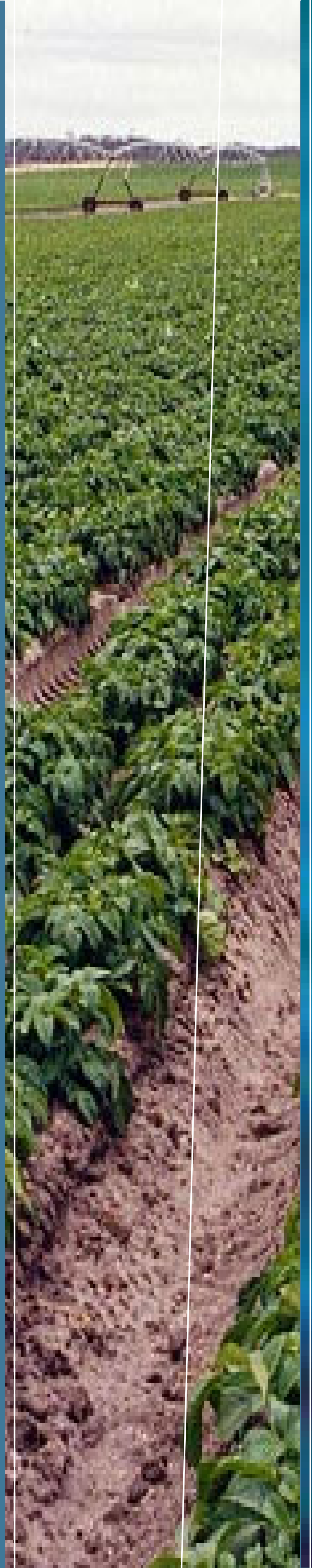
Technical Report No. RB2001/023

Irrigation Benchmarking in the South East

Potatoes 2000



Irrigated Crop Management Service

PIRSA RURAL SOLUTIONS

PRIMARY INDUSTRIES AND RESOURCES SA

SOUTH AUSTRALIA

Natural Heritage Trust
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IRRIGATION BENCHMARKING IN THE SOUTH EAST

POTATOES 2000

Hugh Christie
&
Bill Binks

December, 2001

Irrigated Crop Management Services
PIRSA Rural Solutions

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1.0 INTRODUCTION

This report presents results from the Potatoes section of the Natural Heritage Trust project "Benchmarking to Improve Irrigation Management in South Australia's South East" (Project Number 990042). The same process was carried out with the South East winegrape industry in the 1999-2000 season. This project follows on from similar work undertaken by Primary Industries and Resources SA in the Riverland district of South Australia.

The aim of this project was to develop a module that could be used by grower groups to assess irrigation management and make comparisons across a group of sites. A pilot group of irrigators was formed to test the process of benchmarking performance using a series of quantitative indicators. This also enabled a series of irrigation best management practices to be identified, through case studies and consultation with the group.

Potatoes are a major irrigated crop in the South East, produced for both fresh and processing markets. The industry generates around $25 million in gross farm gate income, with annual production of approximately 103,000 tonnes (Binks, 2000).

Water resource management is an important issue in the South East currently. There is momentum in the region for a change away from the present area-based water licensing system to a volumetric based system. With these changes approaching, the use of benchmarking and objective indicators by growers or companies to assess their own irrigation performance is seen as a potentially powerful mechanism for improving the effectiveness of water use.

The project was carried out by members of PIRSA Rural Solutions' Irrigated Crop Management Service, based at Struan. Technical assistance was also provided by staff from SaFries, (part of McCain's group), based at Penola.

1.1 What Is Benchmarking?

Benchmarking is simply a way to measure and compare performance, relative to a group of others who measure their performance in the same way. By comparing with others in a similar situation, individuals can see how much they can potentially improve by, and identify steps for how to get there. The process of benchmarking can be summarised in three stages.

The first step is to form a comparison group. Ideally this group includes some people at the upper end of current practices and performance. This allows performance to be assessed relative to the perceived industry leaders, thereby maximising the usefulness of the benchmarking process.

The second stage is to measure the performance of all group participants. A series of standardised quantitative indicators is needed to make meaningful comparisons when examining the results, and when repeating the exercise.

The final stage is to examine the results and identify factors behind the performance of leading participants in the group, using case studies if required. These factors are referred to as best management practices.

After this process is completed it can be repeated in following years. In this way participants obtain the most benefit, as they can follow changes in their performance from one year to the next as management practices improve, as well as still comparing with others.

The benchmarking process as presented in this report is not intended for comparing performance against prescribed ‘benchmark’ levels with an absolute value. It is designed for comparison of relative performance, solely within the group of sites assessed. Comparisons with other regions or sites not included in the group may be of interest, but could be misleading and are not recommended.

2.0 METHODOLOGY

Potato growers regarded as generally 'good' irrigators were invited to join a pilot group to test the benchmarking process. Identification of growers was through consultation with growers and industry representatives. Information on irrigation applications, management and returns was collected for the 1999-2000 season, in order to compare irrigation performance and help identify best management practices relevant in the South East.

The eight sites evaluated were located throughout the South East of South Australia and into the south west corner of Victoria. Figure 1 shows the location of the sites. Several irrigators had more than one site.

Figure 1: Location of benchmarking sites.

Planting times ranged from mid-September to early November, with the last of the crops harvested in May. The main variety grown was Russett Burbank, with three crops of other varieties (Kennebec, Shepody and Pontiac). The processing market also dominated with only one crop grown for the fresh market.

Data was collected during several site visits and from an interview at the end of the growing season. Field work involved assessment of the operating irrigation system and a basic soil survey of the site. The interview was used to collect general information about the site, irrigation system details, management practises and crop production. Records of irrigation applied and rainfall were also collected for each site.

Information was processed and entered into a database developed for the project. Drainage components were estimated using modelling of soil, irrigation and evaporation data. The database was used to generate the series of performance indicators contained in this report. For each indicator the performance of all sites was plotted graphically, with sites ranked according to their relative performance. The graphs are intended to be used for assessing a site relative to the rest of the group.

Sites for case studies were chosen by ranking all sites on the basis of their performance across all indicators. The managers of these case study sites were invited to take part in an exercise to determine what practices they undertook, to perform at a level higher than the other participants. Common findings were used as the basis for identifying a series of Irrigation Best Management Practices (IBMP's).

