

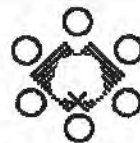
# Final Report to Cotton Research and Development Corporation



**Project CSP107C**

**Purchase of a Portable Photosynthesis System**

**Dr M.P. Bange  
CSIRO Division of Plant Industry  
Cotton Research Unit  
PO Box 59 Narrabri NSW 2390**



## Report Cover Sheet for Annual & Final Reports

The following Reporting Requirements MUST BE MET

### All Projects

You must submit an **ANNUAL PROGRESS REPORT** by the first Friday in February 1999, detailing the progress of your research. NOTE: IF you are seeking continuation of funding for 2000–2001 for the project, this report will form the basis for CRDC's consideration of ongoing funding. Please complete the budgetary requirements if this is a continuing project.

### Terminating Projects

A **FINAL REPORT** must be submitted within three months of completion of the project. This applies in **ALL** cases including research projects, travel, conference attendances, postgraduate, postdoctoral and funded capital items.

### Tick Report Purpose

**Annual Progress Report** (Due 1<sup>st</sup> Fri Feb. to determine continuation of funding)

**Final Report** (Due 30 September or 3 months after completion of project)

Actual start date:  
1/7/99

Anticipated completion date:  
30/6/2000

**OFFICE USE ONLY:**  
Date of receipt:

### Project title (as per original application)

Purchase of a Portable Photosynthesis System

CRDC Project Code  
CSP107C

CRDC Responsible Director (if known)  
David Hamilton

### Organisation

CSIRO Plant Industry

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## **Final Report Purchase of a Portable Photosynthesis System**

### **What was the background of the project?**

A wide range of projects are underway and are about to commence to improve cotton production through increased understanding of aspects of cotton physiology. Most of these projects require measurements of leaf photosynthesis. The lack of ready access to a reliable portable photosynthesis system is hampering these projects, potentially reducing the opportunities and benefits to the cotton industry. Field studies of photosynthesis are normally conducted in a narrow time window (around solar noon) and are also restricted by cloudy weather. Thus demand is high, and the present system is often unavailable to some users. Older less reliable systems have in the past been hired from other institutions in an attempt to satisfy this demand. Purchase of a new portable photosynthesis system would alleviate the problem by providing better access in times of demand and increasing the speed and accuracy of measurements.

Current investigations that require the use of a portable photosynthesis system are:

- Investigations into nutritional (P and N) and hormonal (GA3, PIX, Glycine Betane, PGR IV) effects on photosynthesis and growth of cotton.
- Investigations into the effects of premature senescence on growth and yield of cotton.
- Using plant processes such as photosynthesis and transpiration to identify plants with greater genetic potential for water use efficiency.
- Studies into the effects of insect damage and the interaction of biotic and abiotic stresses on the growth of different genotypes of cotton.
- Using plant processes such as photosynthesis and transpiration to identify plants with greater genetic potential to tolerate heat stress.
- Investigations into the physiology of plant responses to waterlogging as well as assessing new transgenic lines engineered to be tolerant to waterlogging.

### **What were the project objectives and to what extent were these achieved?**

#### **Project Aims:**

*Purchase a new portable photosynthesis system to support projects investigating cotton responses to waterlogging, heat tolerance, insect damage, nutrient supply and exogenous hormones.*

The new portable photosynthesis system (Licor-6400) was purchased and arrived at ACRI in September 1998. It has arrived well before the impending cotton season thus allowing time to setup and calibrate the system. With additional support from CSIRO Plant Industry an additional package was purchased which included a Blue/Red light source, Carbon Dioxide injection system, External Quantum Sensor, and File exchange software.

Selection of the Licor system was based on a number of factors:

- 1.) ACRI already has a Licor 6400 system which has proven suitable for extensive field work. The instrument is robust and portable. It has been used to make up to eighty photosynthesis and transpiration measurements in the field in one working day. It has been used in widely varying climatic conditions including in waterlogged fields during irrigation and in temperatures over 40°C.
- 2.) Purchasing an alternative system would mean that scientific and technical staff would need to be trained in the operation, maintenance, down-loading and processing of data from two different and complex instruments.
- 3.) Purchasing a Licor 6400 will maximise compatibility of measurements made with the two machines. To allow the two instruments to be used side by side in a single experiment would require cross calibration to ensure their relativity over a range of environmental conditions. This problem is minimised by purchasing identical systems.
- 4.) Purchasing a second Licor 6400 minimises difficulties with maintenance, servicing and supplying and stocking of parts. This is particularly important given complexity of the equipment and the somewhat isolated location in which we are operating.
- 5.) Purchase of a Licor system will also allow cross compatibility of accessories including light sources, external PAR sensor, CO2 injection system and batteries.

Two other systems (ADC Bioscientific and Geolab Systems) were investigated but these alternative systems do not match the specifications of the Licor system.

The system was purchased from John Morris Scientific Pty. Ltd. The sole distributor of Licor products in Australia.

**What Methodology was used, and a justification for the use of this methodology?**

Not Applicable

**Detailed results including statistical analysis of results?**

Not Applicable

**A discussion of the results, including an analysis of research outcomes compared with the objectives?**

Not Applicable

**An assessment of the likely impact of the results and conclusions of the Research project for the Cotton industry, and where possible a statement of the costs and potential benefits to the Australian Cotton Industry and future research needs?**

This purchase will enhance numerous projects on cotton physiology, which aim to maintain profitability of Australian production systems. They are:

Dr Michael Bange Delivering the benefits of cropping systems models  
Dr Greg Constable/Warwick Stiller Improving water use efficiency of cotton.

Dr Stephen Milroy CERCOT: ongoing development and application to crop management strategies.

Dr Lewis Wilson Management of mites and early season sucking pests on transgenic cotton. Physiological and morphological responses of cotton to damage by spider mites.

Dr Tom Lei Mechanisms of cotton compensation after pest damage.

Dr Michael Bange/Dr Stephen Milroy Physiological responses of conventional and transgenic lines to waterlogging

Dr Phillip Wright improving the sustainability of cotton production with new plant growth regulators

Improving the prediction and amelioration of Potassium Deficiency in Cotton

**A description of the project technology (eg commercially significant developments, patents applied for or granted, licences, etc)**

Not Applicable

**A technical summary of any other information developed as a part of the Research Project including discoveries in methodology, equipment design, etc.**

Not Applicable

**Recommendations on the activities or the steps that may be taken to further develop, disseminate, or exploit the project technology**

Not Applicable

**A list of publications arising from the research project**

Not Applicable

## PLAIN ENGLISH SUMMARY

**Project Title:** Purchase of a Portable Photosynthesis System

**Principal Researchers:** Dr M.P. Bange

### **Project Aims:**

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