



DELIVERING IMPROVED
WATER USE EFFICIENCY
ACROSS THE MURRAY-DARLING BASIN

Milestone 6 Report

Integration of the Farm Level Water Management Module and Irrigation Inventory Module

November 2003



Government
of South Australia

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Strategic Investigations and Education Program
I2003



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Integration of the Farm Level Water Management Module and Irrigation Inventory Module

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1. INTRODUCTION

The project team provided presentations to the Project Steering Committee (PSC) convened 21/11/2003 at the Mildura Sunraysia Horticultural Centre on activities performed to meet the obligations described under Milestone 6. Activities described under Milestone 6 include:

- Presented reports for trial sites to participating irrigators and relevant stakeholders
- Displayed WUE package at the Riverland Field day
- Integrate the Farm Level Water Management Module and Irrigation Inventory Module into generic water use efficiency and reporting package and report preliminary water use efficiency results to the project steering committee.
- Agreed presentation plan to industry and stakeholders with the PSC.

This report documents the presentation of the trial site reports to irrigators and relevant stakeholders and describes the content of the trial site report. The WUE package was displayed at the Riverland Field day and is discussed in this report. A detailed study of the integrated FLWMM water use efficiency results was undertaken, with various water use efficiency indicators described in the content of this report. Finally, the agreed presentation plan to industry and stakeholders is discussed.

The PSC approved the completion of obligations described under Milestone 6.

2. MILESTONES

2.1. Trial site reports

Written trial site reports were provided to participating irrigators in October and November 2003.

The reports contained:

- Aerial photographs showing planting and irrigation valve unit boundaries
- A range of water use efficiency indicators displayed in tables and graphs
- Water use efficiency indicators calculated to irrigation valve unit level and summarised for each planting variety in the study area
- Graphs of irrigation applied on the trial site relative to reference crop and crop evapotranspiration
- Graphs showing irrigation events rainfall and soil water monitoring readings for the irrigation season
- Simulated changes in soil water content in the crop root zone based on irrigation events, rainfall and daily crop evapotranspiration calculated from climatic data and crop coefficients
- A tabular summary of irrigation dates, hours, water meter readings, irrigation shift and valve unit details
- Tables showing crop information and irrigations system specifications

2.2. Riverland Field day display

The Irrigated Crop Management Service manned a double site within the PIRSA tent at the Riverland field days in September 2003. The display comprised of at least six laminated A1 posters presenting the Irrigation inventory Module and Farm Level Water Management Module. Several A3 laminated photographs depicting field activities performed on the project trial sites. An automated PowerPoint display complemented the posters and photographs. ICMS consultants were available to answer any inquiries and explain the project.

2.3. Preliminary water use efficiency results

Preliminary water use efficiency results for 2002/03 irrigation season were included in the trial site reports provided to participating irrigators. Irrigators provided irrigation records. Results were generated and graphed by the ICMS using excel. Individual trial site results were compiled to summarise results for the project steering committee.

Figure 1 displays a large range in the in the irrigation depth applied to each trial site. The associated deep percolation below the crop root zone generally increases as irrigation depth increases. However, it is important to note the exceptions such as site b and e. Site b applied approximately 100mm more irrigation water without a corresponding increase in deep percolation.

