

Unearthing farmers' information seeking contexts and challenges in digital, local and industry environments

Ann Starasts^a

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Abstract: This study describes the contexts surrounding the information seeking of Australian grain and cotton growers. Information seeking activities of 16 growers over an 18 month period provided insights into what guided their information seeking and what they considered to be 'information' that supported their self-directed learning. Contexts were highly situated, experiential and social. They found most online information to be devoid of these critical contexts, and it therefore did not contribute to their learning. Future agricultural information systems could better facilitate growers' information seeking if they incorporated local and environmental parameters, and enabled information sharing and connecting on local issues.

Key words: information seeking, agricultural information, farmers' learning, rural information and communications technology

1. Introduction

Context in information seeking and needs research describes the situation surrounding a person's information seeking. The value of research into understanding contexts lies in the fact that it provides unique insights into understanding information activities.

In Australia and globally, many rural information studies traditionally have evaluated farmers' information preferences or categorized their needs. Few studies have described farmer-centric perspectives that guide information seeking. These perspectives are defined in this research as contexts, and are explored in terms of their impact on grain and cotton growers' information seeking in Queensland.

Australia is one of the top ten producers of grain and cotton in the world, and uses highly mechanised production systems. Its 12 000 grain growers are typically dispersed throughout Queensland and southern and western states; and 360 cotton growers within Queensland and New South Wales (Australian Bureau of Statistics, 2012). The average size of properties growing grain in Australia is around 1000 ha (Australian Bureau of Statistics, 2011). These are mostly located at up to 300 km away from larger regional centres, and have variable access to local professional consulting services.

Information access for these growers has transformed over the past two decades through increasing digitization of industry and government information and services. The ability to access and use new information from digital and all sources is crucial for growers in order to

maximize sustainability of production and farming systems to meet future challenges such as food security, biosecurity threats, and climate variability.

This article describes research that defines the contexts associated with self-directed information seeking of 16 grain and cotton growers in Queensland in Northern Australia. The user-centred (Dervin, 1998), interpretivist (Cibangu, 2013; Schwandt, 1994) study characterises these contexts, and in doing so defines what growers considered as ‘information’ that supported their learning to make farming system changes. It considers implications for growers’ future information seeking in an increasingly digital world. Findings from this research will inform future directions for industry, private and government information system developers.

2. Problem statement

There is increasing availability of digital information, decision tools and communications to Australian farmers through online systems and mobile phones. Along with this is growth in the use of precision technologies within farming systems to capture on-farm data, and information technologies delivering information from industry, government and agribusinesses.

The digitisation and voluminous nature of available agricultural information is in strong contrast to the field and person-based, targeted extension and training approaches that traditionally have operated in agriculture in Australia.

Management and use of information resources from within these technology-based environments is very much within the domain of the individual farm business. Although agricultural agencies create and communicate information, the onus is with individual farmers to identify their needs for information, and seek, evaluate, and use it for farm decisions and building new knowledge.

2.1 Information and information technology in supporting farmers’ learning

The importance of information in supporting farmer decisions and learning has been widely identified (White & Selfa, 2013; Fountas, Wulfsohn, Blackmore, Jacobsen & Pedersen, 2006). Learning about and adopting new cropping technologies such as precision agriculture, no-tillage, or adapting to climate change is seen as highly information intensive and requiring good information access and quality (Llewellyn, 2007; D’emden, Llewellyn & Burton, 2006). It is suggested that farmers need to be both *skilled and ready to use* information to support system changes and adaptations (Hogan, Berry & Bode, 2011).

Information studies in agriculture in Australia and globally have traditionally reported on farmers’ information and learning sources and channels. Information is often considered as a product (e.g. brochure, web content, electronic newsletter) that is *provided* or *used* in making strategic or operational decisions (e.g. choosing crop varieties or fertilizer and pest strategies).

Studies of information use in agriculture have included farmers’ needs (Rubzen & Rola-Rubzen, 2002), and perceptions of usefulness and quality in adoption and management (Llewellyn, 2007; University of Southern Queensland
ann.starasts@usq.edu.au

Duram and Larson 2001). Accessing and using research and development information and technical information has been a centre point in decision and adoption research (Llewellyn, 2007; Genius, Pantzios & Tzouvelekas, 2006).

Research into identifying farmers' information needs is increasing (Meagy, Rashid, Barker, Islam & Islam, 2013; Glendenning, Babu & Asenso-Okyere, 2010), and along with this is a growing understanding that farmers' needs are for more relevant and context-specific information (Elly & Silayo, 2013). There is increasing recognition of the value of local information (Lawrence, Christodoulou & Whish, 2007) and farmers' own expertise (Aubert, Schroeder & Grimaudo, 2012) as sources of information for learning and decision making.

Social networks, participation in farmer groups, and sharing experiences (White & Selfa, 2013; Llewellyn, 2007) are widely recognized as important means through which farmers access useful information to support their learning about new farming processes. In contrast to this is agricultural content on websites that is little used in farmer decision making or learning (Suvedi, Campo & Lapinski, 1999).