The IBMP's are reasonably general, highlighting the approach to an issue, not an exact solution to a problem. An example of this is to recommend the use of scheduling tools, rather than promoting any specific product.

3.0 PERFORMANCE INDICATORS

Following is a description of the set of indicators used in the project to rank the participants with regard to their irrigation performance within the group. There is also a brief description of the process that was undertaken to calculate each of the indicators.

It must also be remembered that these indicators are only applicable for comparisons within the group. They do not represent a definitive statement regarding the producers who were part of the project. This is especially true of the figures regarding any indicators with a financial component to them. These can not be used to accurately predict the overall economic performance of any producers, and in no circumstances should this be attempted.

3.1 Yield (t/ha)

This was collated from yield information provided by the growers in the group.

3.2 Water Use Efficiency (t/ML)

Yield (t/Ha) was divided by the total volume of water applied to the crop over the growing season (ML/ha), to derive tonnes of tubers produced per megalitre of irrigation applied (t/ML). In terms of irrigation management, this is a more meaningful indicator than yield.

Volume of water applied was calculated based on growers' irrigation records and a field assessment of the operating system (measuring application rate).

3.3 Gross Return per Megalitre ($/ML)

Gross return per hectare ($/ha) was calculated based on the yield (t/ha) and the assigned value of the potatoes ($/t).

Returns were provided by the farmers in the form of a dollars per tonne figure ($/t), which was then used in the calculation of other indicators.

Gross return per hectare was then divided by the volume of water applied over the season (ML/ha), to give the gross return per megalitre of irrigation ($/ML).

3.4 Cost of Water per Tonne of Tubers ($/t)

The cost of water is the combined cost of the water license and estimated pumping costs for the season. The licence cost is based on the crop area and the applicable levy. Pumping costs were calculated using total volume pumped, energy costs, depth to water and pump pressure. The total cost of water expressed as dollars per hectare

($/ha) was divided by yield (t/ha), to give cost of water per tonne of tubers produced ($/t).

All irrigators have ground-water pumping licenses. The three situated in Victoria pay $1.40/ML on top of an annual license fee of $58, while the irrigators in South Australia work under the irrigation equivalents scheme. In all situations though, pumping was by far the most expensive component of water cost. On average the actual cost of the water represented only 11.9% of the total cost per megalitre.

3.5 Gross Return per Dollar Water Input ($/$)

Gross return per tonne of tubers ($/t) was divided by the cost of the water per tonne of tubers ($/t, from the previous indicator), to give a direct comparison of money returned from the harvested tubers with money spent on irrigation to produce the tubers ($/$).

3.6 Application Efficiency (%)

Application efficiency is a measure of how much of the applied water passes through the plants as evapotransporation. It is a good indicator of performance as it represents the proportion of applied water that is actually used by the crop.

$$\text{Application Efficiency (\%)} = \frac{\text{Irrigation Applied (ML/ha)} - \text{Drainage (ML/ha)}}{\text{Irrigation Applied (ML/ha)}} \times 100$$

Drainage was estimated using the Right Amount Right Time program (RART) to model soil moisture status through the growing season. This required information on irrigation applications, soil water holding capacity, daily class A evaporation and rainfall data and crop factors. The program produces a report summarising the amount of irrigation applied and the component that drained through the rootzone.

3.7 Yield per Volume of Drainage (t/ML)

Yield (t/ha) was divided by the estimated drainage volume per hectare (ML/ha) derived by RART, to derive yield per volume of drainage water (t/ML).

3.8 Cost of Drainage per Tonne of Tubers ($/t)

The cost of drainage ($/ha) was calculated by multiplying the cost of water ($/ML) by the estimated drainage volume per hectare (ML/ha). This was divided by yield (t/ha) to derive the cost of water lost as drainage per tonne of fruit produced.

3.9 Stress Days

Although not shown as an indicator in the report, stress days have been listed in the site summary, as it is an important factor in the performance of the crop. The stress days were defined as days when the level of moisture in the soil fell below the soil's Readily Available Water (RAW) value. This is defined as the amount of water that the plant can readily extract from the root zone (or the difference between the soil's water holding capacity at 8kPa and 60kPa suction pressure).

Stress days were collated from the RART model by examining the soil water deficit on the irrigation schedule. The stress days could then be simply counted off the table. While this admittedly has some questions with regard to its accuracy, it is a procedure that will be able to be easily carried out in a repeatable, consistent manner by facilitators using the Irrigation Benchmarking Module in the future.

4.0 SITE INFORMATION

Table 1: Summary of site information

	Property Code	024A POT01	024A POT02	025A POT03	026A POT04	028A POT05	027A POT06	029A POT07	028A POT08
CROP	Variety	Kennebec	Shepody	Pontiac	Russett Burbank	Russett Burbank	Russett Burbank	Russett Burbank	Russett Burbank
	Market	Process	Process	Fresh	Process	Process	Process	Process	Process
	Yield (t)	46.89	34.76	39.09	59.30	50.74	66.62	55	49.24
	Value ($/t)	203.17	195.23	380.26	193	195	193	200	195
SYSTEM	System Type	Centre pivot	Centre pivot	Centre pivot	Centre pivot	Centre pivot	Centre pivot	Centre pivot	Centre pivot
	Pressure Variation		*X*		*X*				*X*
	DU	*X*	*X*			*X*	*X*	*X*	*X*
IRRIGATION	Scheduling Method	Enviro-Scan	Enviro-Scan	GRO-Point	Enviro-Scan	Gopher	Enviro-Scan	Enviro-Scan	Gopher
	Events	73	63	20	66	85	70	69	90
	Water Depth (mm)	552	509	316	421.1	610	515.5	417	587.88
	Water Cost ($/ML)	18.63	20.23	14.71	9.66	14.66	19.17	15.72	13.53
	Stress Days	18	15	30	10	9	17	25	3
	Environmental Losses	*X*	*X*			*X*			*X*

KEY:

Variety = Potato variety planted at site	Scheduling Method = Main scheduling method
Market = Target market for crop	Events = Number of irrigation events per season
Yield = Tonnes per hectare of potatoes from the site	Water Depth = Total depth of irrigation per season
Value = Dollars per tonne value of the potatoes as provided by the producer	Water Cost = Cost of licensing and pumping the water in $/ML
System Type = Type of irrigation system used.	Environmental Losses = Crops that had significant losses due to environmental factors
Pressure Variation = Variation of <= 10%	*X* = Positive response for given category
DU = Distribution Uniformity of => 70%	(shaded) = Case study sites

Explanatory Notes for Table 1:

Water Depth:
This value represents the average depth across the pivot. This can be related to total volume by the relationship 100mm = 1ML/ha. For example the first property applied a total volume of 5.52ML per hectare for the season, which equals the depth of 552mm as shown in the above table.

