MISSION STATEMENT AND OBJECTIVES

MISSION

The Cooperative Research Centre for Sustainable Rice Production will increase the economic, environmental and social sustainability of the Australian rice industry and enhance its international competitiveness through both strategic and tactical research and implementation of practical, cost-effective programs.

OBJECTIVES

This CRC aims to increase the contribution the rice industry makes to the national economy and to the welfare of all Australians by:-

- generating knowledge to improve the sustainability of the natural resources and the systems used to produce rice;
- developing germplasm which will be the basis of a sustainable increase in rice yields and quality;
- developing a more strategic base for rice research in Australia; and
- formally linking key agencies involved in rice research, education and extension and focusing their effort on a common purpose.
COOPERATIVE RESEARCH CENTRE FOR

SUSTAINABLE RICE PRODUCTION

ANNUAL REPORT
1999/2000

An unincorporated joint venture between:

Charles Sturt University

The University of Sydney

Ricegrowers’ Co-operative Limited

CSIRO
(Plant Industry, Land and Water and Entomology)

NSW Agriculture

NSW Department of Land and Water Conservation

Rural Industries Research and Development Corporation

Established and supported under the Australian Government’s Cooperative Research Centres Program
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EXECUTIVE SUMMARY, HIGHLIGHTS

CHAIRMAN’S REPORT

The Second Year Review of the Centre, conducted in November and December, 1999 was of extreme importance, providing a clear gauge of our development. The results of the Cooperative Research Centres Secretariat’s Review were pleasing and indicated the Rice CRC was significantly in advance of comparable Centres at a similar stage of development.

We are indebted to the Review Panel whose professionalism and experienced evaluation of all participants during the Review was balanced by great courtesy and kindness. I was particularly proud of our researchers and students, who clearly demonstrated a commitment to the Centre and an understanding of the importance of the Australian Rice Industry and the value of quality research. The Review Panel’s reported observations support this view.

Having successfully fulfilled the requirements of the initial development period, our focus must now be on bringing existing projects to maturity. We must continue to reassess and question the relevance of our research: to support an inappropriate or unproductive research effort would be a major failure.

The Rice CRC, with sustainability as the driver for its research, can legitimately act as a provider of the kind of balanced and robust scientific data on which industry management and legislative decision must be based.

Indeed, the absolute necessity for equitable and sustainable natural resource use means it is incumbent upon the Centre to ensure the knowledge it generates is taken up by policy makers and administrators.

As the CRC consolidates, it is pleasing to see the development of genuine cooperative research between the Universities, NSW Agriculture, CSIRO and the other major participators. The harmonious relationship between the Centre’s research programs and the research being carried out by RIRDC-funded initiatives indicates the huge potential of rice and irrigation research.

We remain particularly cautious with regard to the application of genetically modified organism (GMO) research by this CRC. There are no artificially modified rice varieties being grown in Australia and until there is unequivocal public acceptance of the principle of GMOs, the rice industry will not risk any adverse market reaction. However, it would be unwise not to remain at the forefront of research in this area. By so doing we will be correctly positioned to respond swiftly should any competitor using this technology emerge.

The survival of primary production, particularly over the past 40 years, has been inextricably linked to increases in productivity. There are great dangers if the rice industry does not continue to seek to maintain its momentum in this regard. In this way rising costs can be offset and water usage per tonne reduced. On an
industry basis it is important that total production remains in the 1.3 to 1.5 million tonnes range. This will help safeguard markets and the industry’s commercial security and ensure the huge grower investment in capital, both on-farm and in mills and storage, can be maintained and serviced.

The professionalism of our Centre’s Board and Management Committee is instrumental in maintaining stability and I am indeed privileged to be able to act as Chairman of this forthright, concerned and talented group.

Much of the credit for the strong position this CRC occupies must go to its Director, Dr Laurie Lewin. The great respect in which he is held is transmitted throughout our organisation. Dr Lewin thoroughly deserves the admiration and support he has from all of us.

The appointment of Mr Michael Cook as Communications Officer has given us a great lift. Michael is an experienced journalist and has an ability to understand the needs and objectives of research. He is most energetic and I am confident his talents will be used to great effect. Ms Julie Symes and Mr Gordon Hart continue to be great assets to the CRC, combining to ensure that the output and performance of the Centre remains within the guidelines set for us.

I also wish to thank Yanco Agricultural Institute, particularly Mr Geoff Creek and his staff for the frequent special assistance from staff and the use of facilities.

