Water Wheel

National Program for Irrigation Research and Development

Coordinator's message

NPIRD PHASE FOUR?

At its meeting in February, the NPIRD Committee decided to develop a discussion paper on the future of NPIRD after Phase 3 finishes in June 2002. The main aim of the paper is to examine whether a Phase 4 of NPIRD is needed and will be supported by funding partners. It will also explore structural and funding options for a future phase.

The third NPIRD Phase, which started 1999/00 concentrates on 6 priority areas: water use efficiency; environmental impacts and effects on irrigation; socio-economic and policy issues; irrigation knowledge and its use; benchmarking, monitoring and feedback; and national coordination and administration

With 12 months left to run, now time to start asking the following questions:

- should there be a Phase 4?
- If there is a Phase 4, should it concentrate on a few big things or many small things?
- If there is a Phase 4, what would be an appropriate budget?
- If there is a Phase 4, who should the funding partners be and how can they be assured of a return on their investment?
- If there is a Phase 4, what would be the best way to administer it?

As part of this assessment process Steve Mills, NPIRD Management Committee Chairperson, has been consulting widely with funding partners throughout Australia. His recent trips to both Western Australia and Queensland have been particularly fruitful.

Committee members have also embarked on email discussions about the future of NPIRD. To date, discussions indicate that the funding partners believe they do have a continuing need for irrigation research and development. For example Peter Day, the Industries Arena Manager for Land & Water Australia, believes the Industries Arena would be hollow if it did not include a substantial investment in irrigation research and development.

Funding partners also apparently value the leverage they can get on their investments through NPIRD. This is especially true where their individual organisations face diminishing budgets. Funding partners might be even more confident about the return on their investment if they could invest specific amounts into research modules that are closely aligned to their core business.

Conference activity

Two events close to the hearts of many of those involved in the irrigation industry are scheduled for July this year.

The Irrigation of Australia's regional conference and exhibition, *Irrigation 2001*, is being held at Toowoomba. The conference has the theme of "Growing Opportunities". In an effort to make the event relevant to as many people as possible the conference will be supported by other activities such as a workshop on surface irrigation, an irrigation fundamentals training course and Certified Irrigation Designer exams. The Queensland Rural Water Use Efficiency Program is also running a workshop on irrigation technology, primarily for researchers but to which all interested people are invited.

A couple of weeks after this conference, and on the other side of the country at Bunbury in WA, the Australian Committee on Irrigation and Drainage will be holding its annual conference. The theme of the conference is "Irrigation is Great Agribusiness". We've included more information about both these conferences on the back page of the newsletter.

Brett Tucker
Program Coordinator

what's inside

Land & Water AUSTRALIA
research · development · innovation

This publication is managed by Land & Water Australia GPO Box 2182, Canberra ACT 2601.

Land & Water'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. It 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.

Land & Water's Home Page is: www.lwa.gov.au

Partners: Land & Water Australia - CSIRO - Department of Natural Resources (QLD) - Department of Land and Water Conservation (NSW) Goulburn-Murray Water - NSW State Water - NSW Irrigators - Southern Rural Water Authority - Sunraysia Rural Water Authority Wimmera Mallee Water Authority - Water and Rivers Commission (WA) - Ord Irrigation Cooperative South West Irrigation - Agriculture (WA)

FOCUS ON

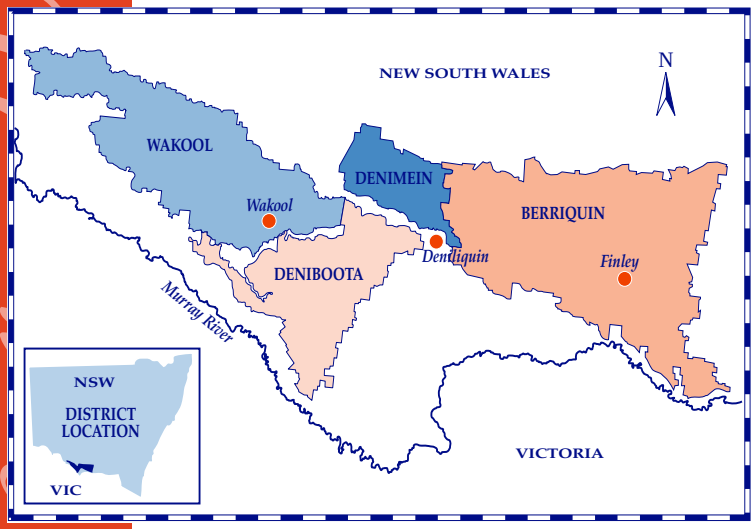
Murray Irrigation Limited Area

The Murray River is an icon in the folklore of Australia.

