Geophysics for Irrigation

David Allen, who won the 2004 NPSI/ANCID Travel Fellowship to investigate geophysical instruments applicable to irrigation problems, has been working with some colleagues and the team at NPSI to distil his experiences into an Irrigation Insight (due out in 2007). A sneak preview gives some reasons to be interested in developments in this area.

The latest hydro-geophysical technology permits new approaches to water management including:

- Imaging of shallow aquifers so that they can reliably be developed as underground water storages resulting in diminishing waterlogging and topsoil salinisation problems. Using geophysical imagery, pockets of freshwater could be extracted from otherwise saline aquitards, reducing downward groundwater movement and mixing of mid level saline aquifers with deeper extensive freshwater aquifers.
- Imaging of connectivity of aquifers with surface water bodies (ie. seepage and saline inflow) so that they can be conjunctively managed.
- Imaging of aquifers to improve bore siting and groundwater modelling.
- Multi-depth imaging of soil properties for management of water application and deep leaching.
- Borehole logging for responsible borehole development and detection of cross contamination of aquifers through poorly cased boreholes.

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The National Program for Sustainable Irrigation is managed by Land and Water Australia on behalf of the partners. The partners include irrigators, water authorities, research agencies, state and Commonwealth departments and commodity groups. For information about becoming involved in the Program, please contact:

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NATIONAL PROGRAM FOR Sustainable Irrigation

exploring FUTURE visions & values

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SUSTAINABLE IRRIGATION

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Evaporation, the new frontier in water savings?

Have you ever wondered how much water your dam is losing from evaporation? Is it worth putting a cover on the dam, or using chemical additives to reduce evaporation over the hottest months of the year? New work undertaken for NPSI has developed a spreadsheet calculator which enables these questions to be answered.

The EXCEL based calculator allows the user to enter the dimensions of various types of dams, the pan evaporation data (linked from NRM Queensland's SILO website), the seasonal variation in the capacity of the dam, and the costs of any evaporation mitigation technologies. The spreadsheet then calculates the amount of evaporation saved (to the nearest 100 000 litres), and the cost of doing so.

A detailed manual is provided, making it easy to step through the spreadsheet.

Erik Schmidt from the Cooperative Research Centre for Irrigation Futures says that the addition of case studies from around Australia enables users to check that their own data entries are about right.

"We have generated case studies that feature:

- varying dam wall height to save water at Bourke
- the use of shadecloth on a re-use dam on a Shepparton dairy farm
- impermeable covers and shadecloth for use on balancing (intermediate) storages in the Lockyer valley
- the use of chemical monolayers to reduce evaporation on a ring tank near Emerald, and
- the use of shadecloth cover on the Darling Downs."

"For example, a hydrological study from the Birdwood Hills in South Australia models a small (9 ML) gully dam storage used to store overland flow water for irrigation in a vineyard. The storage also acts as a balancing storage for extracted groundwater used for irrigation and frost mitigation purposes.

Using an impermeable cover to reduce evaporation, the ready reckoner showed that the system saved **6.1 ML** of water from evaporation each year from the 9.4 ML capacity, 0.53 ha surface area storage, at a cost of **$652 per ML**. The total capital cost of the system was **$36,750** with **$315** in total maintenance costs annually."

This is just one example of how the ready reckoner can help to identify costs and savings – give it a try for your irrigation storage!

The ready reckoner can be found on the National Program for Sustainable Irrigation Knowledge Base at **http://www.npsi.gov.au/knowledge.asp**

Farm dam near Hay, NSW

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Visit our exhibit at ANCID for NPSI publications and tools

...and furthermore, evaporation happens at night too...

Separate work commissioned by NPSI and undertaken by researcher Matthew Hipsey from the University of Western Australia shows that night time evaporation is significant.

Predictions from this study using 10 test (modelled) dams in 4 different climatic regions suggest that between 35-45% of the total annual loss of water through evaporation was during the night, irrespective of a dam's size or the climatic region. For example, in a climate where potential evaporation is approximately 1.5 m/year the night time fraction equates to roughly 0.6 m/year.

This new knowledge has important implications because seepage loss has often been calculated in relation to evaporation. Where the seepage from dams is measured by assessing the drop in water levels overnight, commonly 10-15% is attributed to night time evaporation. This report shows that the loss will be more in the range of 40–60 %.

It also suggests that night time evaporation is not strongly affected by the dam's shape.

This work has cleared up one area of uncertainty about evaporation, and will assist in improving the accuracy of seepage calculations from dams (and by inference, measurements of deep drainage occurring from dams).

The full report can be found by going to the National Program for Sustainable Irrigation Knowledge Base at http://www.npsi.gov.au/knowledge.asp and typing 'Hipsey' into the Author field, or 'night evaporation' into the Keyword field.

