

RURAL WATER USE EFFICIENCY INITIATIVES – MAKING A DIFFERENCE IN ON-FARM WATER MANAGEMENT

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Background

Irrigation accounts for some 60% of water use in Queensland and because the limits to the resource are becoming defined, it is increasingly important to improve the use and management of on-farm irrigation water supplies. The water reform agenda, climate change and expanding population are other drivers.

Queensland's water needs are met through a number of approaches:

- (a) development of new water supplies
- (b) recycling, and
- (c) water use efficiency measures.

Whilst the development of new water sources will continue, a greater emphasis will be placed on recycling and efficiency measures. Community demands for environmentally sustainable developments will drive the push towards better use of existing supplies. At the farm level energy costs will also cause irrigators to look for more efficient means of irrigating their crops, particularly as emissions controls raise the cost of energy.

Withdrawal by government of irrigation related extension services, the void not filled and COAG Water Resources policy provided the impetus to develop a program to address sustainability issues in the irrigation sector.

It was considered that a rural water use efficiency (RWUE) initiative would be an important educational program which would put into effect some of the public education elements of the COAG Water Resources Policy and would help achieve efficient, sustainable use of irrigation water on Queensland farms.

Program development

The primary aim of the RWUE initiative is to improve on-farm use and management of available water, thereby improving the competitiveness, profitability and environmental sustainability of Queensland's irrigation industries.

Key stakeholders were consulted including rural industries, government agencies and environmental groups to develop a framework to deliver water efficiency outcomes. They have had significant influence in the development and management of the initiative.

The concerns of key stakeholders had been taken into account and the proposal included a development methodology that would allow them to have further input to ensure the proposal met their respective objectives. It was imperative that the initiative enjoyed ownership by the farming community and be perceived as a community development project. Each industry group involved irrigators in the planning and development of their respective programs. This has ensured that individual irrigators took this ownership on board and that commitment to the initiative gets down to the grass roots. The importance of having ownership cannot be overestimated in the role it has played in the success of the RWUE Initiative.

The delivery model developed was a partnership between rural industries and government through the Department of Natural Resources and Water (NRW). While overall management of the program remains with NRW, rural industries deliver services to growers to improve on-farm water management. Because the RWUE initiative is a partnership with industry and included their participation in the development of the model, it has greatly increased the adoption of the program in rural communities.

In 1999 funding of \$41m over 4 years was secured to implement the Rural Water Use Efficiency Initiative.

Program Structure

NRW provides grants to those industries involved in the initiative to develop programs and provide services to irrigators in order to achieve agreed milestones and targets. This is done through a formal grant agreement arrangement and periodic payments are made based on the achievement of those milestones and targets.

The Initiative is guided by a steering committee comprised of representatives from NRW, rural industry organisations, Qld Farmers' Federation and Irrigation Australia Ltd whose purpose is to oversee, review and make assessments of progress on the implementation of the RWUE initiative across the state.

In the initial phases the Initiative comprised 4 major elements:

1. Adoption (extension) programs to improve water use efficiency on farms
2. Research to reduce evaporative water losses from storages on farms
3. Financial incentives to achieve best practice irrigation water management
4. Reducing water losses in irrigation water supply and distribution systems.

The RWUE initiative commenced in 1999 as a 4 year program with the involvement of 4 industry groups - Canegrowers, Cotton Australia, Queensland Dairyfarmers' Organisation and Growcom. It was extended in 2003 for a further 2 years but with greatly reduced funding. RWUEI is currently in its 3rd iteration and now involves the production sectors of the Nursery, Turf and Flower industries.

The current initiative has 2 elements – South East Queensland Irrigation Futures (SEQ-IF) which is a rural water use efficiency program for south east Queensland, and RWUE3 which operates in the remainder of the state.

RWUEI has also developed linkages with the CRC Irrigation Futures and the National Centre for Engineering in Agriculture. These bodies assist rural industry operatives with field trials, limited research work and the development of diagnostic tools. Industry groups are also required to develop linkages with NRM groups to work closely with them in addressing relevant priority NRM issues.

Program focus



An assessment of water use efficiency in Queensland indicated that about 60% of irrigation water being used by farms is being used for crop or pasture production with the balance being lost to runoff, drainage and evaporation. Losses to runoff and drainage lead to losses of fertiliser and pesticides from the farm with a resultant impact on downstream environments.

The initial focus of the program was to achieve efficient use of irrigation water on-farm. This has subsequently been expanded to include the development and implementation of Farm Management Systems and a reduction in adverse off-farm impacts.

Delivery mechanisms

Industry groups were required to source extension staff to deliver their programs. They were employed directly through advertising or through an arrangement with the Department of Primary Industries and Fisheries and the Bureau of Sugar Experimental Stations. These agencies seconded experienced staff to work for the initiative.

