Using farmer's information seeking behaviour to inform the design of extension

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Abstract. Dairy farmers in the Central Goulburn Irrigation District used information seeking behaviour to collect a range of information from a number of sources when they were considering adopting centre pivot irrigation (CPI). The information that was sought depended on where the farmers were in the decision making process. General information on CPI function, price, performance and site requirements was collected from a range of sources early in the decision-making process. As the farmers sought to determine how CPI would perform in their unique farm environment their search for information became increasingly specific. The final stage of the information search was very specific and related to price, features, technical specifications, finance and permit conditions. The findings of this small, preliminary study suggest there was a common pattern to the farmers' information seeking behaviour in regard to the type of information sought and the sources of information used. This knowledge can be used to design extension that will enable the farmers to obtain the information they need from fewer sources. This will save the farmers time and effort, and potentially hasten the adoption process. An example of a web-based extension program that has been designed using these concepts is provided.

Keywords: centre pivot irrigation, complex decision making, information seeking behaviour

Introduction

Farmers constantly manage and adapt their farm businesses in order to remain competitive in a changing world. This is done by finetuning existing practices and technologies or by adopting innovations, such as novel products, technologies or practices.

Where there are a number of alternatives, it is necessary for the farmer to choose which innovation, or suite of innovations, will provide the most benefit and best meet the needs of the farm business. Kaine (2004) suggests that this process is highly involving, or important to the farmer as it usually has significant implications for the farm business. Therefore, when making an important decision the farmer will devote time and effort to collecting information, considering the alternatives and selecting the best option, in order to minimise the risk of "getting it wrong". This process is known as complex decision making (Assael 1998).

Complex decision making requires the collection of a range of information from a number of sources (Bystrom and Jarvelin 1995). The purposeful search for information to inform decision making is called *information-seeking behaviour* (Wilson 1997). As individuals, farmers have their favoured information sources (Vergot et al. 2005), which they use depending on the specific information being sought (Solano et al. 2003). The amount of information collected depends on the complexity of the task (Bystrom and Jarvelin 1995) and the importance of the decision being made (Assael 1997; Kaine 2004).

Extension agents and programs have been identified as a source of agricultural information used by farmers (Jensen et al. 2009; Spink and Hicks 1996). This is compatible with one aim of extension: to use communication to help people and communities identify potential improvements to their practices (Australasian Pacific Extension Network 1999). Yet there is little data available on the information needs of farmers considering adoption of an innovation. Consequently most extension is designed in an *ad hoc* manner based on practitioner experience, resources or organisational culture (Roberts and Gillard 2007).

Agricultural studies examine how farmers source general information (Vergot et al. 2005, Villamil et al. 2008), the role of interpersonal information (Ford and Babb 1989; Solano et al. 2003), and the use of specific sources of information such as the world-wide web (Spink and Hicks 1996), written information (Sutherland et al. 1996) and communication networks (Demiryurek et al. 2008). Yet these studies do not tell us what content the farmers were seeking from the information, nor do they consider where the farmer was in the adoption decision making process.

If there is a pattern to the farmers' information seeking behaviour, extension activities could be designed to enable farmers to obtain the required information from fewer sources. Farmers would be able to obtain reliable information more quickly and easily, saving time and frustration, and hastening the adoption process (Solano et al. 2003). Furthermore it may reduce the chance of a decision made on incomplete or erroneous information.

This paper describes a small study conducted in 2004 with farmers who had considered, or were considering adopting centre pivot irrigation (CPI). CPI is a form of sprinkler irrigation consisting of several segments of pipe (usually galvanized steel or aluminium) joined together and supported by trusses mounted on wheeled towers with sprinklers positioned along its length. The system moves in a circular pattern and is fed with water from the pivot point at the centre of the circle. Traditionally farmers had used border check, commonly known as flood irrigation in the region. First adopted in the CGID around 1996, there are now approximately 15 CPI systems in the district.

The study was commissioned by the Department of Primary Industries "Efficient Irrigation Technologies to Match Soils and Dairy Farming Systems" project team to inform the design of their extension program. This study does not represent work conducted solely to examine farmers' information seeking behaviour, but is part of the broader study on adoption. I will describe this study and the subsequent design of the project team's web-based extension.

Methods

Twenty-two dairy farmers from the Central Goulburn Irrigation District (CGID) in northern Victoria were interviewed using semi-structured interview techniques. Semi-structured interviews consist of some pre-tested questions coupled with the use of additional questions to explore the information gained, or to follow up on issues raised (Dick 1998). The farmers interviewed represented three groups: ten of the farmers had adopted CPI; four were considering adopting; and eight of the farmers had not considered adopting CPI. This sample was chosen so that differences in the search behavior between the three groups of farmers in relation to the topic of CPI could be recognized. The farmers were identified through industry and service provider contacts and represented the range of age groups, backgrounds, herd and farm sizes and systems found in the CGID.

