DEVELOPMENT OF A STRATEGY FOR OPTIMIZING USE OF THE INTERNET IN THE AUSTRALIAN IRRIGATION INDUSTRY

A position paper

April 2002

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Anne Currey, Naturally Resourceful Pty Ltd

National Program *for*
Irrigation Research and Development

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EXECUTIVE SUMMARY

Introduction

This position paper summarises research and investigations to develop a strategy for the effective use of the internet in the Australian irrigation industry.

Information was gathered from a variety of sources including:

- Reviews of selected sites on the internet
- Review of previously published work that investigated the use of the internet in Australian agriculture
- A survey of the irrigation industry
- Review of surveys conducted by other organisations on similar and related topics, and
- Workshop discussions with individuals involved with the industry as a user of information or as an information provider.

Additionally, the principles of knowledge management were used in developing this paper. Knowledge management incorporates much more than developing information that can be accessed through websites, however, many of the principles upon which it is based were found to be relevant to the development of an internet strategy.

Internet applications

The paper reviews the most common ways in which the internet is used. The following applications are reviewed:

Static information
Search engines
Bulletin boards and lists
Interactive applications and E-commerce.

How the internet is used

During the project 315 irrigation internet sites were identified (a full listing is provided in Appendix 1). It was found that examples of all the generic types identified have been developed for the irrigation industry, both in Australia and internationally.

The findings of surveys of internet use in the industry provided information on the current patterns of use in the industry. It was found that the level of use within the industry is equal to the highest level of use recorded in Australia. The internet was also identified as an important source of business information .

A summary of the research indicated that the irrigation industry is a frequent user of the internet. A range of information is sought, including technical information, corporate information and industry news. Australian information is sought, and interactivity through email is highly valued.

Evaluation of public websites

Ten public websites, five research and development corporation sites and five state agency sites, were assessed on the basis of:

- Whether target markets are identified and differentiated.
- Whether that information had been processed in a way to tailor it for use by different "markets" e.g. irrigators, growers, general community.
- How easy the information is to access.

Using these criteria the GRDC site and the AgWA site were the best sites, in that both sites contained all of the preferred features. The sites combined both functionality and a depth of information. The other sites contained fewer of the information products or it was more difficult or took more time to reach the final required information.

Results of a survey of internet use

A survey was designed and distributed by email and posted on a website, seeking specific answers to aspects of internet use in the irrigation industry. The results of the survey confirmed the findings of previous surveys. The following key points emerged:

- Respondents were very familiar with the internet, 82% having their own website.
- A range of uses for their own sites were identified, from provision of corporate to technical information.
- Having a website was seen as important to the organisation.
- Most respondents expected that the internet would become more important and they planned to use the internet more for information provision.
- The internet was identified as an important source of technical information. More respondents identified the internet as a source of technical information than believed they used their own sites to provide technical information.
- No site was identified as the best source of information, although manufacturers sites were the most cited source of useful information.

Knowledge management

A number of concepts that apply to knowledge management were identified as relevant to this project and they were used to guide the development of the strategy. These concepts were:
generating value from knowledge based assets, sharing resources and information, and technology not equalling knowledge management.

Draft strategy

The draft strategy has been founded on eight propositions, which were identified from the previous work, and seven "knowledge levers".

The objective of the strategy was identified as "to allow easy internet access to irrigation information that has been designed to meet the needs of different target markets. The strategy incorporates the element of interactivity so that the information seeking habits of these markets and feedback from them can be tracked and information tailored to meet changing needs."

Key stakeholders were identified as being public organisations that see part of their core business as publishing irrigation information on the internet.

The markets for this information include:

- water users and irrigators
- community and natural resource management groups
- water supply sector
- policy and government
- research and education
- commercial and service sector e.g. resellers, extension agents, consultants

An affiliate program strategy is recommended and the following steps proposed for its establishment.

1. There must be explicit recognition that there are different markets for the research results. In this case the markets might include grape growers, extension staff, wine producing companies and other researchers. (Customer knowledge)
2. The results should be analysed and described in such a way that the implications of the research are clear to each particular audiences identified. (Customer knowledge, knowledge in products and services)
3. The websites most used by each market segment should be identified and an affiliation would be established with each site. This is a recognition of "who owns the market now" and is based on the concept of sharing. (Customer knowledge, stakeholder relationships)
4. Once an affiliation has been established a conventional publicity campaign would be used to alert the markets to the presence of the information. This campaign should also recognise the current information sources of the market. (Stakeholder relationships)
5. If a current email list is available, either owned by the key site or owned by one of the information providers, it should be included as a critical element of the publicity campaign. (Stakeholder relationships, knowledge in products and service)

Before internet affiliations can be established a number of knowledge management issues must be agreed by the affiliating parties. The mechanics of establishing web links are relatively simple but reaching agreement on the ownership, content and preparation of the material may not be as simple.

INTRODUCTION

This position paper has been prepared as part of a project funded by the National Program for Irrigation Research and Development. The project (CLW25) aims to research current use of the internet by the Australian irrigation industry and, based on research findings, make recommendations on an industry wide strategy to maximise the communication opportunities offered by the World Wide Web.

The primary focus of this research project is distribution and communication of technical information, in particular the results of research. All research projects supported by public research funds must prepare and implement a communications strategy to ensure maximum take up of research results. As the internet has grown in use an increasing number of researchers have identified the internet as one of the major ways in which their research results will be communicated.

This project had its origins in the belief that the potential of the internet to communicate this type of information was not being as well used as it could. Accordingly the researchers set out to try and identify how the internet was being used, particularly for this type of information and on the basis of that research propose a strategy to improve the performance.

Information was gathered from a variety of sources including:

- Reviews of selected sites on the internet. Ten websites managed by public organisations, five research and development corporations and five state agencies, were reviewed with regard to their provision of information to the irrigation industry.
- Review of previously published work that investigated the use of the internet in Australian agriculture. The Rural Industries R & D Corporation has funded several pieces of research that look at the way in which the internet is used by agricultural communities generally.
- A survey of the irrigation industry. A survey was designed and distributed to several hundred people in the irrigation industry. The survey was distributed by email and placed on a web site.
- Review of other surveys of the irrigation industry on similar and related topics. During the course of this project the Irrigation Association of Australia Ltd (IAA) surveyed its members. Some of the questions asked about use of the internet. The answers to these questions were used to inform the development of the strategy.
- Workshop discussions with individuals involved with the industry as a user of information or as an information provider. The authors participated in a conference of natural resource communicators and chaired a discussion group that reviewed use of the internet as a mechanism for distributing information to natural resource managers.

This information along with relevant principles of knowledge management were used to develop a series of assumptions from which a strategy has been developed and proposed (see pages 23-24 for an overview of knowledge management).

BACKGROUND

Internet applications

To give context to the use of the internet within the irrigation industry a brief review of the general ways in which the web is used has been prepared. The summary is intended to give an overview of the different sorts of capability and functionality that the internet can provide. This general overview forms a background and context against which the use of the internet in the irrigation industry can be assessed.

It must be noted that neither of the authors are technical specialists with regard to the internet, The overview reflects the descriptions the different web based services offered and not technical assessments or descriptions of the different services.

Static information

The most common form of internet site is one where static information is provided in a series of web pages. These pages are like an electronic version of a publication. They usually contain information about the company or organisation that owns the site and provide contact details.

Such sites can contain technical information in the form of pages that may be read, just as pages in a reference library may be read. The information can also be saved to a disc and viewed later. This form of internet publishing is most closely related to the way in which information is presented in printed media, such as books, magazines and newspapers.

The major difference between publishing on the internet and in hard copy print is that distribution is not limited by the physical distribution of the printed material. Any person who can access the internet can access the information stored on web pages. However while this makes the information available to a global audience, reviews of access statistics to such information indicate that actual audience may not be very much larger than the audience reached by more conventional methods of publication.

The apparent ease with which material can be published on the internet and the potential distribution (or market) for the information has led to a proliferation of sites. For irrigation related subjects this project identified 315 sites containing many pages of text and information. This makes finding the most relevant information for a particular purpose or topic very difficult. This problem led to the development of the next type of internet site to be discussed; search engines.

Search engines

A search engine is a program that acts as a tool to allow users to access and interact with information on websites. There are about 10 common search engines accessible in Australia. To use a search engine the user keys in a particular word or words and begins the search. The sites respond with a list of the matches it has found with the words or phrases entered by the user. Because the search engine looks for a match between words and not for the particular context of the words some strange results may be displayed.

As an example a search using the word *pump* details of a range of sites providing information on a topics including the Roman baths and Pump House in Bath, England, numerous pump manufacturers sites, Pump Hill Farm Cottages and the Australian Pump Manufacturers Association. The result is that the use of search engines requires some care, particularly in the selection of the words that will be used to conduct the search.

Managers of internet sites are frequently offered services that represent that they can make web sites more easily found. The result is that web site managers have to consider in the design of their sites how to make them as visible and as accessible as possible. In many ways this challenge for web site managers is no different from the challenge for advertisers to promote particular consumer brands. In fact many of the same communication rules apply in both situations.

Bulletin boards and lists

One of the real advantages of the internet is the way in which it enables geographically dispersed people to conduct conversations on particular subjects. The way in which this occurs is through bulletin boards and user lists.

In general terms these services enable members of the list of a bulletin board to "post" information on a "board" that is accessible to all members. Frequently the information is posted in the form of a question or request for help but bulletin boards also act to facilitate discussion between group members.

In the irrigation industry there is an international discussion group called 'Irrigation-L". Subscribers to Irrigation L, which is free and open to any person interested in irrigation, pose questions and seek answers from other subscribers. Subscribers can also contribute their expertise to answering questions from other members.

Bulletin boards and lists therefore function as discussion groups between people with specific common interests.

The functionality of bulletin boards and discussion groups varies from site to site. In some the editor or manager of the group maintains control over both who can access the site and the content of the submissions to the site. In others there is a greater degree of freedom and the members of the group themselves determine the rules of behaviour required for that particular site.

Another feature of these sites is that they have varying life spans. Some groups continue for years because the subject matter is relevant and interesting to a large group of subscribers. Other sites, for example those focussed on particular events, may cease when the interest in the particular event has waned. The users themselves determine the currency and importance of the site. If there is no interest and little interaction between members the site will probably close. On the other hand frequent interactions will stimulate an ongoing dialogue and hence a continuing bulletin board.

Interactive applications

A common development of static information sites involves the use of interactive programs. These programs range from the use of video, sound and graphics to present information in a more dynamic way to actual computer programs that are hosted on the website. These programs enable the user to perform simple calculations. As an example a number of

irrigation equipment manufacturers provide programs online to evaluate the performance of specific products, such as pumps. The program acts as a decision support mechanism, enabling the user to input data specific to his application and receive suggestions back on the best piece of equipment to meet their needs.

