Department of Environment
and Resource Management

South East Queensland Irrigation Futures

Phase 1 (2006–09)

Program Evaluation Report

Tomorrow's Queensland:
strong, green, smart, healthy and fair

Toward Q Tomorrow's Queensland | Queensland Government

Prepared by:

Water Quality & Accounting

Department of Environment and Resource Management

September 2010

#29456

Minister's message

In 2005, the Queensland Government committed $6 million over four years to address irrigation water use efficiency of rural irrigation industries in the South East Queensland region. This commitment was part of the government's strategy outlined in the South East Queensland Regional Plan to improve the efficiency of rural water use, particularly irrigation systems. This strategy was delivered through the South East Queensland Irrigation Futures (SEQ-IF) program, managed by the Department of Environment and Resource Management. It has proved to be a wonderful example of the success of government and industry partnerships.

This program report and evaluation provides information in relation to SEQ-IF, its purpose, delivery and outcomes and provides us with a pool of information that has been of great benefit to the ongoing program. SEQ-IF commenced during a period of drought which continued well into the program and served to highlight the need for efficient use of limited water resources. The competition for water supplies also emphasised the need to use water in a way that maximised production whilst reducing impacts on the environment.

My thanks go to all participants in the program, rural irrigation industries and irrigation research specialists who all contributed towards meeting and in some cases exceeding targets set at the commencement of the program.

Stephen Robertson
Minister for Natural Resources, Mines and Energy
and Minister for Trade

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Executive summary

South East Queensland Irrigation Futures (SEQ-IF) is a rural water use efficiency program that is provided to irrigators who operate within the South East Queensland regional plan area. The program commenced early in 2006 against the backdrop of a deepening drought and low to no water allocations for the first two years in some areas. Phase 1 of the program finished in 2009. SEQ-IF is a strategy implemented by government to improve the efficiency of rural water use in the region, particularly irrigation.

Participants in the program were the five rural commodity groups operating in South East Queensland (SEQ), viz Dairy, Flowers, Growcom, Nursery and Turf.

These industries were supported via collaboration with the Cooperative Research Centre for Irrigation Futures through which research and development support was provided; the National Centre for Engineering in Agriculture through the provision of technical support and development of specific projects; Irrigation Australia Limited providing technical support to industry development officers and South East Queensland Catchments Ltd that provided cross industry coordination and support. The Queensland Farmers' Federation participated in the management committee.

Extension services provided by each rural industry were underpinned by the purchase of the more expensive equipment needed to assist industry development officers deliver these services. Specific research and development projects were undertaken to assist industry development officers to determine more innovative approaches to achieve water efficiency gains on-farm.

Overall direction to the program was provided through a management committee comprising of all stakeholders and chaired by the Department of Environment and Resource Management (DERM). This committee met on a needs basis to provide this direction and to consider the funding of projects that were put forward. A steering committee met twice each year to discuss the progress of each participant's delivery of the program and their achievement of milestones and targets. A smaller working group provided input to the development of a knowledge management system for irrigation.

The program had three main features:

- improved water use efficiency
- implementation of farm management systems
- addressing natural resource management priority issues.

Targets negotiated and agreed with the industries included a nine per cent improvement in water use efficiency, 25 per cent of irrigators addressing natural resource management priority issues and 24 per cent adoption or implementing farm management systems. The latter is a prime example of the coordinated effort of programs meeting the government's commitment to a memorandum of understanding with the Queensland Farmers' Federation to support farm management systems. Irrigators' engagement in the program was often contingent on them participating in farm management systems.

The evaluation has been conducted primarily on the basis of information contained in milestone reports and final reports submitted by industries. Additionally the evaluation is based on the results of various reports including those on specific projects funded by the program and the methodology adopted by Coutts (2005) in the first phase of the Rural Water Use Efficiency Initiative. Whilst there was not a 'starting point' with respect to water use and other practices there is more robust data available to have confidence in the achievements generated.

SEQ-IF has been a successful intervention program, more so in some industries. The participation rate was high and in some industries all known irrigators participated. Most other targets have also been exceeded.

Under the program a suite of web-based tools, calculators, databases and information systems have been developed that will continue to contribute to the efficiency and productivity gains beyond the life of this phase of the program.

It is estimated that, by the end of this phase, the participating irrigators were collectively saving 21 300 megalitres per year as a result of the program. The level of adoption of water use efficiency measures by individual irrigators varied, with some achieving savings as high as 60 per cent of their water use.

The estimated actual water saving (21 300 megalitres per year) represents about 12 per cent of the total irrigation water use in the region. The government's investment through the program in this first phase represents about $282 per megalitre of water saved over this phase of the program.

Some 40 per cent of irrigators participating in the program over the period were exposed to farm management systems concepts. This exposure ranged from awareness to full adoption leading to improvements on-farm.

As a consequence of farm management systems and water use efficiency promotion, about 28 per cent of participating irrigators would have addressed natural resource management issues relevant to their operations. These outcomes contribute to meeting South East Queensland NRM plan targets.

Participation rates by irrigators in the program have been ranked high, medium and low depending on their level of engagement. Up to 48 per cent of irrigators participated in those activities where the level of engagement was determined to be medium to high. These figures exceeded initial expectations of industries at the beginning of the program.

Limited financial incentives were provided to irrigators to support change in equipment and practices. Whilst these account for a certain percentage of irrigators making a change clearly there were other drivers, the most significant of which is security of water supply linked to productivity.

Although the program and its unique framework have produced valuable outcomes, there are lessons to be taken from this phase to improve the outcomes and benefits for irrigators and the environment for any subsequent water use efficiency programs. Closer linkages with those programs that seek to improve the position of irrigation in SEQ, such as rural futures and regional water supply strategies is highly recommended. Greater engagement with the retail sector and financial incentives to assist irrigators make change should also be considered.

Introduction

South East Queensland Irrigation Futures (SEQ-IF) is a strategy under the South East Queensland regional plan to improve the efficiency of rural water use, particularly irrigation. This program is born out of the principle to ensure that rural water needs are met in an efficient and sustainable way. It is a rural water use efficiency program for SEQ.

SEQ-IF operational area is based on the regional plan area for SEQ and extends from the Sunshine Coast regional council area in the north, Toowoomba in the west and the Queensland–New South Wales border in the south. Any landholder who irrigates in this area is eligible to join the program.

Funding under this program is provided to rural industry groups to enable them to deliver services to their growers to achieve certain targets, inter alia improvement in water efficiency and better on-farm water management.

Rural industries that deliver services within the program and represent irrigators in the region are:

- Flower Association of Queensland Incorporated
- Growcom
- Nursery & Garden Industry of Queensland (NGIQ)
- Queensland Dairyfarmers' Organisation (QDO)
- Queensland Turf Producers Association.

QDO and Growcom had participated in previous phases of the RWUEI and were in a good position to quickly develop a program of activities and targets. The lifestyle horticulture industries had not been involved in RWUEI previously and as a result were not able to quickly provide a program. Nevertheless they did have organisational structures that allowed them to engage readily with irrigators.

Only the production elements of the flower, nursery and turf industries were eligible to be part of SEQ-IF. Whilst there is some cane grown in the south east it was considered that the little irrigation involved did not warrant Canegrowers being part of the program. Dairyfarmers' organisation also undertook to provide services to the irrigated fodder industry. Individual irrigators did not need to align or be a member of any of the industry bodies to be eligible to join the program.

SEQ-IF is a 10 year program to be implemented to 2015. The first phase of four years duration commenced in May 2006 and ended 30 June 2009. In effect this phase was a little over three years duration.

The consolidated targets for all industries include:

- up to 10 per cent improvement in water use efficiency
- 20 per cent participation/adoption of farm management systems
- 40 per cent of growers have been directly involved in SEQ-IF activities
- 23 per cent involved in addressing natural resource management (NRM) priority issues.

Figure 1 SEQ-IF implementation area

Overview of the region

SEQ is a rapidly expanding area in terms of population growth to the extent that urban growth requirements are competing directly with the agricultural sector. Natural resources of both land and water are being impacted with the encroachment of urban spread. Peri urban establishments are another competitor for land and water resources. The region is serviced by 11 local governments all of which support irrigated agriculture to some extent.

Landscape attributes

There are 14 major catchments in the region that support irrigated agriculture. These range from the rich volcanic soils of the Tamborine and Maleny plateaus to the fertile alluvial soils in the valleys associated with the Lockyer, Logan, Albert, Warrill, Cressbrook, Stanley and Brisbane watercourses. Irrigation is also undertaken on soils derived from sandstone north of Brisbane to the sunshine coast hinterland. These tend not to be as intensive as occurs in the alluvial valleys but are important nevertheless particularly the area centred around Nambour.

High levels of salinity in groundwater supplies in some parts, particularly the Lockyer Valley has a limiting impact on irrigation and on water use efficiency. Salt loads that accumulate in the root zone of plants as a result of irrigation need to be moved lower in the profile. To achieve this it is normal practice to 'over water'.

Climate

Drought conditions persisted for much of the region throughout the life of the program being more severe in the western parts. This will mask any water use efficiency gains as many irrigators had much less water to use. The drought also limited engagement with growers who had low or no water supplies.

Long term average rainfall varies significantly across the region with northern coastal areas averaging up to 1730 millimetres (mm) per annum. On the other hand a significant agricultural area of Gatton has an annual average of 796 mm. Pan evaporation averages for these centres range from 1590 mm/annum to 1765 mm/annum.

Table 1 shows the long term median rainfall for selected localities along with annual rainfall for the four years of the program. For much of the program most agricultural areas were suffering rainfall deficits that depending on the severity would have made the task of irrigator engagement more difficult.

Table 1 Rainfall

Locality	Long-term median annual rainfall (mm)	2005 rainfall (mm)	2006 rainfall (mm)	2007 rainfall (mm)	2008 rainfall (mm)
Beaudesert	915	910	768	635	871
Gatton	796	665	598	607	1082
Esk	929	700	648	722	1153
Nambour	1723	1281	1319	1656	1865
Tewantin	1730	1530	1386	1815	1816

Table 2 shows average annual pan evaporation for the same localities.

Table 2 Pan evaporation

Locality	Average annual evaporation (mm)
Beaudesert	1524
Gatton	1796
Esk	1610
Nambour	1522
Tewantin	1573

High evapotranspiration and relatively low rainfall increase the irrigation requirements of crops, for example, cauliflower irrigated in Gatton requires 1.92 megalitres (ML) per hectare (ha) whilst the same crop on the same soil type grown in Noosa requires 1.23 ML/ha.

Predictions of climate to 2030 by the CSIRO indicate that temperature could rise by 0.4^{o}C to 2^{o}C and rainfall averages could change by -10% to + 5% in that time. In general, Australia has an annual net moisture balance deficit, and our environment is largely moisture limited. When the simulated increases in potential evaporation are considered in combination with simulated rainfall change, the overall pattern shows decreases in moisture balance on a national basis (Climate Change—Predictions for Australia. CSIRO 2001). These predictions support the need for irrigators to be water efficient but also to recognise the likely impact climate change may have on their enterprises and inevitably their water management practices.

Agricultural land use

The rural areas of SEQ cover approximately 1.9 million ha or about 84 per cent of the region. Land use is a mix of agriculture (sugarcane, horticulture, fodder, cropping and pastures), conservation, forestry and urban activities. Over 5500 agricultural businesses manage 65 per cent of the land for animal and crop production. In 2006 the population of the rural areas and rural living areas was about 287 800 people (10 per cent of the region's population) and an additional 58 400 people (2.1 per cent) lived in rural towns and villages scattered across the region outside the major urban centres.

Rural communities and industries are facing many challenges. Key issues affecting the rural sector in SEQ include: increased global competition, the accessibility and cost of water, the availability and affordability of skilled labour, the price of land, uncertainty surrounding climate change and the ongoing availability of cheap oil.

SEQ's farming and resource sectors employ around 1.8 per cent of the region's workforce, while the value of agricultural production accounts for just 1.2 per cent of the gross regional economy. However, the total farm-dependent economy (including inputs, transport and processing) in SEQ is worth $8 billion, or 11.4 per cent of regional gross domestic product. SEQ's agricultural economy makes up about 12 per cent of the state's agricultural economy and three per cent of the national agricultural economy.

Agricultural production in the region includes broadacre cropping (cereals, sugar cane and other crops), horticulture (fruit, vegetables and amenity horticulture such as flowers, turf and plant nurseries), and livestock (pigs, meat cattle, milk cattle and poultry). As a result of the drought, total farm income has dropped and fewer people are employed in agriculture. The outlook for the future is also uncertain.

The area and volume of agricultural production in the region has declined during the period 2000–01 to 2005–06. The area planted for sugarcane in SEQ declined by 60 per cent between 2000–01 and 2005–06, due primarily to the closure of the Moreton Sugar Mill at Nambour in 2002. There is a trend towards an increasing number of smaller enterprises operating in SEQ than in 2001. (South East Queensland State of the Region Technical Report, 2008).

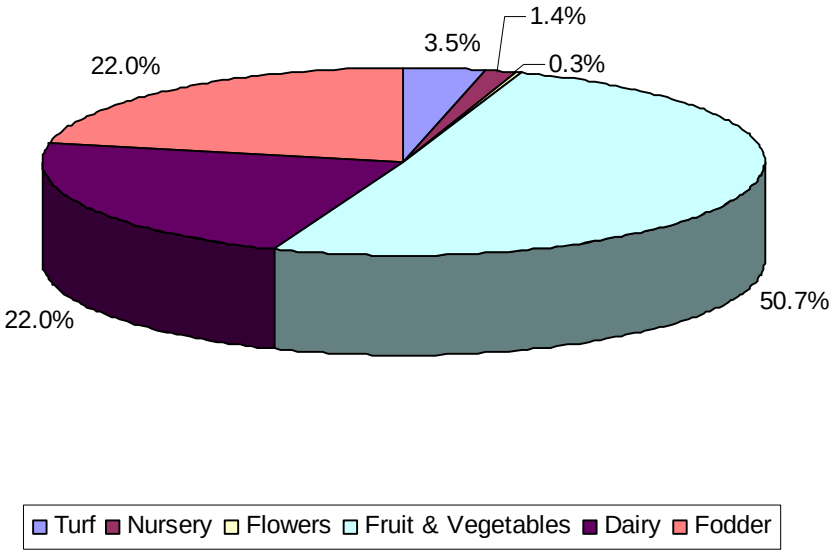
Of the total farmed area irrigated cropping accounts for approximately 45 400 ha. The gross value of irrigated cropping in the region is estimated at $713 million/yr. (South East Queensland Regional Water Supply Strategy, Draft).

Table 3 shows the estimated areas irrigated by commodity groups. These figures were derived from a number of sources including ABS, industry groups and various reports.

Table 3 Areas irrigated by commodity groups

Commodity	Irrigated area (ha)
Turf	1600
Nursery	650
Flowers	150
Fruit & Vegetables	23 000
Dairy	10 000
Fodder	10 000
Total	**45 400**

Chart 1 Irrigated area by commodity



Water supply

Irrigation water supplies are drawn from multiple sources including supplemented and unsupplemented surface water, overland flow, groundwater and on-farm storages. Major sources of supplemented water are:

- Maroon dam supplying the Logan
- Moogerah supplying the Warrill
- Lake Clarendon & Atkinson supplying the Lockyer.

Figure 2 shows the locations of supplemented supplies.

Groundwater supplies are obtained from alluvial aquifers associated with the Lockyer, Logan and Albert, Cressbrook, Warrill, Bremer and other smaller streams. Sandstone aquifers in the Sunshine Coast hinterland and basalt aquifers at Maleny and Mount Tamborine also provide sources of irrigation water.

Many on-farm storages, particularly in the Sunshine Coast, provide the remainder of irrigation water sources. These may provide the only source of water for an enterprise or are used in conjunction with groundwater supplies or unsupplemented surface water.

Figure 2 Supplemented water supplies

Table 4 shows announced water allocations for medium priority water available from storages servicing schemes in the southern part of the SEQ region during this phase of SEQ-IF. Medium priority water is that water generally assigned to agriculture, principally for irrigation use. Announced allocation represents that proportion of a landholder's entitlement available to them in that particular water year.

