



**COOPERATIVE RESEARCH CENTRE
FOR SUSTAINABLE RICE PRODUCTION**

ANNUAL REPORT 2000/2001

Part D

LIST OF PUBLICATIONS AND PATENTS

* = non CRC

Publications in Refereed Journals

Batten, G.D., Marr, K.M., Williams, R.L and Farrell, T.C. (2000). Mineral concentrations in Australian and overseas brown rice genotypes. *Communications in Soil Science and Plant Analysis*, 31 (11-14), 2393-2400.

Khan, S., Xevi, E. and Meyer, W.S. (2000). Salt, water and groundwater management models to determine sustainable cropping patterns in shallow saline groundwater regions. Paper accepted for publication in the special volume of the *Journal of Crop Production* titled *Crop Production in Saline Environments*.

Lanoiselet, V., Cother, E.J. and Ash, G.J. (2001). Production, germination and infectivity of chlamydospores of *Rhynchosporium alismatis*. *Mycological Research* 105: 441-446.

Lott, J.N.A., Ockenden, I., Raboy, V. and Batten, G.D. (2000). Phytic acid and phosphorus in crop seeds and fruits: A global estimate. *Seed Science Research* 10, 11-33.

* **Ming, H., Spark, K.M. and Smart, R.St.C. (2001).** Comparison of radio frequency plasma and ion beam induced surface modification of kaolinite. *J. Physical Chemistry B*, 105 (16), 3196 -3203.

***Page, D., van Leeuwen, J., Spark, K.M. and Mulcahy, D. (2001).** Tracing terrestrial compounds leaching from two reservoir catchments as input to dissolved organic matter. *Marine and Freshwater Research*, 52:223-33.

Spackman, S.L, Lamb, D.W. and Louis, J., (2000). Using multispectral digital imagery to manage within paddock variability in rice production. *Asp.Appl.Biol.* (Eds. R.J. Bryson, W. Howard, A.E. Riding, L.P. Simmonds, M.D. Steven), Association of Applied Biologists, 60: 99-106.

***Sutherland, T., Horne, I., Lacey, M.J., Harcourt, R.L., Russell, R.J. and Oakeshott, J.G. (2000).** Enrichment of an endosulfan-degrading mixed bacterial culture. *Appl. Environ Microbiol.* 66: 2822-2828.

Zhou, Z., Robards, K., Helliwell, S. and Blanchard, C. (2001). Aging of stored rice: Changes in chemical and physical attributes. *Journal of Cereal Science*.

Zhou, Z. K., Robards, K., Helliwell, S. and Blanchard, C. (2001). Distribution of phenolic acids in three Australian rice varieties. *Journal of the Science of Food and Agriculture*.

Zhou, Z., Robards, K., Helliwell, S. and Blanchard, C. (2001). Composition and functional properties of rice. *Food Chemistry*.

Published Conference Papers

Akbar, S. (2001). Channel seepage estimation and identification using two methods. *In* Proceedings of “Electromagnetic Techniques in Agricultural Resource Management conference”, Yanco, NSW, July 2001. (*in press*).

Batten, G.D., Blakeney, A., Ciavarella, S., Lamb, D.W. and Spackman S. (2001). Choosing an NIR instrument and a sample presentation option for plant and soil analysis. *In* Proceedings of “10th International Conference on Near-Infrared Spectroscopy”, Kyongju, Korea.

Batten, G.D. and Marr, K.M. (2000). Protein, minerals and rice paste viscosity. *In* Proceedings of “Cereals 2000”. 11th ICC Cereal and Bread Congress and of the 50th Australian Cereal Chemistry Conference, Surfers Paradise, Queensland, September 2000. Eds. Wootton, M., Batey, I.L. and Wrigley, C.W.

Beecher, H.G. (2001). Electromagnetic induction as a tool for investigation of soil sodicity variation in Australian rice soils. *In* Proceedings of “Electromagnetic Techniques in Agricultural Resource Management conference”, Yanco, NSW, July 2001. (*in press*).

Dunn, T., Fitzgerald, M. and Batten, G.D. (2000). A panicle culture system to manipulate protein in rice grain. *In* Proceedings of "Cereals 2000". 11th ICC Cereal and Bread Congress and of the 50th Australian Cereal Chemistry Conference, Surfers Paradise, Queensland, September 2000. Eds. Wootton, M., Batey, I.L. and Wrigley, C.W.

Farrell, T.C., Williams, R.L. and Fukai, S. (2001). The cost of low temperature to the NSW rice industry. *In* Proceedings of “Australian Agronomy Conference”, Hobart, Tasmania.

Fox, K.M, Farrell, T.C. and Williams, R.L. (2001). Rapid image analysis for counting engorged pollen grains of rice. *In* Proceedings of “Australian Agronomy Conference”, Hobart, Tasmania.

Khan, S. (2001). Developing policies for sustainable irrigation water management using hydrologic economic modelling framework. ACIAR International Water Policy Workshop, Bangkok, June 2001.

Khan, S., King, P., Wang, B. and Best, L. (2001). Role of GIS, remote sensing and hydrology in the environmental management of rice growing areas. Geospatial Information and Agricultural Conference, Sydney, NSW, July 2001.

Khan, S., O’Connell, N. and Robinson, D. (2001). Integrated hydrologic economic modelling techniques to develop local and regional policies for sustainable rice farming systems. *In* Proceedings of “1st Asian Regional Conference On Agriculture, Water And Environment”, International Commission for Irrigation & Drainage, September 2001.

Khan, S., Xevi, E., O'Connell, N., Madden, J.C. and Zhou, F. (2000). A farm scale hydrologic economic optimisation model to manage waterlogging and salinity in irrigation areas. Eds. May, R.L., Fitz-Gerald, G.F. and Grundy, I.H.) EMAC 2000. *In Proceedings of the "Fourth Biennial Engineering Mathematics and Applications Conference"*, RMIT University, Melbourne, Victoria, September, 2000. pp: 179-182.

Lamb, D.W. (2000). Forecasting yield in rice using remote sensing and crop growth models. *In Proceedings of "2000 Symposium on Australasian Research and Application of Precision Agriculture"*, University of Sydney, Sydney, NSW.

Parkash, S., Wootton, M., Delves, R. and Driscoll, R.H. (2000). Impact of storage at -20°C on rice properties. *In Proceedings of "Cereals 2000"*, 11th ICC Cereal and Bread Congress and of the 50th Australian Cereal Chemistry Conference, Surfers Paradise, Queensland, September 2000. 518-521.

Spackman, S.L., Lamb, D.W. and Louis, J. (2000). Using multispectral digital imagery to extract biophysical variability of rice to refine nutrient prescription models. *In Proceedings of "Australasian Remote Sensing and Photogrammetry Conference"*, Adelaide, South Australia, 2000, 431-436.

Spackman, S.L., Lamb, D.W., Louis, J. and McKenzie, G. (2001). Remote sensing as a potential precision farming technique for the Australian rice industry. *In Proceedings of "National Conference on Geospatial Information & Agriculture, Incorporating Precision Agriculture in Australasia, 5th Annual Symposium"*, Sydney, NSW, 403-405.

Spackman, S., McKenzie, G., Lamb, D. and Louis, J. (2000). Retrieving biophysical data from airborne multispectral imagery of rice crops. *In Proceedings of "Geoinformation for all, XIXth Congress of the International Society for Photogrammetry and Remote Sensing (ISPIRS)"*, Amsterdam, The Netherlands, July 2000.

***Sutherland, T.D., Russell, R.J., Nguyen, H. and Oakeshott, J.G. (2000).** Bioremediation of endosulfan. *In "Proceedings of the 10th Annual Cotton Conference"*, Brisbane, Queensland.

Timsina, J.T., Humphreys, E., Smith, D.J., Godwin, D.C., Qayyum, M.A., and Connor, D.J. (2001). Simulation of yield and environmental impacts of wheat after rice in Bangladesh and Australia. *In "Proceedings of 10th Australian Agronomy Conference"*, Hobart, Tasmania, 2001.

Technical Reports

Caldwell, B. (2000). Study of water use and environmental aspects of rice growing. Rice CRC Research Report.

