Water Wheel

National Program for Irrigation Research and Development

PROGRAM COORDINATOR'S REPORT

Welcome to the first Y2K compliant edition of *Water-Wheel* for the new Millennium. I trust all readers enjoyed their Christmas/new year break.

This year is likely to see further significant changes in the irrigation industry as each State continues the process of water reform. The NSW Government has recently released its White Paper on the implementation of a more robust water rights framework. The potential benefits of this process for regional development in NSW cannot be understated. An appropriate water rights framework will underpin investment in sustainable irrigated agriculture well into the future.

The Queensland Government will continue the implementation of its multimillion dollar Rural Water Use Efficiency Initiative. This major program addresses both on-farm adoption and research and development needs. There will be continuing links between this initiative and the National Irrigation R&D Program.

We will provide updates on these initiatives and those in other States during the year.

The NPIRD website is on-line! We are continually adding to the page whose address is <www.npird.gov.au>, so keep your eyes on it. We are in the process of downloading a range of information including project listings/descriptions and various components of the Program Plan and Action Plan. Future downloads will include information packages. First cab off the rank will be a package on soil moisture monitoring.

Information packages are a new concept for the Program. Each package will collate our current understanding on a particular issue. For example, the package on soil moisture monitoring will detail currently available technologies and provide objective information on the features of various commercial devices including relevant case studies. This package is currently at editing stage and should be available on the site by the end of March.

Other proposed information packages include repair and replacement options for concrete-lined channels, flow measurement and water use efficiency.

Feedback from the last edition of *WaterWheel* provided a favourable reaction to the revised newsletter format and in particular the articles focusing on different irrigation regions throughout Australia.

We will try to include a new region in each edition with an occasional extended feature article. Volunteers are welcome - please feel free to contact me if you believe that the activities in your region deserve some national recognition!

Hope you enjoy this edition,

Brett Tucker
Program Coordinator

what's inside

This publication is managed by the Land & Water Resources Research and Development Corporation (LWRRDC), GPO Box 2182, Canberra ACT 2601.

LWRRDC's mission is to provide national leadership in utilising R&D to improve the long-term productive capacity, sustainable use, management and conservation of Australia's land, water and vegetation resources. The Corporation will establish directed, integrated and focused programs where there is clear justification for additional public funding to expand or enhance the contribution of R&D to sustainable management of natural resources.

LWRRDC's Home Page is: www.lwrrdc.gov.au

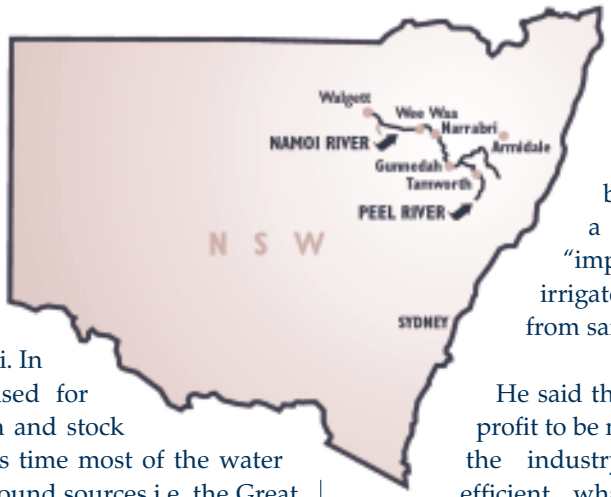
FOCUS ON NAMOI VALLEY

The Namoi Valley is located in northwest NSW. Since the 1960s irrigated agriculture has become increasingly important to the regional economy, mainly as a result of cotton growing. The Namoi and Gwydir valleys make up the centre of Australia's cotton growing industry.

Irrigated agriculture in the Namoi Valley contributes around $267 million a year to output (1995-96 figures based on ABS data) and has a 3:1 multiplier effect on the local economy. It employs almost 1250 people centred mainly on the towns of Narrabri, Wee Waa, Gunnedah and Walgett.