Banking sites are common examples of interactive sites are that enable users to analyse a range of financial issues, such as interest rates or repayment schedules.

E-Commerce

The most technically advanced application of the internet involves E-commerce, or electronic commerce. As the name suggests E-commerce sites enable users to undertake complete transactions, such as buying goods and services, paying bills, transferring funds and exchanging documents such as orders, invoices and receipts.

Security is an important element of e-commerce and special software has been developed that is promoted as being able to protect confidential details, such as credit card numbers and passwords and bank account details.

Some industries have developed significant on line commerce applications, combining a number of companies, both at a particular point in an industry supply chain but also along a supply chain. These sorts of developments lead to different and new management issues for the companies involved.

Overview of irrigation industry sites

Appendix 1 details 315 internet sites dealing with irrigation. The list includes Australian and international sites.

In the Australian irrigation industry all of the internet applications except e-commerce are common. An attempt has been made to establish an industry e-commerce facility, Irr-E-Com, to enable retailers to source irrigation equipment and products from wholesalers and manufacturers. The venture was not able to attract sufficient commercial support. However a number of individual companies use e-commerce facilities for ordering supplies, managing inventories and transferring funds.

The sites in Appendix 1 have been organised in the following way:

News and events
Discussion lists
Websites
    Irrigation sites
    Agricultural sites
Organisations
    Universities
    Government and public research
    Non profit and industry associations
    Water supply Authorities
Equipment suppliers
    Irrigation equipment

Pumps
Measurement and control
Other equipment
Links to other equipment sites
Irrigation Services
Australian
Other services
Management and Control
Drip/micro irrigation
Sprinkler irrigation
References
Software links
Irrigation Search Engines

The range of topics covered and the number of sites identified indicates the volume of information accessible through the internet. The review also demonstrates the large number of organisations who are using the internet in an attempt to distribute information. It also became apparent during the research that searching the internet for information on a specific topic was difficult. It is also difficult to judge the value of the information provided by both private and commercial sites.

The large number and range of sites is matched by the range in functionality of the sites. The majority of the sites provide information about the organisation managing the site with no specific indication of the target audience of the information. In this way they act mainly as colourful on-line advertisements with little technical value. However, these sites do provide useful background.

The aim of corporate promotion can clearly be seen in many, if not all, websites examined in this study. This is not, of itself, a bad thing. Neither are the two aims of corporate PR and information provision mutually exclusive. However, in terms of information that is immediately usable by a target market group e.g. growers, researchers, some sites were obviously much more sophisticated and aware of marketing (as opposed to promotion) than others. This may possibly reflect the stage of website development.

Da Rin and Groves[2] identified four stages of website development, as follows:

1. the electronic “shingle on the door”
2. the flickering of management interest
3. the professionalisation of the internet
4. the internet organisation.

According to Da Rin and Groves, some websites never get beyond Stage 1 and no large scale organisation is yet at Stage 4 (in Australian agriculture). Some websites might incorporate aspects of different stages or some aspects of the one stage. In other words the characteristics they identify are a guide only and not definitive.

The characteristics of each stage are important considerations when looking at an integrated strategy as they will be a key determinant of whether an integrated strategy is even possible.

[2] Da Rin, J. and Groves, J. (1999), *Demand for and Supply of Internet Content for Australian Farm Businesses*, RIRDC Publication No. 99/2

Characteristics of websites as defined by Da Rin and Groves[3] are as follows:

Stage 1. The electronic shingle on the door. Limited information including basic contact details and information; haphazard updating; in-house design by a committed enthusiast with few resources; not integrated into a broader communications strategy; haphazard promotion so that it may or may not be easy to find using search engines; and absence of research into user needs/limited response to user feedback.

Stage 2. Flickering of management interest. More substantial but still incomplete information provision; more use of feedback mechanisms such as email, mainly in relation to website design; external site design with some accepted principles of web design, presentation and promotion incorporated, but probably focusing more on presentation and less on target audience needs or circumstances (e.g. slow lines and the problems with download times caused by complex designs with lots of graphics); and substantial promotion of the site, including via means other than the internet.

Stage 3. Professional website. Based on some research into user needs, integrated into a thorough understanding of the organisation's information and communication resources and strategies; much of the information published by the organisation will be on the site, including access to interactive databases; integration into organisation's communication strategy; design in house or external but in accordance with available standards and sensitive to capabilities of users; and resources dedicated to site development and maintenance.

Da Rin and Groves noted that many of the organisations surveyed by them aspired to this stage of development.

Stage 4. The internet organisation. The internet organisation is defined as an organisation "that has reoriented itself to entirely take maximum advantage of the opportunities the internet offers. In addition to the characteristics of stage 3, this stage includes: using the internet as one of, if not the, major means of information delivery; interactive mechanisms such as email used for a large proportion of internal and external communication with user feedback and communications a major influencer within the organisation; and direct authorship available throughout the organisation."

"Ultimately, those opportunities are only limited by human imagination. However, at this stage they are subject to very real constraints including technology, security, infrastructure and penetration among target audiences, which is why no organisation in Australian agriculture has reached this stage, and no respondent to the survey indicated a determination to attempt to reach this stage." (Da Rin and Groves, page 65.)

More detailed analysis of some of the websites is discussed over the page in an evaluation of the information provision aspects of the sites.

[3] Da Rin, J. and Groves, J., Op.cit, Pp 61-65

HOW THE INTERNET IS USED

What are users of irrigation websites looking for?

From a survey completed by the Irrigation Association of Australia in September 2001, a high priority for users of irrigation websites was “up-to-date technical information”. The survey also highlighted the importance of the internet as a source of information for the survey sample.

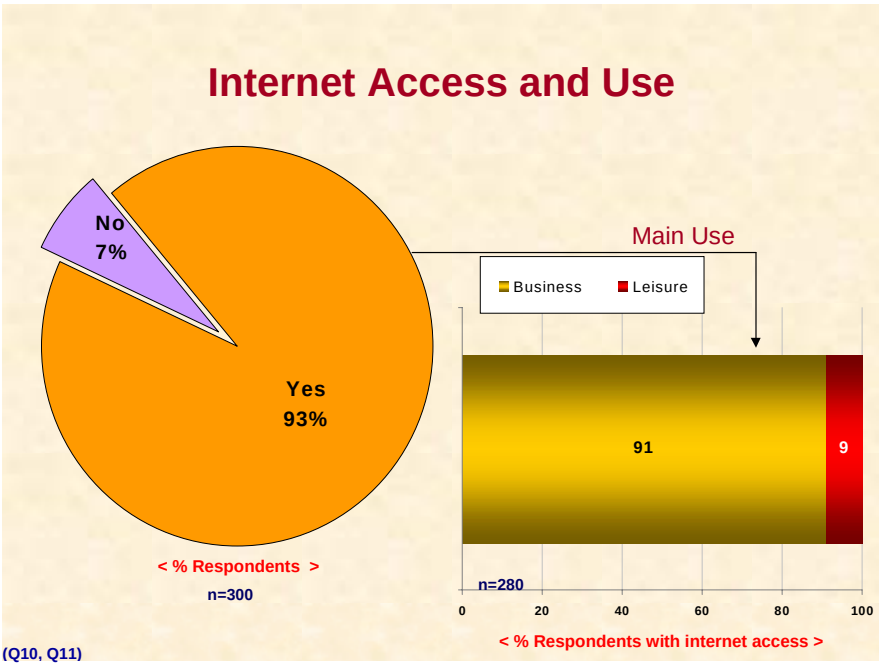

Figure 1. Internet Access and Use, IAA Member Survey

Figure 1 details the responses to questions relating to whether the internet was used and whether the use was for business purposes or for leisure. The report noted:

“Internet access was high among respondents, with 93% having access to the internet. Compared to the Australian population norm, which is about 45%, this is extremely high – comparable to the rate of internet access among young Australians aged 6-17 (92%). This factor, combined with the finding that 91% of members and non-members with internet access utilise the internet for mainly business purposes, offers a great opportunity for the IAA to impact upon current and potential members via its website, and email.”

The research by Da Rin and Groves[1.] found that the contact details of people in the organisations, as well as email feedback, were rated highly and as important as technical information to websites by farmers. This accords with a recent general trend where interactivity, as promoted through email feedback and contact, is recognised as the key use of the internet (Brice and Mussared, pers. comm.).

The following figures from Hitwise Australia [3], an Internet Research Company that provides statistical information on the behaviour of web users, highlights the following about people who search for agricultural information:

- 88.2% of Australian traffic to the agriculture category was directed at Australian websites
- traffic is consistently viewed throughout the week
- demographics is similar with 54% of Australian users being male between 25 and 54 years of age
- the average amount of time spent of each web site is 8 minutes and 5 seconds
- most searches are conducted in New South Wales at 30%, Tasmania 23%, Victoria 17%, Queensland 16%, Western Australia 19%, with the balance between South Australia, Northern Territory and the Australian Capital Territory.

At a workshop for natural resource communicators in Canberra, convened by the Murray Darling Basin Commission (Natural Resource Communicators Conference, 1-14 November 2001, "Growing Or Future Communication Landscapes") a number of observations were recorded about what users were looking for in websites. These were:

> "*More information is needed on websites NOT public relations material, there is a need for Quality Assurance. For example, how do users know that they can trust the information on the site?"*
>
> *"Integration of email (newsflash targeted summary), website (more detailed information) and a personal approach."*
>
> *"The future is to make the net less of a library and more interactive. For example more customised information and to come closer to human contact > VALUE ADDING."*

In summary, web users from the major Australian agricultural regions, of working age, spend time researching Australian agricultural information online. This information includes industry news, products and services.

A summary of the above information indicates the following:

> The irrigation industry is a frequent user of the internet
> A range of information is sought including technical information, corporate information and industry news
> Australian information is sought
> Interactivity through email is highly valued.

What is the aim of website owners?

This does not vary from the purpose of agricultural websites as reported in Da Rin and Groves. These purposes were as follows: publicity of organisation, provision of information for users, provision of services to clients, e-commerce, and efficient means of communicating.

It was also noted by Da Rin and Groves that "Overall, content providers' own interests (publicity) rated highly as those of users."

The aim of corporate promotion can clearly be seen in many, if not all, websites examined in this study. This is not, of itself, a bad thing. Neither are the two aims of corporate PR and information provision mutually exclusive. However, in terms of information that is immediately usable by a target market group e.g. growers, researchers, some sites were obviously much more sophisticated and aware of marketing (as opposed to promotion) than others.