Table 4 Announced allocations

Scheme	Announced allocation %			
	2005–06	2006–07	2007–08	2008–09
Logan	No announced allocation made due to critical water shortage	No announced allocation made due to critical water shortage	80	95–100
Central Lockyer	0	0	0	16–81 in latter part of the year
Lower Lockyer	0	0	16*	13–63 in latter half of the year
Warrill	0	0	71**	30–72 in latter half of the year

* Effective 25th February 2008

** Effective 12th February 2008

Water use

Average irrigation water use across SEQ is estimated at 178 000 ML/annum on average. The estimated average use by commodity groups is shown in Table 5. The volumes determined have been derived from a number of sources including the Australian Bureau of Statistics, various reports and information provided by industry groups. Previous estimates on irrigation water use range from 127 000 ML/year to 522 000 ML/year. There is no definitive figure available but the authors believe this estimate of 178 000ML/yr to be the best determined through an analysis of available data on areas irrigated, enterprise numbers and crop water use.

Table 5 Water use by commodity

Commodity group	Water use ML
Dairy/Fodder	86 000
Flowers	1000
Fruit & Vegetables	74 000
Nursery	9000*
Turf	8000
Total	**178 000**

*Water use in the production nursery sector is tentatively adopted as 9000 even though the ABS derived data puts it much lower. Industry sources cite 'average' water use as 22.5ML/ha from a range of less than five ML/ha to more than 30 ML/ha. A Brisbane Water (Brisbane City Council) fact sheet

states ‘the average nursery in Queensland uses more than 16 million litres of water per hectare a year’. The number of hectares under irrigation, plant varieties, stages of growth and water recycling all add to the difficulty of being able to quantify water use. It is reported that 50 per cent to 80 per cent of applied water is lost consequently when reporting water use by nurseries it is this context and whether or not that ‘lost water’ is recovered and used.

Chart 2 Water use by commodity group

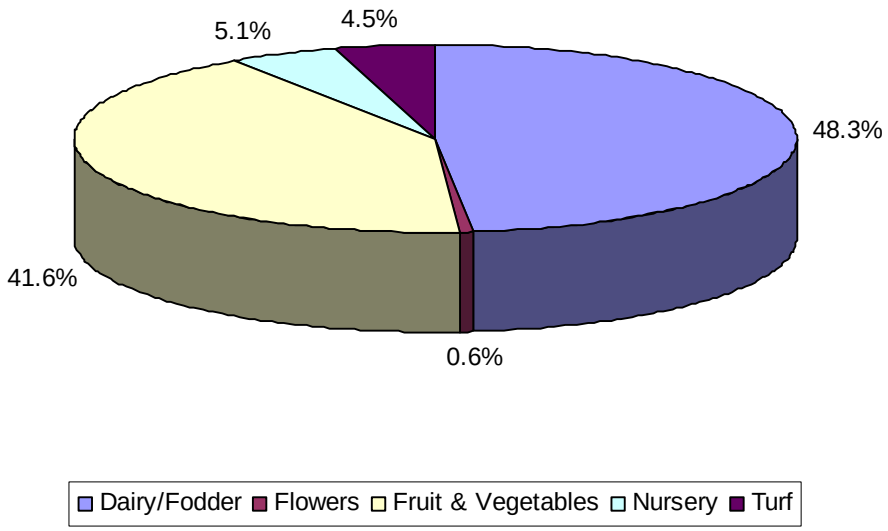


Table 6 shows water use by ABS statistical divisions. These divisions align quite well overall with SEQ region boundaries. The data have been derived from the Australian Bureau of Statistics publication Water Use on Australian Farms 2006–07 and have been proportioned in terms of a total water use of 178 000 ML/annum.

Table 6 Water use by statistical division

Statistical division	Water use ML/yr
Brisbane	27 500
Gold Coast	10 600
Sunshine Coast	29 750
West Moreton	110 150
Total	**178 000**

These data provide industries with a guide as to where the most gains are likely to be made, i.e. West Moreton which encompasses the Lockyer, Fassifern and Logan valleys. Nevertheless these areas represent the areas most affected by drought conditions for much of the program. This made engagement with irrigators difficult and potential water efficiency gains unlikely to be realised.

Chart 3 Water use by statistical division

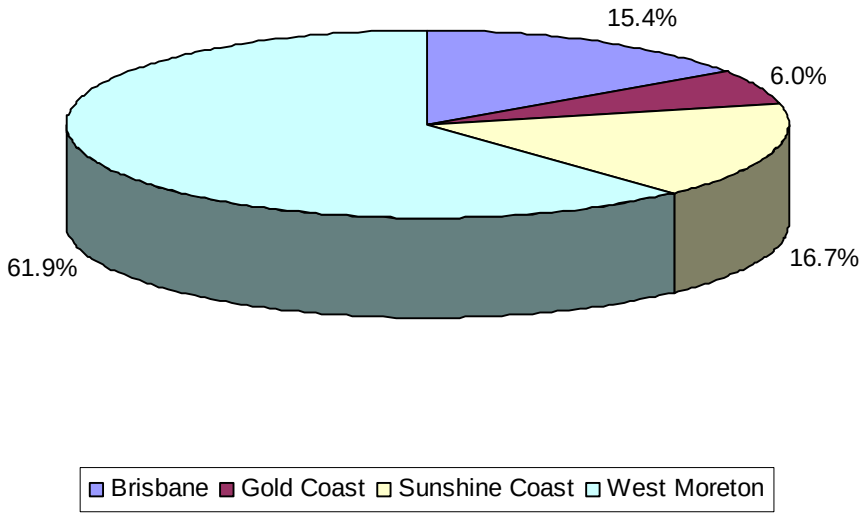


Figure 3 Statistical divisions—SEQ

Irrigation statistics

Whilst they may be available for supplemented systems there are many areas where accurate statistics on irrigation water use, crops or areas grown are generally not available. Based on Australian Bureau of Statistics data, various reports and data supplied by industry groups it is estimated that there are about 2400 irrigators operating in the region. There are more than 30 different crop types irrigated and the area under irrigation is some 45 400 ha. This obviously varies with climatic conditions and availability of water supplies along with commodity prices and personal circumstances. Figure 4 shows the location of significant areas of irrigation throughout the region.

All types of irrigation methods apart from furrow irrigation are in use throughout the region. Travelling irrigation systems appear to be more prevalent in the dairy and fodder sectors whilst micro-irrigation systems are well represented in the flower, nursery and fruit and vegetable industries.

Some work had already been done through the RWUEI to benchmark water use to enable irrigators to determine how they were performing. More needed to be done in this area. Irrigators in some of the industries readily share information on practices, strategies etc but others are more protective of the way they operate and are unwilling to share information which they consider would lose their competitive advantage. This also provided challenges for industries in delivering the program.

Irrigation scheduling methods in SEQ appear to be typical of many reported methods, ie grower's experience and probably account for about 70 per cent of irrigators in the region.

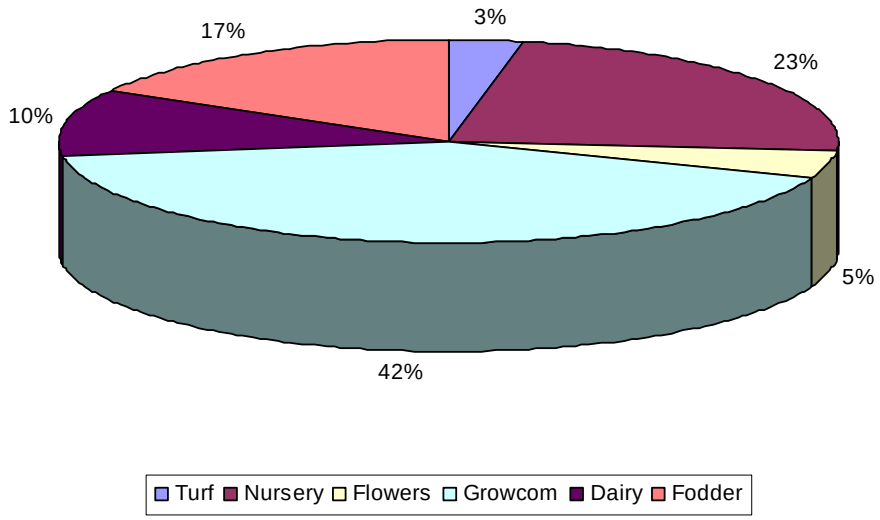
Demographics

Of the approximately 2400 irrigators in the region the majority are in the fruit and vegetable commodity groups. The nursery and flower industries have been affected by the drought and water restrictions and their numbers tend to vary with seasonal conditions. The following table shows the number of irrigators aligned with each industry.

Table 7 Irrigators by commodity group

Commodity group	No.
Turf	76
Nursery	550
Flowers	100
Growcom	1000
Dairy	248
Fodder	400

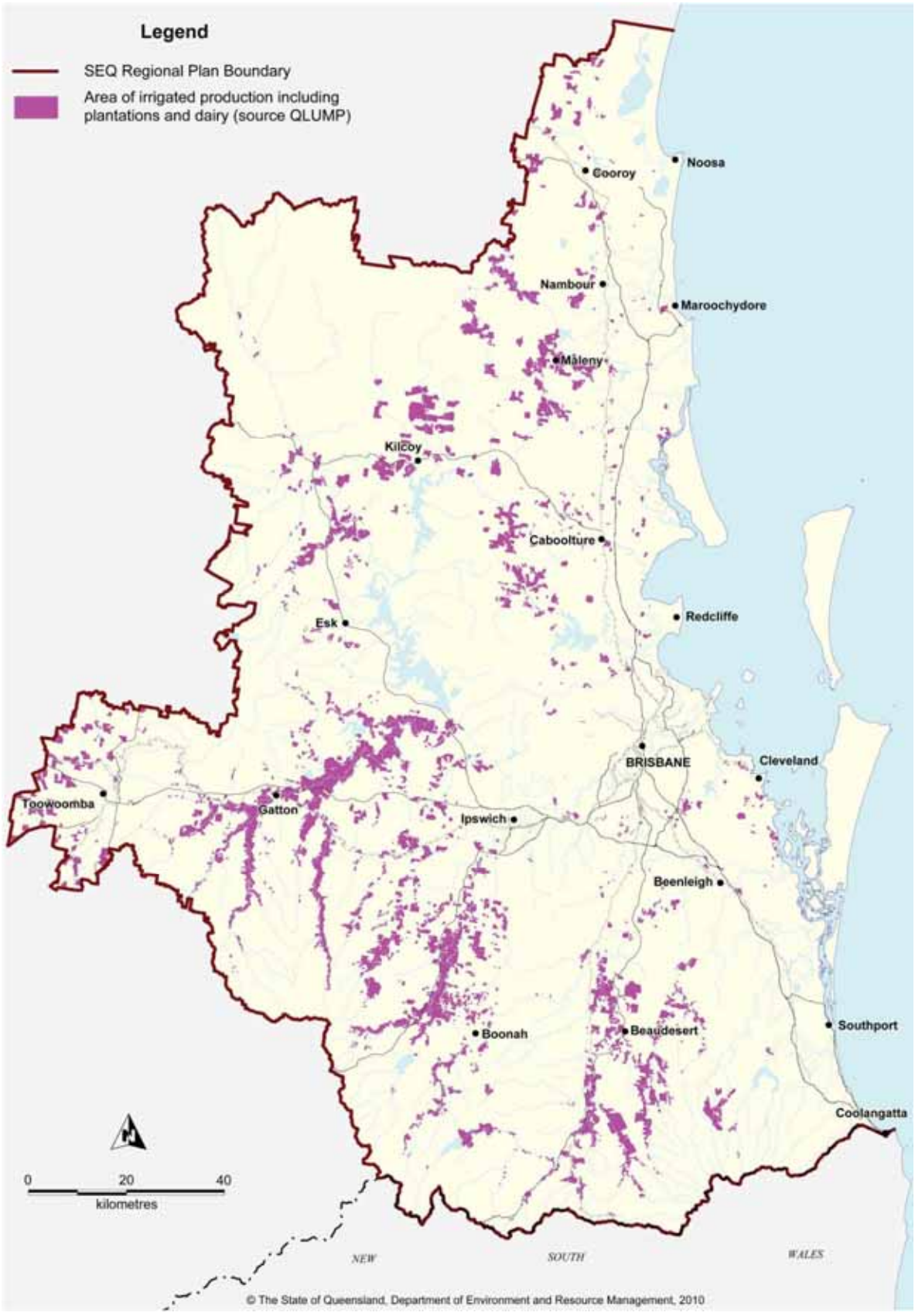
Chart 4 Irrigators by commodity group



A majority of the irrigation enterprises are family owned and operated by people in the 40–60 year age bracket. This is an important statistic to consider when designing an extension program to achieve change. Approximately 40 per cent of these enterprises have been under the one ownership for more than 30 years.

About two thirds use email and 70 per cent use or have used the internet to source farming information. This does not suggest that the internet is their primary source of information or that they found it useful enough to act upon it. Seeking professional advice for farm improvement and irrigation management appears to be more prominent in the flower and nursery industries.

Figure 4 Areal extent of irrigated production



Regional linkages

The Queensland Government's strategic priorities for water in the region are to:

- ensure more efficient management and uses of water
- increase the supply of water to accommodate growth in the region
- diversify water supplies to address climate variability, climate change and other supply risks
- ensure that policy frameworks and subsidies support total water cycle management; and
- review institutional arrangements to ensure efficient, sustainable and equitable coordinate regional water planning and the delivery of bulk water supply and treatment services.

SEQ-IF has linkages to a number of programs or strategies being progressed under the SEQ Regional Plan to secure and protect the position of agriculture in the region. In this context SEQ-IF has been implemented to support a number of other strategies to ensure that these objectives are met.

Rural futures

The draft Rural Futures Strategy is a regional policy under the SEQ Regional Plan to put in place strategies for the economic well being of rural communities and rural industries. The accelerated implementation of SEQ-IF is one of the recommended actions in the water resource theme identified in the draft strategy. Notwithstanding this the implementation of SEQ-IF will contribute towards the aims of the Rural Futures Strategy in securing the future of irrigated agriculture in the region.

SEQ Regional Water Supply Strategy

The SEQ Regional Water Supply Strategy (SEQ RWSS) is aiming to balance water demands and supplies in the region. This strategy examines alternative water sources and demand management options, developing a strategic direction for water supply in the region through to 2050.

To achieve the objectives of the SEQ RWSS one of the strategies identified is:

Improving the use of water resources on farm to achieve efficient and sustainable agricultural production

Helping farmers and their communities respond to changes induced by a range of

regional policy initiatives by:

- continuation of the SEQ Irrigation Futures Program supported by industry programs to implement farm management systems and water use efficiency measures
- enhancing the implementation of the SEQ Irrigation Futures program by:
    - area-wide data collection and monitoring within a managed framework to assist with implementation of improved practices on farm and to provide recognition of achievement and identification of any further improvements required
    - linking on farm efficiency measures with improvements made to improve the performance of irrigation areas and particularly introduction of self managed systems that allow users more flexibility to individually decide on their water use performance.

The success of SEQ-IF in delivering water savings and improving the productive capacity of the irrigation sector is an important element of the SEQ RWSS.

Natural resource management

South East Queensland Catchments Ltd (SEQC) operates throughout the region to address natural resource management issues. There is alignment in some areas and linkages with particular programs being provided by industries to secure common identified outcomes. Property management planning and a reduction in off-farm impacts are the more significant activities where rural industries have forged linkages with SEQC. In addition all the industries have identified in their milestones and targets to address relevant management action targets contained in the natural resource management (NRM) plan.

Land and water management plans

Land and water management plans (LWMP) are a regulatory instrument under the *Water Act 2000*. Their purpose is to ensure that the use of irrigation water supplies are used in such a way that they do not cause land or water degradation. A landholder is required to have an approved LWMP if they purchase water to use for irrigation purposes.

SEQ-IF industries have as part of their programs a reduction in adverse off-farm impacts which directly aligns with LWMP outcomes. This is normally achieved as part of property management planning that tend to reflect the guidelines for LWMP. In addition the LWMP process has an accreditation and recognition framework which are a goal for some of the industries to obtain. Obtaining recognition from DERM will give their programs credibility that would also increase grower participation.

Healthy Waterways

The South East Queensland Healthy Waterways Partnership is a government–community collaboration committed to improving the health of the catchments and rivers of SEQ. Industry involvement is not through SEQ-IF but their efforts in delivering services directly contribute to the outcomes sought by Healthy Waterways.