5.0 IRRIGATION PERFORMANCE COMPARISONS

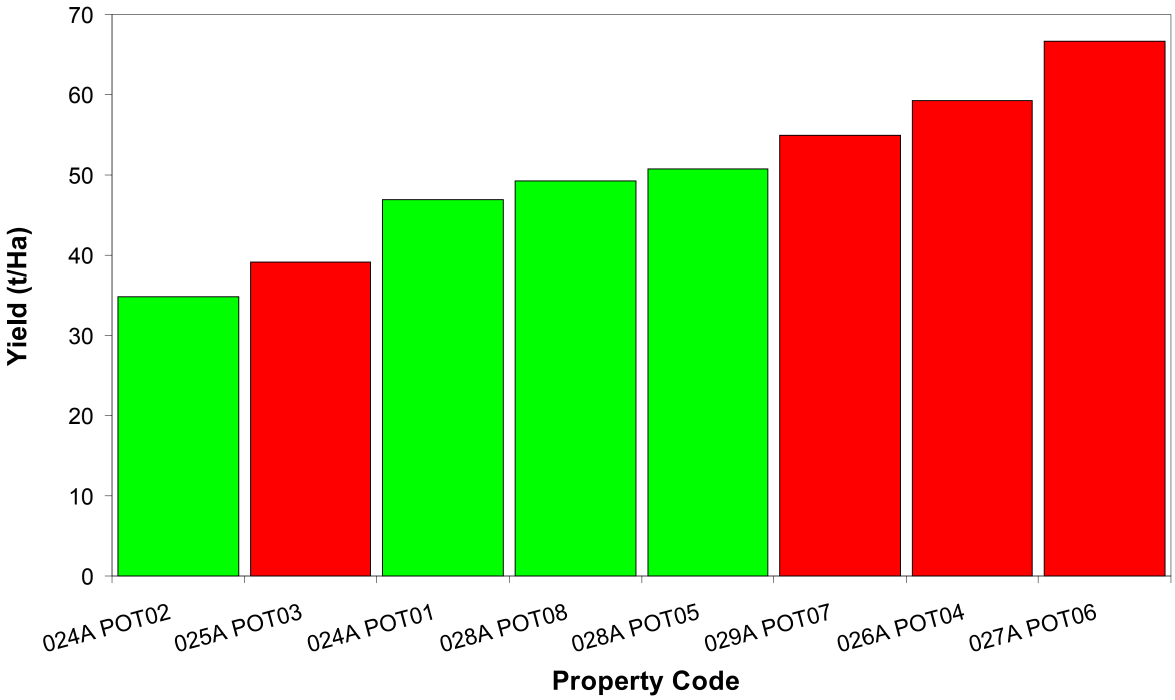
For each indicator all sites were ranked, then plotted in order of increasing performance. It must be stressed that this does not indicate good or bad performance, just that some sites performed better relative to the others.

Case study sites are identified by the red bars on the graphs.

5.1 Yield (t/ha)

This is the traditional way in which growers have measured performance. However, while being important, it does not give an indication of how efficiently irrigation inputs are being used in the operation.

Figure 2: Yield (t/Ha)



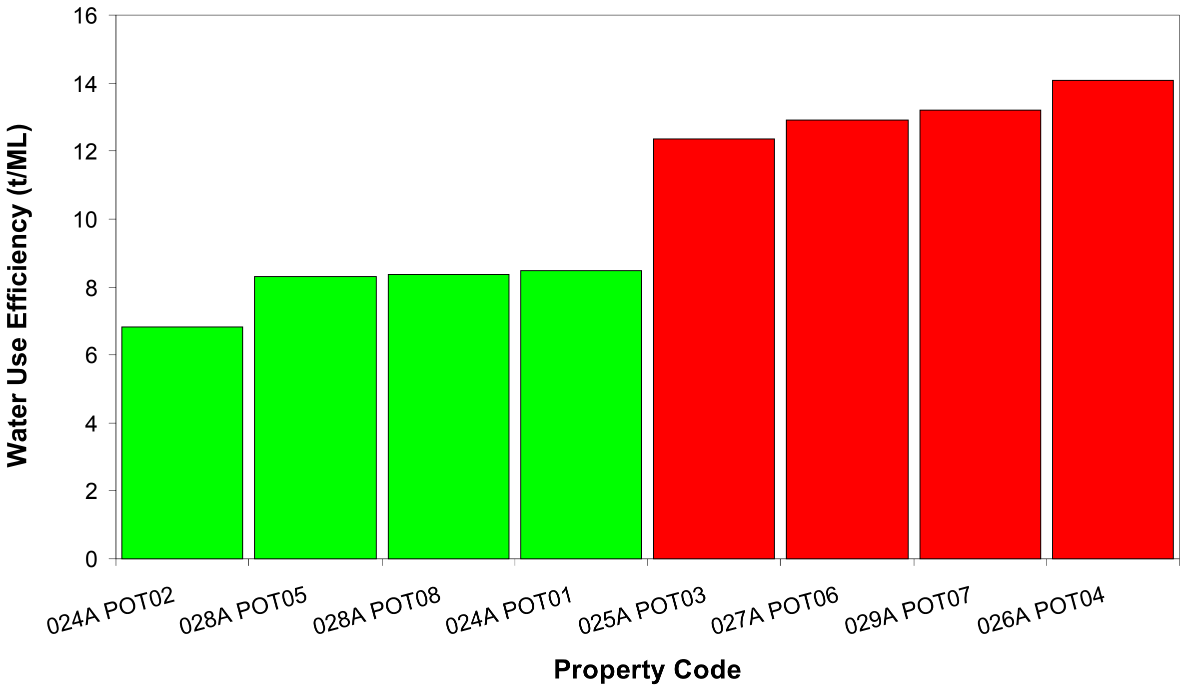
There was a large range of yields in the project, ranging from 35 to 67 tonnes per hectare. There are many factors that can play a role in final yields. These include soil type, environmental influences, disease, and nutrition.

One of the main factors though is variety, as some, such as Russett Burbank, tend to be higher yielding than others. The choice of variety is often governed by location, climate, soil type and desired seeding time.