The farmers were interviewed about why they had or had not adopted CPI. The farmers were also questioned about their information seeking behavior in relation to the information sought, where it was sourced and how it informed their decision making. The source of information was defined as an individual or institution that originated a message (as per Vergot et al. 2005). These were divided into word of mouth sources- customers, other farmers, suppliers and consultants, and published sources- industry magazines, newsletters and newspapers, literature and the web.

The interview responses were recorded manually by two interviewers and then transcribed. Interview notes were cross checked for accuracy, and analysed using case and cross-case analysis (Patton 1990).

Results

All of the farmers knew what CPI was and had seen CPI in the district. Only the farmers who had adopted, and were considering adopting had actively sought information on CPI. These farmers had begun their decision making process by defining their problem and searching for general information on the types of irrigation systems available that would solve that problem. The majority of the information sought was objective at this stage and was in regard to CPI function, price, performance and site requirements. A number of sources were used to collect this information (see Table 1).

After considering this information, some of the farmers continued to think that CPI could meet their needs. These farmers said they then searched for more specific information in order to assess how CPI would perform in their unique farm environment. The information sought at this stage was a mixture of objective information- such as data from research trials and technical information- and subjective information from other farmers.

The farmers who still considered that CPI may best meet their needs then sought very specific information about exact prices, CPI features, technical specifications, finance and permit conditions.

The farmers said they continued to seek information until they understood the process for adopting CPI and felt confident to make a decision. A minimum of three and a maximum of nine sources of information were accessed. Farmers with previous experience or knowledge of CPI sought information from fewer sources than those without.

Table 1: Farmer questions, type and source of information used to inform their decision making in regard to adopting CPI. This data is from fourteen farmers who had considered adopting CPI

Source- word of mouth	Farmer questions related to CPI	Number of farmers
Other farmers	Crops grown, productivity, management of problems, operating costs, implementation problems	14
Irrigation agents	Specifications, price, site requirements	14
Consultant	Agronomic information, types of irrigation available	4
DPI extension staff	Research results- crop production data	5
DPI/ Regulatory bodies	Permit conditions	11
Field days	Crops grown, productivity, management of problems, operating costs, implementation problems	8
Source- published		
Journals	Crop production figures/ research results	8
Industry publications	Agronomic	14
Internet search	Crop production figures/ research results	5

Of the farmers interviewed who had adopted or were considering adopting CPI:

- All visited between one and six other farmers in the region who had CPI; several farmers had travelled interstate
- All collected published information from industry magazines and rural newspapers
- All went to irrigation agents to obtain quotes
- Some farmers had also searched for information on the web

We found that the search for information seemed to be an iterative process as some of the farmers had been to the same source a number of times, seeking different or more detailed information.

Some of the farmers claimed that the information seeking process took a long time and a lot of effort. Some farmers said that research information was difficult to find, and in some cases, difficult to understand. Some farmers had trouble finding enough information to determine how CPI would perform on their farm soil types. One farmer said the most useful information he found was on the web, and was on research trials conducted in Washington State in the USA.

Another farmer bought a CPI system and then found that he would have trouble obtaining a permit to remove the trees where he planned to site the pivot. A number of farmers said they adopted CPI, but that the size system the irrigation agent had recommended could not provide sufficient water to meet the crops' water requirements on hot days. A few farmers adopted CPI then found the operating costs were more expensive than expected.

Discussion

The results of this small study indicate that there is a pattern to farmers' information seeking behaviour and decision-making processes when considering the adoption of an innovation. This finding is consistent with studies conducted in the field of information research and consumer behaviour (Assael 1997, Kuhlthau 1993, Wilson 1997).

The amount and type of information the farmers sought, and the fact they could describe the reasoning behind their decision indicated that the decision to adopt CPI was complicated and important, and that the farmers used complex decision-making processes.

This study shows the range of questions the farmers had in regard to how the innovation would perform in their unique farm situation. This reinforces the suggestion that there are a number of factors the farmer must consider when considering the adoption of an innovation including: the impact of the innovation on other parts of the farm system; compatibility with existing farm technologies; practices and resources' the impact of the innovation upon the family lifestyle; and the cost of adoption (Pannell et al. 2006).