Funded by the Queensland Government through the Department of Environment and Resource Management, SEQ local councils and industry partners, the partnership coordinates the efforts of over 70 partners, including SEQ local governments, researchers, educators and numerous industry and community contributors.

Healthy Waterways partners are delivering on the 500 management actions they have committed to under the SEQ Healthy Waterways Strategy 2007–12.

DERM is managing the Queensland Government's $20 million investment in the strategy's actions to reduce water pollution loads and restore degraded waterways—building on the partnership's unparalleled strength in government–community collaboration.

SEQ-IF contributes indirectly to the objectives of this strategy through better on-farm water management practices. There are also synergies through the implementation and adoption of farm management systems (FMS).

SEQ-IF framework

During 2005, two workshops were held with relevant stakeholders to shape the SEQ-IF program which was to be based on the successful RWUEI program. That is, fund industry bodies to provide services and where appropriate financial incentives to their growers. Stakeholder organisations represented at the workshops were seven rural industry groups and the Queensland Farmers' Federation; South East Queensland Catchments Ltd; and the National Centre for Engineering in Agriculture. The broad framework agreed for SEQ-IF was that it would be delivered by industries; would address certain issues including water use efficiency; and be managed by the then Department of Natural Resources and Mines.

South East Queensland Catchments Ltd engaged consultants Coutts J & R to develop a funding and delivery framework for SEQ-IF. The framework was to provide the basis for the effective development, management and monitoring of the SEQ-IF program. This report which was accepted by stakeholders set out a funding and delivery framework together with high level objectives for service delivery and targets.

Funding framework

A total of $6million was allocated over four years from 2005–06 to 30 June 2009. Allocations for the various elements of the program are set out in the following table.

Table 8 SEQ-IF funding

Component	Basis for funding distribution	Amount
1. Whole of region	Through application for project funding approved by the management committee.	$900 000
2. Industry specific programs	Through grant agreements linked to the achievement of milestones & targets.	$3 500 000
3. Coordination & support	Grant agreement with SEQC to deliver services & achieve negotiated milestones & targets.	$800 000
4. Research & development	As determined by the SEQ-IF management committee.	$800 000
5. Program management	Funded through DERM base funding.	$0
Total		**$6 000 000**

Funding of the industry specific programs was based on an initial allocation of $100 000 to each to enable a person to be employed to deliver the program. The remaining $400 000 was distributed based on a formula of the number of irrigators aligned to the industry and the perceived volume of water they used. The rationale for this was the more water an industry used and the greater the grower numbers meant more resources were needed to achieve the objectives of SEQ-IF. Table 9 shows the statistics on which the industry share was calculated.

Table 9 Industry statistics (SEQ-IF funding and delivery framework)

Industry	Number of enterprises (approximately)	Water use (initial estimate) ML/year
Dairy	290	156 600*
Fodder	1000**	240 000**
Fruit and vegetables	1000	80 000
Nursery	750	37 500
Turf	127***	5000
Cut flowers	160	3000
Total	**3327**	**522 100**

* Dairy water use based on average irrigated area: 60 ha at 9 ML/ha (reworked model with additional input received from Ridge Partners) in a normal year.

** No. of fodder farms based on an estimate of 1000 in the Brisbane and Moreton region (3480 according to 2004 Australian Bureau of Statistics) (some crossover assumed). Water usage based on an average irrigated area of 60 ha at 4 ML/ha in a normal year.

*** Based on average turf farm size at approximately 40 ML/yr (also includes non-irrigated)—estimate that will be refined with auditing,

Other figures provided are best estimates from industries concerned. (Source: SEQ-IF Funding and Delivery Framework)

The following formulae was used to determine additional funding to the industries over and above the base staffing allocation.

$$s_i = \frac{s}{2} \times \frac{n_i}{\sum n_i} + \frac{v_i}{\sum v_i}$$

Where:

Industry share = si

Industry number of growers in SEQ = ni

Industry volume used in SEQ = vi

Total of all SEQ-IF shares = Σsi = S

Total of all growers in SEQ = Σni

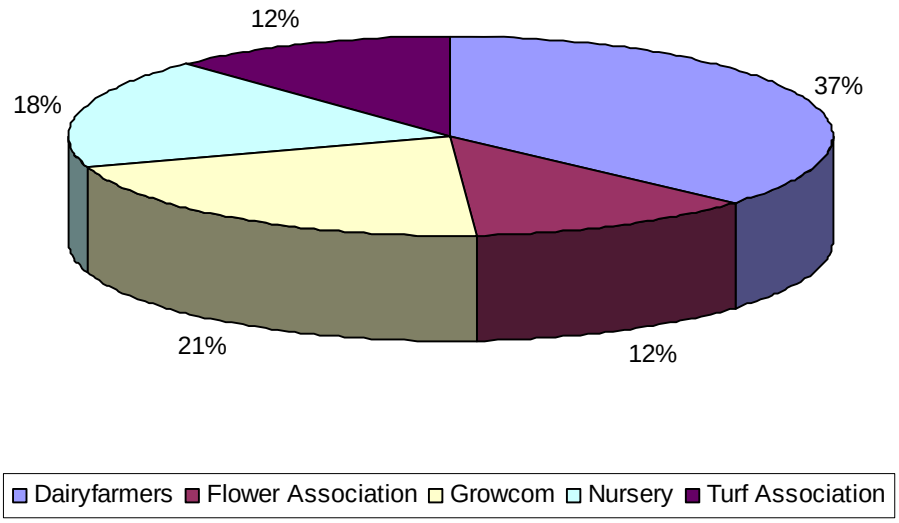
Total water used in SEQ = Σvi

The annual allocation of funds to industries is shown in Table 10

Table 10 Industry funding allocation

Industry	$ allocation/year
Dairyfarmers' Organisation	329 000
Flower Association	111 000
Growcom	190 000
Nursery Industry	160 000
Turf Association	110 000

Chart 5 Funding distribution



Funding was distributed through grant agreements with each of the industries and payments were linked to the achievement of negotiated milestones and targets.

Funding for projects and shared equipment under the whole of region and R & D components was made available through grant agreements where costs exceeded $15 000. Otherwise payment for projects was made on the presentation of invoices following approval of the intended purchase or project proposal.

Delivery framework

The framework agreed by stakeholders included five different components, of which four would be funded through the program and the fifth funded by DERM's base budget. This arrangement would maximise funds available to stakeholders to deliver the program. The components were:

1. whole-of-region priorities
2. industry specific programs
3. coordination and support
4. research and development
5. program management.

Whole-of-region priorities were to include cross industry initiatives, collective purchase of equipment, scoping studies etc.

Industry programs would be negotiated and be funded to deliver negotiated outcomes.

Coordination and support would be provided by SEQ catchments and would assist in delivering coordination of industry effort, regional communication, dissemination of knowledge, training, etc.

Research and development would focus on projects that supported industry programs.

Regional objectives

The Coutts report identified eight regional priorities across all industries. These objectives were to be achieved through industry programs, whole of region activities and research and development work. Evaluation of the success or otherwise in achieving these objectives would be undertaken by DERM. They form the basis on which the success of the program will be measured.

Four year objectives

1. Ninety per cent of primary producers in the region have received information about improving water use efficiency.
2. Relevant commercial operators and 1500 primary producers in the SEQ region have been directly involved in the SEQ-IF water use efficiency training, demonstrations, incentives and/or on-farm activities.
3. Specific changes have been made in management practices and/or improved equipment and operation to improve WUE in 700 primary production enterprises as a result of SEQ-IF activities. Actual target numbers may be revisited after initial audit.
4. Water use efficiency had been improved by 10 per cent within primary production and associated agricultural value chains across the region. These gains will be a combination of improved production per ML used and water released for other purposes.
5. Effective primary production water monitoring processes are in place across the region.
6. Commissioned research and development projects completed and results incorporated into industry programs and FMS.
7. Contribution made to the achievement of relevant management action targets as described in SEQ regional natural resource management plans.
8. Evaluation of program completed.

The targets contained in these objectives may be revised following the completion of the initial regional and industry audits.

Industry objectives

The following objectives and targets have been established in grant agreements with individual industries with varying emphasis placed on each objective. Industry targets adopted are given in later sections.

Four year objectives

1. Ninety per cent of industry enterprises in the region have received information about improving water use efficiency.
2. Designated number of producers and relevant commercial operators have been directly involved in water use efficiency training, demonstrations, incentives and/or on-farm activities.

3. Specific changes have been made in management practices and/or improved equipment and operation to improve water use efficiency in primary production enterprises as a result of SEQ-IF activities.
4. A negotiated improvement (minimum 10 per cent) in water use efficiency has been achieved across primary production and associated agricultural value chains across the region. These gains will be a combination of improved production per megalitre used and water released for other purposes.
5. Industry FMS schemes effectively incorporate water use efficiency elements with a targeted uptake of components related to planning, managing and monitoring water use.
6. Industry extension activities and materials are accessible by other rural and peri-urban water users.

Program management

The overall SEQ-IF program was managed by DERM as part of the state RWUEI. Funding for project management was provided through base funds allocated to DERM. No funds allocated to SEQ-IF were diverted towards program management. In keeping with the funding and delivery framework report administration of industry programs was to be undertaken by DERM.

To guide the industry programs a steering committee comprised of representatives of all the industries was established. This committee met twice per year to review individual industry progress and discuss ways in which the program could be enhanced.

A management committee chaired by DERM and with representation of all industries, the Queensland Farmers' Federation, South East Queensland Catchments Ltd and the National Centre for Engineering in Agriculture was established to guide whole-of-region initiatives, coordination and support functions and research and development components of SEQ-IF. This committee also provided strategic direction for SEQ-IF along with approving projects to be funded under the above functions. The committee met on a regular basis and where possible used email as a means of providing information and obtaining decisions to fund projects.

The management committee served SEQ-IF well in the early stages of the program's development. This applied particularly to whole of region initiatives in setting the direction for the on-going development of a Knowledge Management System for Irrigation in SEQ. It was challenged however where input or review of the more technical aspects of projects to guide the program was required.

As the program matured a technical working group was established to inform DERM and the management committee on the appropriateness and technical applicability to SEQ-IF of projects submitted for approval by the committee. This task mostly related to the various tools and calculators being developed to underpin the Knowledge Management System for Irrigation in SEQ.

Program delivery

In accordance with the funding and delivery framework the following principles were to apply to the delivery of SEQ-IF:

- Expand and enhance the partnership approach of the RWUEI, partnering with the major rural production-focussed industry bodies in SEQ, utilising established industry programs where appropriate, and assisting new industry bodies to develop relevant new programs.
- Link to those elements of FMS aimed at on-farm sustainable resource management and the adoption of practices that optimise water use efficiency and positive natural resource management outcomes.
- Link where relevant to the SEQ Rural Futures Strategy, the SEQ Regional Water Supply Strategy, water resource planning, and natural resource management planning and implementation being conducted at the landscape (sub-catchment), catchment and regional scales in SEQ region—and link into water quality monitoring activities as providing an important indicator of the success of program activities and feedback leading to necessary changes in program activities.
- Attack the issue of sustainable natural resource management at both the farm and landscape levels to ensure desired outcomes for the region are realised
- Provide funding for financial incentives where appropriate
- Share resources across partner industries where feasible
- Seek appropriate research and development support as well as involving commercial operators in the ongoing education/awareness process.

Industry programs

Queensland Dairyfarmers' Organisation

Program overview

The Queensland Dairyfarmers' Organisation (QDO) program was badged as the Dairy and Fodder Water for Profit (DFWP) program.

SEQ-IF: project outline—the QDO believed that there was a need to expand the base emphasis of the rural water use efficiency to broader natural resource management.

QDO proposed a program for SEQ to deliver better natural resource management and other beneficial outcomes at farm, regional and industry levels. The program built on the work undertaken and materials developed during the RWUEI. The SEQ program also continued to be part of the Northern Dairy Industry's FMS program Dairying Better 'n' Better for Tomorrow and strategically linked to the SEQ Regional NRM organisation.

Program activities

The QDO program had a number of main elements:

- Ongoing development, refinement and implementation of the FMS, Dairying Better 'n' Better for Tomorrow. For the fodder industry no FMS system existed and thus FMS delivery could not be undertaken for this sector until that industry sector derived the ability and resources to develop an FMS system.
- A series of water, nutrient, effluent and NRM management adoption/extension/training services. These specifically involved the further development and continuation of the current series of dedicated workshops, on-farm field days and farm tours. For the fodder industry the target service delivery would be on water use efficiency, soil and nutrient management.
- An on-farm system assessment incentive scheme to assist producers to engage professional skills to assess on-farm irrigation and/or effluent management systems,
- A financial incentive scheme to assist producers with the implementation of on-farm system change to derive better water and/or effluent management outcomes,
- On-going development, refinement and delivery of industry decision support tools for sustainable natural resource management within the dairy industry,
- Supporting research projects targeted at deriving improvements in water and nutrient use efficiency and for the management and reuse of effluent.

Flower Association

Program overview

The main objectives of the Flower Association SEQ-IF program was to:

- develop a framework for delivering improved natural resource management and best practice for intensive irrigated industries
- implement broad scale use of best practice for managing irrigation and natural resources
- improve water management in the cut flower and foliage farming systems
- increase sustainability and profitability of the cut flower and foliage industry
- improve environmental performance of the cut flower and foliage industry
- contribute to the recognition of industry best practice programs and for the growers who adopt them.

Program activities

To improve the efficiency of rural water use and achieve broader natural resource management outcomes, Flower Association of Queensland Incorporated (FAQI) adopted the following key activities:

- employment of staff to support industry needs
- industry benchmarking and target setting
- on-farm measurements, benchmarking, systems consulting and mapping
- development and testing of water use efficiency components of FMS
- workshops, training events, field days and industry forums
- collective purchase of strategic equipment
- promotion campaigns
- development of information support—booklets, fact sheets, web-based information and training courses
- research and development trials and demonstrations

The flower program created linkages with and obtained leverage from the Business Water Efficiency Program and Water Efficiency Management Plan process provided through the Queensland Water Commission.

Growcom

Program overview

The SEQ-IF program was to expand on the successes and the momentum of previous RWUEI programs. There was seen to be a need to expand the base emphasis to broader natural resource management and to design tools that will assist with better natural resource management. Accordingly, Growcom designed a program to deliver better natural resource management outcomes at farm, regional and industry scales. It is important to note that SEQ is a region that is heavily targeted with many programs and layers of complexity due to its proximity to Brisbane and unique pressures imposed upon it, it is important to get a good understanding on what happens in the region and try to harness program efficiency through collaboration with other organisations and companies.

Program activities

The Growcom program had four elements:

- an irrigation efficiency and NRM extension service delivered on-farm
- a service delivered on-farm to adequately assess existing irrigation infrastructure and systems and propose beneficial changes for both financial and environmental gain
- delivery of an FMS program and support tools for sustainable business and natural resource management within the fruit and vegetable industry, consistent with frameworks developed by Queensland Farmers' Federation
- integrated approach with South East Queensland Catchments, the regional catchment body for SEQ, to address concerns and work together to address environmental targets defined in the SEQC natural resource management plan.

The program operated at multiple scales:

- At the industry scale—through the design, testing and implementation of FMS support tools and management frameworks for achieving continuous improvement in business management, environmental performance and sustainable natural resource management.

- At the farm scale—through a team of field staff whose focussed on facilitating:
    - further adoption of irrigation system performance, water use and drainage good practice
    - irrigation system assessments and improvement solutions
    - improved natural resource management
    - use of FMS, mapping and support tools

Weather station and seepage meter used to determine water losses from a farm dam

(Photo: K Murday)

Nursery industry

Program overview

The Queensland nursery industry directed the SEQ-IF program to address on-farm natural resource management and environmental issues through a voluntary partnership approach with whole of industry. The concept was to drive change at an enterprise level through industry best management practice, industry based natural resource/environmental management strategies and one on one assistance at the grower level.

The nursery industry delivered all SEQ-IF activities under the FMS umbrella which provided a structured program with all the elements being addressed. The industry believed that to provide on-going benefits from the initial project investment, growers would need to have continual access to information and advice if a long term legacy from SEQ-IF was to be realised. Industry programs offered this on-going assessment/support and drove the continuous improvement process into the future.