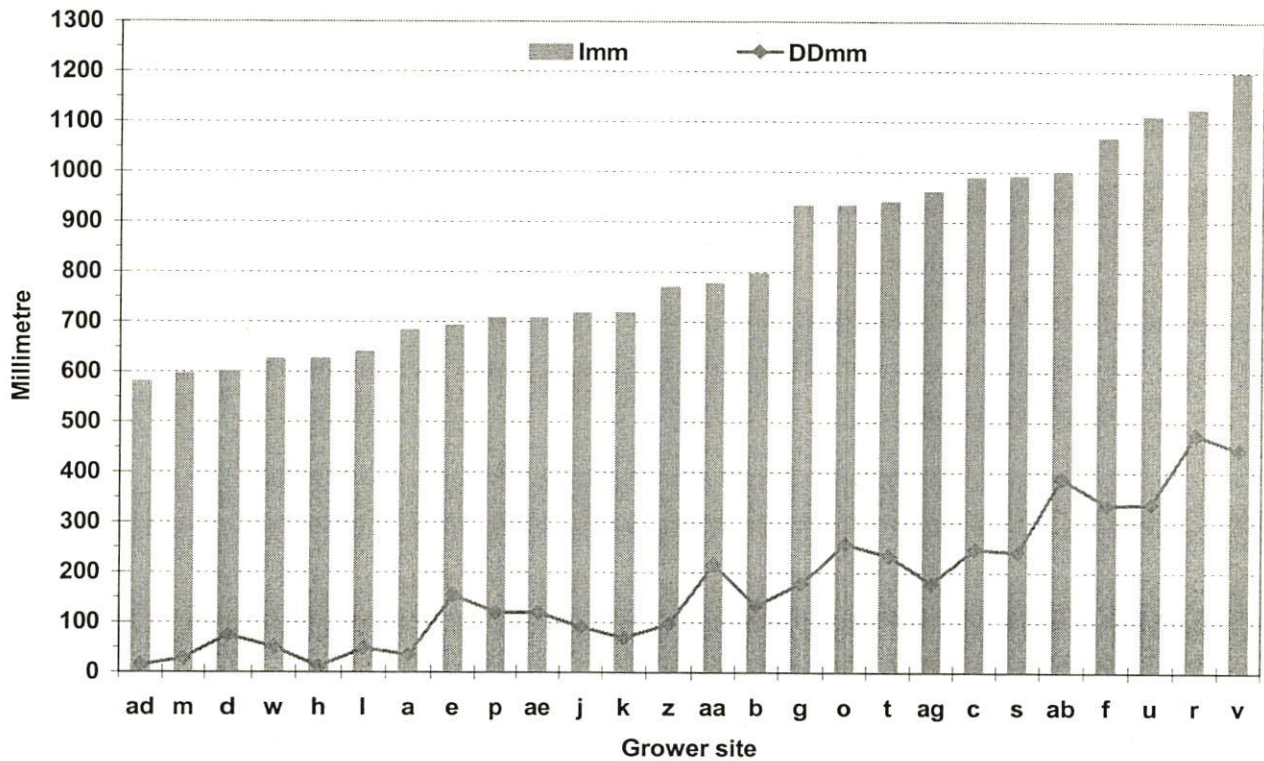


Figure 1: Annual irrigation applied and deep percolation

Figure 2 displays a general trend of declining field application efficiency with increasing irrigation application. However, notable exceptions occur such as sites b and c. It is also worth noting that site "ag" received 960mm and remained relatively efficient (FAE > 80%). Irrigation management per irrigation event plays an important role in overall efficiency.