Humphreys, E., Beecher, H.G., Christen, E., Williams, R., Xevi, E., Thompson, J., Blackwell, J. and Lewin, L. (2000). Research solutions to watertable and salinity problems in the rice growing areas of Southern Australia. Rice CRC Research Report.

Jahromi, F., Cother, E.J. and Ash, G. (2000). Suitability of *Rhynchosporium alismatis* as a mycoherbicide for integrated management of *Damasonium minus* in rice fields. Final Report to the Rural Industries Research and Development Corporation Project UCS 7A.

Khan, S. (2000). Irrigation: getting the balance right. Research project information sheet no. 11. CSIRO Land and Water.

Khan, S., (2000). SWAGMAN Series. Research project information sheet no. 22. CSIRO Land and Water.

Khan, S., and Best, L., (2001). Conceptual groundwater model of the Murrumbidgee Irrigation Area. CSIRO Technical Report under review.

Khan, S., O'Connell N., Xevi, E., McLeod, G., Madden, J., Zhou, F., Robinson, D. and Humphreys, E. (2001). Determining optimal irrigation intensity in irrigation areas. Final Report of Project CWN 13 for LWRRDC.

Khan, S. and Short, L. (2001). Assessing the impact of rainfall variability on watertables in irrigation areas. CSIRO Technical Report No. 10/01.

Khan, S., Short L., Best, L., Townsend, J., Blackwell, J., Jaywardne, J. and Biswas, T. (2001). Onsite and regional impacts of FILTER and SBC CSIRO Technical Report No. 11/01.

***Nyvall, R. and Cother, E.J. (2000).** The current status of biological control of common water plantain in cultivated wild rice grown in Minnesota and in rice grown in new South Wales. Final Report to RIRDC Project TA 990-09.

***Russell, R.J., Sutherland, T.D., Horne, I, Oakeshott, J.G., Zachariou, M., Nguyen, H.V., Selleck, M.L and Costello, M.** Enzymatic bioremediation of chemical pesticides. Australian Biotechnology Association (*in press*).

Van Niel, T.G., and McVicar, T.R. (2001). Remote sensing of rice-based irrigated agriculture: a review. Rice CRC Technical Report P1-01/01, Yanco, NSW, pp. 51.

Van Niel, T.G., and McVicar, T.R. (2000). Assessing and improving positional accuracy and its effects on areal estimation at Coleambally Irrigation Area. Rice CRC Technical Report P1-01/00, Yanco, NSW, pp. 87.

Trade Magazines

Batten, G.D., Blakeney, A.B., Ciavarella, S. and McGrath, V.B. (2000). NIR promotes increases in the yield and quality of rice and wheat. *NIR news*, Vol.11(6),7 and 9.

Cutter, N. (2001). Estimating green grain at harvest. *Australian Grain Magazine -The Ricegrower*, Vol. 11. No.1, p.1

Humphreys, E. and Bhuiyan, A.M. (2001). What farmers think about crops after rice. *The Farmers' Newsletter Large Area* No. 157, pp. 29-31.

Humphreys, E., Bhuiyan, A.M., Fattore, A., Fawcett, B. and Smith, D. (2001). The benefits of winter crops after rice harvest. Part 1: Results of field experiments. *The Farmers' Newsletter Large Area* No. 157, pp. 36-38.

Lewin, L. (2001). Water and cold tolerance high on the research list. *Australian Grain Yearbook 2000*, p.54

Meyer, W.S. and Khan, S., (2000). Software package lifts the water efficiency. *Farming Ahead* 104: 36-37.

Smith, D. and Humphreys, E. (2001). The benefits of winter crops after rice harvest. Part 2: Models to predict what will happen in your situation. *The Farmers' Newsletter Large Area* No. 157, pp. 39-42.

WWW-Based Software

An ArcView extension to allow other users to assess the horizontal positional accuracy of their GIS data, and provide reports to both Australian and US standards, has been posted on the ArcView site (<http://gis.esri.com/arcscrips/details.cfm?CFGRIDKEY=C03BD2F2-680F-11D4-943200508B0CB419>) and is accessible from the CRC web site.

Patents

* Phosphotriesterase from *Agrobacterium radiobacter* P230. Provisional patent filed 15 May 2001 (relates to a larger, non-CRC project of which this CRC project is a component).

PUBLIC PRESENTATIONS, PUBLIC RELATIONS AND COMMUNICATION

Rice CRC participants have been very active in presenting their work through various avenues, including presentations, workshops, conferences, seminars, interaction with visitors, field days and items for mass media.

Presentations to irrigation company Boards and Land & Water Management Plan Boards were a feature of many Program 1 projects, eg - presentations by Dr Shahbaz Khan and Dr Tim McVicar.

Workshops

Some of the workshops at which information was presented during 2000/2001 include:-

- * NSW Agriculture Water Management Sub-Program staff workshop - attended by irrigation officers, water management officers and water use efficiency officers. May 2001 (Project 1102);
- * Salinity Workshop, Bendigo, Victoria, organised by the Australian Geophysical Society. February 2001. "Irrigated Salinity – Opportunities for monitoring, mapping and modelling" . (Projects 1201 and 1403);
- * NSW Agriculture Economists in Programs workshop, Tamworth, NSW. March 2001. "Initial findings of the on-farm financial impacts of the crops after rice project". (Project 6201);
- * NSW Agriculture Economists in Programs workshop, Wagga Wagga, NSW. October 2000. "The findings of the MIA representative farm model". (Project 6201).
- * ACIAR workshop on Productivity of lowland rice in South-East Asia - overcoming environmental constraints, Vientiane, Laos. October/November 2000. "Low temperature constraints to rice production in Australia and Laos: a shared problem." (Project 2201)

Program 1 held a workshop in Griffith in December 2000 at which the following presentations were made:-

- * Ricegrowers' Association of Australia's environmental program (M Linnegar, guest speaker);
- * Bioremediation of pesticide residues in drainage waters (R Heidari, J Oakeshott, R Russell);
- * Rice pesticides in floodwaters and how this is influenced by water management and layout. The determination of the role of sediments. (K Spark);

- * Better prediction of groundwater recharge from rice growing (G Beecher, N Jinadasa);
- * Estimation of soil sodicity and pH using NIR spectroscopy (G Beecher, B Dunn);
- * Measurement of losses from on-farm channels and drains. Assessing the effect of compaction and clay lining on seepage from on-farm channels and drains (S Akbar);
- * Remote sensing of crop types and crop area measurement (T McVicar);
- * On-farm net recharge management (S Khan, N O'Connell);
- * Improving the water use efficiency of rice (J Thompson);
- * Quantifying and maximising the benefits of crops after rice (L Humphreys, D Smith);
- * Modelling and optimisation of groundwater dynamics adjacent to a rice paddock (M McLachlan, K Hodgson);
- * Salt transport at the regional scale (Y Shao, P Xu);
- * Quantifying climatic and management impacts on shallow watertables and soil salinity (S Khan);
- * Risk-based spatial modelling to identify regional soil salinity trends in irrigation areas (L Best);
- * Land and Water Management Plans and research needs (A Van der Lely).

Sub-Program 2.3 held a workshop at Yanco on 10 April, 2001 at which the following presentations were made:-

- * A nutrient budget for Australian rice (K Marr, G Batten);
- * Impacts of stubble burning and stubble incorporation on the sustainability of rice production (C Kirby);
- * Changes in soil fertility under rice cropping (H Gill);
- * Field responses to phosphorus and zinc in rice (Y Dang);
- * Inducing straighthead in the glasshouse (R Williams);
- * Minerals in grains of Australian rice and in samples affected by "straighthead" (P Williams);
- * Minerals in grains matured in the panicle culture system (T Dunn);
- * Iron and zinc manipulation in Australian rice (R Duncan);

- * Implications of minerals to healthy rice crops (L Campbell);
- * Impressions and suggestions for future research (R Welch, visiting scientist).

The following posters were also presented:-

- * Mineral concentrations in Australian and overseas brown rice types (Batten, Marr, Williams and Farrell);
- * Composition of grains from cultured wheat heads (Batten, Dunn, Slack and Steer);
- * A preliminary nutrient audit of the Australian rice industry (Batten, Reuter, Unkovich and Kirby);
- * Straighthead disorder in rice (Troidahl).