Under the FMS program, production nurseries combine the Nursery Industry Accreditation Scheme Australia Best Management Practices (NIASA BMP), EcoHort—Environmental Management System,

Integrated Pest Management (IPM) and BioSecure HACCP programs to deliver a holistic guide to business sustainability. NIASA BMP, EcoHort and BioSecure HACCP are based on the continuous improvement management cycle with businesses applying risk based assessment against each of the program elements.

Program activities

Farm Management System Officer (FMSO) areas of activity:

- on-farm system evaluation (data gathering)
    - irrigation efficiencies—measuring and monitoring
    - system design
        - assess system
        - cost/benefit in system change
    - resource management (recycling, storage, etc)
    - industry best practice (NIASA and EcoHort)
    - drainage management
- on-farm technical assistance—improving resource use, etc.
- relevant liaison with partners (SEQC, etc)
- industry information distribution
- industry training—Waterwork and Environmental Management
    - property planning
    - current practice information gathered
    - course participation allows for on-property assessment.

Environmental and natural resource on-farm audits:

- retro fitting sprinklers
- alternative irrigation systems
- system design
- pumps—efficiencies
- system controllers
- irrigation scheduling equipment

Support implementation and adoption of farm management systems:

- NIASA best management practice
- EcoHort—environmental management system
- BioSecure HACCP—on-property biosecurity

Research and development:

- SPACEPro modeled data—3500 data sets for irrigation sprinklers
- ISPACE database—sprinkler performance parameters and system design tool
- dripper/spray stake selection tool and calculator
- weight-based irrigation scheduling
- electronic on-farm audit tool

- physical properties of growing media investigated
- plant water use efficiency assessment and database
- software to track the SEQ-IF gains across the industry (gains table).

Turf association

Program overview

The Queensland Turf Producers Association was to develop a framework for delivering improved natural resource management and water use best practice programs for the turf production industry in South East Queensland. The program had four main focus areas through which these objectives would be achieved, viz farm management systems, irrigation system audits, water use efficiency and natural resource management activities.

Program activities

The following activities were undertaken:

- an industry audit in SEQ
- interface with NRM groups for linkages and leverage of programs already developed
- the development and implementation of a Turf Production Industry Communication Strategy in SEQ
- the development and uptake of an appropriate farm management system for the turf production industry in SEQ
- preparation, adoption and extension of methodology framework for the total project
- methodology framework developed and implemented for the regular project evaluation and review
- industry benchmarking program on water use undertaken in SEQ
- water use efficiency packages demonstrated and marketed throughout the turf production industry in SEQ
- on-farm extension services provided.

The range of activities undertaken by the turf project included:

- irrigator performance evaluations
- soil moisture monitoring equipment
- scheduling management (irrigation)
- water quality testing
- wetting agent/surfactant trial
- pump costing/efficiency evaluations
- weather monitoring including evapotranspiration
- FMS (and farm mapping) promotion
- field days
- workshops.

Industry targets and achievements

The following tables show the measures and targets that each of the industries agreed at the commencement of the program to be their achievable goals. In most cases these targets were arbitrary, that is there was no firm basis on which they were founded. There was little information available on water use, areas irrigated or irrigation methods in use. For the dairy program, for example, there was virtually no information on the number of fodder growers involved in irrigation. Consequently the targets represented a 'best guess' at what could be achieved. The turf and flower industries in particular were at a stage of discovery with water use efficiency and FMS and involvement in this type of program was unique to them.

A number of targets and milestones common across industries were adopted in relation to program engagement, those implementing changes in management practices, water use efficiency and those addressing natural resource management priority issues. Nevertheless each industry had priority areas they identified that needed improvement in performance to be regarded as operating in a sustainable environment.

The result in the 'Achievement' column has been determined by the individual industry and has been taken from their final report on the program.

Dairy/fodder

In setting milestones and targets the dairy and fodder program had a priority to improve effluent management and the continuing roll out of their FMS program Dairying Better 'n' Better for Tomorrow. To encourage uptake of better performance with effluent management, financial incentives were made available based on achievement of performance based criteria. The incentives also applied to the achievement of water use efficiency gains on the same basis.

Table 11 Dairy/fodder targets and achievements

Measure	Target %	Achievement %
Producer awareness of program	75	100
Producer involvement in water use efficiency activities	50	54
Producer involvement in SEQ-IF activities	40	67
Producers implementing change in management practices	15	55
Improvement in water use efficiency	10	15
Improvement in effluent management	10	46
Enterprises adopting FMS	30	45
Producers involved in addressing NRM priority issues	25	37

Key achievements and highlights

The main highlights of the SEQ-IF DFWP program include:

- achievement by the dairy industry within the region of 15 per cent improvement in water use efficiency, and 47 per cent of the dairy farmers adopting improved effluent management and reuse practices. 67 per cent of dairy farmers being directly involved in the program, and overall 37 per cent of the dairy farmers in the region addressing priority NRM issues on their farmers
- mailing four rounds of DFWP information packages to all SEQ dairy farmers and fodder producers on the database to obtain applications from producers to attend DFWP workshops, apply for an on-farm system assessment or to apply for the financial assistance scheme

- publishing regular advertisements and 32 articles to impart knowledge, increase awareness and encourage producers to participate in the program via the mediums of industry publications and newspapers
- the delivery of 52 workshops and field days (eight through the DFWP program and 44 through Dairying Better ‘n Better programs) with a combined attendance of 526 producers
- establishing on-farm trial and demonstration sites on six sites across the region at Kalbar, Harrisville, Mt Mee, Beaudesert, Carter Ridge (Gympie) and Mutdapilly
- conducting a study tour to New Zealand and linking with the Young Farmers Network tour of the Hunter Valley, to investigate water use efficiency and effluent management and reuse strategies in other regions
- delivering a forage forum to advisors with specialist guest speakers from southern states with expertise in water use efficiency
- conducting 40 on-farm system assessments (OFSA) on irrigation or effluent management and reuse systems by suitably qualified professionals
- through the Financial Assistance Scheme (FAS), supporting on farm systems work on 73 farm enterprises across the region, with 34 being for effluent management and reuse and 39 for water use efficiency
- development of a performance-based incentive (PBI) grant as an additional incentive associated with the FAS to encourage producers to implement a system change which results in a high level of improvement in water use efficiency and/or effluent management and reuse. Eighteen PBI grants have been approved and paid
- undertaking on-farm evaluations of 27 systems commissioned through the FAS to collect, analyse and verify accurate water use efficiency data and to ensure operational performance of systems
- in conjunction with the RWUEI 3 program, forming a working group with relevant expertise to develop a framework for a soil and nutrient management module for the Dairying Better ‘n Better for Tomorrow program that is consistent with a land water management plan. Providing one-on-one advice to a range of farmers in relation to planned on-farm projects and ways to improve water use efficiency and effluent management and reuse
- presenting DFWP information to farmers and stakeholders at many regional forums and conferences
- ongoing linkage development with centralised research and development work and projects.

Evaluating the application uniformity of a centre pivot irrigator

(Photo: C Christiansen)

Flowers

More than 90 per cent of the flower industry have received information through the quarterly SEQ-IF updates, the SEQ-IF video, fact sheets created by industry development officers (IDOs), seminars, the industry magazine, regular farm visits and the FAQI website. More farm visits are planned to provide information to more of the smaller growers.

More than 70 per cent of growers have been directly involved with SEQ-IF through attending soils, water quality and FMS workshops, attending grower seminars such as the Native Flower Seminar, participating in on-farm trials demonstrating monitoring and control equipment, working with IDOs to access Business Water Efficiency Plan (BWEP) subsidies, participating in on-farm irrigation evaluations and discussions, and receiving monthly e-bulletins and the quarterly magazine.

Over 40 per cent of producers have been involved in SEQ-IF activities through regular farm visits, attendance at native and traditional flower seminars, involvement in water meter monitoring, attendance at workshops held in a number of SEQ locations, and on-farm measurement of plant growth and crop water usage.

In SEQ, six of the larger growers and the industry's biggest water users have reduced their reliance on the municipal supply by more than 40 per cent through recycling, catching rainwater and monitoring leachate from their growing systems. Other growers are continuing to improve their scheduling through on-farm monitoring. It is estimated that more than a 10 per cent improvement in water use efficiency has been achieved by the hydroponic growers. With the native and other in-ground growers, there has been an improvement in water use efficiency by improving scheduling and better understanding of crop water use throughout the soil profile. With improved rainfall, irrigation on native farms has been reduced to fertigation only in many cases, reducing total irritation water applied by more than 10 per cent.

Work is nearing completion on the development of an FMS program. A checklist has been created and growers have attended three workshops specifically on FMS to fine-tune the program. Growers have been open to the idea of FMS and see it as a positive step towards sustainability. The three FMS

workshops were held in Nambour (21 FAQI growers attended), Toowoomba (16 FAQI growers attended) and Cleveland (10 FAQI growers attended). This represents more than 15 per cent of enterprises in SEQ that have participated in the FMS. Further development is being undertaken by the Property Management Systems Initiative (PMSI) officer. She has met with growers on some of the farm visits and will be attending future water workshops, seminars and meetings to assist growers in implementing the FMS program.

Testing of on-farm irrigation water storage as well as drainage (waste water) monitoring for electrical conductivity (EC), pH, nitrates, phosphates and alkalinity are being carried out on farm visits. Fact sheets have been created on water recycling and disinfestation, scheduling with tensiometers, interpreting water analysis, the effect of water quality on plants, sampling water for quality testing, and water testing services for Queensland growers. A trial is being drafted in which we will work with 15 hydroponic growers in SEQ to test their irrigation feed water, drain water and water after disinfestation to give growers and industry a better understanding of nutrient trends within closed systems. This will lead to reduced loss of nutrients into the surrounding environments.

Table 12 Flowers targets and achievements

Measure	Target %	Achievement %
Producer awareness of program	90	>90
Producer involvement in water use efficiency	70	>70
Producer involvement in SEQ-IF activities	40	>40
Improvement in water use efficiency	10	>40
Producer participation in FMS	20	49
Producers involved in addressing NRM priority issues	30	ND

ND Not determined

Key achievements and highlights

The project has been highly successful, with many achievements in grower education, improved water management practices and examples of increased water use efficiency. Some of these successes are summarised as follows.

Multiple trials were instigated to evaluate irrigation equipment of potential benefit to the flower industry. These technologies should reduce the chance of crops being inappropriately watered, avoiding inferior plant growth and water wastage.

Numerous field days and grower discussions have taken place, to open communications related to irrigation management and develop strong networks to support on-going system improvements. Overall, 70 per cent of producers and relevant commercial operators have been directly involved in water use efficiency training, demonstrations, incentives and farm activities.

Fact sheets, e-bulletins, brochures, magazine articles, quarterly updates and website information have all been well received by the growers and have maintained their knowledge of project progress and outcomes. As a result, 90 per cent of industry enterprises in the region have received information about improving water use efficiency.

Significant water use efficiency improvements have been reported by select growers, and improvements have been made regarding their general knowledge regarding the water use requirements of their crops. For example, two growers reported a reduction in their water use by as much as 50 per cent through the installation of new irrigation equipment and monitoring tools, setting a benchmark for other growers.

Growcom

To raise the level of best practice within the horticulture industry, Water for Profit (WfP) have provided various workshops on topics such as soil, soil moisture monitoring and fertigation. These workshops are designed to provide growers with a basic level of understanding prior to undertaking workshops such as irrigation scheduling and pump efficiency. As the project has progressed we are seeing a change in grower interest and as such we have developed new workshops such as dam seepage/evaporation in conjunction with National Centre for Engineering in Agriculture (NCEA). Growcom Land and Water is also delivering Centre Pivot–Lateral Move training courses to all commodities with funding from FarmReady and Growcom have commenced developing a drip irrigation training package in a similar format. This training package will better suit horticulture growers and will be available to all commodities.

With the completion of several Growcom FMS modules—water use, soil nutrient and water quality—FMS has commenced to provide the program with improved structure and direction which will be carried through the continuation of SEQ-IF.

Growcom recognises that within SEQ there is little incentive for growers to complete FMS hence the need to drive the delivery of irrigation system assessments, dam seepage monitoring and the use of soil moisture monitoring equipment.

Table 13 Growcom targets and achievements

Measure	Target %	Achievement %
Producer awareness of program	90	100
Producer involvement in program	50	51
Producers implementing change in management practices	30	28
Improvement in water use efficiency activities	8	3
Producer participation in FMS	20	35
Producers involved in addressing NRM priority issues	20	ND
Irrigation system assessments conducted	40	46

ND Not determined

Key achievements and highlights

Access to new equipment has provided IDOs with the ability to fine tune their delivery and support to growers wanting to make necessary changes to improve management practices. Utilisation of pressurised irrigation monitoring systems (PIMs) has provided greater opportunity to analyse irrigation systems hydraulically thus enabling IDOs to better direct the grower in making changes.

Measuring small to medium farm dams using the seepage equipment has provided interesting results with one grower losing 150 mm/day. In conjunction with CRCIF we are developing a case study to highlight the issues we have identified and also to provide growers with a better action plan for when they build and or conduct maintenance on a farm dam.

Involvement in developing Knowledge Management System for Irrigation (KMSI) has been interesting. Growcom WfP has provided a large amount of background information and support for the development of tools such as irrigation performance audit reporting tool/irrigation pump evaluation and reporting tool/water balance tool. It is hoped that through our experience within RWUEI over the last 10 years that we can provide a sound structure to SEQ-IF and KMSI which will assist to establish the project into the future and provide essential data.

On-farm trials have yielded few rewards in the past three years given the effort put into this IDO/grower activity. We have had a number of growers take up soil moisture monitoring and one grower is implementing a complete new irrigation system based on the work conducted by Growcom WfP IDOs. Future aspects of this work conducted on-farm is currently under review and we are looking to change the soil moisture monitoring trial work conducted to ensure that growers and the project get full advantage when using the equipment.

Nursery

The nursery water efficiency program was built on established industry initiatives and incorporated milestones and targets that were complementary to them. These initiatives, milestones and targets are based on the continuous improvement management cycle with businesses applying risk-based assessment against each of the program elements.

Table 14 Nursery targets and achievements

Measure	Target	Achievement
Producer awareness of program	90%	100%
Producer involvement in program	40%	62%
Producers involvement in water use efficiency training	70%	>70%
Improvement in water use efficiency activities	10%	>12%
Enterprises that have adopted FMS	8%	28%
Producers involved in addressing NRM priority issues	10%	41%*

* This figure represents the proportion of growers who undertook measures to minimise the risk of their business on the environment.

Key achievements and highlights

The SEQ-IF Nursery Production Project has achieved and exceeded the initial expectations of NGIQ and has delivered a platform from which industry can continue to address water use efficiency change at a grower level. The project has allowed the engagement of industry on-farm and has resulted in systematic change through grower education and in the adoption of water use efficiency at farm level.

NGIQ has been delivering irrigation efficiency training to the industry since 1995 through the Waterwork training course and has been involved in the national investment in irrigation R&D delivered through the national Nursery Products Levy and Horticulture Australia Limited. The results of this investment and training have, historically, seen a limited uptake by industry on-farm.

The SEQ-IF Nursery Production Project has, over the past three years, seen a greater change at farm level than the previous ten years of industry workshops. The most significant achievement the SEQ-IF Nursery Production Project has delivered is the capacity to support growers, on-farm, in adopting and implementing water use efficiency. The ability to guide growers, on-farm, in addressing the specific issues they confront cannot be overstated along with the trust established between growers and the Farm Management Systems Officer..

Furthermore the SEQ-IF Nursery Production Project has identified gaps in current knowledge and tools that can assist both industry and the project further the adoption of water use efficiency. The SEQ-IF program provided funding to address R&D opportunities as identified and developed solutions that are directly applicable to the aims of the SEQ-IF Nursery Production Project.

The SEQ-IF Nursery Production Project has resulted in a number of key measurable achievements including:

- engaging with 100 per cent of industry regarding water use efficiency information

- the attendance of 625 people at project directed events (workshops, field days, etc)
- more than 600 on-farm visits and high level of industry participation
- alignment with industry partners and DERM in addressing water use efficiency
- establishing data that indicates average water use on-farm is 22.5ML/ha
- average gross value of production per hectare of $391 000
- average gross production value per megalitre of $17 400
- weighted average on-farm water savings of 2.77 ML per hectare due to water use efficiency change
- applied water use efficiency increases average value of production to $566 000 per hectare
- total gains (water use and productivity) based on growers involved exceeds $30 million
- return on investment through SEQ-IF equates to $49 per $1 invested.