The Canberra workshop made a number of observations of relevance to website managers. It was proposed that taking one or more of the following actions would increase the attraction and usefulness of websites.

> *"Potential of the web is for portal sites, for example at regional level, that have local information and links to other sites. Those groups who do this creatively will have the sites that survive."*
>
> *"Skill is to identify audience and its needs and produce information in a creative way to satisfy the needs – "tailor the website experience". Also recognise that it cannot meet all needs."*
>
> *"More collaboration. Loading natural resource management information onto a site that is popular and has lots of hits."*

Website owners and managers from individual organisations will aim to meet the corporate needs of their organisation as a first priority. If the provision of technical information is one of their aims, then the organisation should take into consideration the identifiable needs and wishes of their clients.

EVALUATION OF PUBLIC WEBSITES

For this project we chose to look at public websites relevant to the irrigation industry and assessed them on the basis of:

- whether target markets are identified and differentiated
- whether that information had been processed in a way to tailor it for use by different "markets" e.g. irrigators, growers, general community
- how easy the information is to access.

Given the previous research it was decided that one of the ways in which these websites would be evaluated would be on the extent to which they differentiate between different target markets for their information. For example, a research and development corporation could prepare research reports for either a researcher, an irrigator or a general community market. The explicit recognition on the website of these different target audiences is a clear sign that the website manager recognises some market segmentation.

The next criterion to be assessed was the extent to which the information made available from the site was tailored for the different market segments. As a general observation the traditional extension agencies such as departments of agriculture were more likely to tailor information to the needs of users (farmers).

Finally the sites were judged on the ease of access to information. Ease of access is related to a number of factors including the menu structures on the site, that will determine how easily the information can be found, whether information can be downloaded or whether it is made available through some other method e.g. sales.

Many sites have a combination of downloadable and sales information. Intuitively, and from our own experience, we are much more likely to access information if it is:

- immediately available
- what we are looking for i.e. it answers questions we have at the time or provides information in a timely way on a topic of particular interest.

Using these three criteria five research and development corporation sites and five State agency sites that were examined. They were:

Grains Research; http://www.grdc.com.au
National Program for Irrigation Research; http://www.npird.gov.au
Cotton Research; http://www.crdc.com.au
Horticulture Australia; http://www.horticulture.com.au
Sugar Research; http://www.srdc.gov.au
Primary Industries, Qld; http://www.dpi.qld.gov.au
NSW Agriculture; http://www.agric.nsw.gov.au/
Agriculture Victoria; http://www.nre.vic.gov.au/
Primary Industries SA; http://www.pir.sa.gov.au and
Agriculture Western Australia; http://agric.wa.gov.au

Table 1 summarises the results of this evaluation.

Table 1. Evaluation of Public Websites

Organisation	Market segmentation	Information tailoring	Ease of Access
R & D Corporations NPIRD	No segmentation of the market	Reports and publications not differentiated for different markets/users	♦ Easy to access ♦ Limited information ♦ Some value adding with Irrigation Insights ♦ Information free
GRDC	Yes, for growers, researchers, consumers plus bookshop	Yes, information in each section customized for the market segment	♦ Easy to find ♦ Large range of information ♦ Research reports interpreted for farmers
CRDC	Yes, for growers, researchers and community	Little technical information for different segments Non technical information tailored for segments, for example corporate information	♦ OK to access ♦ Small range of information ♦ No interpretation of information ♦ Research reports contain little technical info ♦ Information free
HAL	No segmentation	Information is prepared for different sectors but each sector must find and choose their information	♦ Keyword search for topic, information product and funding mechanism ♦ Must buy reports ♦ Large range of information ♦ Site set up for e-commerce, has shopping catalogue etc
SRDC	No segmentation	R & D reports tailored for non technical audience	♦ Good range of information, technical and corporate ♦ Some R&D reports free ♦ Some available from SRDC ♦ R&D reports have interpretation for growers

State Agencies Qld DPI	No segmentation	Technical information tailored for farmers. Corporate information presented for a single audience	♦ Search engine yielded 200 “hits” for irrigation ♦ Information freely available ♦ Easy access ♦ Interpretation in some information ♦ Contains corporate, technical and market information
NSW Ag	Market segmented by topic and interest	Range of information on the site, from corporate to farmer notes. Some tailoring of information	♦ Simple keyword search available ♦ Range of information provided ♦ Freely available ♦ Difficult to evaluate quality of information
AgVic	Range of topics, some segmentation implicit in topic choices, eg agriculture in the classroom for schools	Information highlighted and described with brief abstract. Tailoring of information	♦ Keyword search ♦ Easy access ♦ Good description of search results ♦ Freely available ♦ Broad range of information from technical to corporate
PIRSA	Market segmentation in home page menu	Information search reveals range of information, some has been tailored for specific markets	♦ Not as easy to find initial information ♦ Keyword search works well ♦ Similar product and information range to Vic ♦ Information free ♦ On-line bookshop facility

Agriculture WA	Segmentation by topic	Range of tailored info	♦ Excellent initial menu ♦ Keyword search ♦ Search results classified into document type eg farm note, tech note etc ♦ Info free ♦ On line book facility

Table 1 is an overview of the differences between the ten websites. The same word "irrigation" was used to search each site, if a keyword search was available. Some significant differences emerged from a user point of view.

Some sites, for example the Agriculture WA site, provided the following information in response to the search:

- Number of records
- What each record was, i.e. document or links
- The type of document, i.e. journal article, farm technical note
- Additional key words to describe the contents
- Author's name
- Title of the publication.

The site also provides a very clear initial menu that makes it clear which categories of information are available and also recognizes different potential users or market segments by its description of the information. For example one section dealt with careers in the organisation, while another choice highlighted the publications and documents available. This information was also presented in two ways, firstly as a generic group and also by subject area so that the user was offered different routes to the information.

Importantly all of this information was available from the first menu.

Not all of these features were available on the other nine websites, even though it was clear that all of the websites could be classified as professional, according to the four-point classification system of Da Rin and Groves.

On the basis of the criteria used to judge these ten sites the GRDC site and the AgWA site were the best sites, in that both sites contained all of the preferred features. The sites combined both functionality and a depth of information. The other sites contained fewer of the information products or it was more difficult or took more time to reach the final required information.

RESULTS OF A SURVEY OF INTERNET USE

During the project a survey was carried out to determine internet use patterns within the Australian irrigation industry. The survey was placed on the National Irrigation Science Network website and respondents were invited to complete the survey on-line. To encourage people to complete the survey and to inform them that the survey was being conducted a series of announcements were placed in both the print media and a range of web sites that deal with irrigation issues. As well copies of the questionnaire were emailed to over 500 individuals, who were part of irrigation industry newsletters asking them to complete the survey.

The survey ran for a period of two months, from August to September 2001. Thirty-nine responses to the survey were recorded, a low number considering the large number of potential responses that could have been generated. Notwithstanding the low number of responses it does represent a statistically valid sample from which general trends can be deduced.

The analysis below considers each question from the survey, draws conclusions from the results and discusses the implications of the results. It is important to note that the response recorded in the tables below represent the number of responses to a particular section of each question. Not all respondents answered all questions, or all parts of a single question. When questions enabled respondents to select more than one answer, for example Question 7, each response was recorded. This explains why the total of responses to each question does not necessarily add to 39, the number of completed questionnaires received.

Question 1 sought to establish the type of organisation to which the respondents belonged. Just over half the respondents were from the commercial sector, with research and educational institutions the next best represented. This question should be considered in combination with the answers to questions 2-4.

Question 1
Survey Responses

Question	*Response*
1. What is the role/s of your organisation	2
Industry eg association, commodity organisation,	18
water user group	2
Commercial eg retailer, manufacturer, consultant	9 8
Technical eg extension agency	-
Research	
Education	
Other	

Questions 2-5 also sought to establish the general status of the respondents in regard to the internet. Eighty two per cent of respondents had a web site established for their organisation. The answers to Question 3 indicate that the majority of the sites are more than two years old. This suggests that members of the wider irrigation industry are familiar with and have been using the internet for some time. Eighty three per cent of those who

responded indicated that a specific person was the designated web site manager. The manager of the website was more likely to be a member of the organisation rather than an external contractor.

Questions 2, 3, 4 & 5
Survey Responses

Question	*Response*
2. Does your organisation have a website?	
Yes	32
No	7
3. Age of website	
< 12 months	3
1 – 2 years	5
> 2 years	24
4. Do you have a website manager?	
Yes	26
No	5
5. Is the manager a staff member or a contractor?	
Staff	18
Contract	8

The responses to Question 6 suggest that organisations tend to establish sites without deciding a comprehensive updating strategy. Of the 31 responses recorded fifteen organisations update their websites irregularly, in this context this means at more than monthly intervals, while three update monthly, six weekly and five on a daily basis.

This could imply that a substantial quantity of the information being posted on websites is not time sensitive.

Question 6
Survey Responses

Question	*Response*
6. How often is your site updated?	
Daily	5
Weekly	6
Monthly	3
Irregularly	15

Question 7 began to investigate the use and purpose of the websites developed by the respondents. Twenty-one responses were recorded in answer to this question. Seven respondents indicated that organisation news was the purpose of the site, six respondents nominated product or service marketing and five indicated that distribution of research information was the main information aim. These responses are further evidence that many organisations use their websites for distributing public relations and marketing information rather than as a way of distributing technical information.

It is also possible that those organisations providing research information were providing information about the organisation, for example about how they allocate research resources, what projects they support as well as possibly some information about research results.

Only one respondent specifically identified the provision of technical information as the main purpose of the organisation's website.

Question 7
Survey Responses

Question	*Response*
7. What are the main information aims of website?	
Organisation news	7
Industry information and/or updates	2
Product or service marketing information for clients	6
Technical information	1
Members services	-
Water trading	-
Research information	5
Other (*please specify)*	

Twenty out of the thirt-one respondents to Question 8 replied that their website was either very import or important to the organization. This suggests that the internet is already perceived as an important marketing tool for organisations in the industry. These responses when considered in association with the responses to Question 12 in regard to the future use of the internet make it clear that respondents believe that the importance of use of the internet will increase.

Question 8
Survey Responses

Question	*Response*
8. How important is your website in your general communication or information strategy?	
Very important	11
Important	9
Somewhat important	4
Not very important	7

Just over 50% of respondents reported interactive applications on their websites.

Question 9
Survey Responses

Question	*Response*
9. **Do you have any interactive applications on your website e.g. e-commerce, email updates and responses, chat / list**	16

server, online calculations? Yes No	15

The interactive applications reported were identified either as e-commerce, selling of organisational product including hardware or information, email facilities and searchable databases. One organisation also managed a discussion group.