Mr Michael Cook attended the CRC Communicators Workshop in Robertson, NSW in October 2000.

Conferences Attended

CRC participants gave oral presentations at the following conferences:-

The Rice CRC co-sponsored the Murrumbidgee Landcare Forum in Griffith, NSW in June 2001. Presentations by the CRC included briefings on how irrigation research is helping Landcare and Rice CRC groundwater modelling research.

Dr Shahbaz Khan gave a presentation on “scaling issues in the development of economically viable and environmentally sustainable land use practices for the irrigation areas” at the Regional Scale Hydrology workshop convened by the CRC for Catchment Hydrology (October 2000).

Rice CRC Annual Symposium, Yanco NSW - 7 & 8 February, 2001. Project participants presented overviews on current status of work and future directions. The Symposium also included guest presentations by:-

- * Dr Liz Dennis, CSIRO Plant Industry - “genomics and gene technology”;
- * Prof Peter Cullen, CRC for Freshwater Ecology - “technology transfer, communication and knowledge brokering in relation to environmental and water management issues”; and
- * Mr Matt Linnegar, Ricegrowers’ Association of Australia - “Rice industry environmental policy”.

Project presentations included:-

- * Assessing positional and areal accuracy for environmental compliance monitoring at Coleambally Irrigation Area (T van Niel).
- * Improving the water use efficiency of rice (J Thompson).

- * Wheat after rice (E Humphreys).
- * Water quality in rice agriculture - the fate of pesticides in rice cropping (K Spark).
- * Progress in understanding the regional groundwater dynamics of rice growing areas (S Khan).
- * A soil nitrogen test for aerially sown rice (C Russell).
- * Using airborne multispectral imagery for rice management (S Spackman).
- * Iron and zinc transport in rice (R Duncan).
- * Cold tolerance in rice (R Williams).
- * Pathways of assimilate transport in rice anthers (L Cantrill).
- * Seasonal review/vegetative temperatures boost yield potential (W Clampett/T Farrell).
- * Enhancer and gene trapping systems in rice to isolate suitable control sequences for manipulating grain quality characteristics (A Eamens).
- * Amylose - what it controls and what controls it (H Shead).
- * Investigation of variation in the rice soluble starch synthase 1 gene from different varieties (S Oliver).
- * The estimation of green grain content in harvested rice using NIRT spectroscopy (N Cutter).
- * Imaging sectioned rice grains using atomic force microscopy (J Dang).
- * Irrigation courses available at Charles Sturt University (G Batten).
- * A socio-economic research agenda for the Rice CRC (J Spriggs).
- * Professional development for sustainable rice production (S Sivapalan).

The Symposium also included a “taste” session of new rice products presented by Mr Michael Bayles from Ricegrowers’ Co-operative Limited.

Other conferences attended by CRC participants during 2000/2001 included:-

MDBC Forum 2001, Canberra , April 2001.
18th Australian and New Zealand Society for Mass Spectrometry Conference (ANZSMS18), Gold Coast, Queensland, February 2001.
COMBIO 2000 Conference (combined meeting of the Australian and New Zealand Societies of Plant Physiologists and the Australian and New Zealand Societies for Biochemistry and Molecular Biology), Wellington, New Zealand, December 2000.
45th AARES annual conference in Adelaide, South Australia in November 2000.
International conference on “The impact of agricultural research for development in South-East Asia”, Phnom Penh, Cambodia, October/November 2000.
Cereal Health and Life Conference, Gold Coast, Queensland, September 2000.
3rd International Crop Science Congress, Hamburg, Germany, August 2000.
The Crawford Fund’s 2000 International Conference - “Food, water and war: security in a world of conflict”, Canberra, August 2000.
Ricegrowers’ Association of Australia Annual Conference, Deniliquin, NSW, August 2000.
Plasmodesma 2001, Capetown, South Africa, August 2001.
Electromagnetic Techniques in Agricultural Resource Management conference, Yanco, NSW, July 2001.
CRC Association Conference, Perth, Western Australia, May 2001.
11th ICC International Cereal and Bread Congress, Gold Coast, Queensland, 2000.
Riversymposium, Brisbane, Queensland, 2000.
10th Australian Agronomy Conference, Hobart, Tasmania, 2001.
Australian National Conference on Irrigation and Drainage, Toowoomba, Queensland, 2000.

Papers Presented at Conferences

(See also “Published Conference Papers” in “List of Publications and Patents” section)

Cantrill, L. (2001). “Cell biology of chilling”. (Rice CRC Annual Symposium, 7-8 February 2001, Yanco, NSW.).

Cantrill, L., Mamun, M.E., Herbert, K., Jacobs, B., Overall, R. and Sutton, B. (2000). “Cell biology of chilling-induced pollen damage in rice”. (Third International Crop Science Congress, Hamburg, August 2000).

Eamens, A.L. and Blanchard, C.L. (2000) “A survey of sequence variation in rice GBSS1 genes.” (11th ICC International Cereal and Bread Congress, Gold Coast, Australia).

Mamun, M.E. (2000). “Cell biology of chilling-induced pollen damage in rice”. (Combio 2000, 11-14 December 2000, Wellington, New Zealand).

Oliver, S.N., Blanchard, C.L. and Roffey, P.E. (2000). “Investigation of DNA sequence variation in soluble starch synthase genes from different rice varieties.” (11th ICC International Cereal and Bread Congress, Gold Coast, Australia.)

Conference Posters

Akbar, S. (2001). “Measurement and losses from on-farm channels and drains.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Batten, G., Reuter, D., Unkovich, M. and Kirby, C. (2001). “A preliminary nutrient audit for the rice industry.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Baxter, G. (2001). “Optimisation of rice protein extraction.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Beecher, H.G. and Jinadasa, N. (2001). “Better prediction of groundwater recharge from rice growing.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Brindley, S. (2001). “Rice milling process control - white rice milling optimisation.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Cantrill, L., Mamun, M.E., Herbert, K., Jacobs, B., Overall, R. and Sutton, B. (2000). “Cell biology of chilling-induced pollen damage in rice”. (Third International Crop Sciences Congress 2000, 17-22 August 2000, Hamburg, Germany, August 2000).

Cother, E., Lanoiselet, V. and Ash, G. (2001). “Can rice blast occur in Australia?” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Dolferus, R. (2001). “Identification of rice genes involved in cold-induced pollen sterility.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Dunn, B. and Beecher, H.G. (2001). “The estimation of soil sodicity and pH using NIR spectroscopy.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Eustace, K. (2001). “Intranet development.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Farrell, T., Fox, K., Williams, R. and Fukai, S. (2001). “Field screening for cold tolerance.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Gill, H., Black, S., Batten, G., Medway, J. and Chan, Y. (2001). “Impact of Australian rice farming systems on soil changes.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Heidari, R., Bell, K.L., Devonshire, A., Russell, R.J. and Oakeshott, J.G. (2001). “Enzymatic Bioremediation of Pesticide Residues.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

Hill, D. (2001). “Determination of the effects of rapid drying on grain quality using a Satake RMDR 12SD batch dryer.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).

- Hughes, P. (2001).** “Transgenic rice expressing insecticidal proteins from *Bacillus Thuringiensis Israelensis* for controlling bloodworm.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Kerim, T. and Imin, N. (2001).** “Cold changes the normal expression of proteins in the developing rice microspore.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Lewin, L. (2001).** “Rice CRC development programs.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Mamun, M.E., Cantrill, L., Overall, R. and Sutton, B. (2001).** “Cellular biology of rice anther development and alteration in low temperatures”. (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Pan, Y., Williams, P., Khatri, Y., Pye, J. and Bayles, M. (2001).** “Properties of rice flour.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Parkash, S., Wootton, M., Delves, R. and Driscoll, R.H. (2000).** “Impact of storage at -20°C on rice properties”. (Cereals 2000, 11th ICC Cereal and Bread Congress and 50th Australian Cereal Chemistry Conference, Surfers Paradise, Queensland, September 2000).
- Singh, R. and Faour, K. (2001)** “A representative whole farm model of rice-based farming systems in the MIA”. (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Troldahl, R. (2001).** “Rice CRC Education Officer.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Williams, P. (2001).** “Enrichment of rice with Folic Acid.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Wilson, A. (2001).** “Influence of organic and conventional farming practices on invertebrate biodiversity in establishing rice crops.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Wootton, M. (2001).** “Impact of storage at -20°C on rice properties.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Zhao, Z. (2001).** “Distribution of phenolic acids in rice grains.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Zhou, Z. (2001).** “Influence of organic and conventional farming practices on invertebrate biodiversity in establishing rice crops.” (Rice CRC Annual Symposium, Yanco NSW, 7-8 February 2001).
- Zhou, Z., Robards, K., Blanchard, C.L. and Heliwell, S. (2000).** “Rice Ageing and its affect on eating quality”. (11th ICC International Cereal and Bread Congress, Gold Coast, Australia.)