In conclusion, I have been greatly pleased to be involved in the establishment of a Chair of Irrigation at Charles Sturt University. This Chair would not have been created without the generous support of the rice industry through Ricegrowers’ Co-operative Limited. Meeting the challenges of intensifying debate over water usage and the future of irrigation - the rice industry in particular - will depend on the scientific veracity and objective research from this new Chair. I am confident the industry’s investment in this Chair will return great dividends.

Ian Davidge, AO
Chairman
This report marks the conclusion of the third year of the Rice CRC. It has been a privilege to have been associated with the establishment of this organisation, to witness the development of the new and exciting research programs and the induction of new participants into the world of rice research, technology transfer and education.

2nd Year Review

The 2nd Year review was held in two stages on 25, 26 & 27 October, 1999 and 1 & 2 December, 1999. It was generally a positive experience and supported the direction of the Rice CRC. Main recommendations arising from the review were:-

1. The Panel recommends that the CRC re-think how sustainability is conceptualised and that it replace objectives for minimisation of adverse environmental effects of the rice industry with quantified targets for limiting those effects.

2. The Panel would recommend that the Board consider an alternative provider for Sub-Program 1.3

3. The Board should address the linkage between Program 4 and other Programs, and also international opportunities for collaboration.

4. It is recommended the core participants recognise the need for incentives to be provided to attract and retain outstanding researchers outside major cities.

5. The Panel recommends the CRC develop an Intellectual Property management strategy and appropriate communication processes as a matter of priority. It is also recommended that the CRC draw on the experiences gained in other CRCs, both in the agricultural and non-agricultural areas, as a good starting point.

6. The Panel recommends that the Centre seek Commonwealth approval to any formal changes to Schedule 4 of the Commonwealth Agreement as a result of variations to participant contributions.

7. The Panel recommends that the CRC Program funding continue to the end of the current grant period as per the Commonwealth Agreement.

The Board supported these recommendations and is moving to remedy the deficiencies that were highlighted as a result of the review. Sub-Program 1.3 is now fully operational and being provided by CSIRO Land and Water.

CRC Activities

I am always impressed when members of the Rice CRC get together. The Symposium in August, 1999 was particularly worthwhile. It summarised the work of the CRC and provided an excellent opportunity for all members to mix with those from other programs. There was a good "feeling" about the symposium and I am sure it was enjoyed by all.

A further opportunity was provided by the "Chairman’s Tour”. This was designed as an industry awareness tour with a visit to RCL, a rice farm, Coleambally Irrigation
and the Annual Rice Field Day. The tour once again facilitated interaction between CRC participants while achieving its objective of industry awareness.

There were also many program meetings throughout the year. Some were general meetings to refine projects while others were more specifically aimed at particular subjects. The enthusiasm and dedication of participants at these meetings was obvious and this augurs well for the future of the CRC.

**The CRC Program**

The third year of the Rice CRC was one of consolidation when the projects were becoming well established and beginning to produce results.

Significant progress has been made in many of the projects of Program 1. This Program is a key component of the CRC as progress in this area is vital to sustainability of the industry.

Management of watertables is being studied in various projects. Better classification of soil suitability through understanding the impact of sodicity or electromagnetic induction (EM31) readings will minimise recharge. Better modelling of recharge and discharge in CRC projects will also help maintain watertables, both locally and regionally. Use of the Standard Precipitation Index to classify years will assist with explaining the variation of watertable movements over years. These projects are being supplemented by understanding the importance of crops following rice on depth to watertable and the significance of different irrigation techniques to modify rice water use.

Management of salinity is also important in sustainability of the rice industry. Projects on modelling salinity movement both locally and regionally were supplemented by a workshop to highlight key research areas.

Other important projects in this area focused on bioremediation of pesticide residues and analysis of invertebrate biodiversity in response to rice growing management techniques.

Sustainability can also be enhanced through production systems that specifically address key areas. The development of a rice soil test to predict nitrogen requirement has been a long held objective of rice research. An effective test would guarantee reliable production while minimising over use of nitrogen fertiliser. Significant progress was made towards development of such a test during the year. Other projects evaluated soil property changes in response to rice growing and the influence of soil nutrition on value of the rice grain.

Bio-herbicides and manipulating allelopathy both have the potential to reduce herbicide use in the longer term. One project also studied the impact of herbicides on aquatic invertebrates to determine downstream effects of their use.

The projects related to studies of cold tolerance in rice were an excellent example of cooperation between disparate groups and disciplines to solve a significant problem. Low minimum temperatures during the January/February rice reproductive period have a significant impact on rice yields. Commercial average grain yield was reduced by around 1 tonne/ha by cold during the 1999/2000 rice season. Varieties have been identified that have significantly better tolerance to cold and there has been progress towards understanding the nitrogen x cold interaction. Significantly greater cold tolerance will be required if the deep flood system of rice production is to be changed. To achieve this objective, some Rice CRC projects have made significant progress in
understanding cold response at the cellular, protein and genetic level.