Only one respondent who currently does not have interactive applications indicated that they were going to develop more interactive functionality.

The fact that a majority of organisation with websites have developed interactive capabilities is evidence that the industry is reasonably well served, although it should be noted that no analysis of the quality of the sites has been conducted and all of the functionality has been identified by the website managers.

Question 11
Survey Responses

Question	*Response*
11. **Who is the target audience/s for your web site**?	6
Buyers of your goods or services	2
Irrigators	2
Researchers	2
Educational institutions	3
Staff	8
General public	1
Business associates	2 (all above)
Other (*please specify)*	

Most respondents identified either the general public or buyers of their goods and services as the key target markets for their sites. A minority of respondents identified specific market segments, although some of the specific targets mentioned would be included in the general public category and the buyer's category.

This could mean that the majority of the sites are more of the corporate information type rather than sites that have concentrated on tailoring information for specific markets.

Question 12
Survey Responses

Question	*Response*
12. **How do you intend to use the internet in the future in your organisation?**	5
More Info	1
Same Info	-
Less info	
How?	2
Organisation news	3
Industry information and/or updates	5
Product/service marketing information for clients	5 2

Technical information	-
Members services	6
Water trading	-
Research information	
Other (*please specify)*	

Of the six respondents who answered the question five intended using the internet more. The responses to the second part of the question imply a more of the same policy as far as the information to be supplied is concerned. Product, technical and research information were the most commonly identified categories.

Question 13
Survey Responses

Question	*Response*
13. Do you use the internet as a source of irrigation information?	
Yes	33
No	6

The responses to Question 13 confirm the results of other surveys. A majority of the irrigation industry uses the internet as a source of information. In this case 84% of respondents indicated that they use the internet.

Question 14
Survey Responses

Question	*Response*
14. What irrigation information do you obtain from the internet?	
Company news	-
Industry information and/or updates	7
Product/service marketing information	3
Technical information	13
Members services	1
Water trading	-
Research information	9
Financial information	-
Marketing information	-
Bulletin Boards	-
Other	4 (all above)

The information sought by respondents also confirms the information collected in other research. Technical, research and industry information were most nominated. Four respondents nominated all of the information categories.

Over 30 different sites were reported as being most useful in response to **Question 15. Most useful irrigation websites.** A variety of manufacturers sites with 8 “hits” were the most frequently mentioned. Other sites with more than three “hits” were the IAA Ltd site (6), State agencies (4), Discussion groups (4) commodity producer groups (3) and other associations such as Australian National Committee on Irrigation and Drainage and the

Australian Water Association (4). These responses provide further confirmation of the types of information that internet users are looking.

Four users who did not nominate specific websites indicated that the reason why they did not nominate specific sites was because when they looked for information they searched on a topic basis and not by referring to a specific organisation.

Question 16
Survey Responses

Question	*Response*
16. Is there any irrigation information you would like to access but cannot?	
Yes	14
No	18

Approximately 56% of the responses to Question 16 said that they were not satisfied with the current access to information.

The type of information that respondents were looking for was in three categories. The most demanded type of information was described as technical information (6), irrigation statistics, for example volume of water used on specific crops (6) and industry information defined as "people/organisations in the industry (i.e. a network map)" (2).

Approximately 33% of respondents contributed to technical bulletin boards.

Question 17
Survey Responses

Question	*Response*
17. Do you contribute to technical bulletin boards?	
Yes	13
No	26

In the final question respondents were asked whether they would contribute information to an industry site. Seventy seven per cent indicated that they would contribute to an industry site. This has important implications for the strategic use of the internet, since one potential strategy for the industry is to increase the amount of information sharing. This does not imply surrender of copyright, but it could require some alternative approaches to information management.

It is also important to note that these responses did not indicate the type of information that organisations were willing to share. It is reasonable to assume that much public information, such as contact details and the range of products and services would be available for sharing. It may be that organisations would be more circumspect about information that they regard as proprietary, such as detailed technical information.

Question 18
Survey Responses

Question	*Response*
18. Would you contribute information to an industry website?	

Yes	28
No	8

Summary

The survey confirms the findings of other surveys of internet use. The following key points emerged:

- Respondents were very familiar with the internet, 82% having their own website.
- A range of uses for their own sites were identified, from provision of corporate to technical information.
- Having a website was seen as important to the organisation.
- Most respondents expected that the internet would become more important and they planned to use the internet more for information provision.
- The internet was identified as an important source of technical information. More respondents identified the internet as a source of technical information than believed they used their own sites to provide technical information.
- No site was identified as the best source of information, although manufacturers sites were the most cited source of useful information.

KNOWLEDGE MANAGEMENT

Knowledge management has been used in business for at least a decade. While there are a number of definitions of the term, for the purposes of this project the following was used:

> "Knowledge management (KM) is the process through which organizations generate value from their intellectual and knowledge-based assets. Most often, generating value from such assets involves sharing them among employees, departments and even with other companies in an effort to devise best practices. It's important to note that the definition says nothing about technology; while KM is often facilitated by IT, technology by itself is not KM." [4]

From this definition it can be seen that knowledge management is a complex and all encompassing management strategy. It is not in the scope of this project to make recommendations on a knowledge management strategy of this scale. However, a number of concepts that apply to knowledge management are relevant to this project, and they have been used to guide the development of the strategy.

Three key concepts referred to in the definition are those of generating value from intellectual and knowledge based assets, sharing, and technology not equalling knowledge management.

These concepts are significant for this project in the following ways:

Generating value from intellectual and knowledge based assets. All public agencies in Australia that have a role in irrigation, e.g. those mentioned on page 12 of this paper, produce information and make it available through a number of mediums, including the internet.

Most, if not all, would say that they generate value for themselves and for their clients in doing this. But do these organizations really "know what they know", or what other organizations know, about the topic of irrigation? In other words, does everyone in the organization share the same knowledge base and understand the significance of the information?

One of the results of not knowing is the risk of duplication of effort within an organization or by organizations working in the same area. Another risk is that of potentially important information becoming "lost" in the system because its value is not recognised or because of the way the information is presented e.g. as a report on research completed rather than as a practical guide for irrigators.

From a knowledge management perspective, important questions to ask are:

- What knowledge assets do we have?
- How should we manage those assets to ensure a maximum return on them?
- How do we manage those assets to ensure they are accessible?

[4] Santosus,M.and Surmacz, J. (2001), Knowledge Management Research Center website, http://www.cio.com/research/knowledge/edit/kmabcs.html, Posted May 23, 2001

- How do we manage them to ensure they meet the needs of clients (including its applicability to the client's own situation)?

In asking these questions it is essential to remember that not all information is valuable. One influence in determining the value of information is obviously the core business and mission of the organization. Just as important are the information needs of the organization's clients.

Sharing. In this context we have taken "sharing" to be sharing resources and information internally within an organization (e.g. between program areas) and as well as externally between organizations. One result of sharing could be information integrated from a number of sources and made available by those sources individually or through a centralised access point.

Technology does not equal knowledge management. A danger when dealing with knowledge management is to let the technology take over.

> *"Knowledge management is not a technology-based concept…Companies that implement a centralized database system, electronic message board, Web portal or any other collaborative tool in the hope that they've established a knowledge management program are wasting both their time and money.*
>
> *While technology can support knowledge management, it's not the starting point of a knowledge management program. Make knowledge management decisions based on who (people), what (knowledge) and why (business objectives). Save the how (technology) for last."*[5]

[5] Santosus, M.and Surmacz, J. (2001), Op cit

A DRAFT STRATEGY FOR USE OF THE INTERNET

Introduction

In developing the draft strategy we have referred to the mission of the National Program for Irrigation Research and Development, i.e. “To provide leadership for national irrigation research and development and facilitate the adoption of technology that improves natural resource sustainability and the economic viability of irrigated regions”. The aspect of this statement that is most relevant to this strategy is that of facilitating the adoption of technology by making information more accessible and applicable. It also is an extension of the NPIRD communications strategy.

While the strategy proposed in this paper has been developed as a result of discussions with industry, surveying of opinion and with reference to NPIRD priorities, it is important to remember that for the strategy to be successful it must be accepted and “internalised” by other organizations. Even though an organization may agree with the strategy, the process of internalising and implementing it will take some time, measured in years rather than months.

Propositions

The results of the surveys, workshops and the reviews of the existing information sources have been used to formulate a number of propositions from which the draft strategy has been developed. These propositions also incorporate the three key concepts of knowledge management outlined on pages 23-24.

1. The survey of the membership of the Irrigation Association of Australia Ltd found that over 90% of members had access to and used the internet as a source of information. This high level of use is evidence that the internet, if used effectively, could be an extremely useful tool for distributing information to the irrigation industry.

2. Information has to be presented to the user of the information in such a way that they can use the information easily. Research has indicated that people will only search for information for a short time. Information must be both easy to find and easy to understand. As an example a report on a research project will not be of interest to an irrigator unless the implications of the research are immediately clear. Most information reviewed is not in this form, as a result further “processing” of the information by the user is required.

3. Information providers must clearly identify the market for their information and present it in a form that each market segment requires. Information providers must also acknowledge the different segments in their markets.

4. People usually search for information on a topic basis and not by organisation. This has implications for organisations which must decide how to develop linkages with other information providers. This cooperation could take the form of sharing or contributing information to a common site or by sharing a hub that directs users to a range of information sources on a particular topic.

5. The ownership of technical information is not unique to a single information provider. There are many potential providers of information for the industry in both the private and public sectors.

6. Information providers and information users have quite different legitimate corporate goals in regard to specific pieces of information.

7. The most commonly sought information is technical, research and industry information.

8. It should be clear to users how to avoid information that is not of interest to them that is present on websites they visit.

These propositions are not new and similar views have been proposed before. The new research conducted for this project, the surveys and workshops, have confirmed the findings of earlier studies.

As well as these propositions, the draft strategy is founded on a number of "knowledge levers" (see Table 2), in particular customer knowledge, stakeholder relationships, organisational memory, knowledge in products and services and knowledge in people.

Table 2. Seven knowledge levers

Lever	Key activities
Customer knowledge	Developing deep knowledge sharing relationships. Understanding the needs of your customers' customers. Articulating unmet needs. Identifying new opportunities.
Stakeholder relationships	Improving knowledge flows between suppliers, employees, shareholders, community etc. using this knowledge to inform key strategies.
Business environment insights	Systematic environmental scanning, including political, economic, technology, social and environmental trends. Competitor analysis. Market intelligence systems.
Organizational memory	Knowledge sharing. Best practice databases. Directories of expertise. Online documents, procedures and discussion forums. Intranets.
Knowledge in processes	Embedding knowledge into business processes and management decision making.
Knowledge in products and services	Knowledge embedded in products. Surround products with knowledge e.g. in user guides, and enhanced knowledge-intensive services.
Knowledge in people	Knowledge sharing fairs. Innovation workshops. Expert and learning networks. Communities of knowledge practice.