Seminars

Dr Kaye Spark gave the following presentations:-

- * “Pesticides going down the drain”, CSIRO Land and Water, Griffith, NSW, August, 2000.
- * “Pesticide residues in soils and waters”, CSIRO Land and Water, Griffith, NSW, November 2000.
- * “Water quality and irrigation - issues and actions”, CSIRO Land and Water, Adelaide, SA, December 2000.

Mr Greg Doran gave a presentation on “Pesticide residues in soils and waters” at a CSIRO Land and Water seminar, April, 2001.

Ms Fiona McCartney gave a presentation on “My experiences as a CRC summer student” at a NSW Agriculture seminar, Yanco, NSW, March 2001.

Professor Ross Welch (visiting scientist supported by CRC) gave a presentation on “Harnessing the power of agriculture to improve human health in sustainable ways” at a NSW Agriculture seminar, Yanco, NSW, March 2001.

Visitors

Name/Organisation
Soil scientists from North Korea - May 2001.
Malaysian ministerial representatives and representative from Malaysian Agricultural Research and Development Institute, April 2001
Charles Sturt University students, April 2001.
Korean delegation consisting of representatives from ACIAR, Kim II Sung University, Academy of Agricultural Sciences, government and the General Bureau for Cooperation with International Organisations, March 2001.
Representatives from National Institute of Agriculture, Science & Technology and the National Crop Experiment Station, Korea, March 2001.
Korean representatives from Chonnam National University, Suncheon National University and Rural Development Administration of Korea, March 2001.
Representatives from the Xinjiang Institute for Endemic Disease and Research Control, Institute of Nuclear and Biological Technology, Xinjiang and Xinjiang Academy of Agricultural Sciences, China - March 2001.
Representatives from the Xijiang Academy of Biological Sciences and the Xinjiang Academy of Agricultural Sciences, China, March 2001.
Matrix Communications, March 2001.
Representatives from Chonnam National University, Rural Development Administration and Suncheon National University, Korea, March 2001.
Ms Liz Rogers, Water Policy Officer (MDBC issues), NSW Agriculture, February 2001.
Mr Gavan O’Connor, Shadow Minister for Agriculture, Forestry and Fisheries (Australian Commonwealth Government) February 2001.
Japanese farmers, February 2001.

Kellogs Pty Ltd, December 2000.
Johnny Fernandez, researcher, Uruguay, December 2000.
Central Government irrigation study group from China, December 2000.
Charles Sturt University students, November 2000.
Official Japanese delegation from Aomori Prefecture, November 2000.
IRRI representatives, October 2000.
Ehime Prefectural Government, October 2000.
IRRI representatives, Philippines, October 2000.
Andres Pantazoglu, researcher, Uruguay, August 2000.
Ricegrowers' Association of Australia women's group, Wakool Branch, August 2000.
Jindera Branch members of NSW Farmers' Association, August 2000.
Chinese delegation, August 2000.

Overseas Visits by Rice CRC Staff

Dr Liz Humphreys visited the ACIAR IRRI/IWMI/China project on “Impact of Irrigation Water Saving Techniques in China” in August 2000, as part of the development of a new ACIAR project “Growing More Rice with Less Water: Increasing Water Productivity in Rice-Based Cropping Systems”. CSIRO joins the other groups in this new project, which also includes the Murrumbidgee as a study site. Drs Humphreys and Khan visited China in March 2001 for the launch of this new project and field visits. The new ACIAR project has links with CRC projects 1201, 1205 and 1403.

In relation to Projects 1201 and 1403, Drs Khan and Christen visited Pakistan to review the progress of a related ACIAR project “conjunctive water management in South-East Asia” in April and May 2001 respectively.

Dr Humphreys visited Punjab, India in April 2001 as part of the development of a new ACIAR project “Permanent beds for irrigated rice-wheat and alternative cropping systems in north-west India and south-east Australia”.

In June 2001 Dr Shahbaz Khan participated in an ACIAR International Water Policy Workshop in Bangkok, Thailand. He was invited to present a paper on "Developing policies for sustainable irrigation water management using hydrologic economic modelling frameworks". Other participants included presenters from the Indian Institute of Management, Ahmedabad; International Water Management Institute, Sri Lanka; International Food Policy Research Institute, Washington; Khon Kaen University, Thailand; Vietnam Institute of Water Resources Research; International Water Management Institute; Centre for Chinese Agricultural Policy and some representatives from Australian Universities.

Prof Alan Devonshire, IACR-Rothamsted, has been visiting the CSIRO Entomology Bioremediation group from 7 May until 8 June 2001, building on work achieved during his recent 12 month sabbatical. Prof Devonshire is a world expert in the area of pesticide biochemistry and resistance.

During October/November 2000 Mr Tim Farrell attended an international conference on “The impact of agricultural research for development in South-East Asia” in Phnom Penh,

Cambodia. He also attended an ACIAR workshop on “Productivity of lowland rice in South-East Asia, overcoming environmental constraints” in Vientiane, Laos.

CRC officers have also attended international conferences in Germany, New Zealand, South Africa and Cambodia.

Field Days

The Centre was represented at the Henty Field Days (three days) which is the largest event of its kind in southern NSW, as well as the Murrumbidgee Farm Fair (Yanco, NSW).

Media coverage

The Centre issued 22 press releases during the reporting period and a similar number of media interviews of personnel were generated. Information on Rice CRC activities or research progress formed the basis of 14 radio and television broadcasts during the reporting period. Several of these broadcasts had a potential audience of 1.2 million.

Reports in media outlets are listed below.

Date	Publication	Title
Media Releases/Reports - Print		
<i>2001</i>		
May 4, 7 & 8	Country Mail, Country News, Pastoral Times	Cold work/water use efficiency
April 17, 19, 20 & 27	Pastoral times, The Land, Rural News, Country Mail	Visiting scientist, Professor Ross Welch
April-May	Australian Grain Magazine - The Ricegrower Vol 11. No.2	GMO bloodworm: Win, win (pRGi)
April-May	Australian Grain Magazine - The Ricegrower Vol. 11 No.2	Cold tolerance is one step closer (pRGii)
April 5	The Daily Advertiser	A love of science pays off
April	IREC Farmers' Newsletter No. 157	What growers think about crops after rice (p29-31)
April	IREC Farmers' Newsletter No. 157	Dust from landforming - is it a problem?
March 3	Farm Talk (Pastoral Times supplement)	Research assists rice industry
Feb 16, 17, 28; March 3 & 8	Murrumbidgee Irrigator, Pastoral Times, Riverine Grazier, Farm Talk, The Land	Frontier technologies path to water savings
Feb-March	Australian Grain Magazine - The Ricegrower Vol. 11 No.1	Hot summer nights frustrate cool weather tests (pRGiii)
Feb-March	Australian Grain Magazine - Vol. 11 No.1	New soil test to put lime where it's most needed (p22)
Feb 16, 19 & 20	Area News, Southern Weekly, Pastoral Times	Rice industry dedicated to sustainability
Feb 14	Weekly Times	Benefits will answer MG fears, scientist claims
Feb 14	Southern Riverina News	Committed rice industry meeting
Feb 9	Country Mail	Rice research for iron

<i>2000</i>		
October	Area News	Seminar: growing rice with less water
Oct 6	Wagga Daily Advertiser	Murrumbidgee modelling
Aug-Sept	Australian Grain Magazine - The Ricegrower Vol. 10 No. 4	It came through the wheel but did it get to the paddock? (p i)
Aug-Sept	Australian Grain Magazine - The Ricegrower Vol. 10 No. 4	Rice: A meal in three minutes (p vi)
August	Incitec Fertilizers Newsletter	Pre-flood nitrogen research continues (p2)
August	Various - news faxstream	Professor of Irrigation
Aug 10	The Land	Rice CRC
Aug 10	The Land	Rice CRC Symposium
Aug 10	The Land	Professor of Irrigation
Media Releases/Reports - Radio/Television		
<i>2001</i>		
May2001	2UE Rural, ABC Rural Shepparton	Cold work/water use efficiency
April 5	2UE	University medal to Rice CRC student
Feb 7	2UE Rural	Symposium: cold tolerance, gene technology
Feb 7	ABC Radio Riverina	Symposium: gene technology, sustainable production
Feb 7	WIN Television	Symposium: cold tolerance
<i>2000</i>		
Oct 20 & 24	2QN, 2RG	Seminar: Growing rice with less water
Sept 11	2UE, 2RG	Cold tolerance

Communications Officer

Communications Officer, Mr Michael Cook, has continued to implement a number of initiatives within the External Communications Sub-Program. (See Education report, Sub-Program 5.6).

