



WaterWheel

National Program for Irrigation Research and Development

PROGRAM COORDINATOR'S REPORT

Welcome to the April issue of *WaterWheel*. The major news from the program is that, at present, it is in the process of finalising its Phase 3 projects (1999-2002).

In our program plan five priority areas for investment were identified. We have so far approved projects in two:

- water use efficiency
- environmental impacts on and effects of irrigation.

In the other three priority areas (irrigation knowledge and its use; benchmarking, monitoring and feedback; and socio-economic and policy issues) we are currently finalising contracts for a number of projects. This should be completed by the end of May.

As well there are three issues that we are developing as projects in these three priority areas:

1. Crop water balance. This project will examine national consistency and scope the investment requirement and possibility of developing a national crop benchmarking framework.
2. Storage harmonisation. This project will examine the strategic implications of the need for increased variability of flow from the environmental point-of-view compared with the need for increased reliability of flow from an irrigation point-of-view and how we most effectively manage that trade-off with respect to water storage.
3. Assessing the practicality of the draft national guidelines for assessing new irrigation development.

I often am asked how many projects NPIRD manages. As part of Phase 3 we will be managing around 25 new projects and 21 continuing projects from Phase 2. Most of these continuing projects will finish this year.

All remaining projects for Phase 3 will be tendered or commissioned as appropriate. This means there will be no more general calls for research proposals in the next 2 years, other than for submissions for travel fellowships.

In March the NPIRD Management Committee met for 2 days in Tatura, located in the Shepparton Irrigation Region in northeast Victoria. Meeting where irrigation happens is part of the committee's ongoing commitment to keep in touch with irrigation issues. The 2 days involved a field inspection, presentations from researchers from the Institute of Sustainable Irrigated Agriculture and research managers with Goulburn-Murray Water, as well as a general management committee meeting.

In this issue we have focussed on the Shepparton Irrigation Region to give you an insight into the area and irrigation research activity there. The next meeting will be in September at Toowoomba, coinciding with the ANCID conference. This will be an opportunity for local groups in southeast Queensland to meet and discuss issues with the committee.

Word is getting around that we have just about completed our first information package – on soil moisture monitoring. This comprehensive package describes soil moisture monitoring equipment and applications and reviews R&D in the area. We expect to have it available by the end of April. For more information contact Anne Currey, communications consultant with NPIRD.

Brett Tucker
Program Coordinator

what's inside

- Focus on Shepparton Irrigation Region
- Irrigation a risky business: Study findings
- New NPIRD projects

Partners: LWRRDC - 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)



Land & Water
Resources
Research &
Development
Corporation

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.



FOCUS ON SHEPPARTON IRRIGATION REGION

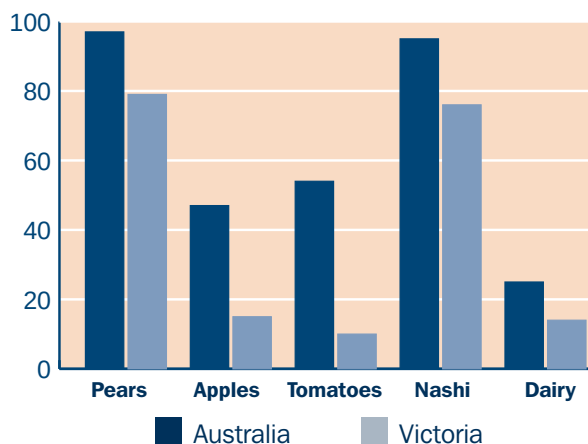
The Shepparton Irrigation Region (SIR) includes the irrigation areas of Murray Valley, Shepparton, central Goulburn and Rochester/Campaspe (see map).

Irrigated agriculture in the region accounts for 14% of Victoria's gross value of production (\$852 million of \$6.1 billion).

The region totals about 520,000 ha. Eighty six per cent of the region is classed as being suitable for irrigation but only a little over half of this suitable area is actually used for this purpose.