It occupies an important place in the belief systems and culture of the aboriginal people, and since white settlement the river has been central to the development of the inland towns and regions on both sides of its banks.

Although it was the subject of much discussion and debate from the mid 1800s, irrigation development only began in the area supplied by Murray Irrigation Limited (see map) after the *River Murray Water Agreement of 1915.* The two dams and 13 weirs and locks that were built along the Murray between Yarrawonga, Echuca and the ocean provided the basis for both transportation along and irrigation from the river.

Water supply to the Murray Irrigation Limited area was later enhanced by the construction of the Snowy Mountains Hydroelectric Scheme and Dartmouth Dam on the Mitta Mitta River and contributions from the Menindee Lakes.



Map. Murray Irrigation Limited area

The Hume Dam was critical to irrigation along the River Murray as it made available large controlled flows of water. Irrigation system construction work actually started in 1933 in the Murray Irrigation Limited area, and by 1935 water had been made available to the first holdings in the Wakool Irrigation District.

The Mulwala Canal, Murray Irrigation Limited's major supply channel, was begun in 1935 and by 1939 it was completed as far as Finley. The canal is almost 200 km long.

Today, the area of farmland supplied with water by Murray Irrigation is around 796,000 ha north of the Murray River. This comprises over 2400 farms owned by 1860 family farm businesses.

Agriculture and irrigation are very important to the region's economy. Annual farm gate production is $300 million. Half of Australia's rice crop is grown in the region, which is also responsible for 10% of NSW milk production.

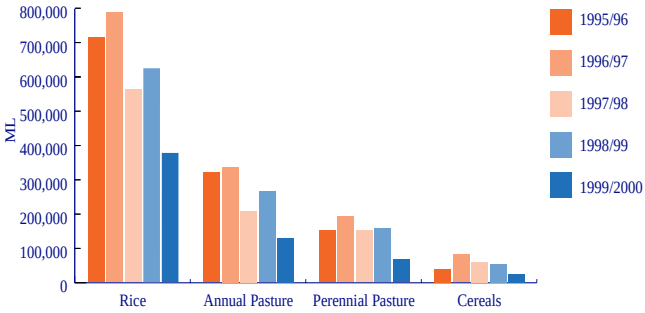


Figure 1. Change in water use between major land uses 1995-2000.

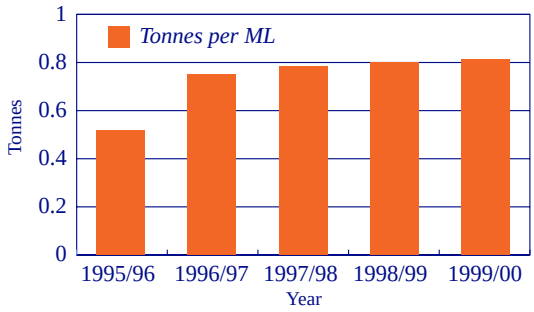


Figure 2. Rice water use efficiency. Since 1996 rice water use efficiency has increased by 64% (growing from 0.52 to 0.81 t/ML).

About Murray Irrigation Limited

Murray Irrigation Limited is the largest privately owned irrigation supply and drainage company in Australia, with an entitlement of 1.479 million ML, which is 67% of the NSW share of Murray River irrigation entitlements. It is based in Deniliquin in NSW and was established on 3 March 1995, when the NSW Government Murray Irrigation Area and Districts were privatised. Each irrigator is a shareholder in the company.

Its infrastructure is valued at $360 million and it has an annual turnover of $25 million.

Issues

Major issues in the Murray Irrigation Area include managing rising watertables and associated salinity, and water security, resulting from both seasonal variation and political uncertainty. More recent issues are water quality and protecting native vegetation.

