

Improved web-based tool for irrigators and service providers: a modern approach to extension

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Abstract. Agriculture Victoria's irrigation team have developed an improved web-based extension tool called 'Irrigation System Selection and Design Guidelines' which includes new information to better meet the needs of today's irrigators. The tool is easily navigated and has a broad range of helpful resources including new instructional videos, animations, podcasts, drone footage, information notes and case studies to maximise an irrigator's ability to access information. The tool provides answers to more than 100 frequently asked questions packaged under five key steps and will guide users through a logical decision-making process. The tool has been tested with potential target audiences, including service providers and irrigators. The tool does not replace the need to get specialist input from irrigation advisers. Rather, the tool will assist irrigators and service providers be aware of key issues to consider during the development and improvement of their irrigation systems to better manage their irrigation risks.

Keywords: Irrigation management, web-based irrigation tool, decision-making

Introduction

Landowners need accurate, relevant and timely information to make good decisions and adopt new technologies on farm in order to remain viable and competitive. Landowners commonly seek this information through research and extension programs and more recently through the internet. There has been increasing interest in how information communication technologies (ICT) and internet base approaches and tools may support decision making. Recent COVID-19 restrictions were among the most influential factors in expanding the adoption of ICTs among landowners and service providers.

Agriculture Victoria's irrigation team have developed an improved web-based extension tool called 'Irrigation System Selection and Design Guidelines' which includes new information to better meet the needs of today's irrigators. The information is presented through a logical five step process that helps support informed decision making for on farm irrigation investment. The five steps considered are:

1. What do I want to achieve?
2. What are my farm's features and constraints?
3. What irrigation options should I consider?
4. What needs to be included in my design and management and what will it cost?
5. What option best meets my goal?

The decision to invest in irrigation technologies is based on several factors which are of a complex nature and include a combination of social, economic and environmental considerations. For example, landowners will usually seek information on the economic factors associated with an investment which includes the projected costs and benefits for their irrigation investments, prior to making an investment decision. It is important to identify what these factors are and provide appropriate information that helps inform the decision-making process to ensure that a landowner has all the facts before deciding to invest in new technology.

It is also important to understand the steps involved in the decision-making process where these different factors are considered. Researchers who focus on tracing decision-making processes suggest that investment in any major technology adoption requires a complex decision-making process. A key aspect of complex decision making is that landowners use multiple types and sources of information and that making a final decision may take an extended period of time. This process often looks like landowners progressing through an information search that begins with general information and becomes increasingly focused on specific and detailed information the closer they are to making a final decision (Rogers 1983).

Given the complexity of the decision-making processes, and the important factors involved at each stage, the first aim of this paper is to discuss the tool for irrigation technology selection and design that has been developed to guide landowners toward making informed decisions for farm irrigation investment. The second aim of the paper is to discuss the principles used, and the benefits achieved, with web-based tools to support this informed decision-making process.

The tool focusses on the three key broad acre irrigation systems utilised in northern Victoria. These are border-check irrigation, centre pivot and lateral move systems and sub-surface drip.

Conceptual tool for irrigation selection and design

The backbone of the tool is a step-by-step process for decision making that starts with the identification of goals and works through five key steps to the final selection of an irrigation system. This five-step process is adopted from Burt et al. (2000) but is presented in the tool in a user-friendly form of questions and answers. This process is consistent with other literature on irrigation infrastructure investment (Rogers 1983; Kotler & Armstrong 1999).

The five decision making steps of the Irrigation Selection and Design tool can be summarised by the following:

- Step 1: Identification of goals is the initial step in the decision-making process. This step requires landowners to ask 'what do I want to achieve with my irrigation investment?'. The goals are specific to an individual landowner and can be related to economic, environmental and social considerations. An economic goal may focus on maximising the return on investment or increasing productivity to achieve better returns and reduce labour inputs. Social goals can be related to lifestyle considerations where landowners adopt a system which provides opportunity for a good night's sleep, without chasing water in the paddock. Environmental goals may relate to the reduction of run-off and deep percolation.
- Step 2: Understanding the context and limitations of the farm. This step requires landowners to ask themselves what are their farm's features and constraints? Informed irrigation system selection is dependent upon understanding the local site conditions and understanding the assets and limitations of an individual farm. Knowledge of the physical site, economic, institutional and management conditions is necessary to inform the system selection and design process. This step assists landowners to consider and document what these are.
- Step 3: Reduce choices. This step requires landowners to ask what irrigation options I should consider? which helps eliminate choices that do not fit either the goals (Step 1) or the farm features (Step 2) and helps landowners to explore the potential systems best suited for a farm. Informed irrigation system selection relies on a good understanding of the features and constraints of individual farm. There are certain features that are a 'given' for a potential farm; for example, soil types as there is not much you can do to change these. Other features are changeable, for example, the location of a fence. Landowners need to consider these features carefully before considering options for irrigation system selection.
- Step 4: Understanding costs. This step requires landowners to ask what needs to be included in my design and management and what will it cost?. This step takes landowners through the process of sourcing detailed designs and costing figures and assists in assessing the financial implications to the farm.
- Step 5: Deciding on the best options. This step requires landowners to ask what option best meets my goal? This is the final selection which requires identification of the system(s) that best meets the development goals. In making the final selection, fine tuning of the system that appears to be the best option may also be necessary. For example, choosing bigger pipelines to a centre pivot system which may increase the capital cost but in the long term decreases the operational cost and reduces total cost of ownership could be the best option. These types of decisions are explored in this step.

