



January, August & Final Reports

REPORTS

Part 1 - Summary Details

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

CRDC Project Number: **CSP144C**

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

Project Title: Cool room for ACRI based projects - Capital

Project Commencement Date: 01/07/2000 **Project Completion Date:** 30/06/2002

Research Program: Farming Systems Agronomy

Part 2 - Contact Details

Administrator: Ken Parker - CSIRO Laboratory Manager

Organisation: CSIRO Plant Industry

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 02 67991500 **Fx:** 02 67931186 **E-mail:** ken.parker@csiro.au

Principal Researcher: Dr Michael Bange - Senior Research Scientist

Organisation: CSIRO Plant Industry

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 02 67991500 **Fx:** **E-mail:** michael.bange@csiro.au

Supervisor: Dr Greg Constable - CSIRO Program Leader

Organisation: CSIRO Plant Industry

Postal Address: Locked Bag 59 Narrabri NSW 2390

Ph: 02 67991500 **Fx:** 02 67931186 **E-mail:** greg.constable@csiro.au

Researcher 2 (Name & position of additional researcher or supervisor).

Organisation:

Postal Address:

Ph: **Fx:** **E-mail:**

Signature of Research Provider Representative:

Part 3 – Final Report Format

1. Outline the background to the project.

This is capital item funded by the CRDC to support CRDC funded project CSP140C ‘The impact of temperature extremes on cotton performance’. The installation of a controlled Temperature Cold Room Facility at ACRI Narrabri is to study chilling injury of cotton, at emergence, development to flowering, and boll period (including the impacts on fibre quality).

Having a facility at Narrabri allows specific types of experiments to be conducted. There is presently no cold room facility at ACRI where the temperatures can be change accurately for this type of experimental work. Ranges of cold and cool temperatures need to be generated to determine the severity of their impacts on different stages of cotton crop development. In addition to this, other cold rooms at ACRI are being used for storage of experimental material, and temperatures cannot be changed.

Having this type of cold room facility at Narrabri will:

- Allow a greater number of experiments to be conducted without jeopardising material stored in other facilities.
- Be able to generate a range of temperatures which will allow more confirmation of the impacts of cold temperatures and give the ability to determine more accurately the critical temperatures at which the impact on crop growth and development occurs.
- Allow a greater number of treatments for different stages of crop development to be exposed to a greater range of temperatures. The plants exposed to the cold treatments will be grown in a more natural environment conducive with existing cotton growing regions.
- Enable more experiments to be conducted because the scientist and the technician to conduct these experiments are based at Narrabri.

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

Purpose: To study chilling injury of cotton, at emergence, development to flowering, and boll period (including the impacts on fibre quality).

Objective: Install a controlled Temperature Cold Room Facility at ACRI Narrabri

Three different quotes were obtained for the production and installation of the cold room. The cold room was installed in July and August by PBS Refrigeration based in Tamworth. The room is fully functional, and is presently being tested for accuracy and variation in room temperature.

The room is equipped to vary temperatures from 20 to -15 degrees Celsius. It is also equipped with appropriate lighting and benches to undertake trials exploring temperature effects on cotton growth and development.

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

This capital item supports the CRDC funded project ‘The impact of temperature extremes on cotton performance’ which addresses all outputs prescribed by the CRDC. Better understanding and improvement of the day degree function for example will assist with crop management directly, as well as through the decision support tools CottonLOGIC and crop simulation models. CottonLOGIC assists with BMP, while crop simulation is used to characterise risk of agronomic production as well as being used to assess production potential for new regions. Crop simulation is also being used to develop information for land and water management plans as well as being used by growers to improve their WUE. Better understanding of different genotypic responses to extreme temperature will also assist directly with agronomic practice as well as plant breeding.

4. Detail the methodology and justify the methodology used.

This capital item supports the CRDC funded project ‘The impact of temperature extremes on cotton performance’ and will have a strong focus on field experiments in a range of climates and where necessary complementary studies under controlled conditions will also be conducted. Sowing date experiments in locations such as Kununurra, Emerald, Bourke, Narrabri, Breeza and Hillston will create very diverse temperature combinations. An important element of this project will be to work with other researchers to collect information from trials spread through the cotton growing regions, including those in northern Australian.

Genotypes used in this study will include current commercial cultivars as well as genotypes known for their potential adaptation to extreme environments. Some screening of genotypes for cold and heat tolerance will occur in this project, but breeding new cultivars will be part of the CSIRO breeding program. New cultivars take at least eight years to develop.

Measurements will include accurate recording crop developmental stages, daily climate variables, crop growth rates, fruit development, crop maturity, yield and quality. This will allow us to:

- Derive field based temperature response functions for a range of key developmental processes including: time to 1st square, square production rate, and fruit development.
- To directly measure the cold shock threshold for the first time and its impact.
- Determine whether the importance of cold shock is the same throughout development.
- Quantify the losses incurred by frost throughout crop development.
- Quantify the losses due to night respiration under high temperature conditions.
- Quantify the genetic variation within existing commercial cultivars and explore potential genotypes for better adaptation to temperature.

Objective: Install a controlled Temperature Cold Room Facility at ACRI Narrabri

Purpose: To study chilling injury of cotton, at emergence, development to flowering, and boll period (including the impacts on fibre quality).

This is capital item funded by the CRDC to support CRDC funded project CSP140C 'The impact of temperature extremes on cotton performance'. The installation of a controlled Temperature Cold Room Facility at ACRI Narrabri is to study chilling injury of cotton, at emergence, development to flowering, and boll period (including the impacts on fibre quality).

Three different quotes were obtained for the production and installation of the cold room. The cold room was installed in July and August by PBS Refrigeration based in Tamworth. The room is fully functional, and is presently being tested for accuracy and variation in room temperature.

The room is equipped to vary temperatures from 20 to -15 degrees Celsius. It is also equipped with appropriate lighting and benches to undertake trials exploring temperature effects on cotton growth and development.

Having a facility at Narrabri allows specific types of experiments to be conducted. There is presently no cold room facility at ACRI where the temperatures can be change accurately for this type of experimental work. Ranges of cold and cool temperatures need to be generated to determine the severity of their impacts on different stages of cotton crop development. In addition to this, other cold rooms at ACRI are being used for storage of experimental material, and temperatures cannot be changed.

Temperature plays a critical but poorly understood role in the growth and development of cotton. The cool starts to the last three seasons have again highlighted of the problems of cold shock and slow crop development rates at low temperature. Low temperatures after sowing increase the time to emergence and reduce seedling vigour often leading to poor establishment, poor early growth and increased risk of seedling diseases. The timing of crop maturity, yield and fibre quality may also be affected. There has also been evidence to suggest that high crop temperatures may negatively impact on crop development.

'The impact of temperature extremes on cotton performance' project will aim to cover three main research components:

- 1.) Develop refined understanding of the impact of temperature extremes on cotton performance.
- 2.) To use information to develop a more functional decision support tools which will enable research and management to be done more accurately in scenarios where extremes of temperature are likely.
- 3.) Utilise this understanding to assist with the development of field management packages of sowing strategies with adapted genotypes