Watertables. As a result of a combination of low rainfall, low irrigation water availability and improved irrigation efficiency the area of land with a high watertable has been falling since the early 1990s.

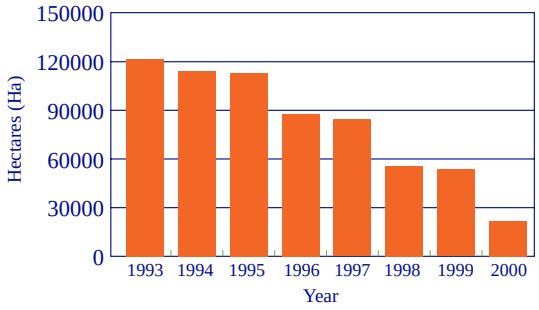


Figure 3. Area of land with high watertables (0 to 2 m).

Salinity. Salt interception is an important facet of controlling the effects of salinity. A major scheme, at Wakool, captures saline water in evaporation basins and protects about 50,000 ha from entering the plant rootzone. In 1999/2000 this scheme extracted 240,000 t of salt, making it the largest groundwater evaporation scheme in the Murray Darling Basin.

Water security. The major factors affecting water security in the area are changes to environmental flows and allocations in the Murray River and compliance with the Cap across the Murray Darling Basin. The introduction of a Bulk Access Regime under the *Water Management Act (NSW)* 2000 will also influence security.

The future

Rising watertables, salinity and declining water quality are all threats to irrigation in the area.

Land and water management plans (LWMPs) are tools being used to enable rural communities to continue agricultural production in irrigated and dryland regions, while improving the environment and downstream river health through encouraging behavioural changes and on-farm works.

The plans were developed through community consultation, and are now being implemented. Their aim is to improve conditions for ongoing sustainable farms for 30 years.

LWMPs are fundamental to compliance with licences held by Murray Irrigation Limited. Each plan is an integrated package including: education leading to better farming practices; structural adjustment; protection of remnant vegetation; controlling water seepage from supply channels; better irrigation water use and fertiliser management; agroforestry and alternative crops; and monitoring and review.

So far the Murray community has invested $153 million in LWMPs, supplemented by $28 million in government support for plan initiatives.

Research and development

A current project funded jointly by NPIRD and Murray Irrigation Limited is *Improving Hydraulic Efficiency of Irrigation and Drainage Systems through Benchmarking*. The aims of this project are to:

- develop a practical set of hydraulic performance indicators for a gravity fed irrigation system which can be applied nationally and internationally
- evaluate the economic benefits of the hydraulic performance indicators and different options to improve hydraulic performance
- develop incentives to encourage water managers and irrigators achieve optimum irrigation and drainage efficiency.

For more information contact David Watts at Murray Irrigation Limited, phone 03 5881 9321, email <davidw@murrayirrigation.com.au>

Another project, funded by NPIRD, NSW Agriculture, Department of Natural Resources and DRDC, is *Improving Water Use Efficiency by Reducing Groundwater Recharge under Irrigated Pastures*. The aims of this project include: quantifying groundwater recharge under well managed irrigated perennial pasture for a range of soil types; and helping irrigation managers and farmers develop sound water use policy and adopt improved irrigated pasture management practices.

For more information contact Hayden Kingston at NSW Agriculture, phone 03 5883 1644, email <hayden.kingston@agric.nsw.gov.au>.

Murray Irrigation Limited is also participating in a project investigating seepage minimisation in large earthen irrigation supply channels. This project is being run with other irrigation corporations and Murray Darling Basin Commission.

CSIRO Land and Water and Murray Irrigation Limited are tailoring the CSIRO-developed

> TO PAGE 6

MURRAY IRRIGATION AREA AT A GLANCE

Bulk licenses	1,479 million ML
Licensed area	796,764 ha
Properties	2400
Regional population	25,000
Water delivered (1999-2000)	675,155 ML (almost half normal usage because of season)
Annual allocation (2000-2001)	95%
Av. price/ML water (1999-2000)	$20.17* ($14.76 in 1998-99)

Crop water use as percentage of total volume delivered

Rice	56%
Annual pasture	19%
Perennial pasture	12%
Cereals	3%
Stock and domestic	2%
Other	8%

** High because of record low annual water allocations in 1999-2000.*

BURDEKIN GROUNDWATER SUSTAINABILITY INITIATIVE

NPIRD is a partner organisation in a major research initiative now underway in North Queensland. The focus of the Burdekin Initiative is to address current water management practices and their potential impacts on long-term sustainability of the Burdekin Delta groundwater systems in north Queensland.