Northern Australia Irrigation Futures (NAIF)

The Northern Australia Irrigation Futures research project aims to develop knowledge and tools – a sustainability framework – to support robust debate and decision-making about the future of irrigation in tropical northern Australia.

The NAIF project will not make decisions about current or potential irrigation in Northern Australia – these decisions remain the responsibility of state and territory governments. Policy makers, regulators, community organisations, environmental groups, managers, irrigators and investors are all potential users of the sustainability framework.

The sustainability framework will also allow for the assessment of existing irrigation areas in order to make these more sustainable.

A stakeholder reference group, including environmental, indigenous, community, agricultural and irrigation interests, has been created to inform the project.

Ross Dalton from the Commonwealth Department of Agriculture, Fisheries and Forestry, with Ian Smith from the Northern Territory Government on a recent NAIF steering committee tour.

The project team are drafting papers on:

- A Guide to Northern Australia's Institutional Water Frameworks
- An overview of irrigation across northern Australia
- Comparisons and lessons from the Daly, Ord and Burdekin irrigation systems
- An overview of the hydrology of northern Australia
- Review of the current understanding of irrigation mosaics.

A paper entitled "Indicator Frameworks for Assessing Irrigation Sustainability" is available by following the links from the National Program for Sustainable Irrigation Knowledge Base:

http://www.npsi.gov.au/knowledge.asp?Ref=288.

The NAIF team have made great progress in developing a network of interested people and organisations and in improving the communication and cooperation between governments on planning for northern Australia.

www.npsi.gov.au

Decisions, Decisions
New Irrigation Insight Book Available Soon

From purchasing or redeveloping an existing property, trading water, selecting crops and cropping systems, to determining when and how much water to apply, decisions on irrigation are required. This new NPSI Irrigation Insight "IRRIGATION DECISIONS: FROM ENTERPRISE PLANNING TO THE PADDOCK" brings together the various and often competing elements of irrigation decisions. By its very nature it moves across the financial, technical, family, social and environmental considerations of making these decisions.

This book is not only suited to farmers seeking a framework for strategically planning their business future. It is a great read for policy makers and planners who need to understand the myriad factors affecting decision making on-farm.

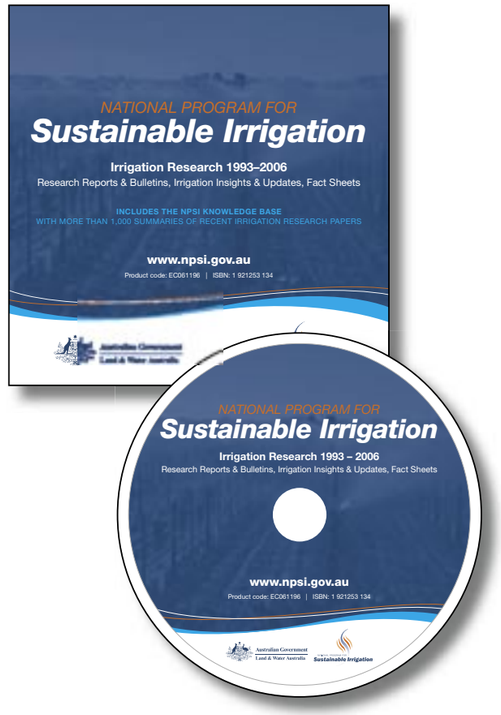
Chapters in the book range from strategic decision making such as enterprise planning – just how much information will the bank manager require – to operational decision making such as water trading and managing the irrigation system's performance.

The final chapter identifies current and potential information sources available to irrigators. This includes traditional sources such as soil moisture monitoring to more recent technologies such as remote sensing which have potential advantages when linked with traditional monitoring tools for assessing spatial variability and coverage of large areas.

The book contains some case studies featuring some leading irrigators and how they have undertaken decisions to improve their irrigation businesses.

The Irrigation Insight series of books produced by NPSI are always very popular and have international standing, This new title will be an important addition to the series.

Irrigation Research CD – All of our reports available free!



Want to find irrigation information but sick of waiting for the webpage to load? We have made all our research reports and other publications, including Irrigation Insights, Factsheets and Research Bulletins available on CD.

We have made the CD so that it looks and behaves like the National Program for Sustainable Irrigation Knowledge Base available at our website, but you don't have to hold your breath waiting for your dial-up connection to drop out half way through downloading that 3 megabyte file!

In addition to all of the research reports commissioned by NPSI, the CD Knowledge Base has summaries of over 1000 research papers and reports. These can be searched by subject area, author or keyword. Where possible, we have provided a link directly to the report. If the research is from a scientific journal we have provided the abstract and a link to the journal website. Many journals have an option to buy individual articles – or you might decide that there are so many good articles that you want to subscribe.

The new CD will be available free at ANCID, or can be ordered from Land & Water Australia or by contacting CanPrint Communications on 1800 776 616 and quoting product code EC061196.