5.2 Water Use Efficiency (t/ML)

In terms of irrigation performance this indicator is a much better representation of the yield from the crop. It gives a direct measure of how much production was achieved for each megalitre of water used.

Figure 3: Water Use Efficiency (t/ML)



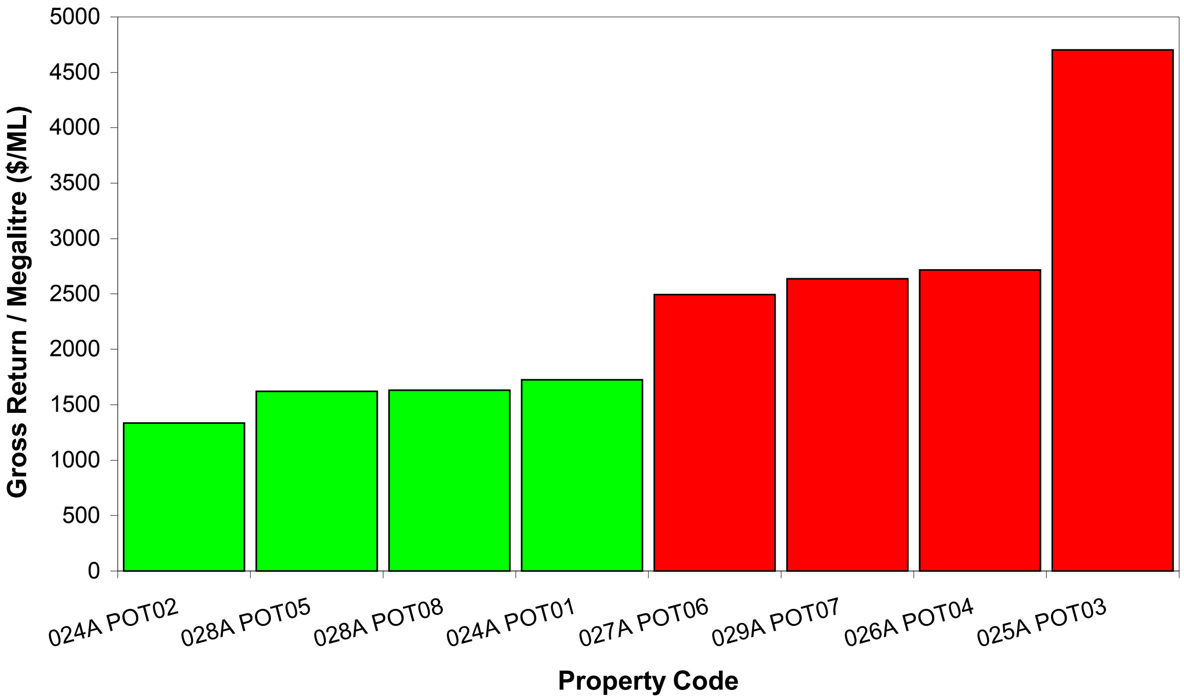
The indices are broken up into two distinct groups with a difference of around 5 t/ML between them. The four leading sites are made up of the three highest yielding sites and the site that had the second lowest yield. This was achieved with a low yield by having a low level of water use.

The lower ranked sites generally had higher water consumption, with lower yields. They also included all the sites that listed environmental losses as a factor in the final yield.

5.3 Gross Return per Megalitre ($/ML)

Gross return per Megalitre is a direct measure of the income generated for every megalitre used to grow the potato crop. It should be noted that this is only a representation of the gross dollar income from the crop, this figure does not represent the true financial state of the producers. It makes no allowance for costs of production or other activities that producers undertake on their farms. As a result this should not be taken as a statement of the financial well being of members of the potato industry, or the industry as a whole.

Figure 4: Gross Return per Megalitre ($/ML)



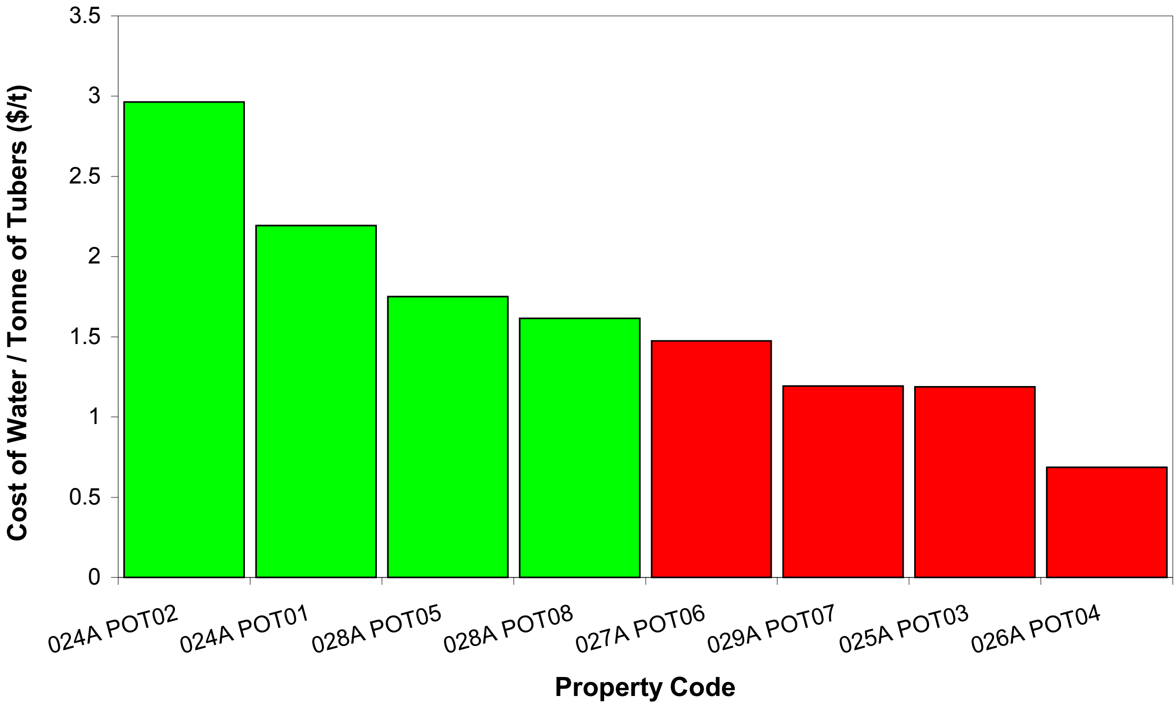
Once again the four case study sites performed significantly better than the rest. What is of interest is that the best-performed site was the second lowest yielding site. This indicates that they grew a high value crop with minimal water, resulting in the significantly higher return per megalitre.