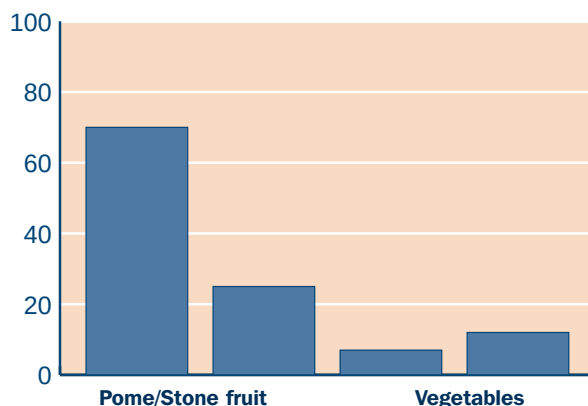
Nearly 90% of the irrigated area is used for pasture production while the rest is used for horticulture (mainly stone and pome fruit, tomatoes and grapes), grain, seed crops, lucerne, forage crops and vegetables.

Shepparton Irrigation Region selected commodities as % of Victorian and Australian production

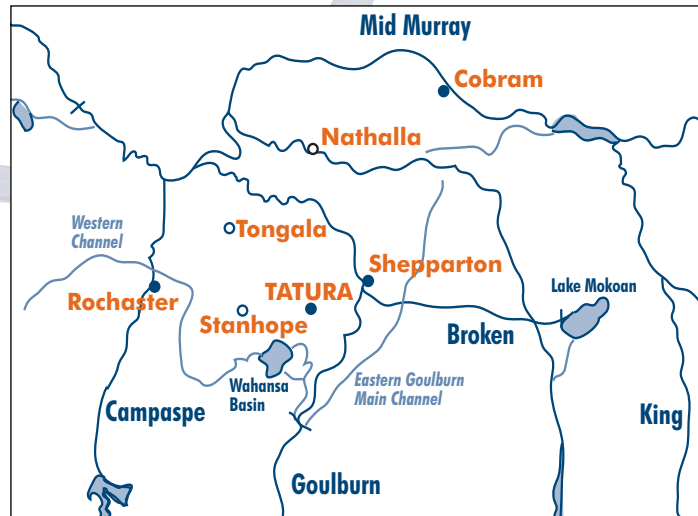


Source. Slide presentation on Shepparton Irrigation Region, Department of Natural Resources and Environment, Tatura.

Shepparton Irrigation Region as % of Victorian production



Source. Slide presentation on Shepparton Irrigation Region, Department of Natural Resources and Environment, Tatura.



History

Irrigation began in the Shepparton area in the late 1800s.

At this time water for irrigation in Victoria was supplied through private irrigation trusts. In 1899 thirty trusts existed. However, after the drought and economic recession of the 1890s, which put a lot of financial stress on the trusts, management of water was centralised under the State Rivers and Water Supply Commission.

The philosophy of the commission was to encourage closer settlement and intensive irrigation so providing livelihoods for a large number of irrigators on small holdings. The Shepparton region was one of the areas where this philosophy was applied. Its legacy can be seen in the SIR today with its large number of small horticulture blocks in the Ardmona and Shepparton districts and 50 to 100 ha dairy farms.

In 1984 the Rural Water Commission was created out of the State Rivers and Water Supply Commission and in 1992 the commission was corporatised to become the Rural Water Corporation. In 1994-95 the corporation was broken up and autonomous organisations to manage rural water supply were created. Goulburn-Murray Water is one of these corporations.

Goulburn-Murray Water is by far the largest rural water supply corporation in Australia (Murray Irrigation is the next largest). In 1997-98 Shepparton Irrigation Region used 67% of all the water delivered by Goulburn-Murray Water. This represented 10% of all irrigated water delivered in Australia.

Major issues

According to Stephen Mills, who is a local dairyfarmer, chairman of both the NPIRD Management Committee and the Australian National Committee on Irrigation and Drainage and



director on Goulburn-Murray Rural Water Authority, the major issues confronting the SIR as far as irrigation is concerned are water use efficiency, nutrient management, long term sustainability and water security.

According to Stephen farmers acknowledge that their irrigation practices must be such that they are more productive while using the same amount or less water.