The Burdekin Delta, a major irrigation area with more than 35,000 ha of irrigated sugarcane and other crops, presents a unique management challenge. Not only does the system overlie shallow major groundwater supplies on which it relies heavily for irrigation water, it is situated close to environmentally sensitive wetlands, waterways, estuaries and the Great Barrier Reef. Local water pricing and water management practices are also critical.

The Delta Water Boards – the North Burdekin Water Board and the South Burdekin Water Board – have a charter that requires them to manage the replenishment of the groundwaters, which are subject to constant threat of seawater intrusion. Current strategies to do this include sand dams in the Burdekin River and a series of distribution channels and natural waterways together with large recharge pits.

Farm practices such as recycling, water spreading and, more recently, direct pumping from recharge channels to farms in some distal aquifer zones have also come to play an integral role in the management of the area's groundwater systems.

With recycling, irrigation water that is not used by the plants (excess irrigation) cycles through the soil back to the groundwater – a practice regarded as helpful to recharge and maintenance of groundwater levels.

Under water spreading, water that is too turbid to be used for recharge via the recharge pits (because it blocks the pits making them ineffective) is made available across the scheme as surface water for farm irrigation. Because this helps spread the silt load across the farmland while keeping the silt out of the recharge pits, it is thought to benefit the soils and assist the replenishment process.

The aims of the NPIRD project

CSIRO's Dr Keith Bristow, who is based in Townsville, is principal investigator of the NPRID project, *Sustainable Management of the Burdekin Delta Groundwater Systems*.

'What is needed is more knowledge of the links between groundwater quality and current management practices at both the farm and irrigation scheme level. Only then will it be possible to say whether existing practices are indeed sustainable in the long term,' explained Dr Bristow.

Important questions relate to the impacts of current and improved irrigation efficiency on 'recycling' and 'water spreading', as well as to the subsequent interactions, if any, with the nutrient, salt and chemical loading of the groundwaters.

Photography by Bill van Aken, © CSIRO Land and Water.

Dr Bristow said, 'We need to understand how irrigation waters are stored and trans-ported through the unsaturated zone. This is essential, as the fate of nutrients, salts and chemicals and their impacts on the groundwater systems will be integrally linked to soil type and water movement through the unsaturated zone.'

Improved understanding of these links, and if need be the development and implementation of improved water and irrigation management practices, would have long-term economic and environmental benefits to Burdekin delta farmers, the wider community and other irrigation areas in Australia.

Groundwater modelling, soil mapping, implementation of demonstration sites and selection of new field sites for experimental work are just some of the activities already underway.

Initiative partners

This initiative is truly a cooperative undertaking involving individual farmers and a range of organisations. As well as the National Program for Irrigation Research and Development, other organisations include the North Burdekin Water Board, the South Burdekin Water Board, CSIRO, the Bureau of Sugar Experiment Stations, Queensland Department of Natural Resources, James Cook University, Australian Centre for Tropical Freshwater Research, Australian Institute of Marine Sciences, Canegrowers, CRC Sugar, Burdekin Landcare, and the Queensland Rural Water Use Efficiency Initiative.

http://www.tvl.qld.csiro.au/_pub/burdekininitiative/

WATER USE EFFICIENCY – WHAT DOES IT MEAN?

Water use efficiency is a term we often hear in the irrigation industry. Ask someone what they understand by it and chances are they'll give you a definition you hadn't thought of or don't agree with.

Not having a common understanding of something that is so basic to irrigation is a problem for all - policy makers, regulators, researchers and water users.

Barrett Purcell and Associates were engaged by NPIRD to develop a discussion document and run a workshop with stakeholders in the irrigation industry to try to establish a common national framework for and definition of water use efficiency.

According to project leader, Jim Purcell, there was a lot of vigorous discussion among the 31 workshop participants.