The adoption programs were delivered through a range of activities including:

-  One on one on-farm advice
-  Field trials

- ✚ Farm walks
- ✚ Workshops
- ✚ Demonstrations
- ✚ Irrigation system evaluations
- ✚ Training
- ✚ Awareness

The engagement process adopted by RWUE to provide these services was:

- **participatory** – *discussions, practical, hands-on, joint activities*
- **demonstrative** – *on-farm training, education, learning, communication and capacity building*
- **on-farm/property** – *local, based on grower's conditions and relevant*
- **consultative** – *meetings, interviews, enquiries, approvals, communication*
- **cross-industry liaison** – *staff training, data, activities, grower visits & tours*

Running concurrently with the adoption program was a suite of financial incentive packages aimed at assisting irrigators to purchase more efficient equipment and tools to better manage irrigation applications. The incentives also included applications to assist in the reduction of off-farm impacts, such as effluent management redesign and water quality test kits.

Research & Development

The RWUE initiative has also funded a range of research and development projects including:

- evaluation of the most cost-effective evaporation mitigation techniques for on-farm water storages
- development of a measurement and diagnostic toolkit to evaluate and improve the performance of sprinkler irrigation systems
- development of in-field irrigation management practices to improve irrigation efficiency of furrow irrigated cotton production systems
- increasing the water use efficiency of trickle irrigation on heavy clay soils
- development of practical methodologies to use new and innovative irrigation and management techniques in Queensland tree crop industries
- measurement of deep drainage losses under cotton
- water use efficiency of siphon-less irrigation systems

Achievements to 2003

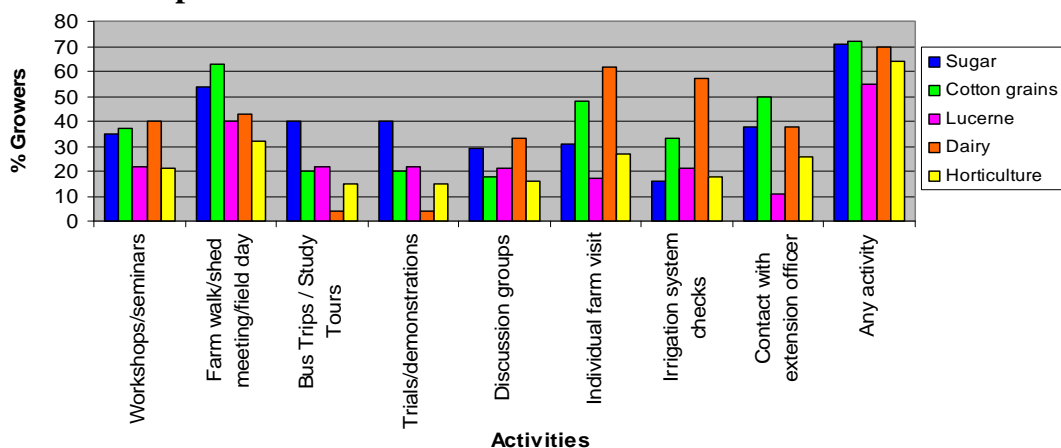
The initial stages of the RWUE initiative were evaluated by an independent firm to quantify the outcomes of the initiative against the criteria developed as part of the framework for program delivery. These criteria are based around three measures: improved water use efficiency; percentage of irrigators achieving best management practice; and social indicators.

They found that investment by government has been realised many times over through direct economic benefits to rural and regional Queensland, industry competitiveness, reduced impacts on the environment, greater water security for irrigators and by providing rural industries with a foundation for meeting the challenges of water reform.

Some of the findings and conclusions drawn from the evaluation are set out in the following tables.

Grower participation

Participation Rates



Changes in water use efficiency

Industry	Estimated water use at start of program ML	Original Target Improvement to WUE		Milestone Reports Improvements to WUE against original estimate		Survey Improvements to WUE	
		ML	%	ML	%	ML	%
Sugar	1,211,000	18,165	1.5	30,275	2.5	199,815	16.5
Cotton & Grains	600,000	60,000	10	67,855	11.3	73,800	12.3
Horticulture	274,493	8,235	3.0	11,073	4.0	86,465	31.5
Dairy & Lucerne	D:330,000 L:175,455	16,500	5.0	30,580	11.2	88,770	26.9
		33,336	19.0	12,600	7.14	26,845	15.3%
Total	2,590,948	136,236	7.9	152,383	5.8	475,695	18.4

* Weighted average

In the view of the evaluator, the actual gains in water use efficiency would be expected to lie somewhere between the estimates derived from the industry milestone reports and those estimated by respondents to a survey – that is between 152,400 ML (7.9%) and 476,000 ML (18.4%) and would be in excess of the Initiative target of 180,000 ML.