Before proposing a strategy to make better use of the internet within the irrigation industry it is worthwhile restating the purpose of the research.

The proposition is that distribution of technical information, including the results of research, through the internet can be made more efficient and that improving the efficiency of communication through this medium is a worthwhile goal.

The high level of internet use recorded by all the studies referred to makes it clear that an opportunity exists to improve the flow of information and potentially improve the rate of adoption of key innovations. The levels of use indicate that the industry is willing to exploit the opportunities offered by the internet. The challenge is for the providers of information to make the information accessible in a form that is easily used.

In general terms the strategy must enable users to find information quickly and easily and information must be readily applied in their business situation. Before information is made available it must be reviewed and if necessary, interpreted, so that users can understand it. The source of information should be credible and as far as possible independent of commercial bias.

Objective

The objective of the strategy is to allow easy internet access to irrigation information that has been designed to meet the needs of different target markets. The strategy incorporates the element of interactivity so that the information seeking habits of these markets and feedback from them can be tracked and information tailored to meet changing needs.

Who to involve

Public organizations who see part of their core business as publishing irrigation information on the internet. A number of these organizations have already been identified (see Table 1, page 13).

Important at this stage is to determine the priority these organizations put on the provision of information through the internet i.e. determine which stage each organization's website is at and future plans for development, according to the categories described by Da Rin and Groves (see page 6). This will be a key determinant of which organizations are ultimately involved in the strategy. If any are not committed to the objective above, or if their website is at stage 1 or 2 and further development is not planned, then it is unlikely that they would be involved in this strategy.

Markets

Target markets for this information need to be segmented. The following is a guide to these markets:

- water users and irrigators
- community and natural resource management groups
- water supply sector
- policy and government
- research and education
- commercial and service sector e.g. resellers, extension agents, consultants

First step

As a first step organizations involved in the strategy need to identify what knowledge assets they have.

Affiliate program strategy

Once these assets have been identified a mechanism needs to be developed that answers the following questions:

- How should we manage those assets to ensure a maximum return on them?
- How do we manage those assets to ensure they are accessible?
- How do we manage them to ensure they meet the needs of clients (including its applicability to the client's own situation)?

One way of doing this is through an affiliate program, which is the process of creating a network of online partners who can refer "business", e.g. in form of requests for information and sales orders to one site through their own site. The number and origin of visitors to the site is tracked, enabling qualitative and quantitative information about visitors to site to be collated. This information can be extremely powerful. As an example, including a facility for visitors to ask questions will allow for a section on FAQs to be developed. It also will provide a feedback mechanism that provides up-to-date indication of information needs of particular markets. This information can then be used for a number of purposes, including being used to help shape research directions and to tailor information to meet market needs.

As an example consider a research project on partial root zone drying. Let us assume that a research project has been funded by NPIRD, the work has been carried out on grapevines at Mildura by staff from CSIRO Division of Plant Industries and NRE, Victoria. Under current practice it is likely that a research report would be published on three websites, NPIRD, CSIRO and NRE. The information may or may not have been prepared for different audiences. If the organisations are well organised they may distribute press releases to announce the results of the research. An affiliate program would result in a coordinated approach that is different.

The following steps could be followed to establish an affiliate strategy.

1. There must be explicit recognition that there are different markets for the research results. In this case the markets might include grape growers, extension staff, wine producing companies and other researchers. (Customer knowledge)
2. The results should be analysed and described in such a way that the implications of the research are clear to each particular audiences identified. (Customer knowledge, knowledge in products and services)
3. The websites most used by each market segment should be identified and an affiliation would be established with each site. This is a recognition of "who owns the market now" and is based on the concept of sharing. (Customer knowledge, stakeholder relationships)

4. Once an affiliation has been established a conventional publicity campaign would be used to alert the markets to the presence of the information. This campaign should also recognise the current information sources of the market. (Stakeholder relationships)
5. If a current email list is available, either owned by the key site or owned by one of the information providers, it should be included as a critical element of the publicity campaign. (Stakeholder relationships, knowledge in products and service)

The internet strategy is one part of a comprehensive communications strategy that will use other means of communicating with the target audiences such as seminars, workshops, field days and newsletters. All of these venues should also have directions on how to access the information on the internet.

The website most visited by farmers is The Farm Shed Web Site, www.thefarmshed.com.au (Australia's No. 1 agricultural site)[6]. The information can also be posted on the three research organisation's websites but a key link will be from the industry site. By affiliating with these popular websites (as they already have traffic), the research organizations, the researchers and the research itself gain exposure. The initial access site may also endorse the information to their visitors through text and articles.

It is possible to deal with proprietary information in this way as well by linking to the site of the owner of the information who can still offer e-commerce facilities. A small fee could be paid to the directing site.

The key difference in approach is the way in which the information is offered to the market. The key step in the proposed strategy is to identify the organisation or organisations that "owns/own" the market currently. The technical capacity of the internet to map and track traffic makes possible affiliations that are much harder to manage in conventional business situations.

Establishing affiliations

The simplest way to implement such a strategy is to build the affiliations on a case-by-case basis. However, it may be possible to establish a single website specifically designed to act as an information hub for the irrigation industry. A consortium of existing organisations as identified above could create such a site or alternatively an industry organisation such as ANCID or the IAA could be encouraged to invest in the site.

Before internet affiliations can be established a number of knowledge management issues must be agreed by the affiliating parties. The mechanics of establishing web links are relatively simple but reaching agreement on the ownership, content and preparation of the material may not be as simple.

Some organisations may not be prepared to affiliate with others, for example a State agency may decide not to affiliate with a commercial organisation or technology supplier.

[6] www.thefarmshed.com.au Hitwise Australia, www.hitwise.com.au, Search conducted 31 August 2001 with 28.54% market share

APPENDIX 1. LISTING OF KEY IRRIGATION WEBSITES

Land and Water News	News	http://www.lawnmedia.com.au/index.htm
F@rmingOn-line	Rural News Group: Rural headlines; Market reports; rural classifieds; industry forums; and rural employment opportunities.	mailto:F@rmingOn-line
Farmwide Online	National Farmer's Federation initiative to help farmers connecting to the internet.	http://www.farmwide.com.au
National Farmer's Federation.	Latest news and issues affecting Australian farmers.	http://www.nff.org.au
Rural Press Grainlist	Grain Market Reports	
Uni Kassel Virtual library - News	Listings of news, events and conferences from all over the world.	http://www.wiz.uni-kassel.de/kww/projekte/irrig/news/news_i.html
Irrigation News you can use	From IGIN Virtual Trade Show.	http://www.igin.com/vts/index.html
The Irrigation Association		http://www.irrigation.org/
Irrigation Journal	From Green-Net Homepage.	http://www.greenindustry.com/ij/current/
TORO -National Support Network		http://www.lljohnson.com/nsnmain.html
James Hardie Irrigation News		http://www.ir.jameshardie.com.au/jh_ir/ir_news.asp
NAAN - Irrigation Systems		http://www.naan.co.il/naan/
UWIN Press Releases		http://www.uwin.siu.edu/announce/press/
Irrigation Jobs	American Site	http://www.irrigationjobs.com/
Events		
Green-Net	Calendar of Events from Green-Net Homepage	http://www.greenindustry.com/calendar/esearch.asp
Micro Irrigation Forum	Future conferences, meetings and seminars in Micro Irrigation from Micro Irrigation Forum, WRML	http://www.microirrigationforum.com/new/meetings/
UWIN Events		http://www.uwin.siu.edu/announce/event/
Discussion Lists		
IRRIGATION-L	Discussion List IRRIGATION-L	http://www.wiz.uni-kassel.de/kww/projekte/irrig/irrigation-l/irrigation-l_i.html

TRICKLE-L	**Trickle-L Irrigation Discussion Group**	**http://www.ars.usda.gov/is/pr/1997/trickle0597.htm**
SALINITY-L	**Discussion List SALINITY-L**	**http://www.wiz.uni-kassel.de/kww/projekte/irrig/dif/salinity-l.html**
SoWaCS	**Discussion List SoWaCS**	**http://www.wiz.uni-kassel.de/kww/projekte/irrig/dif/sowacs.html**
CCI -- Ag E-mail	**CCI -- Ag E-mail Discussion Groups**	**http://www.agpr.com/agpr_htmls/maillist.html**
Discussion Groups		
Agriculture Online Talk	**The Talk section of Ag online is a global coffee shop for agriculturalists. Successful Farming editors and Ag Online content partners have developed the TOPICS below to get things started, but in the future you will be able to create your own discussion groups. In regard to irrigation there is a discussion group on Center Pivot Irrigation.**	**http://www.agcanada.com/AgTalk/AgTalk.htm**
IGIN'S Bulletin Board	**The place where you can ask technical questions of other professionals, post your feedback comments, or anything else related to the Irrigation and Green Industry Network.**	**http://www.igin.com/cgi-bin/Ultimate.cgi?action=intro**
GreenNet Chat Forum		**http://www.greenindustry.com:8080/~green**
Websites		
Irrigation		
WWW Virtual Library IRRIGATION	**A very comprehensive irrigation library dealing with all facets of irrigation. Based at the University of Kassel, Germany.**	**http://www.wiz.uni-kassel.de/kww/projekte/irrig/irrig_i.html**
Irrigation & Green Industry Network (IGIN)	**Huge American based site containing irrigation news, products and reports.**	**http://www.igin.com/**
Irrigation Association of Australia	**The official site of the Irrigation Association of Australia.**	**http://www.irrigation.org.au/**
Green-Net Homepage	**Resource guide for landscape, irrigation, turfgrass, and tree care industry professionals.**	**http://www.gn.apc.org/**