"The good thing is that at the end of the day we actually had a common framework and definition that was agreed to by pretty much everyone who attended," he said.

"What is important now is to ensure that the irrigation industry is aware of and accepts the framework and definition reached at the workshop," he added.

The figure is a summary of the framework for water use efficiency decided on at the workshop.

A report on the workshop and its findings is on the NPIRD website, <www.npird.gov.au> under *Reports and Information.* We're looking for your feedback and comments. Why not check it out and complete the email feedback form on the site.

Recommended efficiency definitions

The definitions recommended at the workshop are shown in the table. The terminology used has been altered slightly from the FAO version to better suit Australian conditions.

Table. Recommended irrigation efficiency definitions

Term	Definition
Overall Project Efficiency (Ep)	Irrigation water available to crop / Total inflow into supply system
Conveyance Efficiency (Ec)	Total outflow from system supply / Total inflow into supply system
Distribution Efficiency (Ed)	Water received at field inlets / Total outflow from supply system
Field Application Efficiency (Ea)	Irrigation water available to crop / Water received at field inlet

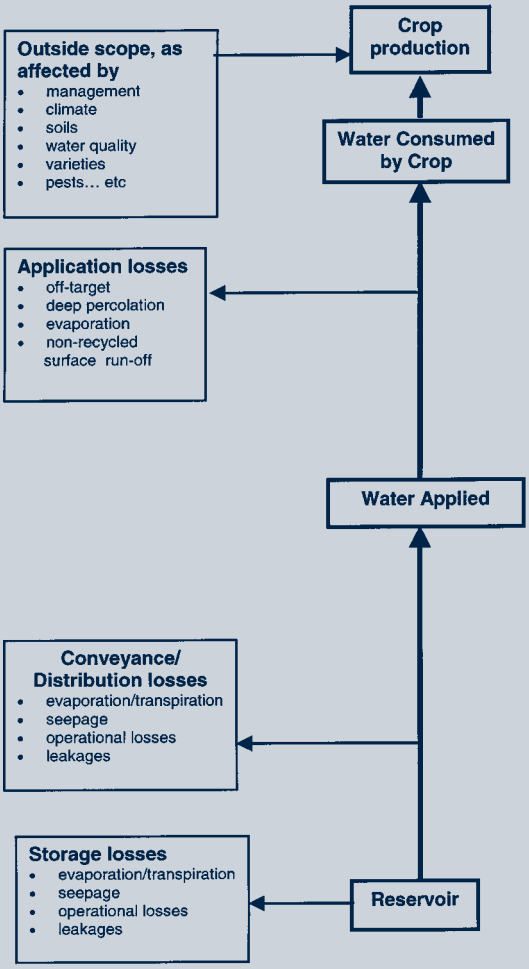
These definitions allow a "nested" approach for a particular irrigation event (assuming no rainfall or unregulated flow into the supply system) as follows:

$$\text{Overall Project Efficiency} = \text{Conveyance Efficiency} \times \text{Distribution Efficiency} \times \text{Field Application Efficiency}$$

Finally, when dealing with either irrigation efficiencies or water use indices, spatial and temporal parameters need to be defined. For instance, a single irrigation application lasting less than one day on a single field will have different efficiencies and indices than a full season irrigation over a large irrigation region. Seasonal performance indices can easily mask individual events and regional indices can mask individual elements.

Similarly, seasonal studies are more likely to be affected by rainfall, dew, subsoil moisture and water tables.

Figure. Framework for water use efficiency



AND NOW FOR STREAMFLOW FORECASTS – A KEY NEW TOOL IN WATER MANAGEMENT

Seasonal forecasting of streamflow could be an important tool in managing Australia's scarce water resources, according to Nick Clarkson form Queensland's Department of Primary Industries.

Nick, who is based in Toowoomba, was commenting on the successful completion of the Rainman Streamflow Project, a Climate Variability in Agriculture Program (CVAP) project (managed by Queensland Department of Primary Industries) which will be of major benefit in irrigation and environmental management.

The project, from its Toowoomba base at the Queensland Centre for Climate Applications, assembled skills across the nation to tackle the highest climate variability in the world. The project was able to exploit the greater impact of ENSO (El Niño and the Southern Oscillation) on streamflow compared with rainfall.