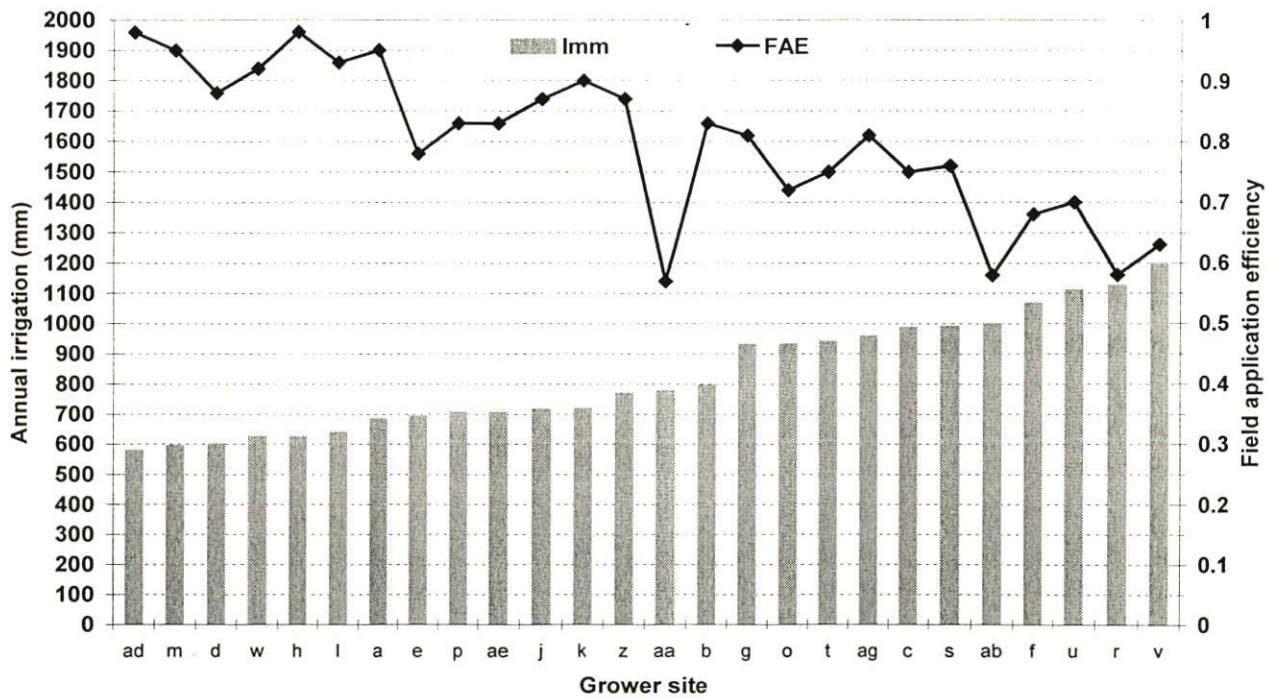


Figure 2: Annual irrigation applied and field application efficiency [(I-DP)/I]

Figure 3 shows a comparison between irrigation depth applied and Crop Water Use Efficiency indices, which use a different method of calculating water use efficiency compared to Field Application Efficiency.

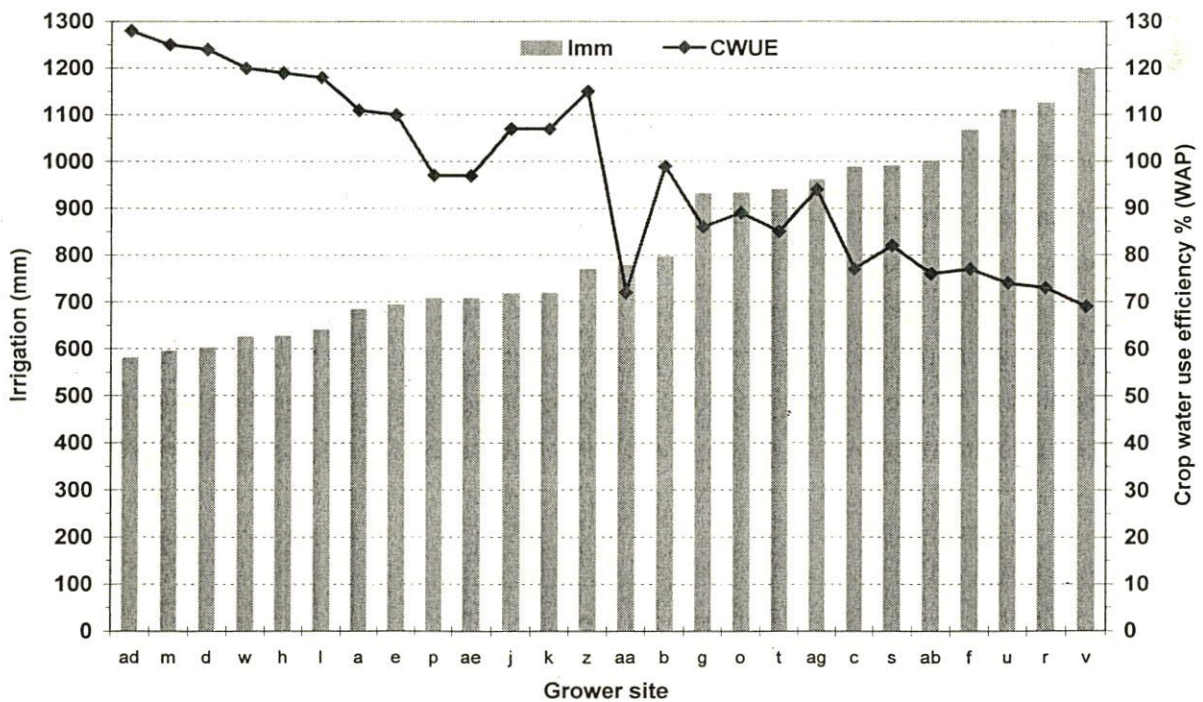


Figure 3: Annual irrigation applied and crop water use efficiency [ETc/(I+Pe)]