Turf

The turf association commenced the program with little or no experience or programs in place in providing the services required to deliver water use efficiencies and contemporary best practices to their industry. It is commendable to see the in-roads they have made and the level of engagement they have been able to achieve.

Table 15 Turf targets and achievements

Measure	Target	Achievement
Producer awareness of program	90%	100%
Producer involvement in water use efficiency activities	70%	79%
Producer involvement in SEQ-IF activities	40%	42%
Improvement in water use efficiency	6%	8%
Producer participation in FMS	30%	26%
Producers involved in addressing NRM priority issues	30%	42%*

* This figure represents the proportion of growers who undertook measures to minimise the risk of their business on the environment.

Key achievements and highlights

The turf industry report two major highlights as key achievements that typify the success of their SEQ-IF program. With the support of the industry there have been a wide variety of tools, technologies and services available to producers to achieve better on-farm water management.

First citation

> ‘This example highlights the use of tools and equipment provided through SEQ-IF to provide the industry development officer (IDO) and producers with detailed information and knowledge to enable more informed decisions to be made to achieve efficient water use.
>
> This particular producer has made good use of the services of the IDO equipment and tools availability. The property uses a centre pivot irrigator and this example illustrates a number of procedures that lead to water efficiency gains and the adoption of better on-farm water management practices.

The IDO conducted a catch can test to evaluate the distribution uniformity and to assess the efficiency and operation of the device. Results showed the device operating at approx 92 per cent coefficient of uniformity (CU) which is above the industry benchmark of 90 per cent CU.

Secondly to understand how much water the crop used and how much is being lost to evaporation the producer was included in the evapotranspiration (ETo) Short Message Service (SMS) trial. SMS messages giving daily ETo readings were relayed to the producer each day. This gave him a better indication of how much water they needed to replace for crop water use and losses from evaporation.

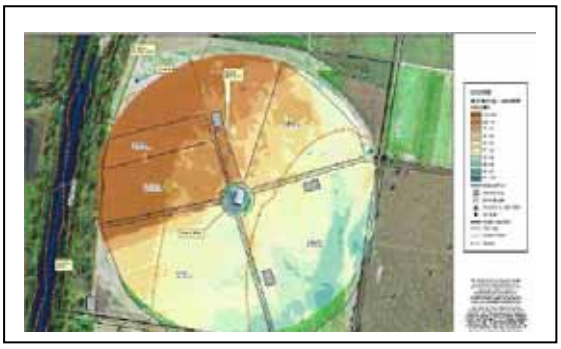
A soil-moisture probe was placed under the path of the centre pivot to get a better understanding of the impact irrigation events would have on the soil profile. In summary, this producer has a good cycle of different tools and technologies in use to help with the Farm Management System.'

Second citation

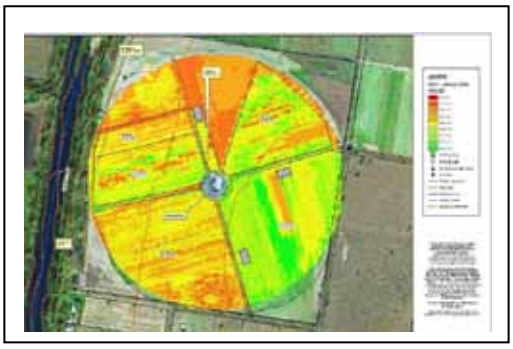
'The second example highlights the use of IDO services, tools and technologies to enable the producer to reduce their impact of irrigation practices on the environment. A ground-based optical scanning device was used to calculate the normalised difference vegetative index (NDVI) of the crop or crop vigour or crop yield. This was represented spatially on a colour map.

Electromagnetic induction technology (EM38) was then used to map soil properties in order to help interpret the NDVI maps and crop production in a spatial context.

These assisted the producer to understand how nutrient movement and water run-off for areas both on and off his farm. This also helps the producer to monitor pH and electrical conductivity (EC)and soil salinity levels and thereby make changes to better manage these inputs.'



Variability of soil salinity on a turf farm generated by EM38 technology



Variability of crop vigour on a turf farm generated from NDVI scanning

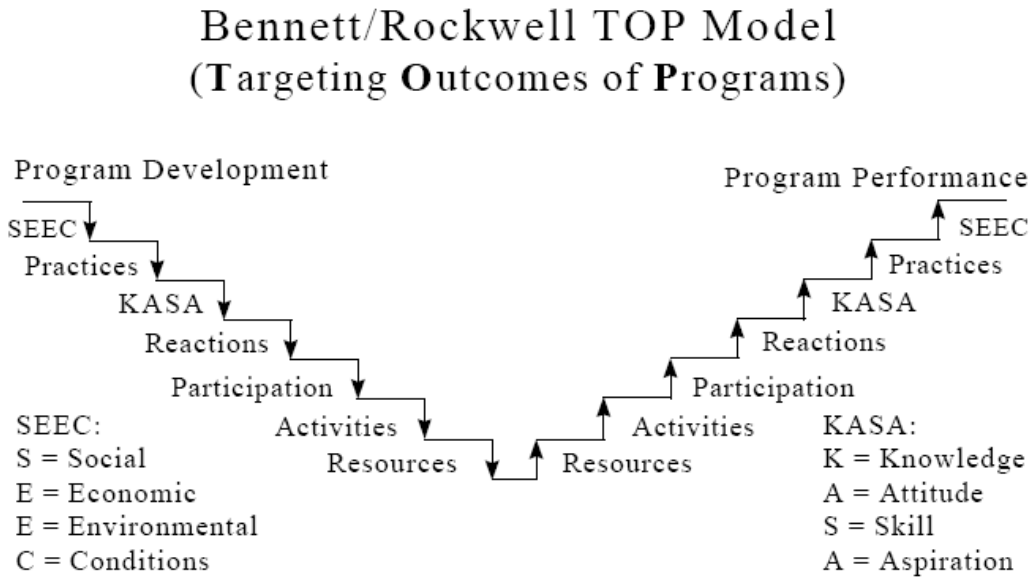
Program evaluation

Evaluation of the program is made at two levels: Improvements in the efficiency of rural water use, particularly irrigation as outlined in the SEQ Regional Plan and the regional objectives detailed in the funding and delivery framework document. These objectives identify specific targets for the region in terms of water use efficiency, on-farm water management practices, the involvement of irrigators in addressing natural resource management issues and level of engagement with irrigators.

Measuring the impact SEQ-IF has had on practice change can be assessed in a number of ways. Surveys of a significant number of irrigators would give the most accurate results if a comprehensive questionnaire was developed and the response was high. This method has some shortcomings—it is expensive and privacy issues have been found to greatly reduce the response rate.

The literature on the evaluation of extension programs points to other methodologies to evaluate the impact and achievement of outcomes. The philosophy of the Bennett/Rockwell TOP Model which is described below has been adopted to a large degree.

Bennett/Rockwell TOP Model



To determine the degree of attainment of program objectives, specific criteria are needed. These criteria identify what measures or data will be collected to demonstrate that the objective has been reached. These measures may vary in quality. This variation in data quality is often referred to as ‘hard’ versus ‘soft’ data. ‘Hard’ and ‘soft’ data represent opposite ends of a continuum, not a dichotomy.

The ‘hardness’ of data is based upon the three qualities of validity, quantification, and representativeness. Validity of data is the extent that they truly reflect the characteristics of subjects or situations being studied. The dimension of quantification relates to the amount or degree of differences that exist between data. Differences are usually represented through the assignment of numerical values to the observations that can then be used to show how much the differences are among subjects on the measures used in the evaluation. Representativeness is the extent to which observations of subjects or situations being evaluated are applicable to a larger population or situation. Representativeness can be enhanced by studying the entire populations or a representative sample of the population.

The degree of ‘hardness’ of data depends upon trade-offs between ideal data and the data needed and resources available to collect data. ‘Hard’ data are more expensive and difficult to obtain and should only be collected when the benefits to decision-making from superior evidence clearly outweigh the costs of obtaining such evidence. Stakeholders in the extension program should be involved in the determination of the ‘hardness’ of data needed and what trade-offs will be made to collect the type of data needed. Stakeholders include program planners, supervisors, and program funders.

There are many situations where 'soft' data on accomplishment of objectives are all that can be obtained. Program participants are often unwilling or unable to be observed or to respond to instruments which require detailed answers and/or extensive time to complete. A guide for determining the 'hardness' of measures used as evidence of achievement of objectives is to collect evidence of a 'hardness' that will meet the needs of stakeholders and the resources available to collect the evidence. (Poling RL (1999) Evaluating extension program outcomes).

'Hard' data in the context of this evaluation is that measured and reported by participating industries throughout the program. The 'softness of other data is accounted for in the 'gains table' analysis of activities and participation rates described in section

Evaluation methodology

This evaluation has been undertaken as a desktop analysis of relevant reports including those submitted as a result of projects funded through the SEQ-IF program. Various other reports concerning water supply and use in the region were used along with the final report by Coutts on the evaluation of the initial rural water use efficiency initiative adoption program.

The evaluation has been heavily informed by industry milestone reports and the final reports on their participation in SEQ-IF. To ensure that sufficient data would be available, those industries and the research and development project participating in service delivery were given formats for both milestone and final reports to follow. Inter alia they were to report on key achievements, achievements against milestones and targets, assessment of effectiveness e.g. changes to water use efficiency, attitudes/behaviours/skills and issues, constraints and learnings.

Data provided by industries give examples of measured savings as a result of certain services provided. These have been used to extrapolate the likely gains made as a result of similar services provided where there was no follow up on likely changes made. Using the high/medium/low engagement levels has provided another gauge to interrogate an industry's water efficiency efforts. In addition three industries have recorded a level of contact with their growers and assign a confidence level in the result depending on the level of contact. Where direct contact has been made and a change put in place a confidence level of 98 per cent is assigned to the water savings. Lower confidence levels apply to other forms of engagement. These data allow a range of likely water savings or other achievements to be generated where there is some confidence in the end result.

The recording of data across industries was not consistent nor was the level of detail therefore the confidence level in some results would be less than desirable. Dairy and fodder for example have used data from their performance based incentive scheme to a large degree to measure change and resultant achievements. These data are actual measured improvements. Industry surveys were also used as was a more crude assessment method of assigning a particular value of impact or change to the level of engagement with irrigators throughout the program.

Results

The results are discussed in five reported outcomes:

- participation rates in the program
- participation rates in farm management systems activities
- participation rates in addressing priority natural resource management issues
- numbers making changes to management practices
- water use efficiency gains.

The program can report against these outcomes in terms of achievement against targets and derive qualitative results of the success or otherwise of the program to date and infer their impact on productivity gains and impacts on sustainability for the sector.

The sustainability of irrigation is a difficult outcome to qualify let alone quantify. It may relate to economic, social or environmental indices. In the context of the SEQ Regional Plan, SEQ-IF's contribution to sustainability of the irrigation sector could be measured against one of the following sustainability characteristics of low levels of water, energy and material consumption, and high levels of re-use of natural resources, materials and waste products and total water cycle management to minimise impacts on the natural water cycle including aquatic ecosystems.

The sustainability of irrigation in the region cannot be measured by the outputs of SEQ-IF alone as other programs operating in this area, climate, commodity prices and a myriad of land use practices amongst others have an impact on sustainability. Nevertheless productivity gains and the effort devoted to natural resource management outcomes have been evaluated albeit with a large measure of objectivity.

Economic sustainability is often argued to be a prerequisite for social and environmental sustainability, for without economic resources there is no real driver for either of the other two indices. This philosophy is one of the underpinning tenets of the SEQ-IF program.

An efficient and productive irrigation sector is important for rural communities in terms of jobs, the environment and the economy. Water efficiency can reduce impacts on the environment including accessions to groundwater, fewer nutrient inputs and reduced energy consumption. The protection of good quality agricultural land should be a consequence of a strong irrigation sector. These are not included in the evaluation of the program but that does not signal that they are not important outcomes for SEQ-IF.

1. Participation in the program

This measure gives a sense of the penetration of industry programs, the level of acceptance of their services and service delivery. Participation in this context means a grower has had an active involvement in a service provided by their industry, for example attended a field day. The level of engagement has then been subdivided into high, medium or low depending on the type of service and the likelihood of a participant making a change as a result of that service. For example, there is a high probability that an irrigator would make a change as a result of being given on-site advice and a low probability of such an outcome from attending a workshop that was promoting awareness of certain management practices.

Of equal importance is an awareness of the need by irrigators for these services. It would be expected that participation rates in the smaller industries would be higher in percentage terms than those in the larger industries. This does not necessarily translate to higher program outcomes.

Table 16 Participation in SEQ-IF

Industry	**No. of irrigators**	**Level of engagement**					
		High		Medium		Low	
		No.	%	No.	%	No.	%
Dairy/fodder	648	175	27	97	15	376	58
Flowers	100	30	30	36	36	34	34
Growcom	1000	200	20	220	22	580	58
Nursery	550	121	22	187	34	242	44
Turf	76	39	51	24	31	13	18
Total	2374	565	24	564	24	1245	52

High

Represents a level of engagement where it is highly likely that a change in management practices or equipment change/modification would result. For example an irrigation system assessment or one on one advice on farm, involvement in financial incentive scheme.

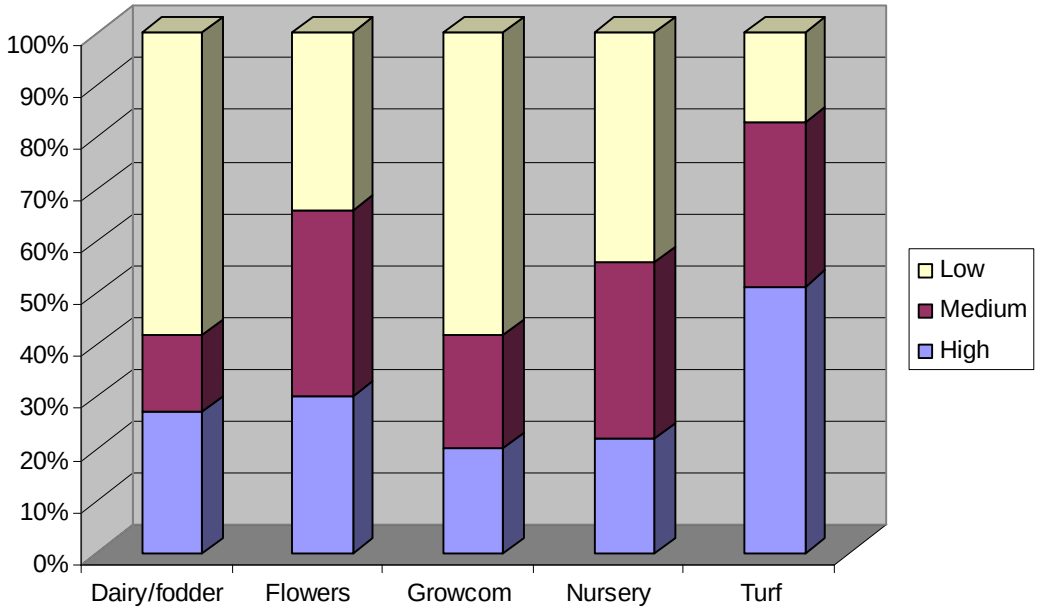
Medium

Involvement in the program such as a workshop with hands on activity, field day or on-farm trial where the likelihood of a change being made is a 50/50 proposition.

Low

Engagement in the program may be a workshop, seminar or the dissemination of information. These examples have a low prospect of generating a change nevertheless some changes are likely for a low percentage of participants.

Chart 6 Participation levels by industry



The first conclusion to be drawn from these statistics is that all of the industries have met and exceeded their targets for irrigator engagement in the program. Engagement is defined as a grower having some contact with the program from a knowledge of the aims of SEQ-IF through industry publicity to a high level one-on-one contact.

These statistics would indicate that some 20 per cent of irrigators in SEQ have made a change that either improved productivity, or delivered water use efficiency or natural resource management outcomes.

2. Participation in farm management systems

FMS is a framework for a methodical approach to managing an agricultural business. A FMS can be used by irrigators to plan their business, document farm management practices and identify and manage risks that may result from operating that business. It can also be used to implement change to water management practices. Consequently irrigators across the region may use or implement FMS to address a range of issues from environmental to productivity matters.