The financial incentive element of the initiative committed \$10.5 million towards the purchase of more efficient irrigation equipment that was accessed by more than 4600 irrigators. Matching investment by irrigators amounted to 3 times the outlay by government.

Water use efficiency targets do not necessarily focus on actual reductions in water use but more on improvements to the irrigation system and/or improved practices. This may well result in increased water use with a particular focus on improved productivity from water use. Many growers use the water they save by adopting new technology or management practices to irrigate more land and improve their productivity.

Current programs

RWUE3

RWUE3 involves the 7 major industry irrigator groups throughout the state and is funded through to June 2009. The targets established in grant agreements with the industries include:

- up to 10% improvement in water use efficiency
- some 30% of growers have made changes in management practices and/or equipment and operation

- some 45% of growers are involved in addressing priority NRM issues.

RWUE3 is essentially an extension program supported by a limited financial incentive scheme. These schemes provide monetary incentives to irrigators to purchase more efficient equipment, soil and water monitoring equipment and effluent management works.

SEQ-IF

SEQ-IF is part of the south east Queensland Infrastructure Plan and Program designed to assist irrigators to achieve water use efficiency measures in the light of increased competition for water supplies in the region. This program has 5 rural industry groups participating along with South East Queensland Catchments Ltd, the NRM body for the region, CRC Irrigation Futures, Irrigation Australia Ltd and the National Centre for Engineering in Agriculture provide support for the program.

Apart from the extension effort of rural industries, SEQ-IF is underpinned by research and development support provided by the CRC to assist industry personnel with irrigation research related activities. This also extends to assistance with field trials, training and the development of tools and software to assist growers and industry personnel better manage on-farm irrigation supplies. Examples of these activities include:

Research trials:

- Improved management of irrigated root zones
- Crop water requirements and deficit irrigation
- Optimising performance and managing in-field variability.

Monitoring tools:

- Pressurised Irrigation Monitoring System
- Data Signature Logger
- Crop vigour sensors
- Continuous monitoring tensiometers
- irriGATEWAY – SMS service – ET₀

SEQ-IF also provides for the purchase of equipment that can be shared across the industries. The rationale for this investment is to reduce costs in the purchase of the more expensive equipment and to foster a greater coordination of effort and sharing of the outcomes of trials and other activities through the use of this equipment. Planning of field days and demonstrations also allows for the coordination of activities that may involve more than one of the industries. Examples of the equipment purchased to date include:

- Automatic weather stations
- Soil/water monitors
- Flow meters

A significant undertaking being implemented is the development of a Knowledge Management System for Irrigation (KMSI) in south east Queensland. In the early stages of the program a scoping study was undertaken to determine the information needs for both irrigators and industry personnel and others. The main aims of the study were to:

1. Document the current status of irrigation related information, mapping and data collection, storage and usage in SEQ and current problems in use for achieving water use efficiency goals.
2. Assess irrigation stakeholder user requirements (eg policy makers, planners, industry groups, irrigation groups, farmers, NRM and catchment groups) for irrigation relevant data, mapping and information systems.
3. Identify gaps and needs.
4. Identify alternative methods for mapping/monitoring and data capture, integration, maintenance & management for irrigation benchmarking and management in SEQ.

5. Propose functional and conceptual design of an integrated mapping and information system that would allow sustainable monitoring and measurement leading to improved benchmarking and reporting of water use efficiency.
6. Develop an implementation strategy and associated management structure.

An implementation strategy for KMSI was devised that included 7 projects each of which is related to the others but could be implemented independently of the others. KMSI is a web based system that comprises the following 7 projects:

- *Electronic Library and Web Tools*
Library of irrigation information with links and access to tools and calculators.
- *Establish Irrigation Audit Database*
Standard format and methods for irrigation auditing including tools to enable storage and benchmarking of irrigation performance.
- *Base Data Collation*
Source and make available natural resource data needed for planning purposes (soils, topography, satellite imagery, groundwater etc).
- *Provide Property and Land and Water Management Planning Base Maps*
Tools to generate standardized base plans and reports with best available natural resource data.
- *Provide tools for industry operatives*
Tools and calculators to use in the field to gather and analyse data and generate reports.
- *Provide tools for growers*
Tools to enable irrigators to record data and benchmarking
- *Regional Statistics and Benchmarking*
Survey to determine land and water use including the development of a database to record irrigation information on an on-going basis.

Most of these projects are underway and are in various stages of implementation. Hosting arrangements for the web site are in place, an Irrigation Performance Audit Reporting Tool (IPART) has been developed, industry operatives have been provided with the hardware and software to generate property maps, tools for growers and industry are being scoped and the regional statistics and benchmarking exercise is due for completion in March 2008.