Figure 4 shows considerable variability between different methods of calculating water use efficiency. It highlights the need to understand the method used to calculate indicators and subsequent affects on results. Otherwise comparison against inappropriate target values and other indicators may cause misleading conclusions. For example, if water management agencies use 85% efficiency as a target for evaluating water use efficiency, 64% of trial site are greater than 85% using Crop Water Use Efficiency (CWUE), but only 35% are using Field Application Efficiency (FAE). Average CWUE is approximately 30% greater than average FAE.

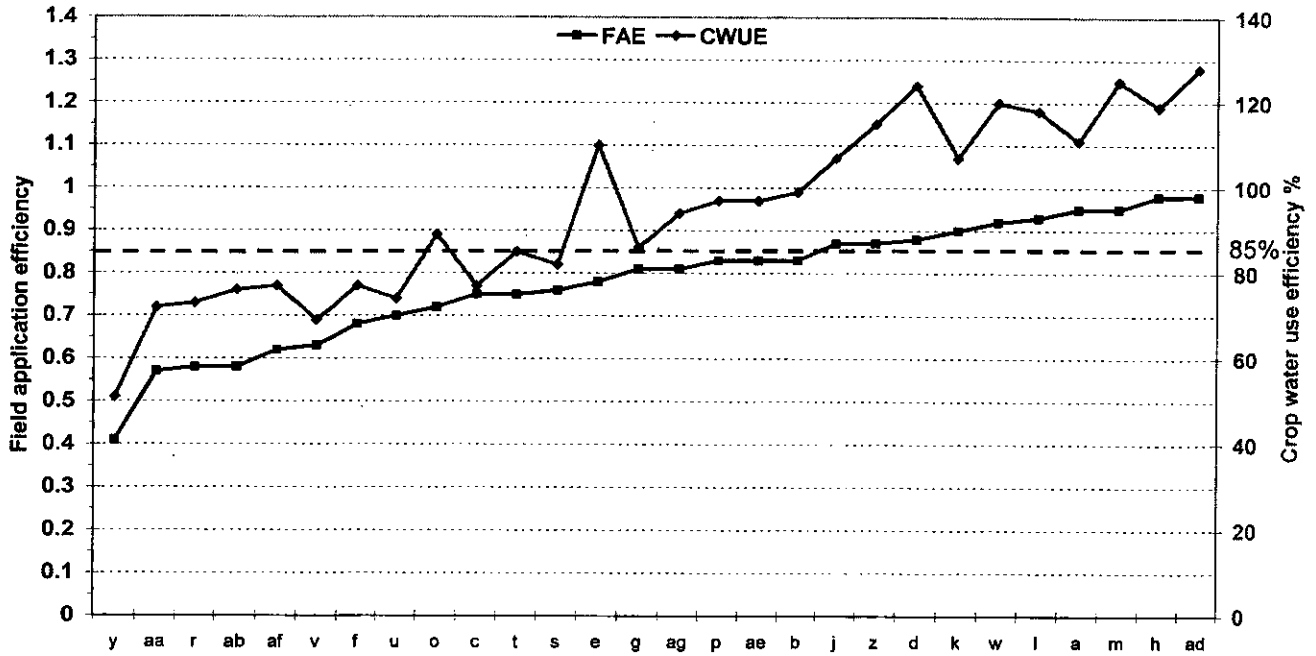


Figure 4: Difference between field application efficiency and crop water use efficiency

In this example, CWUE is based on annual irrigation applied (determined from meter readings) relative to crop evapotranspiration (calculated from average long term Epan and crop factors). This fails to determine deep percolation that occurs during individual irrigation events. The FAE calculates deep percolation for each irrigation event and deducts it from irrigation applied. The result is divided by the irrigation applied. Changes in soil water content in the crop root zone are simulated using cumulative daily crop evapotranspiration (ETc) plus individual irrigation and rainfall events.