Irrigation On-Line	**Resource guide for landscape, golf and agricultural irrigation.**	**http://www.irrigation.com/**
Irrigation forum	**Fairly commercial.**	**http://forums.gardenweb.com/forums/water/**
Agricultural sites containing irrigation information.		
AgriGator	***Worldwide Agricultural SITE INDEX**	**http://www.ifas.ufl.edu/AgriGator/ag.htm**
Florida Agricultural Information Retrieval System (FAIRS)	**Comprehensive site with many papers on irrigation toPICS.**	**http://hammock.ifas.ufl.edu/**
Agriculture Online	**A very complete agriculture information library with up to date news on anything and everything to do with agriculture... including irrigation.**	**http://www.agriculture.com/index.html**
Clark Consulting International, Inc. agLINKS	**At last check the only link in the irrigation section was to the University of Kassel**	**http://www.agpr.com/agpr_htmls/aglinks.html**
AGRINET	**Online interactive agricultural resource center, with products and services index.**	**http://www.spectramedia.com/agrinet/index.html**
OCES's Guide to Agricultural Web Sites	**Oklahoma Cooperative Extension's Guide to Agricultural Web Sites. One large list formerly known as Bob's Awesome List.**	**http://www.okstate.edu/OSU_Ag/agedcm4h/bobslist.htm**
University of Illinois Agricultural Links	**Agricultural sources around the globe.**	**http://www.aces.uiuc.edu/AgLinks/Index.html**
The World Wide Web Virtual Library Agriculture	**Maintained by the NSF Center for Integrated Pest Management, located at North Carolina State University.**	**http://cipm.ncsu.edu/agvl/**
Ag-Links - Links for the Agriculture Industry	**Worldwide web sites of interest to agriculture.**	**http://www.gennis.com/aglinks.html**
Organisations		
Universities		
UWIN Universities Water Information Network		**http://www.uwin.siu.edu/index.html**
Univ of Nebraska-IANR WWW		**http://ianrwww.unl.edu/**

Water Resources Research at University of Nebraska West Central Research Center.		**http://ianrwww.unl.edu/ianr/wcrec/water/index.htm**
International Development Technologies Centre	**At the University of Melbourne.**	**http://www.civag.unimelb.edu.au/idtc/**
International Irrigation Center	**Utah State University.**	**http://www.engineering.usu.edu/Departments/iic/iichome0.html**
Biological & Irrigation Engineering Home Page	**Utah State University.**	**http://www.engineering.usu.edu/Departments/bie/biehome0.html**
Energy Web	**Utah State University.**	**http://www.aste.usu.edu/**
Water, Engineering and Development Centre	**Loughborough University in the UK.**	**http://www.lboro.ac.uk/departments/cv/wedc/index.htm**
Irrigation Training and Research Center	**California Polytechnic State University**	**http://www.itrc.org/**
Arizona Cooperative Extension	**Aims to facilitate the transfer of information from the University to the people.**	**http://ag.arizona.edu/extension/**
BAE	**University of California at Davis.**	**http://www.engr.ucdavis.edu/~bae/**
Texas A&M School of Irrigation		**http://irrigation.tamu.edu/**
HUT Water Engineering	**Helsinki University of Technology**	**http://www.water.hut.fi/**
New Mexico Climate Center	**From New Mexico State University.**	**http://weather.nmsu.edu/**
WRRI Home page	**New Mexico Water Resources Research Institute.**	**http://wrri.nmsu.edu/**
University of Southern Qld, NCEA		**http://www.ncea.org.au/**
University of Central Queensland		**http://www.ahs.cqu.edu.au/clwrm/index.htm**
Government and Research		
Agriculture, Fisheries and Forests - Australia		**http://www.affa.gov.au/**
Australian Bureau of Agricultural and Resource Economics		**http://www.abare.gov.au/**
Australian Geological Survey Organisation		**http://www.agso.gov.au/**
Bureau of Resource Sciences		**http://www.brs.gov.au/**

Bureau of Meteorology		**http://www.bom.gov.au/**
Environment Australia		**http://www.erin.gov.au/**
Murray Darling Basin Commission		**http://www.mdbc.gov.au/**
National Heritage Trust		**http://www.nht.gov.au/**
Standards Australia		**http://www.standards.com.au/**
Streamwatch		**http://www.streamwatch.org.au/**
New South Wales		
Department of Land and Water Conservation (DLWC)		**http://www.dlwc.nsw.gov.au/**
NSW Department of Agriculture		**http://www.agric.nsw.gov.au/**
Waterwise on the Farm		**http://www.agric.nsw.gov.au/waterwise/**
NSW Fisheries		**http://www.fisheries.nsw.gov.au/**
NSW Department of Urban Affairs and Planning		**http://www.duap.nsw.au/**
Environment Protection Authority (EPA)		**http://epa.nsw.gov.au/**
Victoria		
Department of Natural Resources & Environment		**http://www.nre.vic.gov.au/**
Environmental Protection Authority (EPA)		**http://www.epa.vic.gov.au/**
Department of State Development		**http://www.dsd.vic.gov.au/**
Department of Infrastructure		**http://www.doi.vic.gov.au/**
South Australia		
Department for Environment and Heritage (DEH)		**http://www.environment.sa.gov.au/**
South Australian Water Corporation	**SA Water**	**http://www.sawater.com.au/**
Primary Industries and Resources SA (PIRSA)		**http://www.pir.sa.gov.au/**
Environment Protection Agency SA	**EPA**	**http://www.environment.sa.gov.au/epa**

Department for Transport, Urban Planning, and the Arts (DTUPA)	**http://www.dtupa.sa.gov.au/**
Environment Protection Authority	**http://www.epa.sa.gov.au/**
Queensland	
Department of Natural Resources and Mines (NRM)	**http://www.nrm.qld.gov.au/**
Environmental Protection Agency	**http://www.epa.qld.gov.au/**
Department of Primary Industries	**http://www.dpi.qld.gov.au/home/default.html**
Queensland Rural Water Use Efficiency	**http://www.dnr.qld.gov.au/resourcenet/water/rwue/index.html**
Department State Development	**http://www.statedevelopment.qld.gov.au/**
Tasmania	
Tasmanian Department of Primary Industries Water & Environment	**http://www.dpiwe.tas.gov.au/**
Department of State Development	**http://www.dsd.tas.gov.au/**
Western Australia	
WA Water and Rivers Commission	**http://www.wrc.wa.gov.au/**
Environmental Protection in Western Australia	**http://www.environ.wa.gov.au/**
Agriculture Western Australia	**http://www.agric.wa.gov.au**
ACT	
Department of Urban Services	**http://www.act.gov.au/urbanservices/**
Centre for Groundwater Studies	**http://www.groundwater.com.au/**
CSIRO Division of Land and Water Resources	**http://www.clw.csiro.au/**
ABC Rural	**http://www.abc.net.au/rural/default.htm**
Australian Cotton Co-operative Research Centre	**http://www.mv.pi.csiro.au/**
Cooperative Research Centre (CRC) for Catchment Hydrology	**http://www.catchment.crc.org.au/**
National Irrigation Science Network	**http://www.nisn.com.au/**

Center for Irrigation Technology		http://www.cati.csufresno.edu/cit/
Burdekin Initiative		http://www.tvl.qld.csiro.au/purb/burdekininitiative

Non Profit Organisations and Associations

Australian National Committee on Irrigation & Drainage		http://www.ancid.org.au/
Australian Water & Wastewater Association		http://www.awwa.asn.au/
Irrigation Association of Australia		http://www.irrigation.org.au/
Australian Cotton Research Institute		http://www.mv.pi.csiro.au/Aboutus/Org/ACRI.htm
Irrigation Association	A non-profit, North American organisation.	http://www.irrigation.org/
Water Management Research Laboratory	Part of the Agricultural Research Service, a branch of the United States Department of Agriculture.	http://asset.arsusda.gov/wmrl/WMRL.html
Northwest Irrigation and Soils Laboratory	Kimberly Idaho.	http://kimberly.ars.usda.gov/
Irrigation and Resource Management Division	From Alberta Agriculture, Food and Rural Development Home Page.	http://www.agric.gov.ab.ca/ministry/org/irrmdiv.html
Agricultural Research Service	United States Department of Agriculture.	http://www.ars.usda.gov/
Western Irrigation District		http://www.wid.net/
Nursery Industry Association of Australia		http://www.ngia.com.au/
USDA-ARS-U.S. Water Conservation Laboratory		http://www.uswcl.ars.ag.gov/uswcl.htm
United States Committee on Irrigation and Drainage		http://www2.privatei.com/~uscid/
Food and Agriculture Organisation of the United Nations and Irrigation and food security section and Agriculture Department.		http://www.fao.org/ and http://www.fao.org/focus/e/SpeclPr/SPro11-e.htm and http://www.fao.org/waicent/FAOINFO/AGRICULT/Default.htm

International Program for Technology Research in Irrigation and Drainage	Objective of improving the exchange and flow of technical information and research results in the irrigation and drainage sector.	http://www.hrwallingford.co.uk/projects/IPTRID/
Vista Irrigation District On Line!		http://www.vid-h2o.org/
International Water and Irrigation Management Institute	Create sustainable increases in the productivity of irrigated agriculture within the overall context of water basins and the analysis of water resource systems as a whole.	http://www.cgiar.org/iimi/index.htm
California Irrigation Institute	California's oldest continuing independent forum on water and irrigation.	http://www.caii.org/
IALC International Arid Lands Consortium	Independent, nonprofit research organisation supporting ecological sustainability in arid and semiarid lands worldwide.	http://ag.arizona.edu/OALS/IALC/Home.html
Overseas Development Institute	An independent non-governmental centre for development research and a forum for discussion of the problems facing developing countries.	http://www.oneworld.org/odi/index.html
Cotton Australia		http://www.cottonaustralia.com.au/
Sydney Water		http://www.sydneywater.com.au/
Water Research Foundation of Australia		http://incres.anu.edu.au/wrfa/index.htm
Water Services Association of Australia		http://www.wsaa.asn.au/
Alberta Irrigation Projects Association (Canada)		http://www.aipa.org/
American Society of Agricultural Engineers		http://www.asae.org/
Golf Course Superintendents Association of America		http://www.gcsaa.org/
South African Irrigation Institute		http://www.sabi.co.za/

United Kingdom Irrigation Association		**http://www.ukia.org/**
Virtual Library Irrigation		**http://www.wiz.uni-kassel.de/kww/projekte/irrig/irrig_i.html - index**
AGRIGATE	**Is a subject information gateway for resources, both online and offline, identified as valuable to those participating in Agriculture Research. The resources are selected by an editorial review process consisting of specialist librarians and members of the agriculture research community. The purpose of Agrigate is to support identification and dissemination of high quality research materials.**	**http://www.agrigate.edu.au/**

Water Supply Authorities

Sunraysia Rural Water Authority		**http://www.srwa.org.au/**
Goulburn-Murray Water		**http://www.g-mwater.com.au/**
Murray Irrigation Limited		**http://www.murrayirrigation.com.au/**
Murrumbidgee Irrigation	**02 6962 0200**	**no web address**
South West Water		**http://www.members.datafast.net.au/swwa**
Southern Rural Water Authority		**http://www.srw.com.au/**
Coleambally Irrigation		**http://www.colyirr.com.au/**
Central Irrigation Trust		**http://www.cit.org.au/**
Sunwater		**http://www.sunwater.com.au/**
State Water (NSW)		**http://www.dlwc.nsw.gov.au/**
First Mildura Irrigation Trust		**http://www.fmit.com.au/**
Wimmera Mallee Water		**http://www.wmwater.org.au/**
Ord Irrigation		**http://www.kdc.wa.gov.au/ord.htm**