The Queensland Government has signed a memorandum of understanding with the Queensland Farmers' Federation underscoring its support for the development and implementation of FMS and SEQ-IF industry programs each incorporated FMS in their milestones and targets. All industry FMS have natural resource management issues as a key focal area.

Table 17 Participation in FMS

Industry	Number participating	%	Number implementing FMS	Focus area
Dairy	113	46	92	Soil fertility and management natural resource management farming systems Effluent/nutrient management and reuse
Flowers	47	49	-	Awareness
Growcom	177	18	N/A	Water use efficiency Soil/nutrient Water quality
Nursery	368	67	155	Irrigation systems and practices Drainage Water reuse/recycling Water access and monitoring Off-farm movement of waste water
Turf	20	26	-	Awareness

Not all participation or implementation can be attributed to SEQ-IF as there are other programs and drivers operating in this field. FMS was the vehicle used to engage with irrigators to address a range of issues which arguably was to advance their business. The statistics reported here relate only to the number of enterprises participating in FMS and the number actively implementing FMS.

Participation rates are very much dependent on the maturity of an industry's FMS. At the commencement of the program the turf and flower industries had no FMS in place so their participation rates are reduced in comparison to other industries. Of interest in the turf industry the terminology of FMS did not engender any enthusiasm with their growers. When marketed as the Turf Accreditation Program (TAP), interest vastly improved. This phenomenon is not unique to turf but other industries would report similar experiences.

3. Participation in natural resource management actions

Although quantifying the number of irrigators involved in addressing priority natural resource management issues as a result of their involvement in SEQ-IF is possible, quantifying their impact is not. At the commencement of the program each of the industries agreed to address industry relevant priority natural resource management issues.

Table 18 Participation in natural resource management actions

Industry	Number engaged	%	NRM issue
Dairy	92	37	Effluent management, nutrient management and riparian management
Flowers	42[1]	42	Water quality and run-off monitoring
Growcom	ND	ND	
Nursery	147	27	Recycling/reusing waste water and water quality monitoring
Turf	12	16	Water quality, erosion control

[1]Estimated

ND Not determined

This was not well coordinated in spite of SEQC having the contract to provide coordination and support to the industries. In effect it was left to each of the industries to determine their own way forward with addressing management action targets (MATs) and anecdotal evidence would suggest they addressed those issues that were relevant to individual irrigators or the industry. Whether this was relevant to MATs is a matter of conjecture as each industry had natural resource management issues of their own to deal with. They were able to address them in a number of ways and their FMS was the common vehicle which was adopted.

Regulation of the agricultural sector including the requirement for land and water management plans appear to have been the drivers for participation in natural resource management activities. The dairy and nursery industries however delivered technical and financial assistance to irrigators to address effluent management and water reuse through the SEQ-IF program and their relevant FMS initiatives.

4. Changes to management practices

This measure is intended to quantify the number of irrigators making changes to their on-farm management practices outside of the FMS and natural resource management endeavours. During any extension program such as SEQ-IF there will often be a multiplicity of reasons that will impact on outcomes. Amongst them is the driver to avoid regulatory impact on farm businesses.

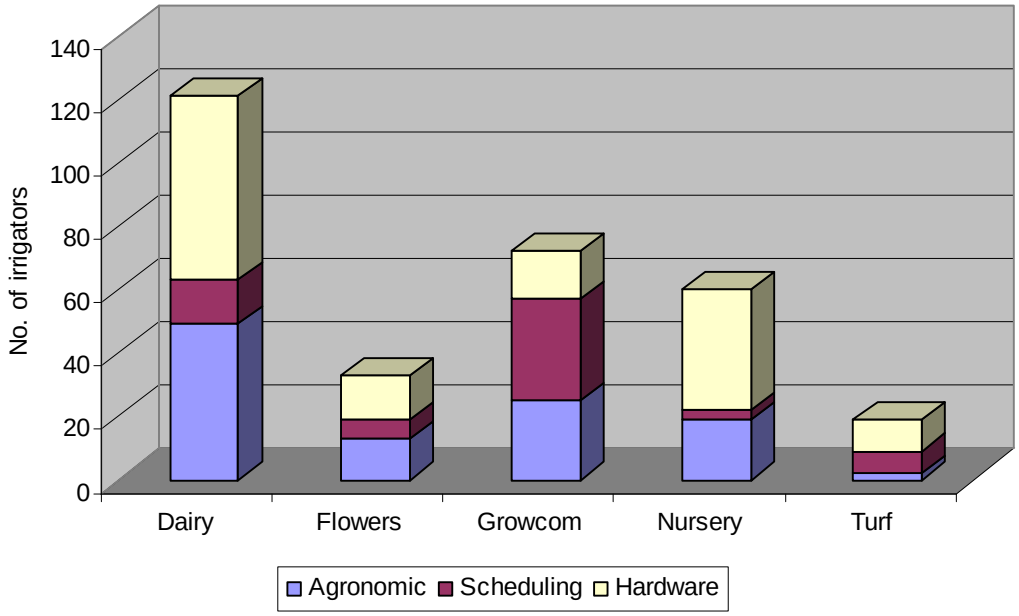
Changes to management practices also have other drivers important of which is the role of industry driven programs such as FMS supported through SEQ-IF. Productivity and profitability generally underpin all of these. For those who had some reliance on urban water supplies restrictions on the use of this water would also have been another driver for change.

The figures in the table below have been derived on the basis of the ‘rule of thumb’ that of the participants in an extension program 40 per cent are likely to make a change to their management practices or equipment. These figures would indicate that changes to irrigation equipment and agronomic measures are considered more important than adopting technologies relating to deciding when and how much water to apply. This could also be a reflection of the particular industry program’s focus but more likely an acceptance by irrigators that their decisions on irrigation timing and application are not in need of change.

Table 19 Changes to management practices

Industry	Measures adopted and grower numbers			
	Agronomic	Scheduling	Hardware	Total % of irrigators
Dairy	49	14	58	49
Flowers	13	6	14	33
Growcom	25	32	15	7
Nursery	19	3	38	11
Turf	2	7	10	25

Chart 7 Changes to management practices



Measures: Agronomic: This strategy includes adopting better soil management practices, crop rotation, fertiliser application and rates etc.

Scheduling: Adopting scheduling information and using scheduling equipment to apply the right amount of water at the right time.

Hardware: Change to more efficient irrigation systems, pumping equipment and irrigation system maintenance.

5. Water use efficiency gains

Water efficiency gains generated through the program are best presented as a range as the 'true value' is by no means definitive. Improvements that yielded gains have been measured in some instance but they account for a small percentage of the likely over all gains achieved.

In the dairy industry where comparison between past irrigation system efficiencies and current systems, there has actually been a turnaround in performance to less efficient operations. This has been attributed to little attention being paid to irrigation system maintenance—an observation that should be taken into consideration for future water efficiency efforts by government or industry.

Information from milestone reports and final reports was used in the 'gains table' to evaluate the savings likely to have been made.

Using information provided in milestone reports which for a number of the industries gave data on actual measured water savings and this was transposed with data on the number of irrigators engaged and the level of engagement. These measured or direct data give an average saving per grower which is then applied to other growers engaged in the program on the following basis:

High level of engagement: 75 per cent to 90 per cent of these irrigators would make changes that that resulted in water savings of 50 per cent to 90 per cent of that achieved by those measured savings.

Medium level of engagement: 30 per cent to 50 per cent would make changes that result in water savings of 50 per cent to 90 per cent of that achieved by measured savings.

Low level of engagement: 10 per cent to 20 per cent of those engaged in the program made changes that resulted in 50 per cent to 90 per cent of that achieved by measured savings.

The following extract from the nursery industry final report gives some credence to using data where a low level of engagement applied.

'To further support the measurement of water use efficiency gains across the region, in August 2008, the project undertook to survey, by telephone, 50 growers considered to have had a no engagement with the project. These growers had been mailed SEQ-IF Nursery Production Project information and had had one on-farm visit by the FMSO. The results from this survey indicated that growers had applied various water use efficiency initiatives including; irrigation scheduling, upgrading pumps, improved sprinkler selection, changing to pressure compensating non-leakage drippers and water recycling.

The degree of change applied by this level of project engagement amounted to 74 per cent of growers improving water use efficiency and a total of 43 per cent indicated implementing change over the next 12 months.' (Nursery and Garden Industry Queensland 2009 Final Report SEQ-IF).

Measured or direct savings in the dairy and turf industries have been derived from irrigation system evaluations. These evaluations allow a scheduling coefficient to be calculated which is a measure of the additional irrigation time required to apply the desired depth of water in the area being under watered. Those system evaluations that had a follow up where the scheduling coefficient had improved have been counted as the measured savings. Certain assumptions concerning flow rate and irrigation times have been made to generate these figures.

The authors believe this methodology errs on the conservative side as there are other influences that motivate an irrigator to make changes. The engagement in the SEQ-IF program may well be a one of a number, e.g. energy costs, reduced water allocations or productivity issues are other imperatives that could precipitate a change that results in reduced water use.

Table 20 Water use efficiency gains

Industry	Direct measure		High engagement		Medium engagement		Low* engagement		Total	
	ML	%	ML	%	ML	%	ML	%	ML	%
Dairy/Fodder	2140	10	5258	24.7	1832	8.6	1448	6.8	10678	50
Flowers	54	0.25	128	0.6	97	0.4	35	0.46	314	1.5
Growcom	470	2.2	3701	17.4	2216	10.4	2240	10.5	8627	40.5
Nursery	208	1.0	446	2.1	333	1.6	187	0.9	1174	5.5
Turf	90	0.4	293	1.375	108	0.5	22	0.1	514	2.4
Totals	2962	13.85	9826	46	4586	21.5	3932	18.75	21307	100

* Achievements could be higher based on nursery industry data.

Chart 8 Water savings by industry

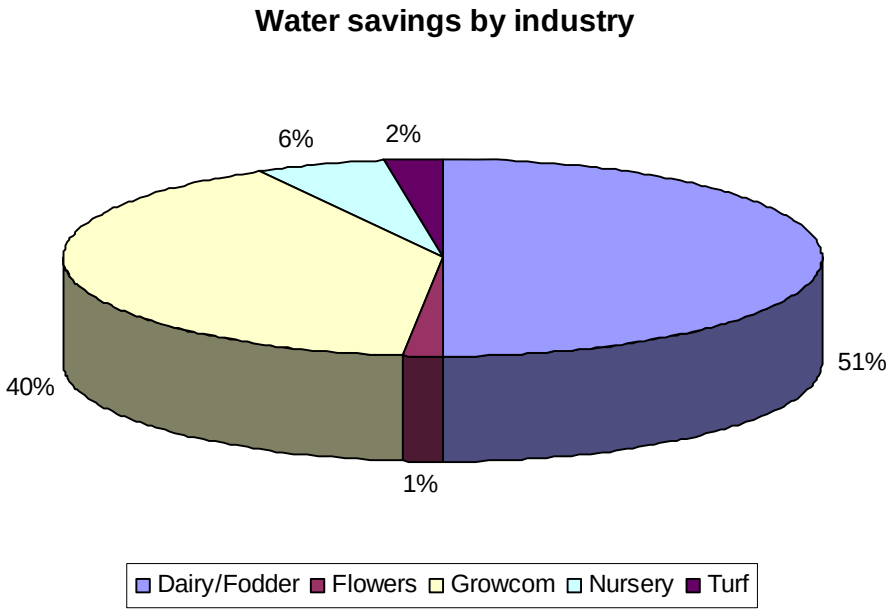


Table 21 gives the range of estimated water use efficiency gains from low to high. The derivation of these values result from a low level of engagement to a high level of engagement in the program but represent the low to high proportion of irrigators who are likely to have made some gains. The values are manipulated further by quantifying the likely savings to be in a range of 50 per cent to 90 per cent of the savings actually measured. This gives a range for water savings of between 14 000 ML and 30 000 ML for the region.

Table 21 Estimated water savings—low to high

Industry	**Low** ML	**High** ML
Dairy/Fodder	6970	14385
Flowers	198	431
Growcom	4885	12368
Nursery	734	1614
Turf	338	690
Totals	**13125**	**29488**

Industry reported water efficiency gains

The following data has been taken from industry final reports on their program. The estimated savings reported by Growcom are significantly lower than determined through this evaluation. The same methodology has been applied to their reported data as with the other industries and the reason is not readily apparent.

Table 22 Industry reported water savings

Industry	Gains ML	Gains (%)
Dairy/fodder	10018	15
Flowers	Not quantified	>10
Growcom	1688–3035	3
Nursery	2.77 ML/ha	>12
Turf	Not quantified	

Dairy: 'The program has achieved water efficiency improvements totalling some 10 018 ML of water (8781 ML for the dairy industry and 1237 ML for fodder), being worth around $49.09 million since its inception. The additional water use efficiency improvements equated to approximately 15 per cent of the dairy industry's current water use under the program.'

Flowers: 'It is estimated that more than a 10 per cent improvement in water use efficiency has been achieved by the hydroponic growers. With the native and other in-ground growers, there has been an improvement in water use efficiency by improving scheduling and better understanding of crop water use throughout the soil profile. With improved rainfall, irrigation on native farms has been reduced to fertigation only in many cases, reducing total irrigation water applied by more than 10 per cent.'

Growcom: 'The water savings made during the project period are smaller than anticipated. This reflects the fact that growers did not have for the best part of the project period sufficient water supplies to maintain 100 per cent of their cropping area. Growcom IDOs have clearly demonstrated to growers involved that by adopting practice changes they will have more water that could be used to improve production. Several of these growers have implemented these changes but we have not been able to document and record the savings within the project timeframe. Other growers, due to price of change, weather conditions and market prices, have not been able to implement practice changes and it may take an incentive program to assist these growers within a certain timeframe.'

Nursery: 'Based on weighted averages, calculated in the Nursery Production Gains Table, the project has achieved water use savings of 2.77 ML/ha. With average water use per hectare at 22.5 ML the water use efficiency across the project is more than 12 per cent:

- Direct measured water use efficiency gains:
    - 36 per cent of growers in the SEQ-IF project area directly measured 6.5 per cent calculated water savings.
- Direct measured productivity gain:
    - 36 per cent of growers in the SEQ-IF project area directly measured 10 per cent improvement in overall nursery production value.'

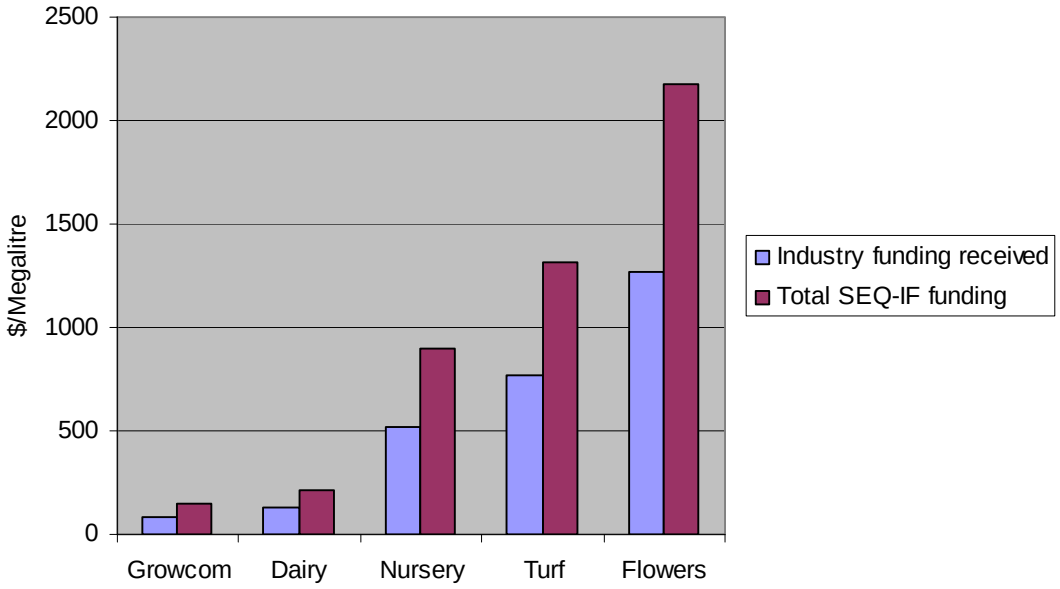
Turf (in response to an industry survey): 'It was revealed that there was a change to approximately 22 per cent of K-lines, travellers and booms, 39 per cent of fixed gun and, 11 per cent pop-up type devices, six per cent being lateral move devices, leaving approximately 20 per cent of the SEQ turf irrigators using centre pivot devices (taking into account the 20 per cent response rate for this questionnaire). This shows the gap between less efficiency irrigation devices (K-Lines/travellers/fixed guns) and more efficient devices (centre pivots and lateral move devices) is closing, even though there are more fixed gun type devices still in use throughout the SEQ turf production market.'