Development of rice microspore and detached organ culture are techniques to assist with plant breeding and cold tolerance research. The progress in these areas during the year was also pleasing.

Recent advances in understanding rice quality - particularly starch structure, will allow more rapid development of improved varieties and products.

It has also been very pleasing to note the improvements in rice processing techniques - particularly in defining grain quality at receival and computer control of processing. The development of new rice products and methods for vitamin and nutrient enrichment will undoubtedly add to the profitability of the industry.

Education is a cornerstone of the long-term future of the industry. Development of skills-based training, along with undergraduate training in CRC projects is the first coordinated attempt to lift the rice education profile in Australia. This has been supplemented by an active postgraduate training program. This is certainly one of the most pleasing achievements of the CRC as it has traditionally been a neglected area in the rice research and development program.

The appointment of Mr Michael Cook as full-time Communications Officer was an excellent initiative. It has raised the profile and quality of both internal and external communications within the CRC and contributed to the sense of unity.

\textit{CRC Management}

The year has seen an improvement in the operational aspects of the CRC. The Board has become a more stable team and is now operating effectively to provide strategic direction. I am particularly grateful to the members of the Board for their skill and commitment in guiding our progress.

Program Leaders have taken on greater responsibility for management during the year. While this has added to their workload, it has meant more effective Program development.

The Management Committee, made up of the Program Leaders and representatives of other key organisations, has been very significant in managing the direction of the CRC. This committee is now operating as an effective and cohesive group.

Mr Jim Miller, the CRC Visitor, has provided very important guidance, particularly during the review process. I believe we have been very fortunate in having Jim as our Visitor. Similarly, Mrs Heather Carswell (our CRC contact officer) has provided us with very valuable advice during the year. Heather will not be continuing as our contact officer so we wish her every success in the future.

The administrative team of Mr Gordon Hart and Ms Julie Symes has had a difficult task in guiding the CRC. Their input is invaluable to maintaining effective administration, creating a sense of unity and ensuring accountability.

I am particularly grateful for the input of Dr Ian Davidge, Chairman of the CRC. His contributions have exceeded those expected of Chairman and he is certainly instrumental in guiding the direction of the CRC. His award of Doctor of Applied Science (honoris causa) from Charles Sturt University was certainly well deserved. I can think of no more worthy a recipient.

It is the sum total of the participants of the Rice CRC that will ensure the success of this organisation. I am always impressed by the skill, aptitude, enthusiasm and dedication of the group. I know that, with
their continued input, the sustainability of the Australian rice industry will be ensured.

Laurie Lewin,
Director
DESCRIPTION OF STRUCTURE AND MANAGEMENT

The Cooperative Research Centre for Sustainable Rice Production is an unincorporated joint venture established in 1997 by an Agreement between the Centre parties:-

Charles Sturt University
The University of Sydney
CSIRO
NSW Agriculture
NSW Department of Land and Water Conservation
Rural Industries Research and Development Corporation
Ricegrowers’ Co-operative Limited

and an Agreement with the Commonwealth of Australia.

The organisational structure of the Centre is outlined below. The management structure consists of the Board and the Director. The Board and Director are advised by Committees and supported by an administration office dealing with administrative and financial activities. The Board is responsible for the strategic direction of the Centre and for ensuring Centre management. The Director is responsible for day-to-day operations of the Rice CRC. He is assisted by a Management Committee, which includes key staff, and Program Leaders. The Rice Research and Development Committee of RIRDC is an advisory committee to the Rice CRC. The Centre Agent is NSW Agriculture and it provides financial and research program/project service and support for the Centre. The Centre’s administrative office is located at the Yanco Agricultural Institute (NSW Agriculture).
THE BOARD

Ian Davidge

Laurie Lewin

Geoff Fishburn

Jim Kennedy

Kath Bowmer

Keith Hutton

Don Napper

John Herbert

Graham Harris

Peter Draper

Helen Scott-Orr
The Centre is governed by a Board of Directors comprised of an independent chairperson, a high level nominee of each of the participating core partners and two persons to represent the interests of the Centre Associates and the Riverina community.

The Board meets a minimum of four times a year, usually two weeks after a Committee meeting so any issues requiring consent of the Board can be dealt with promptly.

The Board has the following functions and powers.

1. To establish policies for the Centre which cover research, education, training, intellectual property, commercialisation, planning, staffing, finance, accounting, reporting and such other matters as the Board considers necessary for the conduct of the business of the Centre, and its accountability to the Commonwealth and the participants pursuant to the Commonwealth and Centre Agreements.