To establish the needs of clients, Queensland Department of Natural Resources worked with four groups of irrigators across the country. At the same time the University of Melbourne was researching methods of seasonal forecasting of streamflow, and seeing how forecasting could help water agencies to improve water allocations (the Southern Oscillation Index, sea surface temperatures and persistence were included).

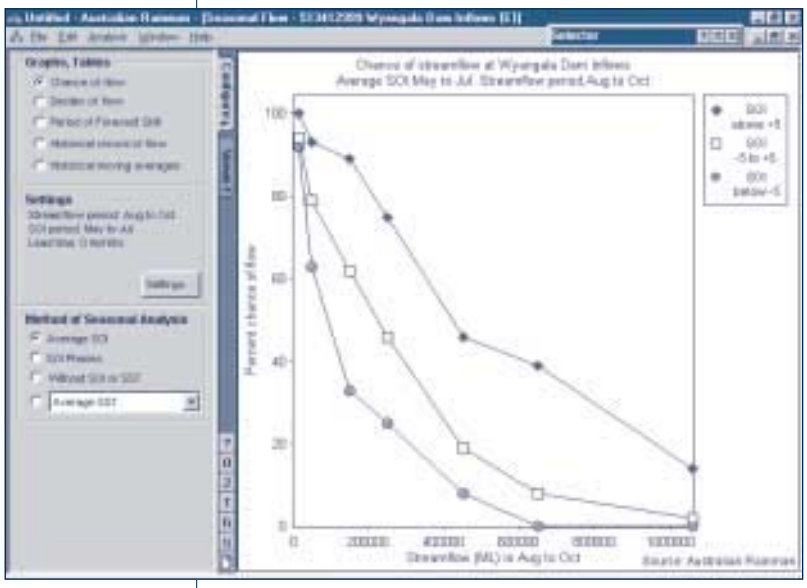
The Bureau of Meteorology's Hydrology Unit in Melbourne gathered historical streamflow records for forecasting from collaborating water agencies.

Results will be available to the water industry through a special supplement to *AUSTRALIAN RAINMAN* in a CD containing:

- the steamflow data and forecasting tools
- a workshop package developed at workshops with irrigators and water agencies.

"The project had made useful progress in offering paths to better water management. Irrigators are keen to learn more about climate variability and risk management", Nick Clarkson said in summarising the three-year project.

The additions to *RAINMAN* will simplify do-it-yourself forecasting (see graph). This will give irrigators a better basis for planning and to seek more information from water agencies about the implications of local rules governing water allocations.



More information

For further information you can contact Nick Clarkson at Queensland Centre for Climate Applications, phone: (07) 4688 1248, email: <clarksn@dpi.qld.gov.au>.

Acknowledgment

This article first in Climag, published by the Climate Variability in Agriculture Program, which is a L&WA program.

> FROM PAGE 3

Murray Irrigation Limited Area

SWAGMAN Farm model to Murray Valley recharge and discharge conditions. This work will help refine the company's hydraulic loading policy that aims to minimise net recharge to the watertable.

Research and development contacts

Murray Irrigation, Deniliquin. Contacts are Geoff McLeod, Manager Environment and Evangel Aseervatham, Manager Engineering Services, phone 03 5881 9300, email <geoffm@murrayirrigation.com.au> and <evangela@murrayirrigaiton.com.au>

CSIRO Centre for Irrigation Research, Griffith. Contact is Liz Humphreys, phone 02 6960 1500, email <liz.humphreys@grf.clw.csiro.au>

References

Murray Irrigation Limited Annual Report 2000

Murray Irrigation website www.murrayirrigation.com.au

Thanks to Jenny McLeod, Murray Irrigation Limited, for her assistance.

CONTROLLING EVAPORATION LOSSES FROM ON-FARM STORAGES – CAN IT BE DONE?

With increasing pressure being placed on irrigators to use water more efficiently the issue of evaporation losses from large storages has become an important issue for the irrigation industry, especially in northern Australia.

Within both the R&D community and irrigation industries there are varying perspectives about the relative importance of evaporation losses and there are varying perspectives about the economic viability of control measures such as barrier methods.