Demonstration of the web site

The irrigation system selection tool with its five-step process has been housed on the 'extensionAUS' site, which is a key site for landowners to access information on irrigation and water related resources in Victoria, Australia. The introductory page of the web site is shown in Figure 2. The site can be accessed from the following link [Irrigation System Selection Tool in Articulate 360](#) or using the following QR code (Figure 1).

Figure 1. QR code for access to the website



The initial landing page provides a summary of the tool and can be accessed from the link. From this page you will be able to access the five-step process (Figure 2).

Figure 2. Welcome page for website

Source: Agriculture Victoria

A screen short of the detailed five-step web content is shown in Figure 3.

Figure 3. Detail provided on the five steps on the website

Source: Agriculture Victoria

The information on the web site is presented in a variety of ways including new instructional videos, animations, podcasts, drone footage and information notes. Irrigators and service providers can go to the topics that they are interested in and access information from those sources (see Figure 4).

For general information there are animated videos which explain the details of border-check irrigation, centre pivot and lateral move systems and sub-surface drip systems. For specific information on those three systems, the user is guided to go into further detail by choosing the topics that they are interested in.

Figure 4. The range of different ways information is presented on the website

Source: Agriculture Victoria

Principles adopted during the development of the tool

Hosting a web site to meet the needs of landowners, extension staff and other parties in the irrigation industry needs to be well-thought-out. Some principles that were followed are listed below.

Usability and utility

The tool is designed as user-friendly for use by non-experts in information technology. Steps were taken to make the information relevant to local conditions and of high utility to potential users. Landowner friendly language is used to make the content reader friendly.

Content organisation

The content is organised in a five-step process for the users to navigate easily. The structure of the content is well-defined and in a pattern that helps make access and finding information easier. The content is in a form that is easily understandable and visually appealing.

Flexibility

The site is flexible in terms of the design so that new features can be added when needed without major disturbance to the configuration.

Content management

The information provided can be commented on so that users can easily upload their views on the content and if required new features can be added easily without detailed knowledge of information technology. Information will be constantly updated to include new research findings.

Key considerations in the development of the tool

There were several key considerations used in the development of the site. These are outlined below.

A committee to oversee the development of content

The Farm and Environment Working group, a local landowner based steering committee was involved in overseeing the development of content. This committee consisted of agency staff and local landowners. Input from this committee have helped to steam line the content and make it more landowner friendly.

Comprehensive information at one-site

The web site collated and developed a huge amount of knowledge base information in a single site. Compared to traditional extension which relies on face-to-face meetings and group discussion which is difficult to scale and inevitably leaves large sections of the population underserved, the web-based information technology has created an opportunity to increase the reach of extension services.

Wide range of target groups

The web site can serve as a 'ready reference' point of information when needed for extension practitioners, researchers, academics, policy makers and landowners. Experience has shown that building web-based information cannot guarantee application at the farm level with clear knowledge uptake strategies required to encourage this. Such strategies used in this project include promoting the site through other sources such as linking the information with Catchment Management Authorities, TAFE and universities. Different aspects of the web information have also been reinforced by practical demonstrations in the field, feedback from users and sharing among stakeholders and demonstrating the information at farm related forums.

Use of creative methods to communicate information

The web site has used fact sheets, animation works, drone footage, podcasts and case studies to communicate information. The focus of these has been ease of use and visual appeal for the audience.

Pick and choose information according to the need

The information is presented in such a way that the end users can use the information according to their needs. The information ranges from general to specific in nature. It is up to the user to decide whether they need to go through the whole five-step process or pick and choose the relevant information according to their needs.

Conclusions

The tool described above is meant to be a flexible tool that provides a step-by-step guide to help users access information on the capabilities and limitations of various irrigation investment options. The tool is designed to help users consider appropriate factors and ask the right questions at each step of the decision-making process. It suggests users move through five steps. However, development of the tools acknowledged that those seeking information may be at different stages of their decision-making process. In that regard, the user of the tool can move to the appropriate sections of the site to make informed decisions on an irrigation investment based on individual need. The web site is developed in such a way that it is easily navigated and the presentation of the information in a provided visually appealing manner in the form of videos, animations, podcasts and drone footage.

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