Investments in water savings

The government investment in SEQ-IF was $6 million of which $3.5 million went directly to industry programs. The remaining $2.5 million was spent in supporting those programs with equipment purchases and research and development projects. The cost to government to achieve savings of 21 300ML is then $282/ML. Chart 9 shows the relative cost per megalitre saved by each industry based on the funding they received directly and secondly by proportioning the $2.5 million based on that funding.

By way of comparison the cost per megalitre for water from Paradise Dam (the most recently constructed storage in the state) is some $1600. This is based on construction costs of $200 million and an annual yield of 124 000 ML.

Chart 9 Cost per megalitre of water saved



Further analysis of productivity gains, grower investments and impact on the regional economy, etc has not been attempted because of the lack of data and the indeterminate impact SEQ-IF may have had on these attributes. Industry reports however do outline some of the outcomes each has attributed to their program delivery.

Dairy: The program has achieved water efficiency improvements totalling some 10 018 ML of water (8781 ML for the dairy industry and 1237 ML for fodder), being worth around $49.09 million since its inception.

Personal investment from the farming sector has been three to one for every dollar received through the financial assistance scheme.

Growcom; $12 143 719 in water savings/production increases.

Nursery: When on-farm water use efficiencies are implemented, particularly a fully recycled system, the average water use is reduced to approximately 5 ML per hectare (new water) returning $78 000 per ML applied.

Significant improvement in water use efficiency has been achieved in the SEQ-IF project area as well as major gains in productivity. Water use efficiency gains have exceeded 50 per cent with associated productivity gains of more than 30 per cent.

Total gains (water use and productivity) based on growers involved exceeds $30 million.

Return on investment through SEQ-IF equates to $49 for every $1 invested.

Coordination and support

This function as outlined in the Coutts Funding and Delivery Framework 2005, included providing purchased new IDO input, IDO support and training, coordinating staff, sharing of knowledge and activities across industries; regional communication and public relations. The framework identified SEQC as the provider of these functions.

Subsequently a grant agreement between DERM and SEQC was struck to enable SEQC to deliver coordination and support services. The agreement was for the life of the program from May 2006 to 30 June 2009 with a value of $200 000 per annum.

The role of SEQC

'The purpose of the SEQ-IF project (coordination and support) managed by SEQC is to provide a coordinating function to foster more integrated and efficient use of resources through a coordinated approach to training, sharing of knowledge and support for the endeavours of technical staff involved in the SEQ-IF project' (SEQC SEQ-IF final report).

The function also included regional communication and public relations as outlined in the funding and delivery framework.

The agreed project activities were to:

- develop a shared understanding of the SEQ-IF program and the relative contribution of each of the industry partners to the agreed outcomes.
- establish contacts with industry IDOs and arrangements for regular meetings
- develop a shared understanding of industry strategies, regional priorities and work plans
- coordinate SEQ-IF program activities including:
    (a) improving networks between program IDOs, including facilitation of regular program IDO meetings
    (b) improving communication between program IDOs, the IIPO and other similar initiatives such as FMS and LWMPs
    (c) ensuring awareness of training and field activities between IDOs and other irrigation industry activities
    (d) developing a program communication strategy to coordinate media activities between industries
    (e) undertaking program publicity and promotion
- promote the sharing and coordinated delivery of information packages and industry activities through:
    (a) supporting industry training of irrigators and consultants
    (b) developing and negotiating coordinated training approaches between industries
    (c) encouraging the sharing of information packages
    (d) establishing industry regional priorities and where applicable ensure they are aligned with natural resource management priorities
- modify relevant educational training activities for promotion of water use efficiency e.g. high school agriculture classes
- build on the information collected in the RWUEI 1 and 2 programs
- collect, collate and distribute case study information to program partners
- commence to assemble information packages for each industry sector of relevant, easily understandable information and to identify individuals and groups that will be the targets for this information and those who can assist in the dissemination of the information

- promote the use of new tools and technology to all irrigation industry sectors, especially irrigation service providers through the RIDO, in consultation with the IIPO and IDOs
- develop and promote irrigation system audits in the region in consultation with the IIPO and IDOs
- develop linkages with the private sector involved in the irrigation industry
- liaise with and foster the capacity for the private sector to provide competent extension services to the irrigation sector
- prepare and disseminate papers/newsletters/information on relevant irrigation matters.

Key achievements and highlights

SEQC reported the key achievements in four areas for which the SEQ-IF project (coordination and support) could play an enabling role (SEQC SEQ-IF final report).

Provision and coordination of general water use efficiency information and education leading to improved awareness of irrigation efficiency opportunities amongst irrigators and improved knowledge and skills of IDOs.

A number of water use efficiency information sheets were produced and provided to IDOs to improve awareness of irrigation efficiencies. The information sheets promoted the IDOs and their work with irrigators in trials and the adoption of particular farm management strategies for improving water use efficiency. The topics included:

- soil moisture monitoring
- irrigation system assessments
- irrigation system design
- irrigation scheduling
- pumping systems
- water quality.

Copies of these information sheets are available on the South East Queensland Irrigation Futures Phase 1 (2006–09)—Program Evaluation Report CD, which can be ordered from the DERM website.

Seven case studies were produced on DVD and made available to IDOs. The case studies illustrated improvements implemented by irrigators and highlighted the value of engagement in SEQ-IF.

The provision of training to improve the knowledge and skills of the IDOs has been a key achievement of coordination and support. Gaps in IDO skills and knowledge were identified and training courses designed and conducted to address these gaps. The IDOs developed sufficient skills and knowledge to be able to use the tools and technologies required to underpin irrigation system improvement recommendations in which they had confidence, and which irrigators and service providers found credible.

‘This increased credibility of IDOs was noted by several IDOs who suggest that it was critical to engaging irrigators and irrigation service providers in field activities and system assessments. The competent use of tools and the usefulness of the information generated by the tools have attracted the interest of irrigators’ (SEQC SEQ-IF final report).

Bi-monthly IDO group meetings provided a valuable forum for the exchange of information generally, the use of specialised equipment, the need for maintenance for optimum and reliable results, and the identification of training to ensure proper use of equipment.

Facilitating access to base spatial information via multi-user licence agreements.

Coordination and support provided mapping products and data licence agreements and training in computer mapping tools to IDOs to enable them to produce property plans of irrigation farms and systems for irrigators.

Coordination and support facilitated provision of:

- current base spatial information layers

- the ArcGIS software which allows irrigators to manipulate and add their own irrigation infrastructure to the base layers
- linkages between the irrigator mapping and the regional KMSI tools.

Assistance to primary producers to develop land and water management plans (LWMPs) utilising user-friendly tools, templates and pre-planning workshops.

Coordination and support provided exposure and opportunities for industries to participate in the SEQC developed PMP Water—a property management planning process that promotes practice change based on action plans.

PMP Water provides a model with multiple entry points for irrigators and a holistic approach which puts water use efficiency in the context of overall farm management by considering such issues as drainage, fertiliser use, soil management and riparian management.

Appraisal of the Coordination and Support function

The coordination and support function of SEQ-IF has demonstrated during the course of the program that it had the potential to provide for a more integrated and technically competent service delivery helper. Learnings from the experience to date suggest that the model should be adjusted to deliver expected outcomes. There is a strong case to introduce a more technical focus to this function to provide support to the industries and involve the service sector.

Background

This task proved difficult for SEQC to deliver these services to the industries as outlined in the agreement. There are a number of reasons for this, foremost among them being the expectation of SEQC that it should have oversight of and direct influence over industry delivered programs. That perception continued throughout the life of the program in spite of many attempts by DERM to have their role clarified and specific tasks identified and agreed.

Additionally the delivery by SEQC did not bring any relevant technical capacity to any facet of the program. This in itself was not a hindrance to servicing this role, nevertheless technical knowledge of some aspects of irrigation methods and/or technologies or extension methods would have enhanced this role. In addition little support or supervision was provided to the person charged with delivering coordination and support services. As a result no specific project plan to deliver these services materialised and activities tended to be delivered in an ad hoc fashion.

Strengths

Nevertheless there were a number of benefits that accrued to SEQ-IF through SEQC's association with the program. The coordination and support function forged a positive working relationship between industries through regular IDO meetings. These meetings also provided a forum to discuss cross industry projects and identified training needs for IDOs and coordination of activities where required. Improved networking is also a positive outcome of these meetings that has led to improved and more efficient service delivery.

The engagement of Daley Water Services to provide input to a number of areas of IDO activities and training is another example of a good outcome to take forward to the next phase of the program. This liaison value adds to SEQ-IF and also fostered a relationship with the irrigation service sector that should be expanded.

The DVD and fact sheet productions were a good example of how this type of promotional material can assist an industry to capitalise on its extension program and facilitate engagement with irrigators. More could have been done in this area firstly to identify other ways in which these productions could have been made more widely available to increase exposure and secondly to identify other case studies to promote.

Leveraging

Through the involvement of SEQC in the program opportunities arose where SEQ-IF benefitted from leveraging off products and services that were the domain of SEQC. Some examples of these include:

- mapping data and data licence agreements
- training in computer mapping tools
- provision of natural resource data (e.g. soils, topography, satellite imagery)
- accessibility of certain technical capacity.

Whilst it was not a SEQ-IF project the property management planning model, PMP Water, developed by SEQC enabled industry partners in SEQ-IF to deliver property planning services which incorporated their farm management systems.

Weaknesses

Whilst each of the industries participating in SEQ-IF had NRM outcomes built into their milestones and targets and in the main aligned with management action targets identified in the SEQ natural resource management plan, SEQC did not provide any coordination or support to assist them in meeting these objectives. That is not to suggest that natural resource management outcomes were ignored. To the contrary each industry continued to provide services that addressed natural resource management outcomes at the farm scale.

A failure of the coordination and support function was the apparent lack of support for industry programs in not value adding to their endeavours. Promoting field day activities with the service sector or the general involvement of this sector in the program and supporting industries in the use/maintenance of equipment are two areas that need attention in the next phase of SEQ-IF. Coordinated program promotion other than what industries did individually is another.

Whole-of-region

The purpose of the whole-of-region function was to accommodate and fund those activities and equipment that gave economies of scale where they applied to all or most of the industries. This component funded the purchase of shared equipment, targeted research and development (R&D) activities, regional statistics collation and information and toolkit development.

In accordance with the SEQ-IF funding and delivery framework the management committee reviewed project proposals and approved expenditure where it was deemed appropriate. A comprehensive list of the equipment purchases and R&D activities is given in Appendix 1 and Appendix 2.

To assist industry groups to deliver services to growers and for growers to access data and decision support tools the whole-of-region and R&D components of SEQ-IF developed a range of tools and calculators and made equipment purchases. In the main these products or equipment were put in place on an industry wide basis, ie their use applied to one industry equally as well to others.

Equipment

Industry IDOs needed various equipment to deliver services to their irrigator members. In the initial phases of the program equipment was a significant part of this funding function. It proved to be an enabling rather than sharing proposition to give them the capacity to deliver appropriate services that were underpinned by contemporary technologies.

Equipment enabled each of the industries to establish creditability with irrigators and also allowed them to gather and collate data that were useful for statistical purposes and provided proof of concept to irrigators in what could be achieved if certain changes were made, including the adoption of new technologies. The perception is though irrigators generally have a long way to go in this area.

Without the funds for the purchase of equipment the program would have been much the poorer. IDOs would have had less opportunity to engage with irrigators, their services restricted and demonstration of better practices through new technologies curtailed.

Ownership of any equipment purchased reverted to the industry putting up the proposal to buy it in the first place. Each of the industries applied to DERM to purchase equipment and the application subsequently forwarded to the management committee for decision. Approximately $420 000 in funding went towards the purchase of a range of measuring and monitoring equipment. These covered:

- significant investment into weather stations; soil moisture monitoring i.e. ‘Enviroscans’ and tensiometers; flow meters; water quality testing kits; GPS units; and equipment used to assess irrigation systems. These were used to gather and collate information on water use, climatic conditions and soil-water conditions.
- the purchase and upgrading of computer hardware and software, to the value of $25 000, to enhance GIS mapping skills and the capacity of IDOs. to deliver property management planning services and mapping products to their irrigators.

Lessons to be learnt

Apart from the initial purchases little opportunity was taken to seek savings through bulk purchases. A more coordinated approach to the purchase of equipment would allow this to occur.

Whilst the use of equipment was to be reported in milestone reports this did not happen on a regular or detailed basis. A consequence was that the appropriateness, suitability, reliability and usefulness of the equipment and subsequent use were not monitored as well as they could have been. An audit of purchased equipment was conducted to determine use, condition and suitability for the intended task.

The technical specifications of some equipment were quite complex and difficult for the management committee to gauge a full understanding of what was put to them to decide.

There was little discussion or analysis of whether or not other models available in the market place could be a better option. Again a question of the technical capacity of the management committee to be able to deal with this issue.

The last two points have largely been addressed through the formation of a technical working group to review equipment purchases and to provide advice on research type projects and development of tools/calculators.

Whole-of-region projects

Knowledge management system for irrigation

The funding and delivery framework for SEQ-IF identified a number of region wide issues which, of particular importance, was the recognition of the need for better sharing of information across industries/regions. This would be achieved through the development of an integrated information system for irrigation water management in SEQ and should be identified for funding early in the program.

A scoping document was prepared by the National Centre for Engineering in Agriculture through the CRC Irrigation Futures that fleshed out the issues related to information needs and proposed a framework through which they could be addressed. This would facilitate, among other things:

- a shared FMS program design and development across industries
- integration and rationalisation of monitoring to allow regional water use efficiency benchmarking and auditing
- efficient use of available information and data (including spatial data and point measurements) for water use efficiency and management
- assistance in development of LAMPs utilising user friendly tools and templates
- promotion and communication of water use efficiency information
- support for preparation of water management assessments at a range of scales (field to farm to catchment and sub-catchment)
- a platform for information capture, storage and reporting to facilitate improved irrigation management performance.

The SEQ-IF management committee agreed to fund a project that would provide a detailed project plan for an integrated information system for irrigation in SEQ to be known as the KMSI. The subsequent report (Knowledge Management System for Irrigation in South East Queensland, Implementation Plan and Strategies) was prepared by the NCEA, Feedlot Services Australia and Agtrix Pty Ltd. This report set out priorities, investments and actions to implement KMSI. Broadly it identified four areas that could satisfy end user requirements and fill data gaps:

- electronic library and web tools
- base property and LWMP map generation
- IDO tools
- grower tools.

The report also proposed seven projects that would lead to a progressive implementation of KMSI which included providing access to rural water information and the development of a range of decision support tools:

- development of an electronic library and web tools
- establishment of an irrigation audit database
- collation of base data
- provision of property and LWMP base maps at the property scale
- development of IDO tools
- development of grower tools
- collation of regional statistics and benchmarking data.

The projects that were identified to deliver these outcomes under these focus areas are shown in Table 23. Also shown in the table are the tools and their function identified against the particular project. The identification of these projects allowed their development and implementation to be staged and the linkages between each of them to be better managed.

KMSI implementation and management

A contract was let to the National Centre for Engineering in Agriculture to progressively implement and manage the development of KMSI. The NCEA had been instrumental in developing tools for use by Industry Development Officers that form elements of KMSI and was best placed to manage this complex project within the context of the 7 projects identified above. An account of the development and implementation of these projects is given below and in Appendix 6.

KMSI communication

Given the potentially complex nature of KMSI and the decision to have much of it web-based, the SEQ-IF management committee agreed that it required targeted and carefully considered communication to likely users. One other element of the communication strategy was to solicit input from irrigators and to also demonstrate the use of the various tools. The Queensland Farmers' Federation undertook to do this work through a grant agreement.