HISTORY

The Namoi River is a tributary of the Murray-Darling Basin and contributes around 1.8% to flows in the Murray-Darling system.



Water extraction has a long history in the Namoi. In the 1890s water was used for limited pasture irrigation and stock and domestic use. At this time most of the water used came from underground sources i.e. the Great Artesian Basin.

In 1960, Keepit Dam was built on the Namoi River above Gunnedah and soon after the cotton industry began.

There have been no new irrigation licences issued on the Namoi since 1976. Despite this, a major issue since the 1980s has been water security.

WATER SECURITY A MAJOR ISSUE

In much of the valley, reliability is low for both underground and surface water.

Jerry Killen, Executive Officer with the Namoi Valley Water Users Association, told *Waterwheel* that the security of surface water has always been less than 100% and is now around 60%. As well, since the mid 1980s groundwater security has emerged as an issue.

According to Jim Purcell, irrigation consultant with Aquatech based at Narrabri, farmers have responded by building on-farm storage to capture off allocation flow (medium and high flow water).

"This ability to capture off allocation flow, along with the investment in infrastructure that has been made by farmers, has been threatened since the introduction of river flow objectives."

Jerry Killen says that the significance of river flow objectives to irrigators is that they may show either that the environment needs more water, or that the timing of access will change thus demonstrating a need for on farm storage, or that security may be threatened.

Both Jerry and Jim agree that farmers acknowledge that there has to be a share of water to go to the environment.

Jim Purcell's clients are adjusting to the situation by trying to get more out of a reduced resource by "improving the way they irrigate so they receive more yield from same megalitre of water".

He said that there is no magical large profit to be made by doing this. Because the industry in general has been efficient, what it means is that some farmers will cut back on area irrigated.

Strategies Jim and other irrigation consultants are working on are centred on reworking irrigation systems to improve performance e.g. improving tailwater management and looking at practices that result in higher yields.

COMMUNITY'S ROLE IN WATER MANAGEMENT

Community involvement in water management has a long history in the Namoi Valley.

The Namoi Valley Water Users' Association is one organisation that has been working since 1967 representing the interests of irrigators and taking up the issue of security.

"The association has been demanding for many years that successive governments stop issuing licenses because of the issue of low security of supply," said Jerry Killen.

The association is also one of the groups represented on the river management committees

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(regulated and unregulated) and the Groundwater Management Committee.

These committees, established by the NSW Government in an attempt to involve the community in managing the water resource, have been working on management plans - for the last two years in the case of the Regulated River Management Committee and for 12 months in the case of the Unregulated River Management and Groundwater Management committees.

Jerry believes that the committees would not work without the representation of the association, which gives "integrity of process".

Regulated and unregulated river management committees. As part of the regulated river management plan, flow rules have been established and the committee will review them in March this year. The river management plan identifies major issues as well as strategies for dealing with these issues. It is a requirement of the NSW Government that the community be involved in the process of developing the plan both through the input of community representatives on the committee and through community consultation. It is hoped that a draft plan will be completed by next year.

The Unregulated River Management Committee is going through a similar process.

Groundwater Management Committee. The major issue that the Groundwater Management committee has been dealing with is that of reallocation. In much of the Namoi Valley groundwater is overallocated. To manage the groundwater resource sustainably, changes in allocation are being made. For some farmers this means that their allocations will be decreased by up to 80%.

An expert panel has just completed a report on this issue and the committee is looking at this report now. As part of this process it is being taken to the community for comment. A draft plan on reallocation will be sent to the Minister for Land and Water Conservation by July 2000.

Research and development. The Australian Cooperative Cotton Research Centre, based at Myall Vale west of Narrabri, is an important research facility where much work on irrigated agriculture is being done. The centre is a cooperative venture between NSW Agriculture, CSIRO, Queensland Department of Primary Industries, NT Department of Primary Industries and Fisheries, Agriculture WA, University of Sydney, University of New England, Cotton R&D Corporation, Cottonseed Distributors, Queensland Cotton, Western Agricultural Industries and Twynam Cotton.