Organisations

Australian Golf Course Superintendents Association		http://www.agcsa.com.au/
Australian National Committee on Irrigation & Drainage (ANCID)		http://www.ancid.org.au/
Florida Irrigation Society		http://fisstate.org/
Golf Course Superintendents Association of America		http://www.gcsaa.org/
Irrigation Journal (USA) Online		http://www.greenindustry.com/ij/2001/0112/
AgNet. Index of Australian Agricultural sites		http://www.agnet.com.au/
Agriweb. Australian web site for rural internet users		http://www.ruralnet.com.au/Agriweb
Agribusiness Association of Australia	Australian Network for Professionals in the Agri-Food sector	http://www.agribusiness.asn.au/
Agrisurf.	Worlds largest agricultural search engine	http://www.agrisurf.com/
Agriscape	A guide to Agriculture - World wide agricultural search engine	http://www.agriscape.com/
Australian Dairy Farmers Federation	News and Issues affecting Australian dairy farmers	http://www.adff.com.au/
Victorian Farmers Federation		http://www.vff.org.au/links
Australian Dairy Corporation		http://www.dairycorp.com.au/
Dairy Australia	Reference site for all Australian dairy information	http://www.dairy.com.au/

Irrigation Equipment

Amiad USA	Filtration, micro-irrigation, and valve products	http://www.amiadusa.com/
Antelco Corporation	Specialising in low volume micro irrigation products	http://www.antelco.com/
Amadas Industries	Travelling irrigators.	http://www.amadas.com/
Boss Irrigation	Wheel moves, travelling sprinklers, aluminium pipe and tube, custom pumps	http://www.bossirrigation.com/

Buckner Irrigation	Controllers, valves and sprinklers.	http://www.bucknerirrigation.com/
Champion Irrigation	Controllers, automatic valves and water efficient sprinklers.	http://www.championirrigation.com/
Chapin Watermatics	Drip irrigation systems.	http://www.chapindrip.com/
DIG Corporation	Drip irrigation, pc drip line, micro sprinklers, misting systems, filters, battery-operated controllers, AC controllers, AC valves, fittings, swivel fittings and accessories.	http://www.digcorp.com/
Drip In Irrigation Company	Drip irrigation tape and greenhouse/nursery products.	http://www.dripin.com/
Hunter Industries	Sprinklers, valves and controllers.	http://www.hunterindustries.com/
International Irrigation Systems, Inc.	Micro-porous drip irrigation systems.	http://www.irrigro.com/
Irritrol Systems	Controllers, valves, sprayheads, rotors and micro-irrigation components.	http://www.irritrolsystems.com/
Irridelco International Corporation	Pivots, linears, travellers, siderolls, portable aluminium systems, sprinklers and guns, microsprinklers, emitters, pulsators, tapes, filters and valves, vertical turbine and submersible pumps, diesel and electric centrifugals.	http://www.irridelco.com/
James Hardie Irrigation	Controllers, micro irrigation, rotors, sprayheads, valves, parts and accessories.	http://www.hardie.com/
KES Irrigation Systems	Misting & humidity systems.	http://www.kesmist.com/pc.htm
Legacy Golf Irrigation	Controllers, sprinklers and valves.	http://www.legacygolf.com/
Lindsay Manufacturing Co.	Centre pivot irrigation systems, steel tubing.	http://www.zimmatic.com/
Maxijet, Inc.	Low-volume mist irrigation for agriculture, landscaping, nurseries, and greenhouses.	http://www.maxijet.com/
NAAN	Israeli site. Drip, sprinkler, and micro irrigation.	http://www.naan.co.il/
Nelson	Lawn and garden products.	http://www.lrnelson.com/

Netafim	Irrigation equipment and drip systems.	http://www.netafim.com/
Plastro	Drippers, and mini sprinklers, pvc pipes, and drainage.	http://www.plastro.com/
P & R Surge Systems, Inc.	Surge irrigation equipment.	http://www.prsurge.com/
Rain Bird	Consumer, turf, golf and agricultural products.	http://www.rainbird.com/
Reinke Irrigation Systems	Centre pivot and lateral move irrigation equipment.	http://www.reinke.com/
Roberts Irrigation products	Drip and micro irrigation.	http://www.robertsirrigation.com/
Senninger Irrigation Inc.	Sprinklers, sprays, pressure regulators for center pivot, linear move, nursery and solid set irrigation.	http://www.senninger.com/
SALCO	Drip irrigation systems.	http://www.igin.com/salcodrip/index.html
T-L Irrigation Company	Manufacturer of advanced hydrostatic irrigation systems and galvanizing services.	http://www.cnweb.com/t-l/
Toro	Lotsa stuff... even irrigation!	http://www.toro.com/
Universal Motion Components	Centre pivot equipment	http://www.umcproducts.com/
Valmont	Centre pivot, and linear move systems.	http://www.valmont.com/
Wade Rain	Wheelie, handmove, pivot, and micro-irrigation products.	http://www.waderain.com/
Weathermatic	Controllers, valves, sprinklers, accessories, and software.	http://www.weathermatic.com/
WeatherTec	Agricultural, turf, micro irrigation products and systems controls.	http://www.weathertec.com/
Pumps		
Sta-Rite	Complete line of submersible pumps, jet pumps and captive air tanks, sewage and effluent pumps and commercial/industrial irrigation pumps.	http://www.berkeleypumps.com/
American Turbine Pump Company	Vertical irrigation pumps.	http://americanturbine.net/
Farmers Manufacturing Co., Inc.	Axial flow and hydraulic submersible pumps	http://fmcpumps.com/fmcpumps

Gornam-Rupp Pumps		http://www.gormanrupp.com/
OASE Pumps	Pumps and fountains.	http://www.igin.com/oasepump/index.html
Sunmotor International	Solar pumps.	http://www.sunpump.com/
Onga Pumps	Australian site	http://www.onga.com.au/
Davey Pumps	Australian site	http://www.davey.com.au/

Measurement Equipment and Controllers

Tain Electronics	Soil moisture loggers and shutter controllers.	http://www.tain.com.au/
Acycsa T-Sol	Autonomous irrigation controllers for agricultural and garden applications, powered by batteries or solar energy.	http://www.acycsa.es/
Tucors Inc.	Advanced controller using two-wire technology.	http://www.tucor.com/
Automatic Water Watcher		http://fishnet.net/~jackh/
TORO National Support Network	Network controllers.	http://www.lljohnson.com/nsnmain.html
Integral Controls	From fertilizer and chemical injector controls to several different types of water pump controls.	http://www.integralcontrols.com/
Greenzone Controls	Computerised Environmental Control Systems.	http://www.greenzonecontrols.com/
Champion Irrigation	Controllers, automatic valves and water efficient sprinklers.	http://www.championirrigation.com/
Frank W Murphy, MFR	Controls and instrumentation.	http://www.fwmurphy.com/
Motorola		http://www.motorola.com/
Irrometer Company, Inc.	Soil moisture indicators.	http://www.irrometer.com/
McCrometer Flow Measurement.	Flow measurement products	http://www.mccrometer.com/
Cambrone Pty Limited	Cambrone soil moisture probe.	http://www.zipworld.com.au/~kuzzell/
Sutron Corporation	Environmental monitoring and control systems.	http://www.sutron.com/
Sentek Sensor Technologies	Irrigation management tools (EnviroSCAN).	http://www.sentek.com.au/
Mini-Clik Sensors	Irrigation sensors for rain wind temperature.	http://www.mrdrip.com/miniclik.htm

Rainbrain	Gutter installed rain sensor	http://www.rainbrain.com/
Automata	Stations, telemetery, sensors, software	http://www.automata-inc.com/
Davis	Weather stations	http://www.davisnet.com/

Other

Fresno Valves & Casting, Inc.	Valves, filters, airvents, gates and lifts, low volume irrigation	http://www.fresnovalves.com/
V.I.T. Products, Inc	Stainless steel irrigation enclosures for Landscape and industrial use	http://www.vitproducts.com/
The Finn Corporation	Erosion control products, among other things	http://www.finncorp.com/
NDS	Drainage products	http://www.ndspro.com/
Otterbine	Aeration products	http://www.abbeywaters.com/otterbine.htm
Hydra-Soil International, Inc.	Manufacturer of Desert Bloom	http://www.okstorm.com/hydra/
IPS Corporation	WELD-ON Solvent Cements for joining plastic pipes & fittings	http://www.ipscorp.com/
SlamShut	Automatic cutoff valves.	http://www.slamshut.com/
Nibco	Metal valves, plastic valves, plastic fittings, slip-fix repair couplings, turfbubbler.	http://www.nibco.com/irrigation/
Waterman	Water control gates, valves & equipment.	http://www.watermanusa.com/
Lasco Fittings	PVC fittings	http://www.lascofittings.com/
Lake	Aluminium pipe; gated, dragline, grooved end, latch style, no latch style.	http://www.lakecompany.com/
Hastings Irrigation Pipe Company	Aluminium products	http://www.hipco-ne.com/
Campbell Manufacturing	Products for residential and light commercial water systems, sewage, effluent, sump pump, water filtration, and treatment systems.	http://www.campbellmfg.com/
Aqua Master	Fountains & Aerators	http://www.aquamasterfountains.com/
KIFCO	Water reels, slurry pumps, slurry reels, hose clamps.	http://www.kifco.com/
Aqua Systems 2000 Inc.	Irrigation and Water Management.	http://www.aquasystems2000.com/

International Irrigation Systems, Inc.	Manufacturing Irrigro® Micro-Porous Drip Irrigation Systems.	http://www.irrigro.com/
	Links to Links	
Product/Source Directory-Irrigation	From IGIN homepage.	http://www.igin.com/Irrigation/index.html
Virtual Trade Show	From IGIN homepage.	http://www.igin.com/VirtualTradeshow/index.html
Plastic Pipe Institute	The Plastics Pipe Institute, Inc. (PPI) is the major trade association representing all segments of the plastics piping industry.	http://www.plasticpipe.org/
Irrigation Equipment	From Agrinet homepage	http://www.spectramedia.com/agrinet/product/pmanu/fpregis/irrig.html
Northern Designs		http://www.northerndesigns.com/
Digital Drip Directory	Index with addresses of manufacturers not on the web	http://www.microirrigationforum.com/new/directory/
Western Brass/Storm Industries	Links to West Ag, Western Brassworks, Western Raintrol, IPD, Proven Pumps, KFC Kingston Co, and West Walker	http://www.igin.com/westag/home.html
Irrigation Services		
Amiad Australia	Water system technologies.	http://www.mildura.net.au/business/amiad.html
Intelligent Irrigation Systems	Intelligent Irrigation Systems develops and sells irrigation management software and hardware to enable irrigators to use irrigation water more effectively and increase the quality of their crops.	http://www.iisystems.com.au/index.html
	Other Services	
Famous Plumbing supply.Com	Plumbing online shopping centre.	http://www.plumbingsupply.com/index.html
Consortium Kuroda Irrigation	Experience in the hydraulic and sanitary installations field, and for agricultural, industrial and residential use. South West USA and Mexico.	http://kuroda.com.mx/irrigation/