2. To approve the activities of the Centre annually and the subsequent Annual Budget as described in Schedules 1 and 4 of the Commonwealth Agreement.

3. To monitor, measure and approve the performance indicators for the Centre.

4. To appoint, oversee and review the performance of the Director.

5. To take account of the relevant policies of each of the parties when considering any matter.

6. To authorise others to act on behalf of the Board and of the Centre.

7. To review the parties' contributions and seek to amend the Schedules of the Commonwealth Agreement provided that affected parties shall have agreed to any change in or any change to their intellectual property arrangements. Such changes will require the approval of the Commonwealth.

8. To consider and, if appropriate, approve new Programs recommended by the Management Committee. Such new Programs will also require approval by the Commonwealth and appropriate changes to the Schedules of the Commonwealth Agreement.
Board membership for 1999/2000

Dr Ian Davidge Chair

Dr Laurie Lewin Director, Rice CRC

Prof Kath Bowmer
    Alternative: Prof Jim Pratley
    Charles Sturt University

Prof Don Napper
    Alternative: Prof Don Marshall
    The University of Sydney

Dr Graham Harris
    Alternative: Dr Jim Peacock
    CSIRO Land and Water

Ms Helen Scott-Orr
    Alternative: Mr Martin May
    NSW Agriculture

Mr Geoff Fishburn
    Alternative: Mr Adrian Thompson
    [from July 1999] NSW Department of Land and Water Conservation

Dr Keith Hutton
    [from July 1999] Ricegrowers’ Co-operative Ltd

Mr Jim Kennedy Prime Minister’s Supermarket to Asia Council

Mr John Herbert Rural Industries Research and Development Corporation (RIRDC)
    Alternative: Mr Peter Core Rural Industries Research and Development Corporation

Mr Peter Draper Rice Research and Development Committee (RRDC)
MANAGEMENT COMMITTEE

Caption:
1999/2000 Rice CRC Management Committee (from L to R)
Dr Laurie Lewin (Director),
Dr Philip Eberbach (Charles Sturt University),
Dr Liz Humphreys (CSIRO Land and Water),
Dr Jeff Davis (RIRDC),
Mr Gordon Hart (Executive Officer),
Dr Liz Dennis (CSIRO Plant Industry),
Dr Bruce Sutton (University of Sydney)
Absent:
Dr Ian Davidge (Chairman, Rice CRC Board),
Dr Yunus Khatri (Ricegrowers’ Co-operative Ltd),
Dr Graeme Batten (NSW Agriculture),
Mr Ary van der Lely (Dept Land and Water Conservation).

The Management Committee is comprised of the Director, the Program Leaders, the Executive Officer and representatives of the parties, not otherwise represented.

The Management Committee assists the Director in attaining the objectives of the Centre through the implementation of the policies of the Board in relation to research, education and training, technology transfer, publication of research outcomes, finance and staffing.

The Committee coordinates the Centre’s activities and prepares new programs and policies for consideration by the Board.

The Committee meets a minimum of four times a year, usually two weeks before the next Board meeting so that any issues requiring consent of the Board can be dealt with promptly.

Management Committee membership for 1999/2000:

Dr Laurie Lewin       Chairman
Mr Gordon Hart        Executive Officer, Rice CRC
Dr Liz Humphreys [from July 1999]    CSIRO Land and Water [Program 1 Leader]
Dr Liz Dennis         CSIRO Plant Industry [Program 3 Leader]
Mr Graeme Marteene [to September 1999]    Ricegrowers’ Co-operative Limited [Program 4 Leader]
Dr Yunus Khatri [from September 1999]    Ricegrowers’ Co-operative Limited [Program 4 Leader]
Dr Philip Eberbach    Charles Sturt University [Program 5 Leader]
Dr Bruce Sutton       The University of Sydney
Mr Ary Van der Lely   NSW Department of Land and Water Conservation
ADVISORY COMMITTEE

The Advisory Committee function to the Centre is undertaken by the Rice Research and Development Committee (RRDC) of the Rural Industries Research and Development Corporation (RIRDC).

As the Advisory Committee to the Centre, the RIRDC Rice Research and Development Committee assists in providing broader input to the policies, planning and Programs of the Centre and to ensure coordination of research projects and functions.

Interaction between RRDC and the Rice CRC has been facilitated by cross-representation on the Board, Management Committee and the Rice Research and Development Committee. Details of Rice CRC Programs are conveyed to RRDC members through the annual Rice CRC Symposium and regular newsletters. This was not found to be sufficient, however, and members of RRDC have been allocated to liaise with the five Rice CRC Programs (as shown below). These are all rice grower members of RRDC.