A Charles Sturt University team led by Mr Ken Eustace continued development of an internal web site or intranet and an on-line conference facility on behalf of the Rice CRC during 2000-2001. Once on-line, these communications systems will circumvent difficulties presented by the broad geographic distribution of Rice CRC personnel. Greater organisational cohesion and significant savings on administrative costs are expected to result from these initiatives.

Education Officer

Since her appointment Mrs Troidahl has been very active in developing specific display material and presentations, arranging programs and visits to rice research and information sites (including farm visits), coordinating and participating in presentations for schools, community groups and international visitors.

AWARDS

Grants

Name	Organisation	Project Title	Source	Amount
Andrew Eamens	Charles Sturt University	Investigation of the molecular mechanisms of starch quality	RACI Cereal Chemistry Division	\$500.00
Sandra Oliver	Charles Sturt University	Investigation of genetic diversity in rice cultivars	RACI Cereal Chemistry Division	\$500.00
Saud Akbar	NSW Agriculture	Assessing the effect of compaction and clay lining on seepage from on-farm channels and drains	Murray Irrigation Corporation	\$10,000.00

Awards

Name	Organisation	Project Title	Source	Award
Sandra Oliver	Charles Sturt University	Investigation of genetic diversity in rice cultivars	Charles Sturt University	University Medal

PERFORMANCE INDICATORS

	1997/98	1998/99	1999/2000	2000/2001
A. COOPERATIVE ARRANGEMENTS				
A1 The contributions of staff from each participating institution to the objectives of the Rice CRC .	Staff from participating organisations have fully committed to the objectives of the CRC. These contributions are detailed in the “Research Staff Resources” table in the “Staffing and Administration” section of this Report. Any shortfall in commitment has been due to staff changes and resignations.	Staff from each of the participating organisations have met their commitments to the Centre. There are some minor exceptions due to resignations. These contributions are detailed under “Research Staff Resources” table.	Staff from each participating organisation have met their commitments to the Centre. These contributions are detailed under “Research Staff Resources” table.	Staff from each participating organisation have met their commitments to the Centre. These contributions are detailed under “Research Staff Resources” table.
A2 The interaction of the Rice CRC and its contributing staff with other funding bodies.	There is strong interaction of contributing staff with other funding bodies. Other bodies that have funded programs include RIRDC, NHT, McCaughey Trust, LWRDC, ACIAR.	Most interaction of contributing staff has been with the Rice Research and Development Committee of RIRDC. Other active involvement has been with the National Heritage Trust, McCaughey Trust, LWRDC and ACIAR.	Interaction with other funding bodies has been with ACIAR, LWRDC, RIRDC and Irrigation Companies.	Interaction with other funding bodies has been with ACIAR, LWRDC, RIRDC and Irrigation Companies.
A3 The range of opportunities for exchange of information on the Centre objectives and activities through seminars and workshops.	Two workshops were completed. These were on mineral nutrition and cold tolerance in rice. There were program meetings for Programs 1 (two meetings), 2.1, 2.2,	Workshops were completed on Water Use Efficiency and Cold Tolerance. Program meetings were held for Program 1, 4 and 5 and Sub-Programs	Exchange of information was facilitated by - Annual Symposium; “Chairman’s Tour”; Program meetings for Programs 1, 2, 5 and the Cold Focus group.	Exchange of information was facilitated by the Annual Symposium and Program meetings, discussion with irrigation Boards, and many seminars, presentations and contributions to workshops.

	1997/98	1998/99	1999/2000	2000/2001
	2.4, 3.2, 4 and 5.	2.1 and 2.2/3.2. Seminars were presented by contributors to the Centre.	Other workshops were - Salinity; Water Use Efficiency; Economic evaluation of alternative resource management strategies in a risky environment; Water quality; Cold –induced sterility in rice.	
A4 The extent of interaction with research groups other than those directly participating in the Centre.	Research groups from many organisations have interacted with CRC programs. These include participants from The University of Queensland, Australian National University, The University of Melbourne, University of Wollongong, The University of NSW, Incitec Fertilisers Ltd.	Research groups, other than those with active participants in the Centre, are from Australian National University, University of Queensland, University of Melbourne, University of Wollongong, University of New South Wales, Incitec Fertilisers Ltd.	Active participation in Centre activities has included that of Australian National University, University of Queensland, University of Melbourne, University of NSW, Incitec Fertilisers Ltd.	There has been active participation with research groups from the Australian National University, University of Queensland, University of NSW, Incitec Fertilisers Ltd and environmental staff from Murray Irrigation Ltd, Murrumbidgee Irrigation Ltd and Coleambally Irrigation Cooperative Ltd.
A5 Evidence of upgraded links between members of participating institutions.	Links between participating institutions have been upgraded in many areas. Program 1: Existing links have been strengthened rather than new ones created. New links are those established in the supervision of postgraduate students. Program 2.1 New links between NSW	Program 1: Additional links established with University of NSW. Program 2: Building upon links established in 1997/98. Links with University of Queensland expanding. Improved links with Japanese researchers. Program 3: Expanding on existing links and establishing new links with Australian National University, CSIRO	Program 1: Upgraded links between Universities, Irrigation Companies, CSIRO, NSW Agriculture and NSW Dept. Land & Water Conservation. Program 2: Building on existing links as in 1998/1999. Program 3: Links between University of Sydney and CSIRO expanding. New links between CSIRO and	The linkages already developed during the first three years of CRC activities have been reinforced. Stronger links have developed with irrigation companies. Links between CSIRO and The University of Sydney have expanded, as have links between CSIRO and Charles Sturt University.

	1997/98	1998/99	1999/2000	2000/2001
	Agriculture, CSU, Incitec and CSIRO Plant Industries are significant. Program 2.2 and Program 3.2. A strong network has developed between NSW Agriculture, University of Sydney, CSIRO Plant Industries and other organisations outside the CRC. These are generally new links. Program 4. Links have started to develop between RCL and The University of Sydney. Program 5. New links have been developed across institutes as a result of the postgraduate program (as indicated in A6).	Entomology, Dr Deep Saini (University of Montreal). Program 4: Improved links developing between Ricegrowers' Co-operative Limited and Charles Sturt University and University of NSW. Program 5: Most improved links have developed through postgraduate supervision.	NSW Agriculture. Program 4: Expanding links between RCL, NSW Agriculture, CSU and CSIRO. Program 5: As for 1998/1999.	
A6 The interaction of University and non-University staff in the education program.	Postgraduate supervision has been outlined in Section 5. Of the 6 students appointed to date, 5 are supervised jointly between University and non-University staff.	Postgraduate supervision has been outlined in Program 5. Of the 17 current students, 11 are supervised jointly between University and non-University staff.	Of the 17 current students, 10 are supervised jointly by university and non-university staff. All others have contact with non-university staff.	Of the 32 students who were current during 2000/2001, 14 were supervised primarily by university staff, 3 were supervised by non-university staff and the remaining 15 were supervised jointly by university and non-university staff.
B. RESEARCH AND RESEARCHERS				
B1 Papers in refereed journals.))	Eight publications in refereed journals.	Seven publications in refereed journals.	Ten publications in refereed journals.