Amiad USA	North American distributors for Amiad filtration systems, Plastro, and Raphael Valves.	http://www.amiadusa.com/
TurfStuf	Turf/golf related services.	
Northern Designs	Irrigation Consultants and Designers with Northern Designs	http://www.northerndesigns.com/linked.html
Sourcebook Xeriscape	USA Landscaping	http://www.greenbuilder.com/sourcebook/Xeriscape.demo.html
UWIN Water Experts Database	Database to provide a listing of water professionals and their areas of expertise.	http://www.uwin.siu.edu/databases/experts/index.html

Management and Control

Irrigation Management	Selected sites on the Internet that have information about irrigation management and soil water conservation (from New Mexico State University)	http://weather.nmsu.edu/Irrigation_Management.html
Best Management Practices	Information from the Department of Soil Science at North Dakota State University.	http://www.soilsci.ndsu.nodak.edu/bmp/
Granular Matrix Sensors		http://www.cropinfo.net/granular.htm
Environmental instruments home pages		http://weather.nmsu.edu/instruments/
Siemens Business Services - Siemens Corporate Network	German salty stuff.	http://www.scn.de/
Sowacs (Soil Water Content Sensors) Web Home Page and Discussion Group e	Everything you wanted to know about soil water content sensors.	http://www.sowacs.com/
Soil Moisture Sensors	Sponsor MIF	http://www.microirrigationforum.com/new/sensors/

Drip/Micro Irrigation

Micro Irrigation Forum	Comprehensive forum on Micro Irrigation.	http://www.microirrigationforum.com/
Trickle Irrigation Research Group W128		http://weather.nmsu.edu/w128/
Drip Research Technology Services USA		http://www.drts.com/

K-State SDI Web		http://www.oznet.ksu.edu/sdi/
Articles		
BIBLIOGRAPHY - Crop response to drip irrigation		http://asset.arsusda.gov/WMRL/bib11.html
BIBLIOGRAPHY - Cotton response to drip irrigation		http://asset.arsusda.gov/WMRL/bib12.html
BIBLIOGRAPHY - Tomato response to drip irrigation		http://asset.arsusda.gov/WMRL/bib13.html
Introduction to Drip Irrigation		http://www.dripirr.com/intro.html
Horticulture Information Leaflets	Includes the following fourlinks:	http://www.ces.ncsu.edu/depts/hort/hil/veg-index.html
Drip or trickle irrigation systems	An outline of components.	http://www.ces.ncsu.edu/depts/hort/hil/hil-33-a.html
Drip or trickle irrigation systems	An operations and troubleshooting checklist.	http://www.ces.ncsu.edu/depts/hort/hil/hil-33-b.html
Using plastic mulches and drip irrigation		http://www.ces.ncsu.edu/depts/hort/hil/hil-33.html
Vegetable crop irrigation		http://www.ces.ncsu.edu/depts/hort/hil/hil-33-e.html
DRIP irrigation Frequently Asked Questions	PlumbingSupply.com	http://www.plumbingsupply.com/faq-drip.html
Links		
P & R Surge Systems, Inc.	Huge site, with products and information.	http://www.prsurge.com/
Sprinkler Irrigation		
Selecting A Sprinkler Irrigation System		http://www.ext.nodak.edu/extpubs/ageng/irrigate/ae91w.htm
Sprinkler Selection for Optimum Center Pivot Performance		http://www.nal.usda.gov/ttic/tektran/data/000007/97/0000079746.html
Irrigation References		
Irrigation Tutorials;	New Mexico State University.	http://weather.nmsu.edu/Teaching_Material/Tutorials.html
Water Quality Database Conservation	Irrigation research listing provided by Purdue's School of Agriculture.	http://hermes.ecn.purdue.edu:8001/server/water/bib/Conservation/Irrigation.html
Sourcebook Efficient Irrigation		http://www.greenbuilder.com/sourcebook/XeriscapeGuideline5.html

Colorado State Cooperative Extension Crop Online		http://www.ext.colostate.edu/menucrop.html
Nebraska Extension Pubs, Irrigation Engineering		http://ianrwww.unl.edu/ianr/pubs/catalog/irr_eng.htm
Surface Irrigation	A book (PDF file) by the California Energy Commission.	http://www.energy.ca.gov/process/pubs/surface_irrigation.pdf
WaterWiser Books and More		http://www.waterwiser.org/frameset.cfm?b=2
Intelligent Irrigation		http://www.cohort.com.au/aerogatn/booklet/contents.html
ASAE - Publications Catalog		http://www.asae.org/pubs/
Irrigation Books	Books in the New Mexico Library that have information about irrigation.	http://weather.nmsu.edu/Teaching_Material/soil456/books.html
UWIN New Books		http://www.uwin.siu.edu/announce/newbooks

Software links

IRRISOFT	Comprehensive database on irrigation and hydrology software.	http://www.wiz.uni-kassel.de/kww/irrisoft/irrisoft_i.html
BIE Irrigation Engineering Software	Software developed at Utah State University.	http://www.engineering.usu.edu/Departments/bie/software.html
Other Computer Software from the WMRL	Software developed by the Water Management Research Laboratory.	http://pwa.ars.usda.gov/fno/wmrl/software/index.html
USGS Water Resources Applications Software		http://h2o.usgs.gov/software/
HIDROSOFT		http://www.geocities.com/CapeCanaveral/2175/
ASTE Energy Software	Energy software by the Agricultural Systems Technology & Education department at Utah State University (includes irrigation practices program).	http://www2.aste.usu.edu/
Agricultural Models and Tools	Various computer models and tools for agricultural applications from New Mexico State University.	http://weather.nmsu.edu/models/
WaterWiser Books, Software & More		http://www.waterwiser.org/frameset.cfm?b=2

Software from Oklahoma State University		http://clay.agr.okstate.edu/software/
Cornell Pump Company Centrific 5.6		http://www.cornellpump.com/Centrif.html
CROPFLEX - Irrigation and Water Quality Model		http://ulysses.atmos.colostate.edu/~crop/
FAO Water Management Software		http://www.fao.org/WAICENT/FaoInfo/Agricult/agl/lwris.htm
USBR Flume Design Program - Winflume		http://www.usbr.gov/wrrl/winflume/
SPAW - Soil, Plant, Atmosphere, and Water Budget Model		http://www.bsyse.wsu.edu/~saxton/spaw/spaw.htm

Irrigation Search Links

IANR Web Search Engine	University of Nebraska-Lincoln, Institute of Agriculture & Natural Resources (IANR) research catalogue .The indexing is done on a bi-weekly basis; this will probably be upgraded to daily in the near future.	http://www.unl.edu/unlpub/research.shtml
Technology Transfer Information Center - TTIC		http://www.nal.usda.gov/ttic/
IA's Irrigation Product Manufacturers		http://203.164.173.124/irrigation/search/search.asp
IA's IRRI-GATE Search Engine		http://www.irrigation.org.au/SearchthisWeb.htm
Sakia - Search the World IRRIGATION Index		http://www.wiz.uni-kassel.de/kww/sakia/sakia_i.html
Agrinet Searching	Multiple search engine Interface	http://www.spectramedia.com/agrinet/ht/search1.html
Nomade	Irrigation (matériel): French site.	http://www.nomade.fr/
AgSearch	Water and Irrigation	http://www.agsearch.com.au/
Search ALL Menus on Texas A&M Server		http://search.tamu.edu/
BioAgMed INFOMINE Search Screen		http://infomine.ucr.edu/search/bioagsearch.phtml

UWIN Quick Search	**http://www.uwin.siu.edu/databases/qsearch/index.html**
ISO Catalogue Search	**http://www.iso.ch/iso/en/CatalogueListPage.CatalogueList**

APPENDIX 2. INTERNET SURVEY QUESTIONNAIRE

1. What is the role/s of your organisation *(please tick one or more boxes to identify the main role/s of your organisation)*
Industry eg association, commodity organisation,
water user group
Commercial eg retailer, manufacturer, consultant
Technical eg extension agency
Research
Education
Other
2. Does your organisation have a website? *(please circle)*
Yes No
3. Age of website
< 12 months
1 – 2 years
> 2 years
4. Do you have a website manager? *(Please circle)*
Yes No
5. Is the manager a staff member or a contractor?
(Please circle)
Staff Contract
6. How often is your site updated?
Daily
Weekly
Monthly
Irregularly
7. What are the main information aims of website?
Organisation news
Industry information and/or updates
Product or service marketing information for clients
Technical information
Members services
Water trading
Research information
Other (*please specify)*
8. How important is your website in your general communication or information strategy? (*please tick)*
Very important
Important
Somewhat important
Not very important
9. **Do you have any interactive applications on your website e.g. e-commerce, email updates and responses, chat/list server, online calculations?** *(Please circle answer)*
Yes No
10. If you answered yes, briefly describe the application/s

11. **Who is the target audience/s for your web site** (*tick more than one if appropriate*)?
Buyers of your goods or services
Irrigators
Researchers
Educational institutions
Staff
General public
Business associates
Other (*please specify)*
12. **How do you intend to use the internet in the future in your organisation?**
More Info Same Info Less info
Organisation news
Industry information and/or updates
Product/service marketing information for clients
Technical information
Members services
Water trading
Research information
Other (*please specify)*
13. Do you use the internet as a source of irrigation information?
Please circle
Yes No
If yes please go to Question 14. If no please go to Question
16.
14. What irrigation information do you obtain from the internet?
Company news
Industry information and/or updates
Product/service marketing information
Technical information
Members services

Water trading
Research information
Financial information
Marketing information
Bulletin Boards
Other

15. What are the 3 most useful sites for irrigation information for you?
Please specify addresses

16. Is there any irrigation information you would like to access but cannot? *(Please circle answer)*
Yes No
If yes please specify

17. Do you contribute to technical bulletin boards?
(Please circle answer)
Yes No

18. **Would you contribute information to an industry website?** *(Please circle answer)*
Yes No