Figure 5 displays gross value of grapes per hectare. The returns per hectare relative to annual irrigation applied are extremely variable. However, the graph indicates high irrigation application rates are not essential nor a key determinate in achieving above average returns. Trial sites b,d,i,m,w,z and aa are examples where above average returns were achieved with below average

irrigation application per year. Except for one, these sites achieved gross returns greater than \$1000/ha with less than 800mm/yr of irrigation. This supports the view that profitable returns are dependant on many factors other than total irrigation depth applied. Optimising individual irrigation events, varietal selection, canopy and general agronomic management, marketing and contract strategies are some examples.

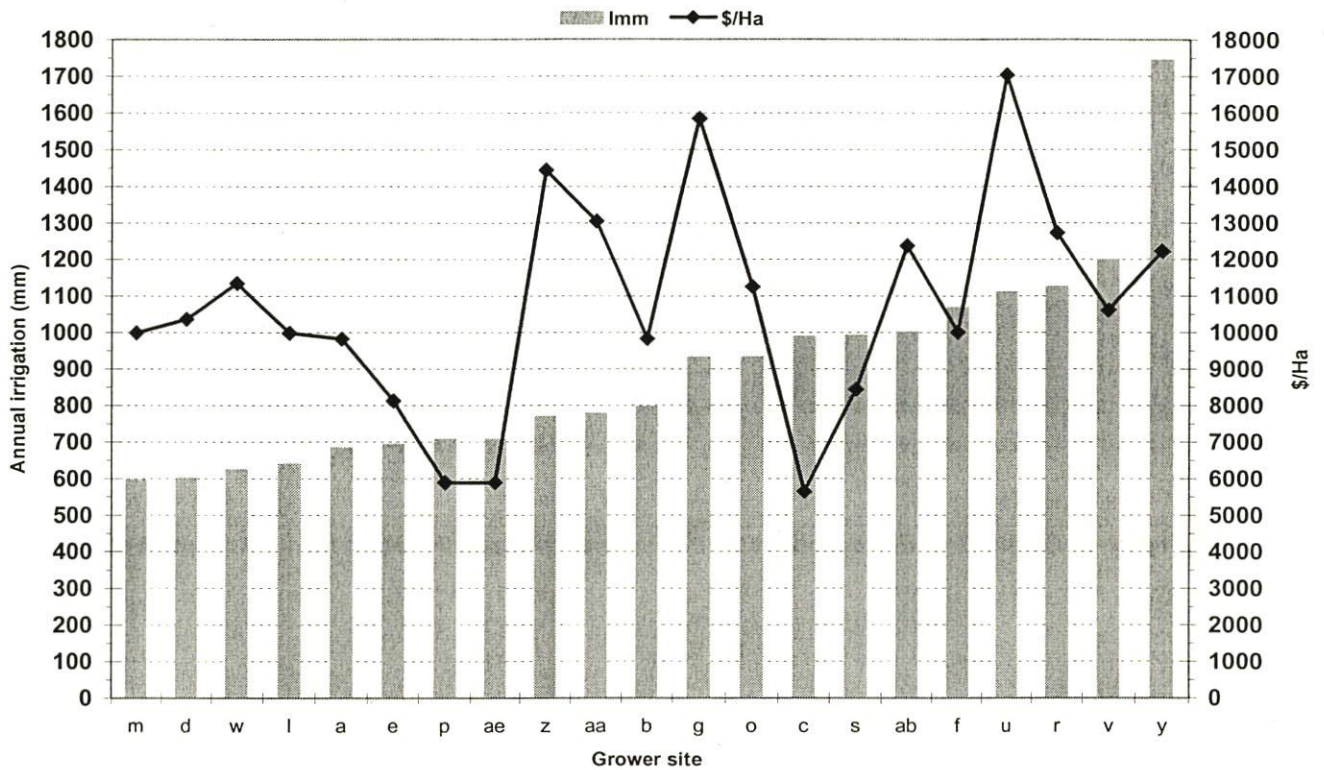


Figure 5: Dollars per hectare

Figure 6 reveals changes in field application efficiency (FAE) between 2001/02 and 2002/03. Considerable improvement in FAE occurred at 5 sites. Irrigators adopted soil water monitoring with diviners at two of these trial sites. A third started considering soil water monitoring results from the project into his irrigation management decisions and generally monitored things in more detail. The fourth irrigator became aware of the need to