	1997/98	1998/99	1999/2000	2000/2001
B3 Software development and application.))))There has been)insufficient time) for the CRC to have)produced formal outputs	SWAGMAN Farm development and application by Irrigation Companies.	SWAGMAN Farm development continued and application by Coleambally Irrigation has expanded. Remote Sensing Horizontal Accuracy Extension program (ArcView) was posted to the CRC website.
B4 Scientific developments that are applied throughout the industry.))))	Application of Folic Acid to rice (RCL). Process Control (RCL). EM31 for rice soil suitability (Program 1.1 – with RIRDC)	As for 1998/1999 plus new quick cook products (RCL).	Application of remote sensing for “precision agriculture”. Expanded range of “quick cooking” rices. Application of new rice receipt technologies at all receipt sites.
C. EDUCATION AND TRAINING				
C1 The number of graduate programs offered and successfully completed.	Graduate programs are under development to commence in 1999.	Undergraduate program to commence Spring 1999 – Rice Farming Systems. Undergraduate program in Cereal Science to commence 1999. Specific rice training provided for 11 students from University of Sydney.	*There were 571 undergraduate students involved in 7 CRC sponsored courses. * 4 Honours students completed and 2 enrolled.	* There were 153 undergraduate students involved in 5 CRC-sponsored courses. * 4 Honours students were enrolled, 3 of whom have completed their studentship.

	1997/98	1998/99	1999/2000	2000/2001
C2 The number of post-graduate opportunities offered and successfully completed. Distribution among the participating institutions is also an important measure.	5 postgraduate positions appointed, a further 10 have still to be commenced.	Currently 17 postgraduate positions appointed, with an additional 5 to commence shortly and 4 to be established. Number of students currently exceeding target of appointing 16 students by Year 4 and on track to satisfy target of appointing 32 students by Year 7.	17 postgraduate students enrolled. 4 Sydney University 7 CSU 2 Univ. of Queensland 2 ANU 2 University of NSW	28 postgraduate students were enrolled - 7 Sydney University 13 Charles Sturt University 2 University of Queensland 2 Australian National University 2 University of NSW 2 University of Technology, Sydney (2 Masters completed, 1 PhD withdrawn)
C3 Establishment and use of vocational training programs.	Vocational training programs are being developed.	Vocational training programs in Irrigation and Rice Production have been developed. The rice module is to be presented initially in spring semester 1999.	Vocational training delivered in - Rice Production; Irrigation; Colour sorting (processing).	Vocational training delivered in - Rice Production; Irrigation; Colour sorting.
C4 The extent of wider community information opportunities.	Community information opportunities are developing.	Community information opportunities have been provided on many occasions. Examples are – Women in Rice group, Landline program, Australian Geographic, involvement in several press articles, over 30 visitors (often consisting of large groups) to the Centre and other participating locations, involvement in two field days and other activities	Community information opportunities have been extensive through - school visits, interaction with community groups; press releases; - Land & Water Management Plan education program, net recharge management module.	Community information opportunities have been extensive through:- * six presentations to school groups; * presentation to Murray Valley womens group; and * excellent take-up rate of Rice CRC news releases in local press (at least 50 articles or broadcasts generated by 22 news releases during 2000/2001).

	1997/98	1998/99	1999/2000	2000/2001
		at various locations. Coleambally Irrigation Cooperative Ltd education module.		
D. APPLICATION OF RESEARCH				
D1 Application of improved technology to improve sustainability throughout the industry.	Application for EM methodology, crops following rice and new processing techniques have commenced.	Application of EM methodology, folic acid application to rice and infrared processing enhanced. HACCP application commenced. Soil testing pilot study to commence.	As for 1998/1999. Also Application of modelling for Irrigation Companies (Program 1).	* Enhancement of post application. * Application of “crops following rice” to manage groundwater. * “Rice on beds” application to manage water use and system sustainability.
D2 The value of the product, processes or services in increasing exports or import substitution.	New products are still under development.	Folic acid enhanced rice sales have commenced.	Marketing of quick cook rices commenced by RCL.	Expanded range of “quick cook” products on supermarket shelves.
D3 Contribution of the findings to new standards of operation.	HACCP implementation across sector has commenced.	HACCP application across processing sector has commenced.	HACCP implementation across processing sectors.	Application of improved receival and processing techniques to improve product quality.
D4 The extent to which skills of the Centre are drawn on by users.	Opportunities have been limited to date.	Skills developed by the Centre and by other research providers have been incorporated into improved production systems.	As for 1998/1999	Skills of Program 1 staff have been incorporated into operations of irrigation companies - particularly in application of EM31, SWAGMAN Farm and understanding salinity and groundwater.
D5 Contribution to user-orientated presentations - eg. seminars, popular journals or other media.	Two seminars, plus one radio interview.	Contribution has increased, with staff being involved in over 15 seminars, 30 conference presentations, 10 popular journal articles, and several media opportunities.	CRC staff have been involved in at least 4 specific opportunities to address the public (eg, field days), as well as 6 workshops, 11 conferences and 10 seminars which included exposure to non-CRC	CRC staff have contributed to:- * 3 staff at 6 field days; * 7 workshops; * 5 conferences; * 10 seminars; and a number of print, radio and television opportunities.

	1997/98	1998/99	1999/2000	2000/2001
			participants. Several of the seminars were presented to non-CRC students. Many CRC staff have prepared papers and posters for conferences primarily involving research audiences. The appointment of the Communications Officer has greatly increased dissemination of information to the public via the print, radio and television media.	
E. MANAGEMENT AND BUDGET				
E1 Normal financial reporting and auditing will ensure that the resources are effectively managed.	Financial and auditing system in place.	Financial and auditing system in place.	As per 1998/1999	Financial and auditing system in place.
E2 Establishment of procedures to monitor and report on the research program and achievements in relation to other activities of the Centre.	Project system is being established.	Project system is established.	As per 1998/1999	Project system is established.
E3 Timely and accurate reporting of progress towards the objectives of the Centre.	Needs improvement	Improved over 1997/98	Equivalent to 1998/1999	Equivalent to 1999/2000
E4 The extent to which objectives are modified or rationalised in line with new knowledge or changes in the social or economic environment.	There is continued assessment of objectives. Initially there has been limited need for change.	There is continued assessment of objectives. Initially there has been limited need for change.	There has been continued modification of objectives with changes in the social and economic environment.	Strategic Plan reviewed and updated during the year.

	1997/98	1998/99	1999/2000	2000/2001
E5 Accurate monitoring of projects including financial management and progress towards meeting agreed milestones.	Project management systems have been developed.	Project management systems have been developed.	Project management systems are in place.	Project management systems are in place.
E6 Accurate monitoring of agreed performance indicators and financial transactions.	Monitoring will be part of project management system.	Monitoring will be part of project management system. Financial transactions are continually monitored.	Milestones and financial transactions are monitored.	Milestones and financial transactions are continuously monitored.

BUDGET

Budget and Financial Report

Notes relating the in-kind contributions report and cash report.

Basis of accounting

The financial information in these tables has been prepared on the basis of cash accounting.

In-kind contributions

In-kind contributions represent each partner's expenditure on Rice CRC projects.

Multipliers set down in the Commonwealth Agreement have been applied consistently.

Variations

In-kind contributions from partners

In-kind contributions from a number of partners exceed their obligations under the Commonwealth Agreement. The factors involved relate to a greater input of human resources, inflationary effect on salaries and identification of overheads covering CRC-funded staff. The costs were not accounted for when inputs were originally calculated.

Cash contributions

Contributions from the Murray-Darling Basin Commission (MDBC) (non-participant) will no longer be available, as originally planned.

Funding from this source will now be by application for funds in accordance with MDBC Strategic Investigations and Education plan.

The fourth instalment of the CRC grant of \$575,000 for 1999/2000 has been deferred until Year 5 (2001/2002) where it will be returned in equal instalments during that year. This was necessary due to the slow start up of projects and the large amount of cash resources held.