Irrigation and water management related projects are managed under the Sustainable Farming Systems Program.

For more information contact Nicky Schick at the centre on 02 6799 1586,
email <nickys@mv.pi.csiro.au>.

Community based committees. There are five community based committees that are involved in irrigation related issues.

Namoi Community 2000 Plus - Executive Officer, Julie Glover, phone 02 6742 6393

Namoi Valley Water Users Association – Executive Officer, Jerry Killen, phone 02 6792 5222

Namoi Regulated River Management Committee – Executive Officer, Anna Bailey, phone 02 6764 5929

Namoi Unregulated River Management Committee – Executive Officer, Anna Bailey, phone 02 6764 5929

Namoi Groundwater Management Committee – Executive Officer, Anna Bailey, phone 02 6764 5929

ABOUT THE NAMOI

Water licenses. Water licenses in the Namoi Valley are based on either:

- regulated streams (Namoi River)
- unregulated streams (some tributaries of Namoi River)
- groundwater.

There are 1970 license holders in the valley (820 groundwater licenses, 460 unregulated stream licenses and 690 regulated stream licenses). Some farmers have a mixture of two or three of these licenses.

Area irrigated. The total area irrigated is about 89,000 ha (based on 1997 figures). Forty thousand hectares of this total comes from groundwater.

Crops. Cotton is the major crop grown under irrigation. About 50,000 ha are grown in the Namoi Valley.

Other crops include lucerne, horticultural crops such as olives, pecans and wine grapes, and row crops such as sorhum, soybean and maize.

Contribution to the economy. Nearly $267 million farmgate production, most of which is exported. Employs around 1250 people.

Reference

Namoi 2000 Plus, brochure published by Namoi 2000 Plus (1998)

WATER SAVINGS OF UP TO 50% WITH PARTIAL ROOTZONE DRYING IN HORTICULTURAL CROP

A recently completed 2-year research project managed by Brian Loveys from CSIRO Division of Plant Industries demonstrated some exciting results for water use efficiency for horticultural crops such as grapes, citrus and pears.

The project, *CDH1 – Improving the Water Use Efficiency of Horticultural Crops*, looked at developing a water efficient technique for irrigating horticultural crops and defining the responsiveness of major groups of irrigated horticultural crops such as citrus and pome fruit to this technique. A further aim of the project was to devise optimum irrigation schedules for each of these crops.

PRD IMPROVES WUE IN GRAPEVINES

The technique developed as a result of the research project has been called **partial rootzone drying** (PRD), which maintains both wet and dry soil within the upper horizons of the rootzone.

According to principal investigator, Brian Loveys, PRD improves water use efficiency of grapevine management without affecting crop yield when compared with normally irrigated vines. A significant feature of the technique is that it requires only half of the rootzone to be irrigated at any one time.

"PRD offers the possibility of saving up to 50% of normal irrigation allocations. As a result of the project we are proposing that the technique be refined and developed for a wider range of horticultural crops, as it has the potential to reduce water use substantially without affecting yield," he told *WaterWheel.*

EXCITING RESULTS FOR TREE CROPS

Brian said that glasshouse & field experiments showed that fruit trees with their roots divided between two large containers responded within a few days when water was withheld from one half of the roots.

Stomatal conductance was reduced by between 30 and 50% compared with fully irrigated controls and this means the trees used less water. Conductance recovered once the trees were returned to full irrigation," he explained.

In the field, PRD irrigation was applied to citrus and pear orchard trees.

Citrus. Navel orange trees in the MIA were converted from flood to drip irrigation and PRD treatments applied by both flood and drip. In the PRD flood treatment, water input was reduced by 40% but the trees experienced a degree of water stress, attributed to poor water infiltration into the soil.