Except for the leading site, all other sites closely mirrored their results for water use efficiency (t/ML). This is an indication of the evenness of the prices paid by the processing sector, where as site 3 supplied the fresh market sector and received a significantly higher price for its produce.

5.4 Cost of Water per Tonne of Tubers ($/t)

This indicator measures the cost of supplying the water required to grow a tonne of tubers. This encompasses pumping, licensing, and in the case of Victoria, a rate per estimated megalitre (as the bores are not metered). The cost of water is influenced by factors such as the location of the site (directly related to the cost of allocations), the required depth of the bore, required operating pressure, and pumping costs. It does not include the cost of running the irrigation system, or any allowance for cost of infrastructure or maintenance. Therefore the real cost of applying the water to the crop would be significantly higher for all producers.

Figure 5: Cost of water per Tonne of Tubers ($/t)



These results, on the whole, are reasonably close together with half the sites at or below $1.50/tonne, and all sites under $3/tonne. The leading site here is helped in a large way by its significantly lower water cost ($9.66/ML, compared to an average of $15.68/ML). This was also combined with a high yielding crop.

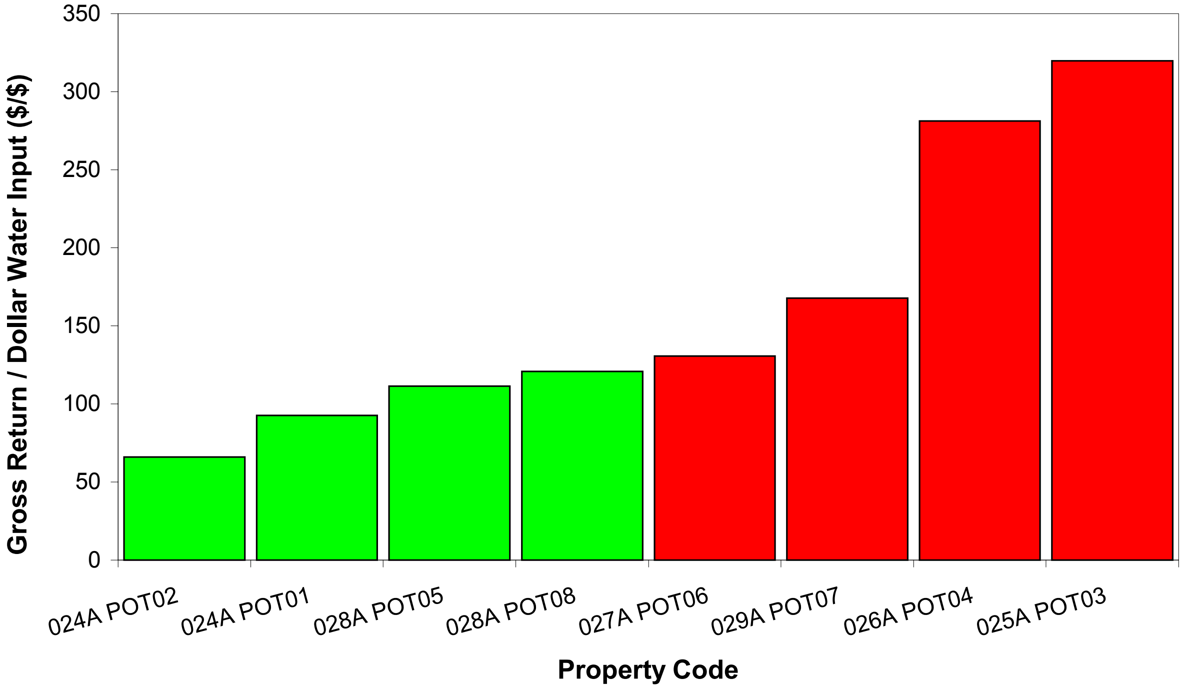
Another factor is that the three leading sites also have lower depths of application, which assists in achieving lower total water costs, mainly due to reduced pumping hours. The fourth ranked site compensated for its high water cost by producing the highest yield.

5.5 Gross Return per Dollar Water Input ($/$)

This indicator takes the return per megalitre one step further by introducing a monetary value for the water. This gives a direct measure of the type of returns growers received for every dollar they spent on acquiring water.

As discussed before, these figures do not allow for machinery, infrastructure or other costs, and therefore can only be used as an indication, not as a definitive result.

Figure 6: Gross Return per Dollar Water Input ($/$)



The two leading sites both have returns of over $300/$. The difference between this and the lower end (around $65/$) is significant. However these lower results are not necessarily a poor result, as the lowest value in a similar project in the Riverland was less than $15/$ (Skewes et al, 1997).

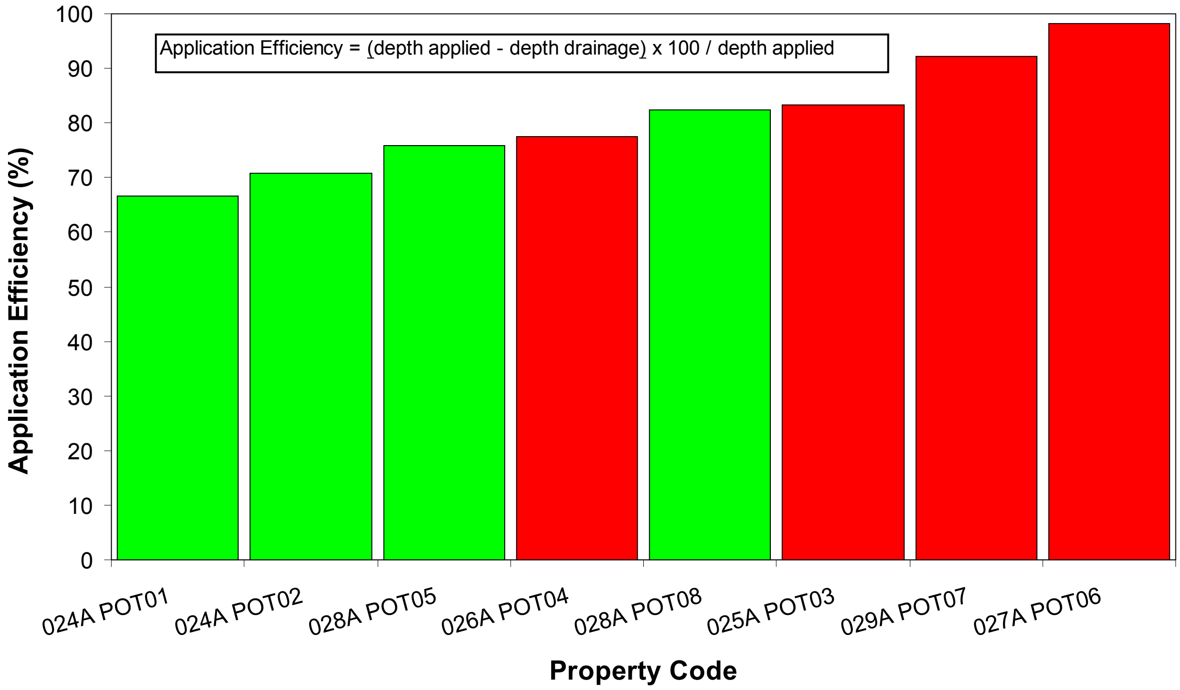
The top two sites are greatly assisted by having two of the three lowest water-pumping costs, with site 4 being the only site under $14/ML at $9.66/ML. Site 3 is also assisted again by the low amounts of water pumped and the high value of its crop.