Costing of Contributions

Table 1
In-kind Contributions from Partners (Dollars in \$'000's)

PARTICIPANT	Actual					Cumulative		Projections				Grand Total						
	97/98	98/99	99/00	2000/01		Total to date		2001/02		2002/03		2003/04		Total	Agr'mt	Diff		
	Actual	Actual	Actual	Actual	Agr'mt	Actual	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	7 Yrs	7 Yrs	7 Yrs		
Charles Sturt University	S	239	240	195	234	217	908	868	217	217	217	217	217	217	217	1559	1519	40
	C						0	0								0	0	0
	O	399	401	326	391	362	1517	1448	362	362	362	362	362	362	362	2603	2534	69
	T	638	642	521	625	579	2426	2316	579	579	579	579	579	579	579	4163	4053	110
University of Sydney	S	88	151	110	113	95	462	380	95	95	95	95	95	95	95	747	665	82
	C			8			8	0								8	0	8
	O	147	252	183	188	159	770	636	159	159	159	159	159	159	159	1247	1113	134
	T	235	404	301	301	254	1241	1016	254	254	254	254	254	254	254	2003	1778	225
CSIRO - Land & Water	S	84	254	195	296	211	829	858	200	211	200	211	200	211	200	1429	1491	-62
	C						0	0								0	0	0
	O	180	476	669	938	322	2263	1307	670	322	670	322	670	323	670	4273	2274	2000
	T	264	730	864	1234	533	3092	2164	870	533	870	533	870	534	870	5702	3764	1938
CSIRO - Plant Industry	S	79	107	77	74	83	337	332	83	83	83	83	83	83	83	586	581	5
	C						0	0								0	0	0
	O	172	151	140	142	149	605	596	149	149	149	149	149	149	149	1052	1043	9
	T	251	258	217	216	232	942	928	232	232	232	232	232	232	232	1638	1624	14
NSW Agriculture	S	435	533	463	466	527	1897	2072	527	527	527	527	527	527	527	3478	3653	-175
	C						0	0								0	0	0
	O	981	2494	3678	2839	863	9992	3369	2500	863	2500	863	2500	863	2500	17492	5958	11534
	T	1416	3026	4141	3305	1390	11888	5441	3027	1390	3027	1390	3027	1390	3027	20969	9611	11358
NSW Dept of Land & Water Conser	S	131	127	162	156	90	576	360	100	90	100	90	100	90	100	876	630	246
	C						0	0								0	0	0
	O	167	230	209	183	154	789	616	180	154	180	154	180	154	180	1329	1078	251
	T	298	357	371	339	244	1365	976	280	244	280	244	280	244	280	2205	1708	497

Ricegrowers' Co-operative Ltd	S	234	417	316	215	439	1182	1756	316	439	316	439	316	439	2130	3073	-943		
	C						0	0							0	0	0		
	O	685	1012	800	709	667	3206	2668	790	667	790	667	790	667	5576	4669	907		
Note 2 (RCL)	T	919	1429	1116	924	1106	4388	4424	1106	1106	1106	1106	1106	1106	1106	1106	7706	7742	-36
Other Organisations	S	44	175	324	232	158	775	557	158	158	158	158	158	158	1249	1031	218		
	C						0	0							0	0	0		
	O	89	222	609	594	298	1514	1067	298	298	298	298	298	298	2408	1961	447		
Totals per category	T	133	397	934	826	456	2290	1624	456	456	456	456	456	456	3658	2992	666		
	S	1334	2004	1842	1786	1820	6967	7183	1696	1820	1696	1820	1696	1820	12055	12643	-588		
	C			8			8	0							8	0	8		
	O	2820	5239	6614	5984	2974	20657	11707	5108	2974	5108	2974	5108	2975	35981	20630	15351		
	GRAND TOTAL IN-KIND (T1)	T	4154	7242	8465	7770	4794	27631	18889	6804	4794	6804	4794	6804	4795	48043	33272	14771	

S=Salaries; C=Capital; O=Other; T=Total

Note 1: DLWC Adjustments have been made for revised figures previously provided for the 97/98 & 98/99 financial years.

Note 2: RCL Adjustments have been made for revised figures provided for the 97/98 & 98/99 financial years.

Reports previously supplied which are affected by the revised figures have been provided to the Secretariat.

Note 3 : A supplementary document has been provided to the CRC Secretariat setting out full details of salaries and associated costs for all staff who contributed.

Due to the confidential nature of this information this document will not be made public.

**Table 2
Cash Contributions**

PARTICIPANT	Actual					Cumulative		Projections				Grand total				
	97/98	98/99	99/00	00/01		Total to date		2001/02		2002/03		2003/04		Total	Agr'mt	Diff
	Actual	Actual	Actual	Actual	Agr'mt	Actual	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	7 Yrs	7 Yrs	7 Yrs
RIRDC	500	500	500	500	500	2000	2000	500	500	500	500	500	500	3500	3500	0
Ricegrowers' Co-operative Limited	75	75	75	75	75	300	300	75	75	75	75	75	75	525	525	0
University of Sydney	60	60	60	60	60	240	240	60	60					300	300	0
Total cash from participants	635	635	635	635	635	2540	2540	635	635	575	575	575	575	4325	4325	0
Other cash																
Non-participants MDBC (Note 1)					150	0	600		150		150		150	0	1050	-1050
External grants						0	0							0	0	
Contract Research						0	0							0	0	
Commercialisation						0	0							0	0	
Education						0	0							0	0	
Interest		18	21	34		73	0		26		14		14	127	0	127
Refunds (Note 2 97/98)	-72	4	13	42		-13	0		6		6		6	5	0	5
Sub-Total other cash	-72	21	33	76	150	59	600	32	150	20	150	20	150	131	1050	-919
CRC Grant (Note 3)	941	2313	1746	2347	2300	7347	7245	2934	2875	2318	2300	2318	2300	14917	14720	197
Total CRC cash contribution (T2)	1504	2969	2415	3058	3085	9946	10385	3601	3660	2913	3025	2913	3025	19373	20095	-722
Cash carried over from previous year (=UB for previous year)		715	1603	1097.95												
Less Unspent Balance (UB)	715	1603	1098	938												
Total cash expenditure (T3)	789	2081	2920	3218	3085	9008	10385	4005	3660	3194	3025	2896	3025	19103	20095	-992
Note 4 03/04																
Allocation of cash expenditure between heads of expenditure																
Salaries	383	1207	1777	2098	1910	5464	6368	2452	2260	2064	1910	2025	1910	12005	12448	-443
Capital	30	12	45		60	87	236		72					87	308	-221
Other	376	862	1098	1121	1115	3457	3781	1553	1328	1130	1115	871	1115	7011	7339	-328

Note 1 : MDBC grant no longer available in this form. Applications for funding will now be by application to the MDBC funding committee.

Note 2 : Negative \$72k is an allowance for RIRDC's prior contribution to a project that the Rice CRC agreed to be responsible for.

The transaction has been reflected in this manner to show RIRDC met their cash requirements for 97/98 from the prior financial year.

Note 3 : One instalment of \$575,000 from the CRC in 99/00 transferred to year 5 01/02. CRC grant figures include both actual & forecast annual inflator.

Note 4 : Forecast expenditure for 03/04 includes expenditure which over-runs into 04/05.

**Table 3
Summary of resources applied to activities of Centre**

	97/98	98/99	99/00	2000/01	Cumulative		2001/02		2002/03		2003/04		Grand total			
	Actual	Actual	Actual	Actual	Total to date	Total to date	Budget	Agr'mt	Budget	Agr'mt	Budget	Agr'mt	Total	Agr'mt	Diff	
					Agr'mt	Actual	Agr'mt						7 Yrs	7 Yrs	7 Yrs	
Grand total in-kind (T1)	4154	7242	8465	7770	4794	27631	18889	6804	4794	6804	4794	6804	4795	48043	33272	14771
Grand total cash Expenditure (T3)	789	2081	2920	3218	3085	9008	10385	4005	3660	3194	3025	2896	3025	19103	20095	-992
Total resources applied to activities of Centre (T1 + T3)	4943	9324	11384	10988	7879	36640	29274	10809	8454	9998	7819	9700	7820	67147	53367	13780

Allocation of total resources applied to activities of Centre between heads of expenditure

Total salaries (Cash & in-kind)	1717	3211	3619	3884	3730	12431	13551	4148	4080	3760	3730	3721	3730	24060	25091	-1031
Total capital (Cash & in-kind)	30	12	53	0	60	95	236		72					95	308	-213
Total other (Cash & in-kind)	3196	6101	7712	7105	4089	24114	15488	6661	4302	6238	4089	5979	4090	42992	27969	15023