Electronic Library and Web Tool

The South East Queensland Irrigation Futures website <www.seq.irrigationfutures.org.au> has been set up with relevant data with links to various websites containing irrigation information. The website is hosted by Stralia Web using the platform developed through the CRC Irrigation Futures. Each of the industry groups, through their IDOs, has the capacity to upload information, e.g. advice on upcoming events such as field days, results of trials etc. The site is moderated by DERM.

Maintaining the currency of some of the web pages has proven to be a challenge. Opportunities to post events were lost in many instances through a lack of appreciation of the potential of the site to advertise or highlight these events. There was also some apathy to making use of the site which may be related to each participant in SEQ-IF having their own web sites. This applied equally to DERM and rural industry groups.

Usage of the SEQ-IF web site has been moderate with an average page use of 114 per day or more than 3400 per month. The average number of visitors per day has been 63. Little promotion of the site was carried out as it was an evolving and continuing exercise with tools and calculators being added as they were developed. It is intended to continue to develop the site and make use of short video clips showing contemporary best practice methods for a range of practices relevant to the irrigation sector.

This also includes the water resource information tool designed to enable irrigators to obtain information from existing web sites on both surface water and groundwater.

Irrigation audit database

This database has been developed as a web-based application to assist the irrigation industry undertake and report irrigation system evaluations. The software, known as IPART (irrigation performance audit reporting tool) stores data on individual pressurised irrigation system evaluations.

It provides functions to assess the efficiency of an irrigation system and make recommendations on irrigation system practice changes. Functions allow benchmarking from collected data across industries, regions, cropping and time.

IPART public access—online facility to access summarised data from IPART database. Summarised irrigation system performance data is made available to the public via the web. Users can search data on regions, system type, cropping and time

Another tool that complements IPART is IPERT (irrigation pump evaluation and reporting tool) which is online software that has been designed to assist the irrigation industry undertake and report about on-farm evaluations of pumping systems. Functionality allows assessment of efficiency of an irrigation pumping system and to make recommendations on system changes. Like IPART it is also an IDO tool.

Whilst the data entered into IPART and IPERT contains individual property specific data that would be regarded as private, various levels of access have been provided for the dissemination and use of these data. For example, DERM has access to aggregated data where the identity of individual irrigator is protected.

Collation of base data

This project was to collate available base data to be used in the production of property plans such as land and water management plans. These data included soils, geology, vegetation, topography, photography, ground and surface water and other datasets. SEQ Catchments indicated their systems were capable of providing and producing the necessary maps. As a result this project was curtailed and resolved to the development of GMap – a web portal and map request and repository tool for natural resource information.

Provision of property and LWMP base maps at the property scale

This was provided through the upgrade of computer hardware, software and licensing together with GMap.

Development of IDO tools

As reported earlier IPART and IPERT are identified as irrigation audit databases. These two pieces of software have also been designed as IDO tools to assist them to evaluate and analyse data obtained during a system assessment. Additional tools that are in various stages of development are detailed below.

EconCalc

EconCalc is an economic calculator for irrigation systems. This decision support tool is used to economically evaluate the costs and benefits associated with a new irrigation system. The tool consists of an online data entry interface which collates all the necessary user inputs that will be used for calculating and generating a graph. It calculates a number of economic performance indicators such as i) nett present value (NPV); ii) annualised costs/benefits (annuity); iii) the internal rate of return (IRR) and the benefit–cost ratio.

EnergyCalc

EnergyCalc consists of an online data entry interface that links to a database hosted on a centralised server. EnergyCalc assesses direct on-farm energy use, costs and the greenhouse gas emissions associated with diesel, petrol, LPG and electricity consumption. EnergyCalc examines energy use across key processes within a production system and can be used to evaluate farming practices such as tillage, spraying, irrigation etc. EnergyCalc collates all the necessary user inputs that will be used for generating assessment(s).

IRUSTIC

IRUSTIC is a web-based database reference tool used to identify the seasonal irrigation demand for crops in South East Queensland. The IRUSTIC database contains simulated seasonal irrigation demands for various crop averaged over a period from 1970 to 2007 generated by the RUSTIC software developed by DERM under another program.

Water manager tool

The water manager tool is a strategic decision support tool used to assess current irrigation management practices and the interactions between crop and irrigation system. The water manager tool also develops a personalised irrigation schedule and water budget for the grower based on the characteristics of the enterprise.

Pressurised irrigation monitoring system

Pressurised irrigation monitoring system (PIMS) is an electronic tool kit to assist irrigation consultants and industry extension staff conduct performance assessments on pressurised irrigation systems.

PIMS has the ability to continuously record across irrigation cycles allowing better scrutiny of systems, particularly if the system is pressurised by a pump performing variable duties. PIMS monitoring modules can be set up remotely from one another across the farm. Recording can be done in several places on the system and relayed by telemetry to a central 'coordinator'.

PIMS data are able to be downloaded into IPERT for analysis. PIMS can provide valuable data on changes and variability of hydraulic pressures across a whole pumped/irrigation system.

Development of grower tools

Primary Industries and Resources, Government of South Australia has developed software which is used by irrigators to generate comprehensive irrigation reports to review irrigation management and production practices. The irrigation recording and evaluation system (IRES) has the capacity to plan irrigation scheduling, determine water budgets, generate weather data etc. As part of KMSI, IRES was trialled with a number of irrigators in SEQ to determine its suitability or what modifications might be needed.

The pilot showed that irrigators found it too difficult and too detailed for them to be interested in using it. This is in spite of individual irrigators being given one-on-one assistance to implement IRES. It was then decided to develop a more receptive and less detailed decision support tool—grower data capture tool.

Grower data capture tool

Grower data capture tool is a web-based data captured tool with simplified irrigation recording and scheduling features based on evapotranspiration. The grower data capture tool allows irrigators to record irrigation and rainfall while also calculating daily crop water use. This tool assesses crop water needs, i.e. supply vs. demand, based on the irrigation amount, irrigation frequency, rainfall and crop water use. The tool provides a useful reporting mechanism for irrigators while allowing this data to be collated for benchmarking purposes.

Collation of regional statistics and benchmarking data

This project was progressed through the awarding of a contract to Feedlot Services Australia and the National Centre for Engineering in Agriculture

The aim of this project was to continue the outcomes of the KMSI Implementation Plan in regard to initiating the development of an irrigation audit database and collect regional statistics via an irrigation survey distributed directly to irrigators across the five rural industries. The collation of data was at two levels. Firstly, through an assessment of existing relevant databases and secondly, through a questionnaire survey of irrigators.

The resulting survey did not achieve the target sample number (10 per cent) due largely to the issue of privacy. Rural industry groups hold information on contact details for their growers but this was treated mostly as private information. Nevertheless the resulting report Regional Statistics Collation and Benchmarking South East Queensland Irrigation Futures does contain useful statistics and data analysis.

A by-product of the study was the development of RESSTAT (regional statistics reporting and benchmarking tool). RESSTAT is online software designed to collect and analyse data on irrigation practices. Designed to be an IDO tool it collates statistics and benchmarking information pertaining to irrigation practice. It provides for ongoing capture of data allowing comparisons across industries, regions, and time.

KMSI tools development summary

The tools and calculators developed under KMSI and summarised in Table 23, are in various stages of completion as end user feedback is accounted for redevelopment occurs. Given the nature of some of the tools it was envisaged that they would require refinement into the next phase of SEQ-IF.

This has been a challenge to elicit input from stakeholders and deliver a product that meets the expectations of all from initial conception of a tool through to its various stages of development.

Table 23 Tools developed under KMSI

Project	Product developed	Function
Electronic library and web tools	SEQ-IF website	Repository for irrigation information that is relevant to South East Queensland
	Water resource information tool	Provides access to online data such as water storage levels, weather reports, groundwater levels, etc.
Irrigation audit database	IPART	Software to evaluate pressurised irrigation system performance
	IPERT	Software to allow collation and analysis of pumping system evaluation data
Farm resource mapping system	GMap	Web portal and repository of farm resource maps
IDO tools	EconCalc	Tool to evaluate the economics of greenfield investment and irrigation system conversion
	IRUSTIC	Interrogative database to determine seasonal crop water use for a range of localities and soil types
	Water manager tool	Tool to develop and assess irrigation schedules.
	EnergyCalc	Estimates and benchmarks energy use at the farm or paddock scales
Grower tools	IRES (Did not proceed)	Pilot with irrigators the irrigation recording and evaluation system
	Grower data capture tool	Decision support tool to record and assess irrigation and scheduling events
Regional statistics platform and benchmarking	RESSTAT	Database to collate statistics and benchmark irrigation information

Research and development support

The SEQ-IF management committee met early in the program to decide how the research and development component of SEQ-IF should be delivered. It was generally agreed that R&D activities should directly support industry development officers in their endeavours with field activities. Sufficient research was believed to have been undertaken in the area of water use efficiency and that there would be little tangible benefit to the program if all money resources in this funding function were committed towards research. The committee agreed to a proposal put by the National Centre for Engineering in Agriculture that they could provide this support to the industries based on agreed tasks and ad hoc support as the need arose.

This approach did not rule out some research work being done. There were R&D projects proposed by the industry groups that the management committee decided were worthy of being funded that would contribute towards the goals of SEQ-IF. A list of these and a synopsis of each is given in Appendix 2.

The National Centre for Engineering in Agriculture through the CRC Irrigation Futures submitted a proposal to provide research and development support to establish an integrated research program to support the rural irrigation industry IDOs. The management committee agreed to fund the proposal, known as Research and Development Support (RADS), to run initially for two years after which its effectiveness would be assessed. RADS was to deliver on the following key objectives:

- provide research and development outcomes that will underpin a 10 per cent improvement in water use efficiency by 2009 for SEQ-IF
- provide the basis for changes in on-farm water management practices and/or take-up of more water efficient equipment and operations through research and development
- assist in the uptake of farm management systems through better definition of best management practices and efficiency targets
- assist grower involvement in SEQ-IF by providing up to date research for SEQ-IF stakeholders by conducting research at a local level while having access to the broader research framework of the CRC for Irrigation Futures at a national level.

RADS was delivered through the summer zone of the CRC Irrigation Futures, which gave some leveraging to SEQ-IF towards improving irrigation water use efficiency, benchmarking and best management practices. This would be achieved through a focus on a number of priority areas including:

1. irrigation management practice and system performance improvements
2. irrigation scheduling and crop water use
3. monitoring and measurement for performance benchmarking
4. water storage and delivery systems
5. irrigation and nutrient management
6. improved extension and adoption of best management practices.

The RADS program was subsequently extended for a third year with a focus on delivering specific projects for each of the industries.

Growcom

Root zone salinity and monitoring tools—provide interpretive and technical support in relation to soil solute extraction. Conduct on-farm research to evaluate soil nutrient issues.

Provide workshop support and technical assistance with PIMS, IPART, and other tools as they arise.

Turf

Conduct on farm research to evaluate spatial variability in conjunction with IDOs trials/activities.

Provide workshop support and technical assistance with PIMS, IPART, tensiometer, and other tools as they arise. Provide interpretive support for IDO trial data.

Flowers

Assist in assessing leaf sensors for irrigation scheduling and controlling with possible cross referencing using load cells under gerbera/rose pots.

Deploy the data signature logger (DSL) to improve irrigation performance.

Provide workshop support and technical assistance with enviroscan data and other tools as they arise.

Dairy

Pasture management—conduct on-farm measurements to evaluate spatial variability in conjunction with IDOs trials/activities.

Provide workshop support and technical assistance with PIMS, IPART, and other tools as they arise.

Nursery

Scheduling tools—in collaboration with Department of Employment, Economic Development and Innovation, develop and assess weight-based irrigation scheduling and control.

Provide workshop support and technical assistance with other tools as they arise.

RADS activities

The RADS team worked closely with IDOs on more than 16 trial sites throughout SEQ conducting:

- crop water use efficiency and benchmarking studies
- crop vigour and EM38 surveys
- PIMS testing
- monitoring root zone salinity accumulation and nutrient fluxes
- developing and supporting a range of monitoring tools that facilitated the objectives of SEQ-IF.

Measuring crop performance—Normalised Difference Vegetation Index (NDVI)

Measuring ET with an Eddy Covariance (ECv) Station

The monitoring tools used to improve water use efficiency included: PIMS, DSL (Smart water metering), continuous logging tensiometers, soil solute monitoring tools, and weight based irrigation scheduling devices.

SMART water metering data signature logger (DSL)

Mentoring and training was an ongoing activity for RADS. Mentoring included:

- provision of instrumentation advice and field support for installation, maintenance and data acquisition
- provision of guidance on strategic data collection and benchmark reporting over project life
- the incorporation of spatial variability data into GIS mapping systems
- general liaising and coordinating in regard to performance evaluation, software and tools with industry consultants such as Daley Water Services.

Performance assessment

An assessment of the effectiveness of the RADS program can only be measured against the achievement of initial objectives outlined on page 74.

The RADS concept is regarded as an essential element of the SEQ-IF program and it has underpinned program delivery by most of the industries. The various tools trialled and activities delivered have highlighted significant issues with irrigation equipment and practices which through mentoring and training have enhanced the IDOs technical and extension capacity.

The RADS program has empowered IDOs in delivering outcomes through trials and tools development and enabled field trials to be conducted that would not have otherwise occurred. This has provided demonstrated proof of the effectiveness of new technologies, equipment and practices.

This model for delivering R&D activities has provided expertise and technologies to industry programs that would not have otherwise been available.

Lessons to be learnt

The following improvements would benefit the research and development component of SEQ-IF:

- a yearly or regular review of activities
- better communication with participating industries
- closer scrutiny of project proposals by the relevant industry and technical working group
- a process to compare ‘off the shelf’ products against new proposals to develop similar products
- separation of research projects from those to be undertaken through the RADS project
- RADS delivery input from industries/coordination and support. The management committee is too far removed from these activities and IDOs do not have the authority or capacity to direct their RADS program.

Irrigation Australia Ltd role

DERM partly funded an irrigation industry project officer (IIPO), to assist in the RWUEI. The IIPO is employed by Irrigation Australia Ltd and he also had contractual responsibilities with Horticulture Australia Ltd to provide technical support to industry development officers employed in the irrigation industry.

The overall objective of the position was to raise the professionalism and sustainability of irrigation in Queensland's urban and rural enterprises. This was to be achieved through a number of agreed tasks:

- assemble for each industry sector relevant information packages that cover:
    - training
    - certification
    - new technologies and practices
    - case studies.
- develop training packages consistent with the national qualifications for irrigators.
- continue development of irrigation auditing (both rural and urban) with a view to certifying auditors
- maintain close linkages with all current water use efficiency programs
- continue to promote water use efficiency and irrigation to high school agriculture classes
- continue involvement with water use efficiency education and extension programs throughout the state, covering both rural and urban irrigation
- promote the use of new tools and technology to all industry sectors.

The IIPO was not funded from SEQ-IF funds but provided services to SEQ-IF as a consequence of his commitment to the RWUEI throughout the state.

The IIPO then was only able to commit a portion of his time to the SEQ-IF program. Horticulture Australia Ltd also partly funded this position hence he also had to meet obligations under the contract with them. The IIPO reported to a management committee that was represented by IAL, industry and DERM.

Where industries engaged personnel to deliver water use efficiency services to irrigators it was largely on the basis of limited exposure to the skills/expertise required. The IIPO was integral to the program through providing the guidance and skills development to IDOs to enable them to deliver competent and relevant services to irrigators to achieve the outcomes required by the program.

The IIPO attended the regular IDO meetings convened by SEQC where he was able to address technical issues of concern and arrange training events particularly those dealing with the larger irrigation systems and pumps. IAL has played an integral part in the development and provision of training packages for IDOs. These packages ranged from personal development training through to the recognition of prior learning process to attain the industry accreditation of certified agronomist. It also included skills development in the assessment of on-farm irrigation systems.

Support to individual IDOs in the use of equipment and irrigation system evaluation and interpretation of results was also provided.

The IIPO also assisted in providing services to irrigators mainly in the area of irrigation system assessments and overall hardware evaluation. He also provided authoritative advice to the program involving the purchase of equipment and the development and implementation of the various tools and calculators. He played an important role in introducing some of these tools to areas outside SEQ and brought to the program relevant concepts that originated through Irrigation Australia Ltd at the national level.

Training in flow measurement using an orifice meter and portable flow meter

(Photo: G McGlashan)