Brian said that drip irrigated trees showed no water stress symptoms. In trees irrigated on both sides water savings of up to 60% could be achieved while when one side only was irrigated (PRD), water input was reduced by as much as 80% compared with the fully irrigated flood treatment. Fruit quality and yield remained acceptable.

Water use efficiency was also greatly improved for Valencia oranges with PRD irrigation. There was substantial night-time movement of water within citrus trees in response to the creation of both wet and dry roots and some of the effects of PRD could be attributed to this. Water applied to the one side of the trees actually moved into the roots on the dry side of the trees. PRD appears to add another dimension to the water management of citrus trees, although the mechanisms by which this is achieved are not yet fully understood.

Pears. PRD was applied to flood irrigated pears in the Goulburn valley by watering only one side of the row. Water input was thus halved. Crop yield and quality were unchanged, as were measures of tree physiology such as stomatal conductance and shoot water potential. Measurement of soil water provided no evidence that the trees were accessing stored soil water. The next step in this work will be to apply the technique to tree line irrigated, high density peach and apple orchards.

POTENTIAL OF PRD

There are around 248,000 ha of irrigated horticultural crops in Australia (ABS 1993). It is possible that in future there may be major problems with sustaining water supply to these crops. In the grape industry, for example, even current water use is considered to be unsustainable in some areas.

As well, current irrigation practice can be environmentally damaging through depletion of groundwater reserves, rising watertables, salinity, nutrient leaching and eutrophication of waterways.

It is against this background that PRD shows much potential as a technique that reduces water use while not affecting crop yield.

RESEARCH FUTURE

According to LWRRDC Program Manager – Water Resources, Nick Schofield, the results of CDH1 have been so promising that NPIRD will be funding a new project on the topic in Phase 3. This project will consolidate NPIRD's investment to date in PRD technology.

ACKNOWLEDGMENTS

Researcher scientists who collaborated with Brian Loveys in this project were Dr Peter Dry, University of Adelaide (work on Valencia oranges and glasshouse/field experiments), Dr Ron Hutton, NSW Agriculture (work on Navel oranges in the MIA) and Dr Peter Jerie, Institute for Sustainable Irrigated Agriculture, Tatura (work on pears in the Goulburn Valley).

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PRD – OTHER PERSPECTIVES

Chris Brodie, Technical Services Manager at Wingara Wines at Red Cliffs in Victoria, has had a PRD trial running since October 1997 on nearly six hectares of the 400 ha vineyard he manages. *Waterwheel* asked him what he thought of the technique.

"We initially became involved in the trial because all the reports about it read very well, said Chris.

"We were particularly interested in the fact that PRD appeared to allow for large water savings and reduced vine vigour while at same time retaining yields. Water can cost a lot of money here so anything that looks like it will provide savings we obviously will look at."

According to Chris the trial has demonstrated that in using PRD they've come close to maintaining yields "in the area of where we want them".

"Water use has been reduced by 40% and, what's more, the wines produced from fruit grown on the trial area are of a better quality than before," he said.

Wingara will be running the trial on the 6 ha site for another season and then will definitely look at converting more area to PRD as long as they get another season of positive results.

Chris complimented Brian Loveys and his team for the innovative work they have done in this area.

Trevor Eden, an irrigation consultant with Greene Eden Watering Systems in Adelaide, has installed a number of PRD systems. According to Trevor the system has several advantages.

"With the right tools and equipment, installation is an easier process. There are no tube wires and associated aboveground pipe drippers that can be damaged by mechanical harvesters.

"The ability to fertilise directly through the system to the rootzone is another big advantage," he said.

Trevor only uses driplines that have a root barrier to exclude the possibility of root intrusion.

Designing and installing PRD systems does require knowledge and experience in subsurface drip. Anyone installing PRD needs to take special note of soil conditions and quality Trevor told *WaterWheel*.

"Rocky ground or areas where trees, vines or any type of major root growth has been removed and roots have formed water channels will hamper moisture movement to the rootzone," he explained.

"Establishing new vines can also be a problem, depending on soil conditions, but a temporary surface drip tape can facilitate plant growth in the early stages," he added.