5.6 Application Efficiency (%)

Application efficiency is a measure of the proportion of water applied that is available to the plant for evapotransporation. Any water that is not used is assumed to pass down through the root zone and become drainage. This is a good measure of how efficient an irrigator is, as it provides a direct link to how well the producer manages the crop water requirements, as over irrigating will lead directly to drainage.

This indicator does allow for some evaporation from the soil surface, and variation in crop water usage. This is done by coefficients in the computer model. The model does not allow for factors such as losses due to wind, interception by foliage and similar factors.

Figure 7: Application Efficiency (%)



The range of results is reasonably significant with a spread from 67% to 98%. Most of the sites are above 75%. While some of these may be lower than ideal, it does also reflect the various soil types found throughout the project.

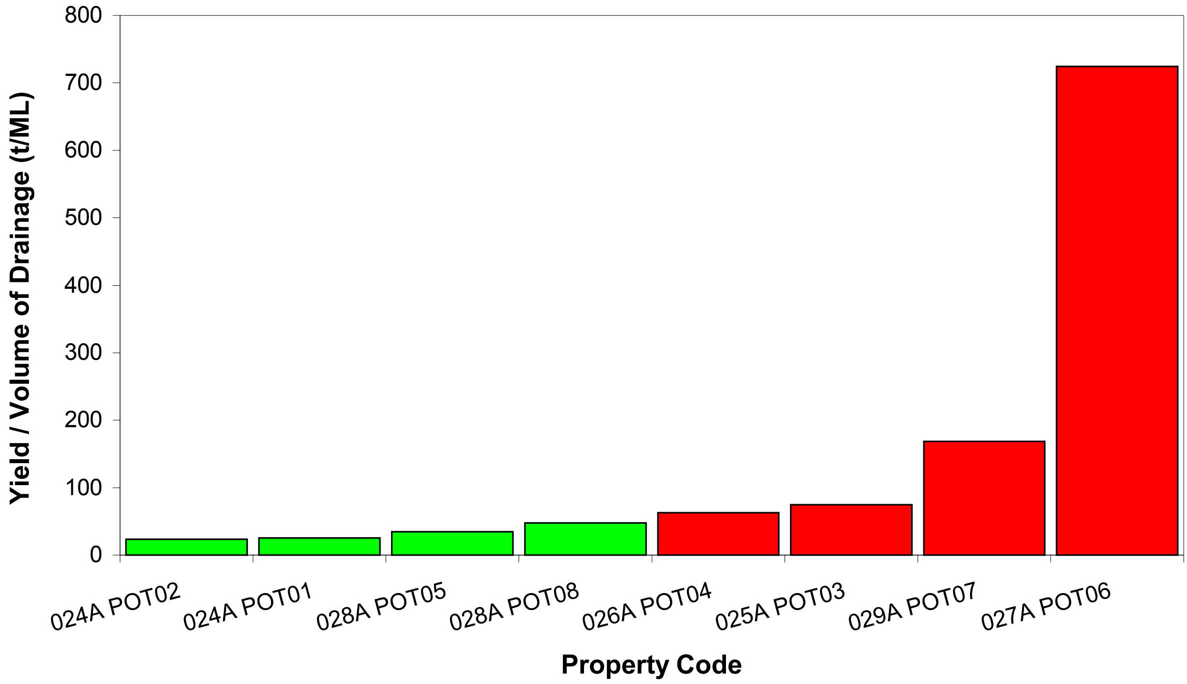
Also, while 98% is a very high efficiency, this is not desirable, or feasible, in the majority of conditions. There is generally the need for some drainage in most soils to allow an appropriate amount of leaching to occur through the profile to remove salt from the plant's root zone.

5.7 Yield per Volume of Drainage (t/ML)

This indicator is very similar to water use efficiency, but instead of examining the total amount of water applied it looks at the proportion of this that moves through the root-zone and becomes drainage.

While some drainage is needed to allow leaching, high amounts of drainage can result in serious problems. It also represents costs that are producing no measurable return to the producer.

Figure 8: Yield per Volume of Drainage (t/ML)