Program 1 - Sustainability of Natural Resources
Mr Noel Graham, Mr Leigh Vial

Program 2 - Sustainability of Production Systems
Mr Peter Sheppard, Mr Russell Ford

Program 3 - Genetic Improvement for Sustainable Production
Mr Randall Williams, Mr Ian Mason

Program 4 - Product and Process Development
Mr Daryl Gibbs, Mr John Hemley

Program 5 - Education, Skills Development and Technology Transfer
Mr Peter O’Connor, Mr Stuart Nixon

CENTRE VISITOR

The Rice CRC’s Visitor is Mr Jim Miller. He is appointed by the CRC Secretariat to liaise with and assist in monitoring the CRCs he has been allocated. He acts as an independent adviser and helps establish constructive links between the Secretariat and the CRCs.

CENTRE PROGRAMS

The research Programs are broken into five main areas, these are :-
1. Sustainability of Natural Resources in Rice-Based Cropping Systems.
2. Sustainable Production Systems.
3. Genetic Improvement for Sustainable Production.
5. Education, Skills Development and Technology Transfer.

Each Program has a leader to direct and monitor the research activities. The Programs are further divided into Sub-Programs which also have a nominated leader. Beneath each Sub-Program are the research projects which all have a Project Leader who is the principal researcher.

**GENERAL**

The Rice CRC is a distributed organisation with participants located with partners and associates throughout NSW and Queensland. It is therefore important that Management addresses the need to build a Rice CRC spirit amongst the participants. This has been partly achieved through representation on the Board and Management Committee.

The annual Symposium has been essential in fostering the cohesion that is necessary in the organisation. Other important mechanisms have been the “Chairman’s Tours”, the newsletter “Rice CiRCle” and various Program meetings and specific workshops.

The appointment of a Communications Officer for the Rice CRC has been very important in assisting the dissemination of information and the establishment of a CRC identity.
COOPERATIVE LINKAGES

The Rice CRC sits within an existing network of research, development and service structures impacting on rice production and resource use in the southern irrigation areas. These groups include research, extension and education service providers, regulatory authorities, irrigation suppliers, community groups such as Land and Water Management Plan groups and industry organisations. There have also been active links with international organisations at various levels.

The role of the Rice CRC is to establish new links or to enhance those that have not been strong in the past.

Strong links are important to ensure cooperation across all levels from natural resource use to marketing of end-product. The Rice CRC does not operate in isolation from either more applied research and development activities or the day-to-day operations of the industry. It is linked to the existing community and industry infrastructure in a way that aims to ensure a seamless two-way exchange between the theoretical and the practical application of technology (Figure 1).

Cooperative links have been fostered internally, with outside organisations within Australia and internationally.

Figure 1

> Export Income
> Farm Welfare
> Community Welfare
> National Benefit

Extension and Application

Existing Tactical and Applied

New Strategic

Environmental Responsibility + Advanced Agronomy + Improved Varieties + New Products and Processes

Rice Grower

RCL and Secondary Processor

Researcher Processor and Farmer Skills

Sydney U.
CSU
MCA
NSW Ag

Program 1

Program 2

Program 3

Program 4

Program 5

CRC for Sustainable Rice Production

Land & Water Plans and Applied Research

Water Distributors

Extension Services

Pure Seed

Applied Agronomy Research

Rice Varieties

Applied Product Developmen

Pure Seed

New Products and Processes

Improved Varieties

Advanced Agronomy

Environmental Responsibility

Rice Grower

Program 1

Program 2

Program 3

Program 4

Program 5

CRC for Sustainable Rice Production

Figure 1
The Rice CRC has continued to foster new links between organisations and to enhance those already established. The level of cooperation is extensive. Some examples are provided below.

Many of the projects in Program 1, for example, have links with other projects which range from occasional interaction to full collaboration. For example:-

Project 1205 “Quantifying and maximising the benefits of crops after rice” is directly linked with Project 1206 “Using models to determine the benefits of wheat after rice”, and both are linked with Project 6201 “Economic evaluation of alternative resource management strategies in a risky environment”.

Results from Project 1205 are being used to assist the model development and understanding of groundwater dynamics in Projects 1201 “On-farm net recharge management” and 1403 “Quantifying climatic and management impacts on shallow watertables and soil salinity”.

Many of the projects in Program 1 have strong links with the regional irrigation companies – Murray Irrigation Ltd, Coleambally Irrigation, and Murrumbidgee Irrigation Ltd. This is particularly the case for Projects 1102, 1201 and 1403, while Project 1105 is also developing similar links.