"In the last few years, water shortages mainly because of dry seasons have emphasised the fact that we are dealing with a limited resource and we must have strategies to deal with this," he said.

"Farmers accept that there are efficiency gains to be made, however, it's expensive to do this, especially if commodity prices are low.

"Often increasing efficiency isn't just a matter of rejigging an irrigation system, rather it involves redoing a whole farm plan, which might incorporate a different irrigation system, replanting, putting in new trellises and making changes to drainage systems.

"These changes can cost a horticulturist around \$25,000 to \$40,000 a hectare," Stephen explained.

Nutrient management is also a big issue in the region. The Goulburn-Broken Catchment has been identified as one of the biggest contributors to nutrient loads in the Murray River so there has been a lot of work done on minimising this contribution.

"Some of the things we are doing are reusing water and improving our understanding of the nutrient cycle on farm so we can better manage it," said Stephen.

The catchment also has a nutrient minimisation strategy in place.

The SIR is a healthy regional economy in terms of income and production. This is underpinned by agriculture, and irrigation in particular. According to Stephen, some are asking whether the management of resources in the area will maintain the region's sustainability into the long term.

"How we use our groundwater, managing our rivers to improve water quality and maintaining soil health are just some of the issues we need to deal with to ensure this long term sustainability," he said.

The final issue is that of water security.

"The competition for water will get stronger, especially if the quality and availability of our groundwater deteriorates," said Stephen.

This competition will come from urban users and the environment, as well as irrigators.

"While irrigators have a property right to security water, they need to know that this will continue to be secure," he said.

According to Stephen a positive aspect of the SIR was the willingness of organizations and community and farmer groups to work together to find solutions to what are often difficult and multifaceted problems.

"This ability to work in partnership is a great strength", he concluded.

Research and development

The major group responsible for irrigation research

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NPIRD research projects

NPIRD has several projects in place in the Shepparton Irrigation Region.

Project number	Project title	Start date	Completion date	Agency/organisation	Principal investigator
CDH2	Improving the Water Use Efficiency of Horticultural Crops	January 2000	January 2003	CSIRO Plant Industries	Dr Brian Loveys
DAV23	Alternative irrigation technologies in field cropping to increase water use efficiency	April 1997	June 2000	Department of Agriculture Victoria	Mike Schultz
GMW1	Construction and refurbishment of earthen irrigation channel banks	Mar 1995	Dec 1997 extended to Dec 1999	Goulburn Murray Water	Ian Moorhouse
GMW6	Nutrient removal from rural drainage systems using wetlands	Jan 1999	Oct 2002	Goulburn Murray Water	Ross Plunkett
GMW3	Benchmarking the distribution efficiency of an irrigation supply system	May 1998	June 2000	Goulburn Murray Water	Wes Douglas
GRD3	Irrigated cropping advance 2000: industry development and implementation of best practice	Aug 1997	June 2000	Dept of Natural Resources & Environment, Victoria	David Ugalde

For more information on these projects contact Brett Tucker or the principal investigator.



WATER SAVING TECHNIQUE TAKEN UP OVERSEAS

Groundbreaking work done in Australia on partial rootzone drying (PRD), a technique that produces water savings of up to 50% in irrigated horticultural crops such as grapes, citrus and pome fruits, has been taken up by researchers in England and the US.

According to Dr Brian Loveys, scientist with CSIRO Plant Industry and leader of the Australian project team that developed the technique, PRD relies on only half of the rootzone to be irrigated at any one time (hence its name). This causes biochemical changes in the roots which reduces the amount of water lost by the leaves. Fruit yield is unaffected, however, resulting in increased water use efficiency.

In England, a \$A2 million project with aims based largely on the work already done by Dr Loveys and his team will evaluate whether PRD technology is suitable for the European Union and other Mediterranean basin countries. Similar projects are being proposed in the US.

"Horticultural crop growers in both Europe and the US are coming under the same pressure as growers in Australia to use irrigation water more efficiently," he said. "They are recognising the



Researchers involved in the partial rootzone drying project, Dr Brian Loveys from CSIRO Plant Industry (left) and Dr Peter Dry, Senior Lecturer from the University of Adelaide.

potential of our work for their own regions."