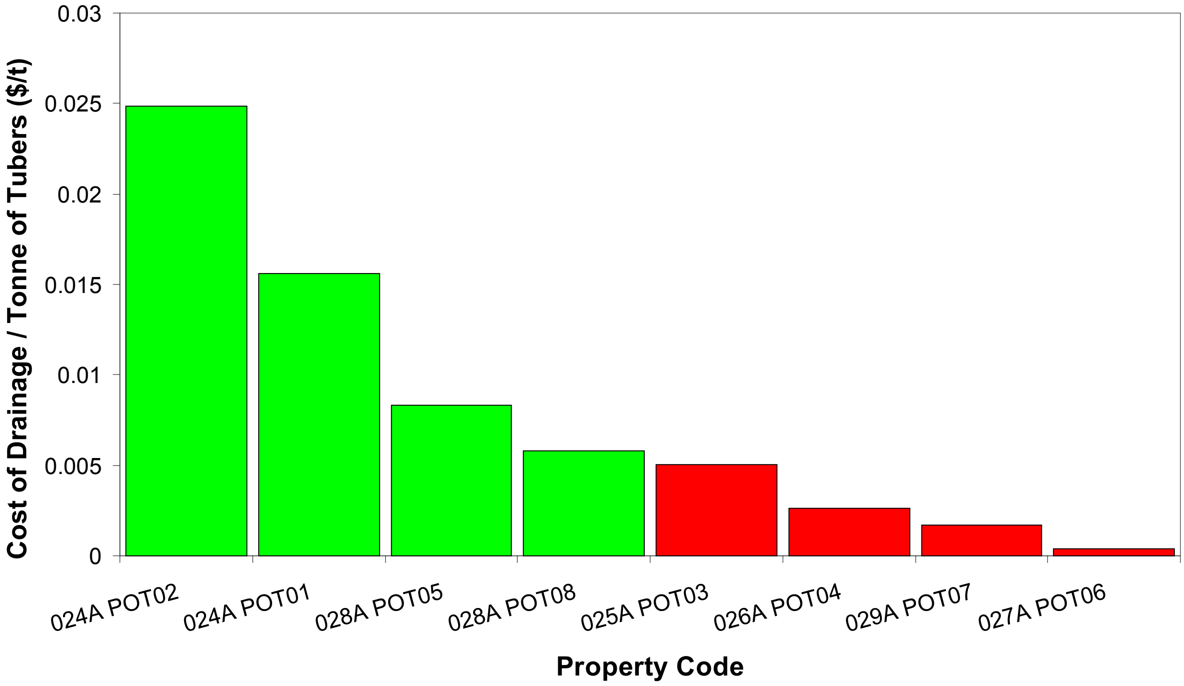


There is a significant range of results within the group with the leading sites at 724 t/ML and the lowest at 23 t/ML. The two leading sites, which were significantly higher than the others, were assisted by their very high irrigation efficiencies (92% and 98% respectively).

5.8 Cost of Drainage per Tonne of Tubers ($/t)

This indicator is very similar to the cost of water per tonne of tubers, except that it is looking at the proportion of the water applied that is unavailable to the plant as a result of drainage.

Figure 9: Cost of Drainage per Tonne of Tubers ($/t)



Once again site 6 is clearly the leading site, due to its very high efficiency. The largest improvement though has been for site 4 due to its low water costs, where as site 3 has dropped back in part due to its lower yield.

However it must also be noted for that the highest cost of drainage per tonne of tubers is less than 2.5c/t. Therefore it can be argued that this indicator does give an indication of performance, but at these levels provides few financial concerns to the producer.

6.0 IRRIGATION BEST MANAGEMENT PRACTICES

The case study sites were selected on the basis of good performance across all of the performance indicators. This was done by ranking the sites for each indicator (score from 1 to 8), then summing these to give an overall score (see Table 2).

The four sites chosen had significantly better scores than the rest of the group. The next best site had a score of 41 with the highest individual score being 63, out of a possible 64.

Table 2: Ranking of case study sites for each performance indicator.

	025A POT03	026A POT04	027A POT06	029A POT07
yield	7	2	1	3
t tubers / ML	4	1	3	2
$ / ML	1	2	4	3
$ water / t tubers	1	2	4	3
$ / $	2	1	4	3
App. Eff. %	3	5	1	2
t tubers / ML drain	3	4	1	2
$ drainage / t tubers	4	3	1	2
TOTAL	25	20	19	20

Note: ranking is 1 (top) to 8 (bottom)

All case studies were then interviewed on a range of topics ranging from their management philosophy and understanding of soil water principles, to what they regarded as effective methods of extension for their industry.

These replies were then collated and similar ideas and approaches to managing their enterprises were combined to form the basis for the Irrigation Best Management Practices.

The IBMP's were purposely kept reasonably general, as it was the approach and philosophy behind the management of the site, not an exact method, which was the desired outcome. For example it is recommended to use some form of soil moisture monitoring, however no one method or product has been recommended as the preferred option.

6.1 IBMP 1: Place high importance on irrigation management.

All of the producers interviewed said that effective management of irrigation was the key factor in a successful potato crop. Any stresses placed on the potatoes during the growing season will directly result in lower yields and returns. The main factor that causes stress on a potato crop is over or under watering.

This translates into regular checking of the crop and the amount of soil moisture that is available to it. This is especially important for crops such as potatoes that can use large amounts of water relatively quickly, and suffer significantly from deficits in available water.

This level of care is generally replicated in all facets of the operation. Practices such as regular crop inspections also allow the crop to be checked for disease, pests, or general ill health.

Also the overall management approach is to produce a high value crop in a sustainable manner. The sustainability of any irrigated industry is directly related to the efficiency of the watering practices.

6.2 IBMP 2: Understand the soil and its relationship with water.

Knowing your soil, as well as how it interacts with the water applied was stressed by all case studies. This was listed as one of the key factors to growing a high yielding, high quality potato crop.

One of the case study growers commented that they could have up to six soil types running through a pivot. When this occurs it becomes even more important to have a good grasp on the soil characteristics. Without this it becomes nearly impossible to strike a balance for the requirements of the whole crop across the paddock.

All growers discussed factors such as refill points, field capacity and drainage of water. This knowledge allows the crop to be managed much more efficiently, and avoiding stress is seen as one of the key requirements for a high yielding quality crop.

One comment that summed up the general feeling was, “as long as the soil and water are right, we can fix everything else”. These two factors need to be right before anything else can be done.

6.3 IBMP 3: Monitor soil moisture using objective tools.

All case study sites use some form of objective measurement of soil moisture and actively use this in the scheduling of irrigations. All growers found that this not only improved the accuracy of their watering, but also their efficiency

A common view was that by checking moisture levels regularly, you can identify trends in the soil moisture and be able to "water harder, earlier" in the words of one grower. This allows the crop to be run much closer to the refill point without causing damage, or danger of going under this point and causing stress to the plant. It also allows the profile to be filled closer to field capacity without excessive drainage or water logging the crop. Without some objective measure it is very hard to do this accurately.

The improvements derived from effective soil moisture measurement are significant, and acknowledged. Growers have even noticed the improvement with newer technology over older methods. It allows them to meet the needs of the crop much more efficiently and accurately. This directly relates to both improved yields and tuber quality.