There is a different level of internal cooperation in the groups working on cold tolerance in Programs 2 and 3. There are groups working on tolerance at the plant level (NSW Agriculture and the University of Queensland); plant reaction at the cellular level (University of Sydney); genetic control of cold tolerance (CSIRO Plant Industry) and protein responses to cold (Australian National University). All groups working on this important problem have met twice in the past year. This has ensured no overlap in the work but has also encouraged a high level of cooperation.

Cooperation between participants in Program 4 and the cereals groups at NSW Agriculture, the University of Sydney, the University of NSW and Charles Sturt University has improved during the year. This is an important advance and will bring benefits to all groups.

Rice CRC Symposium

The annual Rice CRC Symposium provides an ideal opportunity for all participants to interact, to share in the total program and to form a Rice CRC culture. The Symposium is important in an organisation such as the Rice CRC whose participants are geographically distributed both within and between Programs. The Symposium also provides an opportunity for Programs to hold group meetings. The format of the Symposium has been successful in generating a spirit of cooperation and a greater understanding of the scope of the work being carried out by the CRC.

The Symposium also featured a presentation by Prof Alan Devonshire, IACR-Rothamsted, who has been visiting the CSIRO Entomology bioremediation group from August 1999 until July 2000 and is a world expert in the area of pesticide biochemistry and resistance.
**Program Meetings**

Additional Program meetings have been held for Programs 1, 2.1, 3.3, 4 and 5. These have been supplemented by specific workshops on salinity, water use efficiency and water quality.

**Chairman’s Tour**

The Chairman’s Tour (formerly referred to as the “Induction Tour”) was held in March 2000. It provided an ideal opportunity for all Rice CRC participants to meet in an informal setting to discuss issues of common interest and broaden their knowledge of the CRC and the rice industry in general. The tour covered two days, with a social gathering on one evening. One of the main objectives of the tour was to provide an environment for staff to meet others working in different areas of the CRC and establish opportunities for networking and collaboration. This year’s tour was held in conjunction with the annual Rice Field Day at Jerilderie which gave participants access to research information being produced by other major research providers, in addition to the CRC.

**Newsletters**

Rice CRC members are invited to contribute to our internal newsletter, the Rice CiRCle, which is distributed to all participants. Three newsletters were distributed in the last financial year. A revised version of this newsletter, the Rice CRC Update, is also circulated to all rice growers to keep them abreast of developments within the CRC and its research.

**LINKS WITH OTHER ORGANISATIONS**

The Rice CRC has worked actively with many other organisations with an interest in rice research and development.

Many rice research projects are funded through RIRDC. Some links are maintained between the CRC and the Rice Research and Development Committee of RIRDC to ensure coordination of projects.

At the Program level there are also close links to ensure harmony across the spectrum of research.

Participants in the Rice CRC have actively sought opportunities with organisations that are not part of the core structure. Some of these have been through postgraduate studentships while others have been through mutual research interest. These additional links have included participants from:-
Australian National University  cold tolerance
University of Queensland  cold tolerance
University of New South Wales  rice quality; regional salinity prediction modelling
University of Wollongong  rice quality
University of Technology, Sydney  groundwater and salinity dynamics

Strong external links have been made across all Programs. Some examples for Program 1 are provided below.

Contact has been established with researchers in the Queensland sugar industry who are similarly interested in undertaking research on rapid, quantitative diagnosis of sodic soil conditions in the field (1102).

The project looking at optimising agronomic options at the farm scale (1201) is closely linked with related modelling and field projects with Murray Irrigation Ltd, LWRDRC and Coleambally Irrigation.

The project investigating bioremediation of pesticide residues in drainage waters (1303) has links with the Cotton Research and Development Corporation, the CRC for Sustainable Cotton Production, the Horticultural Research and Development Corporation and the Rural Industries Research and Development Corporation.

Project 1403 - “quantifying climatic and management impacts on soil salinity and shallow watertables”, has established links with Dr Simon Cook (Leader, CSIRO Precision Agriculture Group, CSIRO Land and Water, Perth). Dr Cook will provide technical expert advice and input on spatial salinity issues and participate in the technical workshops/meetings of the Rice CRC. This project also has strong links with NSW Department of Land and Water Conservation groundwater workers not directly involved in the Rice CRC.

Ms Julia Humphries, PhD student from Department of Plant Science, Waite Campus, University of Adelaide spoke to Yanco Agricultural Institute and Rice CRC staff on 22 June, 2000. Her presentation was titled: “Beta Carotene in Wheat and Rice”. This was an extension of cooperation with the University of Adelaide group on minerals and rice (Program 2).

INTERNATIONAL LINKS

International links have been fostered through ACIAR projects, funded visits, visitor exchange and through contact with the many international visitors to the CRC administration office and its partner organisations.