The research project on PRD in Australia was funded by the Grape and Wine Research and Development Corporation, the National Program on Irrigation Research and Development, CSIRO Plant Industry, NSW Agriculture, Department of Natural Resources and Environment Victoria, the South Australian Research and Development Institute and the University of Adelaide.

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and development in the SIR is the Institute for Sustainable Irrigated Agriculture, at Tatura. Bob Wildes is the irrigation program leader, phone 03 5833 5239, email <robert.wildes@nre.vic.gov.au>

Goulburn-Murray Water has a small research program and is a partner in NPIRD, Cooperative Research Centre for Catchment Hydrology and the Cooperative Research Centre for Freshwater Ecology. According to coordinator of research, Derek Poulton, the authority has focussed on four major areas of research: asset management, water use efficiency, drain management and river and environmental health.

For more information you can contact Derek on phone 03 5833 5690, email <derekp@g-mwater.com.au>

References

Langford, J.K., Forster, C.L., Malcolm, D.M. (1999), *Toward a Financially Sustainable Irrigation System: Lessons from the State of Victoria, Australia 1984-1994*, World Bank Technical Paper No. 413, The World Bank, Washington

Shepparton Irrigation Region, Department of Natural Resources and Environment, Tatura, slide presentation (2000)

The Economic Impact of Irrigated Agriculture in the Shepparton Irrigation Region, Report prepared for Sustainable Regional Development Board, May 1996. Prepared by EconSearch P/L and FarmStats AustraliaP/L

ABOUT THE SHEPPARTON IRRIGATION REGION

Water supply. Water is supplied through Goulburn-Murray Water, the largest rural water supply company in Australia. In 1997-98 Shepparton Irrigation Region used 67% of all the water delivered by Goulburn-Murray Water. This represented 10% of all irrigated water delivered in Australia.

Water entitlements. Water entitlements are for either diversion licenses or water rights supplied from the area channel system
Channel supply irrigators - 6740
River diverters - 360

Area irrigated. Around 225,000 ha of the region's 520,000 ha is irrigated.

Crops. Pasture, horticultural crops (mainly stone and pome fruit, tomatoes and grapes), grain, seed crops, lucerne, forage crops and vegetables.

Water use. Water use by crop (ML) is as follows:

□ Broadacre mixed farming	31%
□ Dairying	64%
□ Horticulture	5%

Gross margin per ML

□ Broadacre mixed farming	\$20-150
□ Dairying	\$180-600
□ Horticulture	\$400-2800

Contribution to the economy. Irrigated agriculture in the region accounts for 14% of Victoria's gross value of production (\$852 million of \$6.1 billion).

In 1993-94 irrigated agriculture contributed directly 24% of the region's jobs and 24% of the value added gross regional production. When indirect effects are accounted for the contribution of irrigation was almost 45% of gross regional product and 43% of regional employment.



IRRIGATION A RISKY BUSINESS: STUDY FINDINGS

Anne Currey, Communications Consultant, NPIRD

A recently completed project for the National Program on Irrigation Research and Development has highlighted that one of the impacts of water industry reforms has been to transfer the responsibility for irrigation risk management from governments to irrigators.

Before the reform process started in the 1980s, water management agencies such as Victoria's Rural Water Authority and Water Resources Commission in NSW, essentially managed supply risk through their respective allocation policies. Individual irrigators had limited opportunities to manage their own risk.

According to study authors, Tim Cummins and Charles Thompson, risk management is all about "maximising the areas where we have some control over the outcome while minimising the areas where we have absolutely no control".

They cite the example of water trading as one way that irrigators can manage the risk associated with events over which they have no control such as drought.

The application of water trading, as with other changes to the way irrigation water is managed at bulk supply level, has been accelerated in most states as a result of the water reform agenda initiated through COAG.

The study implies that the up side of the water reforms has been to provide flexibility for individual irrigators to control their exposure to risk by using strategies such as buying and selling water and achieving savings through measures such as increasing efficiency or building on farm storage.

However, importantly, the study also found that this flexibility can only be taken advantage of if irrigators have access to the right information and are willing to use it.