This study demonstrated that a range of information was required to enable the farmers to answer their questions about the implications of adopting CPI. This supports the suggestion that the more serious the consequences, and the more complex the situation, the more widely the

information-seeking net is cast. This is because the decision maker's need for information and some confidence about the potential outcomes is stronger (Vanclay 2004).

There is a role for extension in providing reliable, timely and relevant information to support farmer decision-making. Often extension is designed to provide *more* information. Yet as Fountas suggests: "It is not a lack of available data that will impede progress in modern agriculture. Rather the challenge will be to identify the usefulness, importance and relevance of the gathered data for optimising farm efficiency" (Fountas et al. 2006: p193).

Consequently, I suggest that extension will be more efficient in meeting the farmers' information needs if designed with an understanding of the farmers' decision-making processes and search behaviour in mind. This will reduce the number of sources the farmers must access to obtain the necessary information. The farmers' information search process will be quicker, easier and potentially more thorough. This will increase the value of the extension work by assisting farmers to identify and evaluate potential improvements to their practices more easily.

Based on the results of this study, the "Efficient Irrigation Technologies to Match Soils and Dairy Farming Systems" project team developed a web-based extension package for dairy farmers considering the adoption of CPI. The team selected and compiled information based on the information needs of the farmers interviewed for this study. The web site information is structured so that farmers move through a number of logical steps (see Figure 1).

Step 1 helps farmers identify what they are hoping to achieve through installing or upgrading their irrigation. Step 2 is designed to assist the farmers in estimating the benefits that could be obtained from adopting a new, or upgrading an existing irrigation system. This step takes into consideration the performance of the farmers' current irrigation system, and the features and constraints of the farm. Research information has been adapted and presented to enable farmers to determine the perennial pasture water needs, pasture productivity and irrigation efficiency of their farm. In step 2 a range of legislative information on topics such as earthwork planning controls, remnant vegetation, farm effluent management, new irrigation development and farm dams has been compiled.

Step 3 helps the farmers eliminate choices of irrigation systems that do not fit either their goals (step 1) or the farm features (step 2). This step also provides information on the relative strengths, limitations and costs of different irrigation systems.

Step 4 provides information the farmer needs regarding the planning, design and management and costs of CPI. In this section there is information about system capacity and its ability to supply enough irrigation water in hot weather, and other problem solving information such as how to minimise wheel rut formation in the paddock.

Step 5 provides information on the potential risks of adopting of CPI versus border check irrigation.

The web pages are clearly laid out with supporting information provided under the relevant titles and located on linked web pages. The majority of the information provided is objective. However the project team have recognised that farmers will also be seeking subjective information about other farmers' experiences and have published interviews with farmers who have worked through the adoption process, detailing the farmers' experiences and opinions about CPI.

Based on the results of this study, if the *Efficient Irrigation Technologies to Match Soils and Dairy Farming Systems* web site had been available to the farmers interviewed in 2004, their search for information may have been quicker, easier and less stressful. The farmers would have obtained more thorough, reliable and relevant information, and consequently may have been less likely to encounter problems with their CPI.

While the project team cannot obtain data on how many times their web site has been accessed, feedback from farmers has been positive, and approximately two hundred CD's containing the information had been distributed upon farmer request.

Figure 1: Front page of the efficient irrigation to match soils and dairy farming systems project web page

Irrigation System Selection and Design Guidelines

The information on the Irrigation and Design Guidelines is packaged under 5 key steps which will guide you through a logical decision making process. To proceed, click on a fin of the wheel or one of the following :

> **Step 1** - What do I want to achieve?
> **Step 2** - What are my farm's features and constraints?
> **Step 3** - What irrigation options should I consider?
> **Step 4** - What needs to be considered in my design and management, and what will it cost?
> **Step 5** - What option best meets my goals?
> Index of Questions
> Case Studies

Victoria
The Place To Be

Source: The State of Victoria, 1996 – 2009 Accessed 29th June 2009 from: http://www.nre.vic.gov.au/DPI/Vro/vrosite.nsf/pages/lwm farmwater efficient irrigation wheel

Conclusion

The results of this study suggest that dairy farmers used information seeking behaviour to inform their complex decision making processes when considering the adoption of CPI. The farmers had different questions, requiring a range of information to answer, depending on where they were in their decision making process.

This paper suggests that, to be effective, extension should be designed with the farmer's information needs in mind. This would reduce the number of sources of information the farmer needed to access, reducing the time and effort the farmer had to spend on information seeking behaviour, and potentially hastening the adoption decision. The "Efficient Irrigation Technologies to Match Soils and Dairy Farming Systems" project team has created a web site with these concepts in mind. Farmer feedback on the web site has been very positive.

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