6.4 IBMP 4: Relate observations and other information to measured data for scheduling irrigation.

All case study sites, while using an objective measure, also used a variety of other methods when scheduling irrigation. Mostly they checked the crop by simply the feel of the soil or digging a hole. While they know they cannot be as accurate as the measuring device, it does provide a check that it is working properly. It also allows much more of the crop to influence the irrigation scheduling decisions than just the small area surrounding the monitoring site.

This is evident by one grower who has two different objective measurement devices that are calibrated from each other. These are then used to develop a more accurate feel for water moisture across the paddock. This allows them to schedule for the whole paddock, not just the locations that have probes.

Walking the crop can also give indications that the moisture levels are not quite right. While the area around the probe may be in perfect health, plants in other sections of the paddock could easily be showing signs of over or under watering that are easily identified visually.

Also the growers, while being open to advice, retain the decision on when to irrigate and do not simply leave it to a device or outside consultants. This is especially true when they have a long-term relationship with the site or sites similar to it.

6.5 IBMP 5: Design and maintain the irrigation system correctly.

To irrigate a crop successfully and efficiently you must have a system capable of getting the water where you want it, when you want it. To do this the irrigation system not only has to be designed correctly initially, it must also be maintained over its life.

Annual servicing is one of the keys to this. This gives the grower the best possible chance of running through the season with minimal interruptions from breakdowns. It also ensures the system is doing what it is meant to and not over or under watering.

This also requires regular work throughout the season to ensure that the system is running at an optimum level. This includes checking the system regularly during operation in case of blockages or other problems, as well as assessing the uniformity of application.

6.6 IBMP 6: Actively access new information.

All case study participants actively seek out new information on irrigation techniques, pests, crop management and anything else they believe will help them to become more productive and efficient growers.

This is the case even when there are top-level agronomic services provided to growers in certain markets. They still seek out information themselves and examine advice before acting upon it.

The source of this information tended to be wide ranging. Industry consultants, service providers, industry publications, the internet and other growers were all utilised. One producer in particular stated that any services or equipment they purchase is expected to come with ready backup and advice on all relevant details.

All the irrigators interviewed expressed an interest in the use of field days and seminars to provide opportunities to access the latest information. A common view was that they need to be run intensively with as much quality information as possible. A difference of opinion exists though, as to whether such days should be specific or wide ranging.

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APPENDIX 1: DESCRIPTION OF CASE STUDY SITES

026A POT04 & 027A POT06:

A South Australian grower based in the Kalangadoo area. Apart from potatoes he also produces prime lambs and beef cattle, as well as doing contract seed cutting for other growers. Total production of potatoes is around 121ha of a range of varieties, but mainly Russett Burbanks.

Irrigation equipment consists of a number of centre pivots with guns as needed. The main scheduling tool used is an EnviroSCAN on each site. Visual inspection is also used to back these up and to allow them to assess the crop as a whole.

The grower had two sites, the first being 24ha of Russett Burbanks (POT 04), which was part of a larger pivot. Soils are a mixture of sandy loams and loamy sands (43cm) over sand on a clay base (83cm). Total irrigation depth applied for the season was 421mm (4.21 ML/ha), in 66 events. The cost of the water was $37.04/ha. It was estimated that the crop had a total of 10 stress days for the year, which had no noticeable impact on the crop.

The second site (POT 06) was on leased country south of Mt. Gambier and consisted of 60ha of Russett Burbanks under a centre pivot. Soils are a heavy loam (50cm) over loamy sand. Total irrigation depth applied for the season was 515mm (5.15 ML/ha), in 70 events. The total cost of the water was $98.30/ha. The estimated stress days were 17, causing no noticeable impact on the crop.

025A POT03

Is a grower situated north of Mt. Gambier producing potatoes for the fresh market as well as beef cattle. Total production of potatoes is 146ha of mainly Pontiacs.

Irrigation equipment is a mixture of pivots, single span linear moves and a number of sprinklers used primarily for filling in corners. Irrigation scheduling is assisted through a combination of Gro-Point probes, tensiometers and manual feel.

The project site was a 36.5ha area of Pontiac potatoes irrigated by centre pivot. Soils are loamy sand to sand (45cm) over a clay base. Total irrigation depth applied for the season was 316mm (3.16 ML/ha), in 20 events. This water was accessed at a cost of $46.48/ha. It was estimated that there were a total of 30 stress days for the season, which had minimal impact on the crop.

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029A POT07

Is located in the Lake Mundi district of Victoria. The grower concentrates mainly on a combination of potatoes and prime lamb production. Total production is around 73ha of potatoes a year for the processing market, of which 63ha were Russett Burbanks and 10ha were Ranger Russetts in 1999-2000.

Irrigation equipment is a combination of three pivots and one travelling gun. Irrigation scheduling is aided by the use of an EnviroSCAN on one of the crops, with regular crop walks and holes dug to confirm this over the whole circle.

The site for the project was a 20ha pivot of Russett Burbanks. Soils are generally loamy sands (43cm) over an impermeable clay layer. Total irrigation depth applied for the season was 417mm (4.17 ML/ha), in 69 events. This water cost $65.55/ha for the season. A total of 25 stress days were estimated for the season, with little or no impact on the crop.

APPENDIX 2: INORMATION ABOUT THE IRRIGATION BENCHMARKING MODULE

The aim of this project was to conduct benchmarking exercises with pilot irrigator groups to assist in the development of a stand-alone module for ongoing irrigation benchmarking assessments.

The benchmarking module developed is targeted at comparing individual irrigation units, either within the one property or company, or in a group of independent growers' sites.

The module is intended to be used by a coordinator, who assembles a group of sites for comparison. Individual irrigators receive a manual and a set of questionnaires. The coordinator collates information together following the irrigation season, and uses the benchmarking database to generate the set of performance indicator results.

The module is available now from PIRSA Rural Solutions on CD Rom, and consists of:

- Irrigator Manual
- Irrigator Questionnaires: Crop, Irrigation System and Field Assessment
- Irrigation Schedule Recording Sheet
- Coordinator Manual
- Blank copy of the Irrigation Benchmarking Database (for MS Access*)

*Note: One computer per benchmarking group with Microsoft Access installed (version 97 or more recent) is required for data entry and production of comparison graphs.

Further enquires about the module can be directed to Irrigated Crop Management Service, PIRSA Rural Solutions, Loxton SA 5333 (phone 08 8595 9138).