Irrigators clear about needs

In workshops with irrigators, study coordinators found that some of the things they needed to know about were:

- ❑ The probability of seasonal allocations being different to water entitlements. Property rights need to be defined explicitly in terms of the volume of the entitlement and the probability of receiving various percentages of that entitlement in any given year. Irrigators need to know and understand the probability function of their property rights to water.
- ❑ The probability of seasonal allocations being increased during a season. Linked with this is a need to understand the probability of different climate scenarios. And they need to know and

understand actual forecasts for the coming season.

- ❑ The relationship between seasonal allocations and the market price for water in their supply system.
- ❑ The on-farm options available to them, including substitutes for water.
- ❑ How best to test business health under a range of seasonal allocation scenarios to determine optimum water allocation for the short and long term.

"Irrigators at the workshops made it clear that the water reforms have generated a lot of uncertainty, said Tim Cummins

"This was particularly the case for NSW irrigators, who made it clear that their number one priority is a clearly specified share of the available water resource protected by legal entitlement."

He added that while irrigators accepted the need for environmental flow, they wanted to see good scientific numbers on environmental needs before more water is made available to the environment.

As well they wanted to see existing irrigation practices codified to ensure the rights associated with them are not eroded.

"Irrigators find constant changes to operating rules confusing resulting in uncertainty which affects their ability to deal with risk," said Tim.

The study also interviewed water retailers and water wholesalers to get their views on risk management.

Brett Tucker, NPIRD program coordinator, said that the findings of the

study are significant because through the water reform process we have directed more responsibility for supply and price risk management towards individual irrigators.

However, we have provided very little management support to help them cope with this change.

Some individuals have adapted particularly well, but others are finding it difficult to come to grips with the changed environment in which they are operating. This study recommends the necessary tools to help them adjust.

He added that the study will be used to guide future research and development work by the program in the area of risk management.

"We are now funding a project to develop an irrigators' risk assessment kit," he said.

"This kit, is a practical response by the program to the need for information expressed by irrigators during the study."

Acknowledgment

Sturgess and Associates provided the economic theory for risk management.



Tim Cummins

"Above all, they want clear, hard and fast rules"



NEW PROJECTS GO AHEAD

NPIRD has approved contracts for five new R&D projects in the priority areas of water use efficiency and environmental impacts of and effects on irrigation. The projects are:

Rigorously determined water balance benchmarks for irrigated crops and pastures (CLW21). Project leader is Liz Humphreys from CSIRO Land & Water at Griffith.

Project aims are to:

- ❑ obtain and review data in the grey and published literature for determinations of deep drainage, crop water use and paddock water use for the range of irrigated crops, management practices, soils and climatic conditions experienced in Australia and to collate those data considered to be derived from rigorous determinations
- ❑ carry out rigorous paddock scale water balance determinations for maize, winter cereal, annual pasture, lucerne and canola grown under good management practices
- ❑ use the data to validate and refine models used for determining optimal irrigation intensity and net recharge management in the irrigation areas of the southern Murray-Darling Basin.

For information contact Liz Humphreys, CSIRO Land & Water, Griffith phone 02 6960 1528, email <liz.humphreys@grf.clw.csiro.au>

Collaborating organizations are Murray Irrigation Ltd, Coleambally Irrigation Corporation and Murrumbidgee Irrigation Corporation.

Improving the Water Use Efficiency of Horticultural Crops (CDH2). Project leader is Brian Loveys from CSIRO Plant Industries.

Project aims are to:

- ❑ undertake a third year of Partial Rootzone Drying (PRD) trials on the existing experimental sites to further investigate potential longer term effects of PRD, including biennial bearing and poor fruit set
- ❑ incorporate more extensive groundwater monitoring to clarify the extent of groundwater utilisation by plants under a PRD regime
- ❑ incorporate sapflow measurement techniques to better understand the compensatory movement of water around the plants in response to PRD regimes
- ❑ For a range of horticultural crops: demonstrate best management practices for the use of PRD; redefine minimum crop water requirements for

successful crop maturation; and prepare guidelines for the maintenance of productivity in years of low water availability.