Many control measures have been proposed and tested, but it is not clear to what extent these have been tested in combination as integrated systems.

NPIRD has just approved a project to get a clearer picture about evaporation losses from on farm storages and the practicality of controlling them.

The project will concentrate on auditing and summarising research and development on the topic and develop a model for determining the practicality of, and potential for, controlling evaporation losses in the future.

Its aims are as follows:

- To quantify total annual evaporation losses from both on-farm and off-farm storages throughout Australia.
- To quantify respectively what proportion of total system losses and total on-farm losses, evaporation losses from storages represent.
- To identify who is working on what aspects of evaporation losses in Australia
- To develop a conceptual model for a systems-based approach to the future management of evaporation losses.
- To use this model to determine the most economically viable evaporation management options, based on present knowledge and research.

Tenders are being assessed now with the aim of having the project complete at the end of August. The results will then be published as part of NPIRD's *Irrigation Insights* series as a book and on the NPIRD website.

For more information contact Tim Cummins, phone 02 6629 1170, email <*Tim.Cummins@bigpond.com*>.

LAND & WATER AUSTRALIA'S R&D NEWSLETTERS

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- *Intersect* – Land & Water Australia general newsletter
- *CLIMAG* – Climate Variability in Agriculture Program newsletter
- *RIPRAP* – Riparian Land Management R&D newsletter
- *Rivers for the Future* –River Health and Algal programs magazine

For more information or to be added to a mailing list contact Land & Water Australia, phone 02 6257 3379 or email <public@lwa.gov.au>.

ANCID 2001 IRRIGATION AWARDS

The Australian National Committee on Irrigation and Drainage (ANCID) is calling for nominations for its 2001 Irrigation Awards.

Stephen Mills, ANCID Chairman, said that winners in each of the four categories will receive a $2000 cash prize as well as an engraved plaque.

He also acknowledged the support of sponsors for the awards, SMEC Victoria, Agriculture, Fisheries and Forestry Australia, and ANCID.

"The awards provide an opportunity to showcase improved management of both commercial water supply and drainage infrastructure and on-farm irrigation and drainage systems across Australia," he said.

"The awards will be presented to people or organisations whose projects and activities display demonstrated improvement towards best practice rather than to those with the highest level of performance or which are the biggest," Mr Mills stated.

"Nominated projects should also demonstrate regional benefits and potential for wider application," he added.

> TO PAGE 8

Irrigation 2001 Conference and Exhibition at Toowoomba

Wednesday 11 and Thursday 12 July 2001 at Rumours Convention Centre

The IAA and Exhibition and Trade Fairs, who have together developed the national conference and exhibition into a worldclass event, are now working to organise a similarly successful regional event in Toowoomba this year.

The theme of the conference is *Growing Opportunities*. The benefits delivered by efficient irrigation will be highlighted at the conference, which will be a mix of plenary presentations and smaller workshops. The information needs of both urban and rural water users and those who service them will be catered for.

The exhibition will feature what's new in technology and equipment. Manufacturers as well as local companies and suppliers will be there.

Australian National Committee on Irrigation and Drainage Annual Conference

Sunday 29 July to Wednesday 1 August 2001 at Bunbury Regional Entertainment Centre, Bunbury, Western Australia.

The theme of ANCID's annual conference is *Irrigation is a great agribusiness*. Papers on the following topics will be featured:

- successful irrigation projects and stories
- groundwater irrigation issues
- drainage
- new technologies
- river restoration
- environmental issues.

After the conference why not stay for the post conference tour to the Ord River.

> FROM PAGE 7

ANCID 2001 IRRIGATION AWARDS

Awards will be presented in the four categories of:

- Improvements in water distribution works
- Effective water use on the farm
- Improved practices in drainage management
- Working relationships in the water industry

The judging panel will comprise an eminent citizen and a media identity with links to the water industry as well as a water industry expert.

The awards will be presented at the 2001 ANCID Conference, which being held at Bunbury in WA, 31 July to 2 August.

Entries must be lodged by 11 June 2001.

More information

Forms and more information are available from John Mapson, Goulburn-Murray Water, phone 03 5833 5511 or the ANCID website, <www.ancid.org.au>.

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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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