monitor Spring irrigations carefully due to the previous seasons data revealing large drainage events during the previous Spring. One site showed a large decline in FAE (y). The decline seems to be due to imprecise irrigation record keeping, which did not accurately track irrigation valve units against water meter readings.

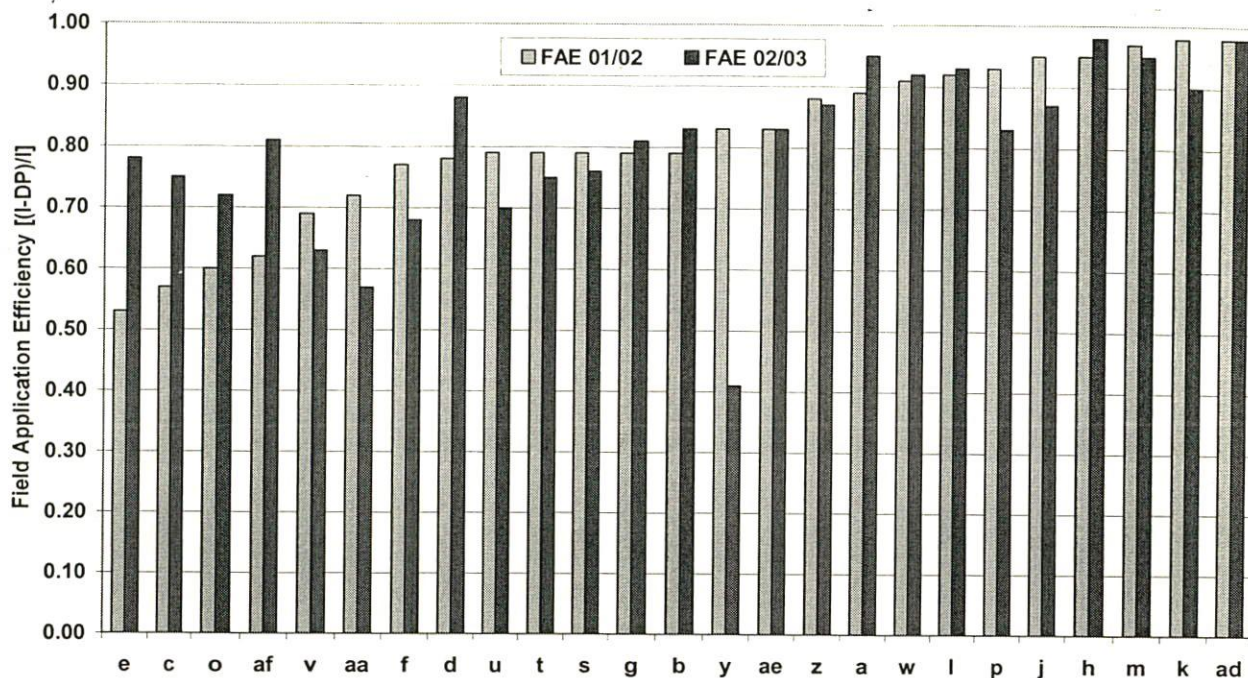


Figure 6: Changes in Field Application Efficiency from 2001-02 to 02-03 irrigation seasons

2.4. Integrate the Farm Level Water Management Module and Irrigation Inventory Module

Integrating the Irrigation Inventory Module and Farm Level Water Management has been achieved by developing a methodology to transfer key information between the two software tools. Import and export functions between the prototype software tools minimises duplication of data entry and enhances usefulness as well as reporting capacity of each tool. Considerable effort has been invested in developing consistent codes and data validation lookup tables.

The data capture screens, storage tables and code have been written for the Farm Level Water Management Module irrigation recording and evaluation system (IRES) prototype software and is currently being tested. The data capture screens and methodology were presented to and approved by the Project Steering Committee.