Communication and consultation with irrigators and industry personnel will be on-going in the development of tools and the web application of grower information. The issue of data privacy has been raised often and will be a significant barrier to the acceptance of KMSI. It is proposed that growers will be able to view their own information as will industry personnel who deal with them and growers will be able to view certain information on others but will not have access to personal details such as name or exact property location. Government will have access to aggregated data which may be on a sub-catchment scale.

It is anticipated that the KMSI project will be completed by June 2009.

Benefits of RWUE model

One-off programs identify specific issues and conclude with specific outcomes. The RWUE initiative on the other hand has been evolving and it demonstrates a focus on long-term sustainable solutions in a number of ways:

Continuous learning

- The programs have instigated collaborative learning between the different industry groups through joint field days and workshops.

- The industries have developed a range of fact sheets, newsletters and other resources to assist growers continue with their learning.

Setting of realistic and achievable targets that are reset with each new phase of the initiative

- Targets are set by industry in negotiation with government. These targets are based on realistic expectations and reflect issues in particular regions for the different industries.

Supporting investment in new technology with ongoing extension support

- The initiative is committed to providing on-going extension support to growers to maximise the benefits through the uptake of new technologies.

Continued investment of resources from government and industry groups

- RWUE has been funded by the state government since 1999 with in-kind contributions from the industry groups. Government funding has been decreasing and resourcing by industry partners has been increasing with the aim that industry groups will eventually fully support these type of programs into the future. In-kind contributions by industry partners and others significantly enhance the RWUE initiative.

Ownership of the program by industry

- The RWUE framework allows industry groups to establish milestones and targets in partnership with government. This has given the industries ownership of the initiative and a greater desire to have the initiative succeed and continue into the future.

Challenges

- Grower involvement in some industry programs has lessened as result of drought
- Irrigators not in financial position to upgrade equipment
- Allocation of water limited/not secure
- Significant minority of growers not aligned to industry bodies
- Growers tending to stay on-farm, not attending workshops etc
- Many services one on one - expensive, time consuming and limits project outcomes
- Labour shortages in some areas also restricting grower's ability to attend workshops
- Industry capacity to continue program. Strategy to maintain capacity to deliver targeted in agreements
- Retention of trained staff
- Still heavy reliance on funding
- Agreement duration limited therefore uncertainty of ongoing employment for extension staff.

The future

The significant gains made in water use efficiency through the initial stages of RWUE are unlikely to be repeated without substantial support from government. Further gains are likely to be hard won. It is speculated that the industries have engaged with the innovators and early adoptors of new technologies/better practices in the initial phases of RWUE and in the later phases of RWUE they will be endeavouring to engage with those who are less amenable to change. In addition there is a core of irrigators who do not align with or recognise that their industry body represents their best interests. Consequently they are reluctant to participate in programs provided by 'their industry'.

Financial incentives to modernise on-farm irrigation systems are regarded as the best way to obtain 'best bang for your buck'. Such an approach would however need to be underpinned by a rigorous system assessment program and technical support for the proper operation and maintenance of new equipment. The latter would by necessity involve the retail sector and irrigation consultants as well as rural industry groups.

Current RWUE programs will continue to provide extension services in the conventional manner to irrigators. Whilst these methods take a toll on resources there are opportunities to produce some

good results. One of the activities that is gaining momentum is irrigation system evaluations particularly where power consumption is an issue. Leveraging off other initiatives such as programs offered by regional NRM groups and Commonwealth government initiatives will need to be investigated further.

The development and use of diagnostic tools and decision support systems also feature prominently in current programs and will continue to be promoted in the future. Some examples include the use of SILO data supplied to growers via SMS, further development of IPART and other tools to enable more precise irrigation to occur. The development of KMSI will continue and will provide irrigators and industry operatives with a repository for information and tools at a range of levels from farm to catchment scale.

Training for industry operatives to keep their skills current and broadened to meet demand will be essential to deliver up to date services. Training will also be necessary to complement the tools used in providing those services that assist irrigators to meet certain regulatory requirements. This would demonstrate to the regulator that the industries had robust programs in place that would give some rigour to the outcomes and remedial measures to be implemented by irrigators to address the issue(s) in question.

Building capacity within industry groups to continue the delivery of services is a challenge that is being addressed with varying degrees of success. Some of the industry groups have established programs that will survive without state government funding but still rely on external funding sources. It is a requirement in the current grant agreements that each industry develops a work force plan that will partly address this issue.

The retention of staff and maintenance of a skills base is an on-going problem where such programs are seen by extension officers as being short term.