project was not able to be finalised. Please see above comments.

3. **How has your research addressed the Corporations three outputs: Sustainability of natural resources, profitability and competitiveness, and/or people and communities?**
   The purpose of the high clearnace applicator was to reduce the field walking of chemical applications. The design and use of high precision radar controlled spray applicators with GPS referencing is consistent with the most advanced spray equipment currently being used within the Australian Cotton Industry. The high clearance applicator allows researchers to deliver pestcides safely to the target sites at all stages of crop growth from pre-emeregent to defoliation. In addition the potential to study the impact and precision of GPS guided spray equipment is also now possible. In conjunction with the radar controlled speed system the high clearance applicator is capable of delivering extremely accurate doses of pesticides where necessary. The aim of building this equipment has therefore been satisfied in terms of the Corporations three primary outputs. The delivery of herbicides with greater precision will afford increased protection of our natural resources and will allow researchers to accurately quantify the benefits that could be obtained with better placement of herbicides. Greater accuracy of delivery will result in less wastage of chemical leading to greater profitability and therefore a more competitive industry. While it is acknowledged that these specific objectives have not as yet been quantified it is envisaged that in the future this could be achieved.

4. **Detail the methodology and justify the methodology used.**
   N/A

5. **Detail results including the statistical analysis of results.**
   N/A

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

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.**
   N/A

8. **Describe the project technology (eg. commercially significant developments, patents applied for or granted licenses etc).**
   N/A

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

The high clearance applicator currently allows researchers to accurately apply up to eight different pesticide treatments to experimental plots in field experiments before requiring additional pesticide. As well, 8m broad-acre spraying can also be accomplished from a 300L central tank. The applicator has been designed with a parallel lift hydraulically actuated variable boom so that the spray nozzles can be positioned at correct height for application, minimising drift and off target impacts, as well as ensuring correct coverage of pesticides (particularly herbicides). Alternatively drop nozzles can be fitted to the applicator allowing the accurate placement of herbicides within a crop as a plot directed spray.

A single herbicide or herbicide mixture can be placed into one of eight 20L stainless steel canisters, each with in-built level sensors to monitor herbicide quantities. An air compressor with variable pressure output is used to displace herbicide from the tanks to any or all of the booms. Selection of the booms is controlled via eight electrical solenoids each individually controlled from within the cabin. The cabin is airconditioned and also has a positive pressure fan to prevent herbicides or carriers from entering the cabin, allowing the operator to spray safely throughout the year. The high clearance applicator is an extremely flexible and robust unit that allows researchers to compare a number of herbicide treatments with much greater efficiency than was previously possible. With the addition of the radar controlled speed device and Dickey John control system greater accuracy has been attained in terms of application speed thereby affecting output rate. This has resulted in more even coverage of herbicides and therefore greater confidence in results achieved from field experiments.

10. **State the recommendations on the activities or other steps that may be taken to further develop, disseminate, or to exploit the project technology.**

N/A

11. **List the publications arising from the research project.**

Nil

Part 4 – Final Report Plain English Summary

You must submit a half to one page Plain English Summary of your research proposal that is not commercial in confidence, and that can be published on the World Wide Web. An electronic copy of the Plain English Summary must also be forwarded by e-mail (angela@crdc.org.au).

The construction of a high clearance experimental sprayer capable of applying a number of different herbicde treatments quickly and efficiently was identified as a priority in weed research. It is often necessary to apply a number of spray treatments at various cotton and weed growth stages to determine the most effective method of controlling a range weeds commonly found in cotton crops. Prior to the construction of the high clearance applicator the most common method of applying herbicides was by gas powered back pack sprayer through a 4m hand held boom. Using this method it was often difficult to apply the required number of herbicide treaments in the same day at different sites.

The construction of this unit was the first of its kind in Australia, as far as we are aware of. Many overseas reaserchers have also commented on its unique design and operational flexibility. The ability to apply up to eight different herbicides simultaneously and safely from a pressursied cabin has improved the conduct and quality of research in the Cotton CRC's weed management group. In addition the ability to transport the unit off ACRI has allowed additional off station research to be conducted.

The sprayer was constructed in conjunction with Armour Industries in Gunnedah and delivery was accepted in November 1998. The addition of a Dickey John spray control unit which uses radar to determine spray speed was added to applicator. This unit has improved clear ground speed accuaracy and allows the connection of a hand held global positioning system (GPS) desired as part of the original concept to ensure spray site referencing accuracy.

The high clearance applicator has and is used in a number of herbicide, pix, defoliant and farming systems trials conducted both on and off the Australian Cotton Research Institute.