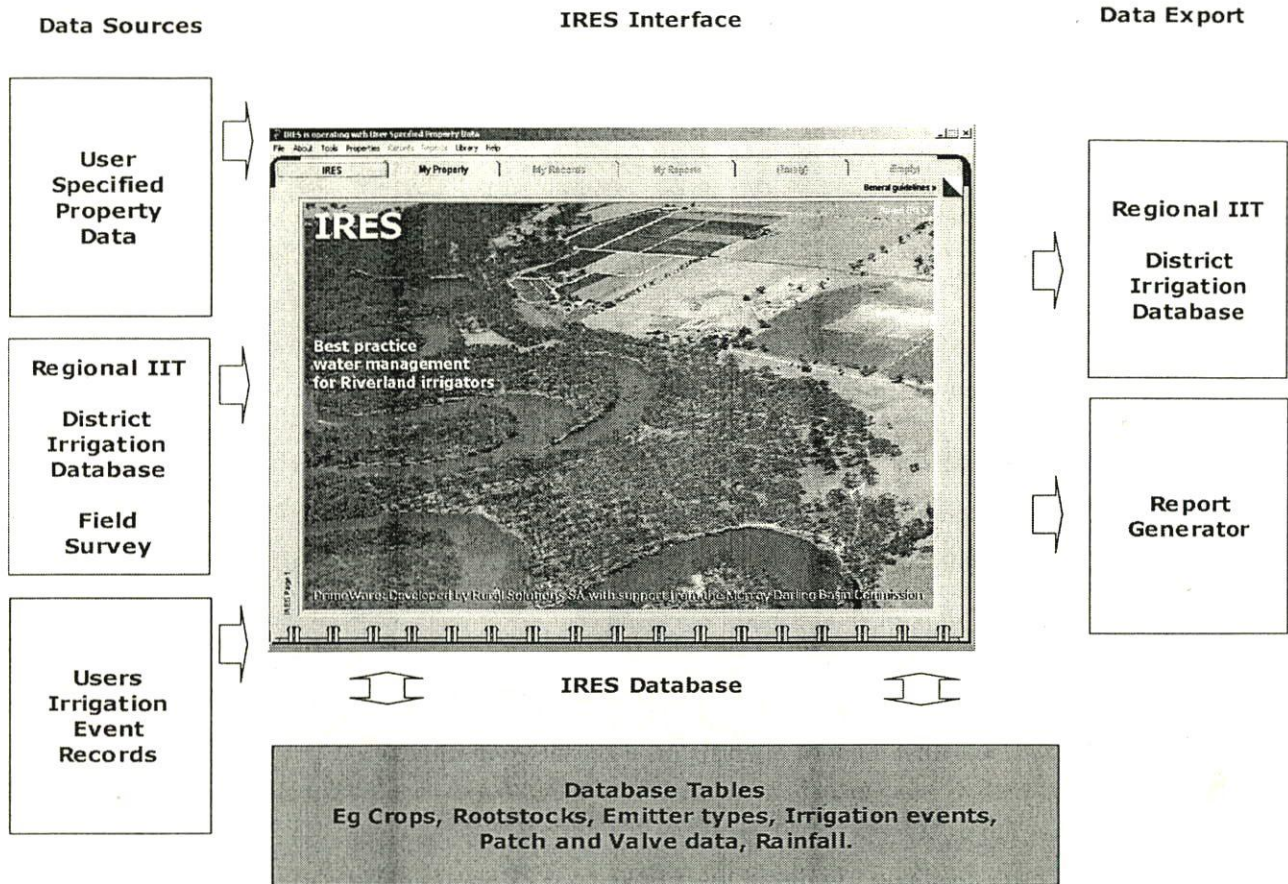


Figure 7: Data pathways for the irrigation reporting and evaluation system prototype software

2.5. Agreed Presentation Plan to Industry and Stakeholders

A presentation plan for the communication outcomes of the project was compiled. This plan includes compiling presentations targeted to specific audiences and generating .pdf files of the reports, manuals and standards produced throughout the project. Demonstrations of the IIT, WUE Module and FLWMM will be put together to provide standards demonstration of the tools in action. Sample outputs and analyses of the data collected using these tools will be included in the final presentation toolkit as well as a project fact sheet. The complete presentation plan can be viewed in Appendix 1.