Dr Janet Taylor (Plant Biotechnology Institute, National Research Council of Canada, Saskatoon, Saskatchewan, Canada) spent time with Dr Gavin Ash (Charles Sturt University) working on host specificity of Rhynchosporium alismatis. This visit was worthwhile in developing links on this area of pest management.

Dr Toshihiro Hasegawa is an Associate Professor at Hokkaido University and has research interests in cold tolerance, root growth and crop modelling. He worked with Mr Robert Williams and Mr Tim Farrell at Yanco from February 15 to March 30, 2000. Dr Hasegawa is
a highly respected rice scientist in Japan working in Hokkaido, an area of Japan that suffers significant low temperature injury.

Future collaborative work with Dr Hasegawa will build on the gains made in a number of areas during his stay in Australia. These gains include Japanese data on the comparison of cold water and cold air screening, effect of root mass on cold tolerance, the physiology of low soil and water temperature on rice growth in the early stage and modelling the impact of N status on rice yield. Dr Hasegawa presented his research work at the CRC Cold Tolerance workshop, CSIRO Division of Plant Industry, Canberra and at Yanco Agricultural Institute.

During his stay Dr Hasegawa successfully tuned his rice growth model to Australian conditions. The model was able to identify key differences between Australian and Japanese varieties in response to nitrogen fertiliser. Recovery of nitrogen applied pre-flood and at panicle initiation is 70% and 30% respectively in Australia, whereas the reverse occurs in Japan. This pattern captures the major differences between optimum nitrogen management in Australia compared to Japan. Continued modelling work will assist in the development of the soil nitrogen test in Program 2.1.

Dr Richard Tester from the Glasgow Caledonian University is collaborating with Assoc Prof Kevin Robards and Dr Stuart Helliwell (Charles Sturt University) on a project looking at starch-lipid interactions and their role in ageing processes in rice (4504). Dr Tester has extensive experience in starch chemistry where his specialty is the relationship between starch structure and its relationship to starch functionality. He brings to the project specific expertise in characterising glucans and their interactions with starch granules. His work has led to a far greater understanding of how starch components interact during biosynthesis and the molecular basis for gelatinisation properties. His collaboration is essential to the timely completion of the project.

Dr Shahbaz Khan is undertaking collaborative research in spatial hydrologic economic modelling of rice-based irrigation systems with members of the Massachusetts Institute of Technology, USA. Links have been established with Prof Dennis McLachlan’s group, Massachusetts Institute of Technology (MIT), USA and Prof Wolfgang Kinzelbach’s group at the Swiss Federal Institute of Technology, ETH, Switzerland with regard to the project looking at quantifying climatic and management impacts on soil salinity and shallow watertables (1403).

Prof Jim Oster (University of California) reviewed and largely agreed with approaches being developed in the rice land suitability assessment project (1102).

CSIRO Land and Water is developing a link with the Department of Agricultural Economics, University of the Orange Free State, South Africa in regard to their project on “optimising agronomic options at the farm scale” (1201).
Dr Shaohui Xu, a visiting scientist from the Chinese Academy of Sciences - Nanjing Institute of Soil Science, spent two months at Griffith sponsored by the CSIRO/CAS agreement. He and Dr Shahbaz Khan developed a program to determine soil water fluxes which is being applied to the “Crops after rice” Project (Projects 1205, 1403).

Dr Manoranjan Mondal from the Bangladesh Rice Research Institute visited Griffith for six weeks to undertake training in SWAGMAN Destiny. He then used the findings from model simulations to assist in the design of field experiments in an area of Bangladesh affected by coastal salinity. His visit was funded by The Crawford Fund with links to Project 1206 and the related ACIAR project.

Prof Alan Devonshire, IACR-Rothamsted, a world expert in the area of pesticide biochemistry and resistance, has been working with the CSIRO Entomology Bioremediation group.

The Cell Biology Group at the University of Sydney has obtained materials from researchers overseas to carry out some of their work. Antibodies raised against beta-1,3-glucanases have been obtained from Dr Michel Legrand's group at the Institut de Biologie Moleculaire des Plantes, Centre National de la Recherche Scientifique, Strasbourg, France and will be used in the investigation into callose dissolution in rice anthers. A cutinase enzyme to be trialed for speeding up penetration of physiological dyes into live anther cells has been obtained from Prof Maarten Egmond at Unilever Research Laboratories in the Netherlands (3202).