According to Trevor PRD (and subsurface drip) has a bright future in the irrigation industry for permanent crops, turf and landscape. He does add that this future will depend on the end users' ability to "conquer their need to 'see the water' and their concern that buried drippers will block up with soil".

JUST RELEASED

GUIDELINES ON REPAIRING AND REPLACING CONCRETE LINED IRRIGATION CHANNELS

Brett Stevenson, Department of Natural Resources Queensland

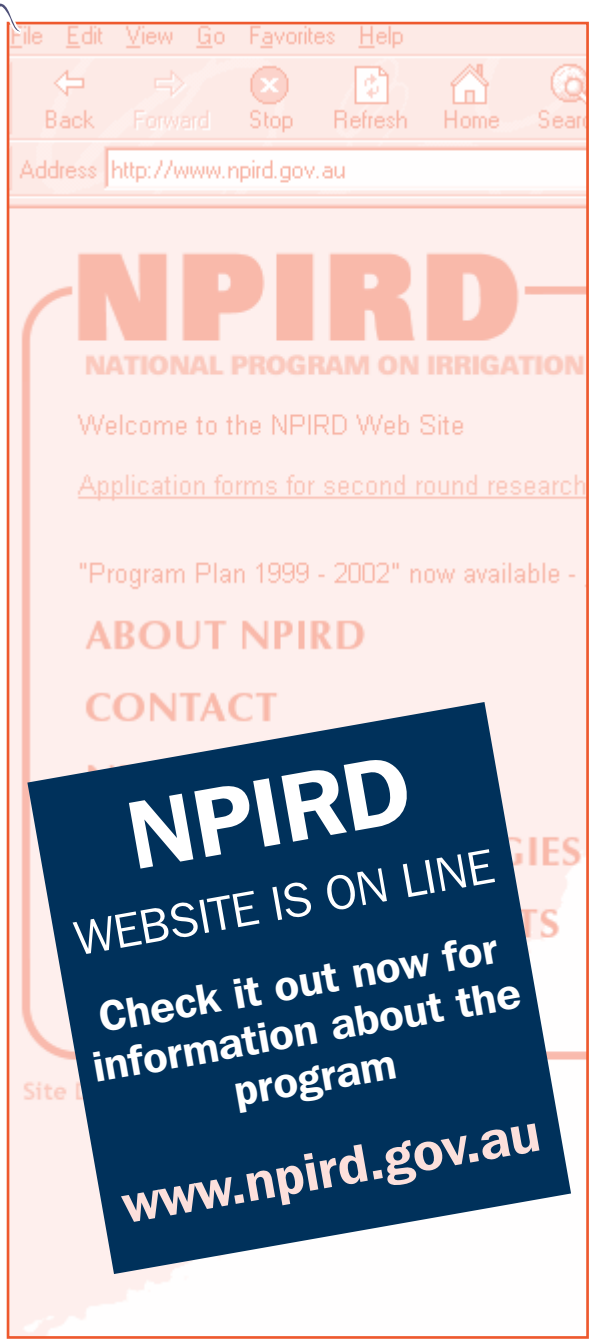
Concrete lined irrigation channels in Australia date back to the turn of the century. Despite this long history, the long-term performance of unreinforced concrete lining has generally been poor. For example, few installations older than 30 years have survived intact without the need for major maintenance to limit leakage.

Improving how we repair or replace concrete lined irrigation channels will result in less wasted water. As a consequence more water can be made available for increased agricultural production or to reduce pressure on existing water resources. Reduced channel leakage may also reduce land degradation problems associated with rising saline groundwater tables.

A research project supported by NPIRD investigated options for repairing and replacing concrete lined irrigation channels has recently been completed.

The aim of the project was to provide advice to those responsible for maintaining irrigation schemes on the best ways of dealing with failed concrete channel lining.