APPENDIX 1: PRESENTATION PLAN TO INDUSTRY AND STAKEHOLDERS

	<u>CD</u>	<u>Res</u>
<p>1. Identify a single point of contact for WUE M&R package</p> <p>One stop shop may be backed up by initial SLA for support and/or Train the Trainer program</p>		✓
<p>2. Presentations targeted to specific audiences</p> <ul style="list-style-type: none"> • Separate slide shows <ul style="list-style-type: none"> a) General concepts of entire package for policy type audience (possible voiceover) <ul style="list-style-type: none"> • Limitation of scale for regulatory approach • Regulatory approach vs targeted assistance programs • Cost/benefit analysis (vs alternative methods) • Linkages to basin-wide reporting systems b) GIS tools explained in detail with links to IRES briefly explained for GIS professionals and Irrigation professionals working in cooperation with GIS bods. <ul style="list-style-type: none"> • Data management advantages • Multi-use database • In built coding standards • Ongoing data management • Update programs (central point of contact) c) IRES (FLWMM) explained in detail with links to District Irrigation DB and IIT/WUEM explained briefly for Irrigation professionals and GIS professionals working in cooperation with Irrigation bods. <ul style="list-style-type: none"> • Day to day adaptive management of drainage past the rootzone • Accuracy and variety of indices • Incentive programs for managing salinity impacts 	✓	✓

	<u>CD</u>	<u>Res</u>
d) Nuts and bolts presentation of entire package should also be made available for presentations to community groups, industry group reps and environmental/irrigation managers working for state agencies or catchment boards. (possible voiceover)	✓	✓
3. Pdfs of all reports and documentation		
• Milestone Reports	✓	✓
• Tool Manuals		✓
• Required Table Import formats		✓
• Crop Survey Handbook		✓
• Crop Standard	✓	✓
• Crop Standard LUTs for ANZLUC and ALUM Classifications		✓
4. Grower Testimonials and Demos		
• Testimonials from irrigators at both ends of the performance management spectrum to highlight improvements and integration into business	✓	✓
• Video footage of irrigators and sites in action with various components of the toolkit	✓	✓
5. Canned Demo Of Tools In Action		
• IIT & DIDb structure (possible voiceover)	✓	✓
• WUE module (textual accompaniment)	✓	✓
• IRES (FLWMM) (possible voiceover)	✓	✓
6. Sample Outputs and Analyses		
Mock ups of:		
• Maps		
• Charts (DIDb & IRES)		
• Property Plans		
7. Glossy 4-page fact sheet/pamphlet		
WUE M&R package outlined in similar style to CSIRO for Planning SA project factsheets		✓

8. Presentation Timeframes and Audiences

Promotional CDs to be sent to:

- all Irrigation Authorities, CMAs & Community Groups with horticulture across the basin
- all State Agencies involved with NRM
- Federal Agencies such as BRS
- National stakeholders such as Horticulture Australia, wine producers and other hort. commodity groups

Targeted presentations to potential adoptees

- I2003 Investors Forum - Adelaide Dec 10 2003
- IAA conference - Adelaide Early 2004; WUE M&R package
- ICID 2nd Asian Regional Conference - Moama Early 2004; WUE M&R package
- DPI Victoria/GM Water - Tatura Mid 2004; GIS & Irrigation
- DPI Victoria/Sunraysia Water Authorities - Irymple Mid 2004; Irrigation & GIS
- NSW Ag/Murrumbidgee Irrigation/Hort Council - Griffith Mid 2004; WUE M&R package
- SA Ag Bureau - Contact Kevin P for Riverland group. SA Murray Irrigators (Mike Vegter)
- SRW/FMIT Sunraysia Irrigation - Lindsey Leake (sec), winegrape growers, dried fruits, table grape groups, citrus growers (PM)
- WMI/NSW ag (JG) WMI DLWC - LWMPs Howard Jones (chair LWMP), Mark King (chair CMA), ME & Bill Tatnell.