Table 4
Allocation of resources between categories of activities

Program	Resource usage			
	\$ Cash (1) ('000s)	\$ In-kind ('000s)	Contributed Staff (2)	Cash Funded Staff (2)
Research	2114	5445	17.05	21.42
Education	665	361	1.10	3.11
External Communications	99	0		1.00
Commercialisation/Tech. Transfer	9	1242	4.60	
Administration	332	722	2.31	2.99
Total	3218	7770	25.05	28.52

(1) Cash from all sources, including CRC program

(2) Person years, Professional staff (total should be as in "Research Staff Resources" table)

List of Capital Purchases

Description of Equipment	Date Purchased	Sub-Program	Cost \$
Fluorescence attachment and Nikon Coolpix 990 digital microscopic camera for Leica DM IL Inverted microscope	7/2000	3.3	12,906
<i>Leaf Meter</i>	4/98	2.4	10000
<i>Precision low temperature illuminated incubator Model 818</i>	4/99	3.2	25000
<i>PCR Thermal Cycler (Gene Amp Thermocycler)</i>	6/99	3.4	12500
<i>Gel electrophoresis and documentation equipment (Instadoc 2 Gel Documentation System)</i>	6/99	3.4	13500
<i>Leica Inverse Microscope</i>	12/99	3.3	8600
<i>Hach Field Sodicity Kit</i>	01/2000	1.1	5617
<i>Fluorescence detector</i>	01/2000	3.4	20000

**BRIAN H. MAGUIRE
ASSOCIATES**

**INDEPENDENT ACCOUNTANT'S REPORT TO
THE CO-OPERATIVE RESEARCH CENTRES' SECRETARIAT
DEPARTMENT OF INDUSTRY, SCIENCE AND RESOURCES
REPRESENTING THE COMMONWEALTH IN RESPECT OF
CO-OPERATIVE RESEARCH CENTRE FOR SUSTAINABLE RICE PRODUCTION
FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 JUNE 2001**

Scope

We have conducted a limited scope review of the financial statements of the Co-operative Research Centre for Sustainable Rice Production (CRC-SRP) for the year ended 30 June 2001 comprising Budget Tables 1, 2 and 3 in accordance with clause 14(1)(f) of the Commonwealth Agreement. The parties to the Co-operative Research Centre are responsible for the preparation and presentation of the financial report and the information contained therein.

The scope of our review as based on our understanding of the business activities of the Co-operative Research Centre for Sustainable Rice Production and the systems for recording financial information and preparing financial statements. The review as limited to specific procedures consisting primarily of:

- inquiries of and written representation from CRC-SRP personnel as to:
 - the continued effectiveness of internal accounting controls;
 - the existence of material matters relating to the financial position
 - compliance with the terms of Clauses 4, 5(1), 5(2), 5(3), 9(1), 9(5) and 12(2) of the Commonwealth Agreement; and
- analytical review procedures applied to financial data

These procedures provide less assurance than an audit conducted in accordance with Australian Audit Standards. We have not performed an audit and, accordingly, we do not express an audit opinion.



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TELEPHONE (02) 6953 3022 • FACSIMILE (02) 6953 3406
PARTNERS: A. J. COLLINS CPA • A. J. RODDY CPA • J. D. SLATER CPA

Review Opinion

In our opinion, the financial information presented in Tables 1, 2 and 3 presents fairly the sources of funding, the application of funding and the financial position of Co-operative Research Centre for Sustainable Rice Production for the year ended 30 June 2001 in accordance with Australian accounting concepts and applicable Accounting Standards, the CRC Secretariat's Guidelines for Auditors, and the requirements of the Commonwealth Agreement in terms of Clauses 4 (Contributions), 5(1), 5(2), 5(3) (Application of Grant and Contributions), 9(1), 9(5) (Intellectual Property) and 12(2) (Financial Provisions).

1. The multipliers adopted by the Centre to value in-kind contributions other than salary costs have a sound and reasonable basis and each partner's component of the Researcher's Contributions for the year under report has been provided at least to the value for that year committed in the Budget as specified in the Agreement, and the total value of all Contributions for the year under report equalled or exceeded the amount of grant paid during the year (not including advances). [Clause 4]
2. The Researcher has used the Grant and the Researcher's Contributions for the Activities of the Centre and in my professional opinion there appear to be no material report irregularities. [Clause 5(1)]
3. The Researcher's allocations of the budgetary resources between Heads of Expenditure has not been lower or higher than the allocation in the budget by \$100,000 or 20% (whichever is the greater amount) without prior approval by the Commonwealth. [Clause 5(2)]
4. Capital Items acquired from the Grant and Researcher's Contributions are vested as provided in the Joint Venture Agreement [Clause 5(3)]
5. Proper accounting standards and controls have been exercised in respect of the Grant and Researcher's Contributions and income and expenditure in relation to the Activities of the Centre have been recorded separately from other transactions of the Researcher. [Clause 12(2)]

LEETON NSW
12 September 2001

BRIAN H MAGURIES & ASSOCIATES



ASHLEY J. COLLINS - PARTNER

**BRIAN H. MAGUIRE
ASSOCIATES**

GLOSSARY

ABA	Abscisic acid
ACIAR	Australian Centre for International Agricultural Research
ANU	Australian National University
AWQMG	Australian Water Quality Management Guidelines
BRRI	Bangladesh Rice Research Institute
CANCES	Centre for Advanced Numerical Computation in Science and Engineering
CIA	Coleambally Irrigation Area
CICL	Coleambally Irrigation Cooperative Limited
COS	carbonyl sulphide
CRC	Cooperative Research Centre
CRC Rice	Cooperative Research Centre for Sustainable Rice Production
CSIRO	Commonwealth Scientific & Industrial Research Organisation
CSU	Charles Sturt University
DLWC	NSW Department of Land and Water Conservation
DSC	differential subtraction chain
EM	electro magnetic
ESP	Exchangeable Sodium Percentage
EPA	Environment Protection Authority
ERIC	enterobacterial repetitive intergenic consensus
EST	expressed sequence tag
ET	evapotranspiration
EQOs	environment quality objectives
GAMS	General Algebraic Modelling System
GBSS	granule bound starch synthase
GIS	geographical information systems
GPS	global positioning system
GRDC	Grains Research & Development Corporation
ha	hectares
HACCP	hazard analysis critical control point
HQI	halogen quartz iodide
IREC	Irrigation Research & Extension Committee
IRRI	International Rice Research Institute
IGS	intergenic spacers
ITS	internal transcribed spacers
IWMI	International Water Management Institute
LAI	Leaf Area Index
L&WMP	Land and Water Management Plan
LP	linear programming
LWRRDC	Land and Water Resources Research & Development Corporation
MDBC	Murray-Darling Basin Commission
MIA	Murrumbidgee Irrigation Area
N	Nitrogen
NCGM	National Centre for Groundwater Management
NHT	National Heritage Trust
NIR	Near Infra-Red
NSW	New South Wales
NSWAGRIC	NSW Agriculture
OH&S	Occupational Health & Safety
OP	organophosphate
PBI	Plant Breeding Institute
PCR	polymerase chain reaction
PhD	Doctor of Philosophy
PI	panicle initiation
PIN	panicle initiation nitrogen uptake

PRC	People's Republic of China
QU	Queensland University
RCL	Ricegrowers' Co-operative Limited
REP	repetitive extragenic palidromic
RIRDC	Rural Industries Research and Development Corporation
RRDC	Rice Research and Development Committee
RVA	rapid visco analysis © Newport Scientific
SAR	sodium absorption ratio
SATs	stomatal aperture-related traits
s.e.d	standard error of difference
SGRL	Stored Grain Research Laboratory (CSIRO Entomology)
SPC	Statistical Process Control
SPI	Standard Precipitation Index
SSR	single sequence repeat
SU	Sydney University (The University of Sydney)
SWAGMAN	Salt Water And Groundwater MANagement (®Registered trademark for CSIRO suite of models)
t/ha	tonnes per hectare
UNSW	University of New South Wales
USA	United States of America
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UTS	University of Technology, Sydney

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For Sustainable Rice Production

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