The result of the project is an electronic textbook (available on CD) containing a series of guidelines and case studies describing the various options available to deal with such problems. The package contains links throughout, which help the user hone in on the best solution for their particular problem, without wading through reams of paper.



"Human knowledge is doubling every 10 years.

The winners in the coming century will be those societies most able to discover, develop, capture and profitably trade in new knowledge.

The losers will be those who fail to do so. Their fate will be to fall under the economic suzerainty of the others."

Cribb, J. and Wilcox, C (1999), "Dumbing Down the Clever Country", *The Walkley Magazine*, August 1999.

NATIONAL IRRIGATION SCIENCE NETWORK NEWS

Jeremy Cape, Coordinator,
National Irrigation Science Network

One of the projects the network is currently involved in is working with industry to develop a national irrigation code.

Developing the written code is the final stage of the project, funded by the Murray-Darling Basin Commission and the Irrigation Association of Australia (IAA). Previously a global search identified all the codes relevant to irrigation. A list has been collated and can be viewed on the IAA website <www.irrigation.org.au>.

The current phase has involved workshops at Echuca, Mildura and Narrabri with irrigators and representatives from the irrigation service sector. The aim of the workshops has been to identify the elements participants believe should be included in a national irrigation code.

These elements have been developed around the following four areas:

- planning an irrigation system
- designing an irrigation system
- installation and commissioning
- operation and maintenance.

A noticeable thing has been the level of agreement between people from all areas on the elements that need to be included. This is independent of the irrigation system.

Something else that was very clearly expressed at all workshops is that the code should be voluntary and not used by regulatory or other bodies to enforce change on irrigators.

This is your chance to have a say. The draft text of the code can be found on the network website from February 2000. We're looking for comments before the draft is finalised in March 2000.

MORE INFORMATION

If you would like more information about the code or the National Irrigation Science Network you can contact Jeremy Cape on phone 08 8303 8552 or email <nisn@adl.clw.csiro.au>. The network's website is <www.nisn.com.au>.

NPIRD ESTABLISHES GUIDELINES FOR TECHNICAL REFERENCE GROUP

To help it assess first and second round applications for funding NPIRD has established a Technical Reference Group.

There are four members of the group. Program Coordinator, Brett Tucker, and the independent chairperson will maintain membership of the group for the 3-year phase of the program, while two other members will be specifically appointed to each call by the NPIRD Management Committee.

The role of the group is to assess first and second round applications according to criteria established by NPIRD. Their recommendations are passed to the NPIRD Management Committee.

Members have been selected based on criteria including; their knowledge of the nature and diversity of irrigated agriculture in Australia, their knowledge of previous R&D effort that has gone into the issues on which the call is based and a thorough understanding of the issues on which the call is based.

None of the members are involved directly in any project submitted to the call.
Members of NPIRD Technical Reference Group, for the second call are:

Chairperson, Christine Forster, former LWRRDC board director and NPIRD chairperson

Brett Tucker, NPIRD Program Coordinator

Members for NPIRD Phase 3, call 2 are:

Noel Dawson, former NPIRD Program Coordinator

Mike Hedditch, General manager, grower Services, Rice growers Cooperative

MORE INFORMATION

For more information about the reference group contact:

Brett Tucker, Program Coordinator
Phone/fax: 02 6964 1873
Email: <mcs@webfront.net.au>

Management Committee chairperson, Stephen Mills

MANAGEMENT COMMITTEE ELECTS CHAIRPERSON AND DEPUTY

At the end of last year the NPIRD Management Committee elected Stephen Mills as its chairperson and Warwick Watkins as its deputy.

Stephen has been a member of the NPIRD Management Committee since it was established in 1993. He is chairman of the Australian National Committee on Irrigation and Drainage and is a director on the board of Goulburn-Murray Water.

Warwick is Chief Executive of the Department of Information Technology Management and a director of LWRRDC.