For information contact Brian Loveys at CSIRO Plant Industries, phone 08 8303 8615, email <brian-loveys@pi.csiro.au>

Determining whole-of-system water use efficiencies for NSW river valleys (DAN14)

The project aim is to determine whole-of-system water use efficiencies (WUE) for selected river valleys in NSW. Integral to this will be:

- ❑ improved understanding of whole-of-system water balances within selected valleys
- ❑ greater definition and more rigorous modelling of irrigation delivery and application systems and their interaction at farm, region and valley levels
- ❑ assessment and prioritisation of opportunities for increased WUE, including an assessment of supply system constraints on WUE
- ❑ quantification of potential water savings through increased farm, sub-catchment and valley-wide efficiency in NSW
- ❑ documentation of the critical factors required for successful whole of system WUE modelling

Development of Guidelines for Quantification and Monitoring of Seepage from Earthen Channels (10004/WRW1 - MDBC joint project)

Project aims are to:

- ❑ develop guidelines for the best practice quantification and monitoring of seepage from earthen channels
- ❑ conduct a workshop to review the draft guidelines
- ❑ distribute the guidelines and booklets to at least 50 stakeholders.

Review of Natural Resource Planning and Implementation processes used in selected Irrigation Regions throughout Australia, but primarily within the Murray Darling Basin, over the last 15 years (I10006 – MDBC joint project)

The project aims, for each of the irrigation related Land and Water Management and Salinity Management Plan areas and processes throughout the Murray-Darling Basin and two plan areas outside the Murray Darling Basin, are to:

- ❑ document the philosophy, responsibilities and process used for their plan development and approval



- ❑ document the method and process used for the implementing, general monitoring, compliance monitoring, auditing and financing
- ❑ assess why the different management models were/are used in each jurisdiction identified and provide a critic of the relative performance of each model
- ❑ report upon the consistency across existing or proposed plans
- ❑ identify and report upon whether, there has been any changes to the plans or implementation processes
- ❑ analyse and report on the consistency between plans of the methodology and rigour of the salt load determinations and the possible implications of any differences in technique or rigour in both the planning and implementation stages of the plans
- ❑ undertake a technical review/audit of the methodology and calculations of the Salt loads and the River Murray implications (in terms of EC at Morgan) for each of the Land and Water Management plans which are on the MDBC Salinity and Drainage Strategy Register
- ❑ document the findings of these objectives and use them as a basis for a series of workshops to determine whether a consistent, or better, approach to can be developed and to document the findings from each of these workshops.

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.

CLEVER COMMUNICATION

If you want to improve your skills in telling others about your research, read on.

LWRRDC is offering half-cost support to researchers working on LWRRDC R&D projects (this includes NPIRD projects) to attend 2-day communication workshops.

There are two workshops to choose from:

- ❑ **Presentation skills**, which aims to improve the ability of scientists to get a clear message across in front of a large audience. The workshop covers structuring and preparing effective presentations, overcoming nerves, handling questions and making the best use of audio-visual aids.
- ❑ **Media skills**, which gives scientists valuable tips on how to work with the media. Working journalists give participants practice in interviewing in front of microphones and cameras and getting the message across as accurately and effectively as possible.

The workshops are run by Toss Cascoigne and Jenni Metcalfe, who have backgrounds in journalism, science communication and education.

Cost for each workshop is \$595 (plus GST from 1 July), \$300 of which is paid by LWRRDC providing research agencies pay the balance.

To apply, contact Glenn Conroy at LWRRDC quoting your LWRRDC supported R&D project (and any previous media or presentation skills training).

Glenn's email is <glenn.conroy@lwrrdc.gov.au>

For information about the workshops contact Jenni Metcalf on 07 3846 7111, email <jenni@econnect.com.au>.

COURSE places and dates

Presentation skills

Canberra: June 19-20
Perth: July 31-August 1
Brisbane: September 4-5
Hobart: October 9-10

Media skills

Melbourne: May 1-2
Canberra: June 22-23
Perth: August 3-4
Brisbane: September 7-8
Hobart: October 12-13



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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.