Dr Darshan Brar from IRRI has offered to provide their collection of interspecifics and backcross materials in tissue culture, as part of the 2000-2003 postgraduate studentship to work on “Microspore culture of rice for rapid breeding and enhanced levels of interspecific recombination”. It has been agreed with IRRI that Dr Xiaochun Zhao will spend a week at IRRI learning about the program and bring back to Australia in vitro F1 and BC1 lines involving crosses of O. sativa (AA) with wild species having BB, CC, BBCC, EE, FF, GG, and HHJJ genomes, which are highly sterile. In January 2000, approval to import this collection into Australia was received from AQIS (3301).

A collaborative international link is also being sought between the Rice CRC and the Rice Research Institute of Yunnan Agricultural University (PRC). Dr Zhao was trained at this University and is familiar with the germplasm, much of which is adapted to cool mountainous land at 1900 metres above sea level. Dr Zhao may travel to Yunnan province at the same time as he travels to IRRI in the Philippines.

International Projects

Links have been maintained with ACIAR Project 95/100 “Plant breeding strategies for rainfed lowland rice in north-east Thailand and Laos”. This project is managed by Assoc Prof Shu Fukai, University of Queensland. The involvement of the Rice CRC was through studies on genotype-by-environment interactions for phenology (ACIAR Sub-Program 5) and particularly focused on cold-by-nitrogen interactions. There is to be an involvement of the CRC in a follow-up project in Laos and Cambodia.

Project 1106 is also the Australian component of ACIAR Project no. 9432 “Nutrient and irrigation management for sustainable rice-wheat cropping systems in Bangladesh and Australia”. Other partners in this project are The University of Melbourne (c/- Prof David
Connor, Project Leader), the Bangladesh Rice Research Institute (c/- Dr Panaullah) and the Bangladesh Agricultural Research Institute (c/- Dr Razzaque).

Project 1403 has links with Dr Prathapar’s group, International Water Management Institute, through a project on conjunctive water management in Pakistan and Australia funded by CSIRO, the International Water Management Institute (IWMI), ACIAR and Coleambally Irrigation Corporation. The Australian component is led by Dr Evan Christen, CSIRO Land and Water.

**Visiting Scientists**

Many of the visits by international scientists have been discussed in earlier sections. These include:-

- Prof Alan Devonshire, IACR-Rothamsted (CSIRO Entomology);
- Dr Shaohui Xu, Chinese Academy of Sciences - Nanjing Institute of Soil Science (CSIRO Land and Water, Griffith);
- Dr Manoranjan Mondal, Bangladesh Rice Research Institute (CSIRO Land and Water, Griffith);
- Dr Janet Taylor, Plant Biotechnology Institute, National Research Council, Canada (Charles Sturt University);
- Dr Toshihiro Hasegawa, Hokkaido University (NSW Agriculture, Yanco).

Other visitors were:-

- Ms Anke Hildebrandt from the Swiss Federal Institute of Technology, ETH, Zurich who visited CSIRO Land and Water, Griffith to work on a regional hydrologic model of the MIA;
- Dr Men Sarom and Mr Ty Channa from the Cambodian Agricultural Research and Development Institute who visited the Rice CRC and Murrumbidgee College of Agriculture to study rice research and education management and rice research techniques;
- Prof Dennis McLaughlin, MIT, who attended the Program 1 meeting in December 1999.
Overseas visits by staff from the Rice CRC included:-

Mr Ken Eustace (Charles Sturt University), October 1999. Study visit to USA to study internet development.

Dr Shahbaz Khan (CSIRO Land and Water). Visited Ralph M. Parsons, Laboratory, Massachusetts Institute of Technology, USA – 27 March to 15 April 2000. Collaborative research in hydrologic economic modelling of rice-based irrigation systems.

Mr Robert Williams travelled to Hokkaido and Tohoku regions in north Japan in August/September 1999 to investigate current research in low temperature tolerance. Mr Williams visited four locations in north Japan that routinely screen segregating populations for low temperature tolerance. The visits were made two to three weeks prior to harvest when genotypic variation in cold tolerance was visible. At all locations, deep cold water at 19.5°C was a standard screen that identified some highly tolerant advanced lines. Every site used deep cold bore water to screen rice varieties in the field, with one site having a facility for cold air screening above a rice paddy.

Mr Williams recommended that further collaboration with Japanese rice breeders continue, especially through the sharing of genetic resources. Several cold tolerant varieties have been exchanged between Yanco Agricultural Institute and Myagi Prefecture Agriculture Station, Furukawa. Mr Williams invited Dr Hasegawa from Hokkaido University to Yanco during the 1999/2000 summer to facilitate joint research on crop modelling and the physiology of cold tolerance.
Low temperature screening at Hokkaido Central Prefectural Research Station. The roof closes and the air coolers reduce the air temperature to a constant 20° C from panicle initiation to flowering.

The following table identifies linkages established within Rice CRC projects.

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See part B