LWRRDC's R&D

LWRRDC publishes a number of newsletters which help land, water and vegetation resource managers and researchers share R&D program specific information. These include:

- *FOCUS* - Dryland salinity R&D program newsletter
- *Intersect* - LWRRDC general newsletter
- *CLIMAG* - Climate variability in agriculture program newsletter
- *RIPRAP* - Riparian land management R&D program newsletter
- *Rivers for the Future* - River health and algal programs magazine.

Streamline is the natural resources database supported by LWRRDC. To subscribe to, or to receive a brochure about Streamline, phone Pam Handyside on (02) 6236 6267 or email *<infoscan@acslink.aone.net.au>*

To be placed on the mailing list for any of these free newsletters contact LWRRDC on phone (02) 6257 3379, fax (02) 6257 3420 or email public@lwrrdc.gov.au *for a Communication Request Form.*

Water Wheel

DO YOU KNOW SOMEONE WHO HAS MADE A SPECIAL CONTRIBUTION TO THE IRRIGATION INDUSTRY?

Why not nominate them for the third Irrigation Association of Australia MacLean-Iedema Award.

This award is named after Scott MacLean, a former IAA chairman, and Don Iedema, two strong supporters of the organisation in its earlier years at both a regional and national level. Tragically Scott, Don and an employee of the company were killed in 1995 in a light plane crash.

In recognition of their contribution to the irrigation industry and the association, the IAA offers the MacLean-Iedema Award to perpetuate and honour their memory. The recipient of the award receives a cash prize and a commemorative plaque.

So if you know someone who has made a notable contribution to the industry in one or more of the following ways, why not nominate them:

- a long dedicated commitment to the industry
- innovation or excellence in their field of expertise or endeavour
- contributing to the industry more than could be expected in their day-to-day involvement
- enhancing the performance and image of the industry through their involvement or leadership.

Applications must be accompanied by a detailed outline of the nominee's contribution to the industry supported by suitable referees. A panel of judges from within the industry will assess each application and will then make a recommendation to the IAA Board. The winner of the Award will be announced at the Irrigation Australia 2000 Conference and Exhibition in May.

Application forms will need to be submitted by the end of March 2000. Further details of the award and application forms can be obtained from:

Irrigation Association of Australia Ltd
PO Box 301 Homebush South NSW 2140
Ph (02) 9746-0531 Fax (02) 9764-2331

Email <pgarrad@netspace.net.au> or download the form from the IAA website www.irrigation.org.au>

SODICITY CONFERENCE

Soil sodification is one of the most insidious forms of natural resource degradation facing Australian agriculture. It has been recently reported that sodicity appears to be increasing across much of Australia (LWWRDC Occasional Paper 17/97) and that most farmers aren't using soil amendments (SCARM Technical Report 70).

A three-day conference will be held at the Institute of Sustainable Irrigated Agriculture (ISIA), Tatura, Victoria, on 28 February-1 March 2000 to bring together a range of agricultural industries with a major interest in sodicity.For more information contact :

Dr Aravind Surapaneni, Institute of Sustainable Irrigated Agriculture (ISIA), Private Bag, Ferguson Road, Tatura, Victoria 3616, Australia. Phone 03 5833 5223, fax 03 5833 5299, email <aravind.surapaneni@nre.vic.gov.au>.

IRRIGATION AUSTRALIA 2000 CONFERENCE AND EXPO

Irrigation Australia 2000 Conference and Expo will be held in Melbourne 23-25 May 2000 at the Melbourne Exhibition and Conference Centre.

The conference and expo is the biggest irrigation event in the Southern Hemisphere and is a unique opportunity to meet people involved in the irrigation industry both in Australia and from overseas and to see and hear about the latest in irrigation technology.

The theme of the conference is *Water – Essential for Life*.

Registration forms are available from Conference Secretariat PO Box 2349, NORTH BRIGHTON Vic, 3186.
Phone 03 9530 6777, fax 03 9530 6526, email <services@profconferences.com>.

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NPIRD Mission. To provide leadership for national irrigation research and development and facilitate the adoption of technology that improves natural resource sustainability and the economic viability of irrigation regions.

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