It appears that farmers' real needs for information to support their learning and innovation are potentially not being met from within information technology environments (Glendenning & Ficarelli, 2012; Sulaiman, Hall, Kalaivani, Dorai & Reddy, 2012). The role for much extension information on industry websites in supporting farmers' learning and knowledge processes therefore appears to be unclear (Walisadeera, Wikramanayake, & Ginige 2013; Glendenning & Ficarelli, 2012; Llewellyn, 2007). There is a need for more studies based on the farm and farmer information processes to identify what drives information needs for learning, innovation and building knowledge in agriculture, and how information technology-based resources could be more effective.

Few studies of farmers' information use have been centred on farmers' self-directed learning. Few are case based or qualitative, or describe the how and why of farmers' strategies in seeking information. The dearth of this type of research occurs even in light of the high learning demands that are associated with farming system changes, and the current knowledge of the influential role of information access on adoption of new farming processes (D'Emden et al., 2006).

This research attempts to provide initial insights into the contexts surrounding farmers' information seeking and what constitutes 'information' to a grower as they direct their own learning to make farming system improvements. It attempts to investigate how these impact on growers' information seeking in online environments:

- What contexts surround farmers' information-seeking to support their self-directed learning to make farming system changes?
- How are these contexts impacting on growers' information seeking, especially in online environments?

3. Literature Review

Research into information seeking from user-centred (Kuhlthau, 1991) perspectives allows it to be considered as part of a broader process of learning or building knowledge. It allows for consideration of a role for information in supporting this overall process, and facilitates the emergence of understandings of what actually constitutes 'information' for users.

By placing the user at the centre, information seeking is seen as a constructive process of finding meaning or 'making sense' from information (Dervin 1998; Kuhlthau 1991). There has been significant use of 'Sense-making' (Dervin 1999) as a theory guiding information seeking research and context studies as it allows for the emergence of insights about how a person makes sense of their information experiences.

3.1 Context impacts information seeking and frames meaning

Context includes the situation, conditions and structures surrounding an event. These affect knowing and learning through their interaction with the setting, the availability of tools, and social activities (Brown, Collins & Duguid, 1989). Context is seen as significantly bound up with meanings (Miranda & Saunders, 2003; Achleitner & Wyatt, 1992), and therefore contributes to how people make meaning from seeking information. Johnson (2003) defines context as a 'framework for meaning' in order to view, interpret and make sense of information seeking (p. 744). An understanding of context is therefore seen as necessary in research into information seeking (Vakkari, Savolainen & Dervin 1997).

Descriptions of contexts surrounding growers' information seeking can therefore provide insights into why they use particular strategies or how they make sense of information. Talja, Keso & Pietilainen (1999) suggest that case and longitudinal studies are appropriate strategies to emphasise the significance of context in information research.

3.2 Descriptions of context

Previous considerations of contexts in information seeking research have described them as physical spaces (Savolainen, 2006a), networked spaces (Savolainen, 1999), information use environments (Taylor, 1991 in Savolainen, 2009), time (Savolainen, 2006b), and situations and resourcing (Johnson, 2003; Dervin, 1998).

Characteristics of these contexts contribute to information seeking. Personal attributes such as prior knowledge, expertise and past experiences are contextual factors contributing to information seeking (Savolainen & Kari 2004; Vakkari 1999). A person's values, attitudes, interests, and expectations also contribute to developing their information needs and to information seeking (Savolainen, 2014; Choi, 2010; Tewksbury & Althaus, 2000); and to how they make meaning from this (Savolainen, 2012). Perceptions about accessibility, quality, convenience and credibility of information sources and channels also guide information seeking (Connaway, Dickey & Radford, 2011; Choi, 2010; Savolainen & Kari, 2004). Some authors have gone further to categorise the impacts or relationships between information seeking contexts and information seeking (Kari & Savolainen, 2007; Johnson, 2003).

3.2.1 Information seeking constructs

University of Southern Queensland
ann.starasts@usq.edu.au

Information seeking contexts have also been described in the sense of socially-based constructs which guide the information seeking of a community or its members. Small World (Chatman, 1991) identifies how local, often small communities with established beliefs, norms and activities limit information needs and seeking beyond what is required within their community and every day (Chatman, 1991). Information grounds (Pettigrew, 1999) is a similar socially-based construct describing an information seeking context. These are environments where people come together for a purpose and the social nature of the gathering enables information sharing – such as what might occur in local grower workshops, meetings or community events.

3.3 Seeking information to support self-directed learning

This research considered information seeking within a process of learning. Learning occurs when the content is personally relevant to past experience or present concerns, and when learners feel comfortable and are actively involved ((Merriam & Caffarella 1999). Adults are self-directing (Tough, 1979), use their experiences in learning (Kolb, 1984), identify their own readiness, and organise learning around life problems (Knowles 1984).

4. Methodology

This research investigated the question: What contexts surround farmers' information-seeking to support their self-directed learning to make farming system changes? It explored information seeking from growers' perspectives and was based on qualitative case and ethnographic methodologies (Cibangu, 2013; Williamson, 2006). These allowed for the emergence of information use insights beyond those preplanned (Barry, 1995), and for in-depth description of information seeking experiences.

A collective case study was chosen because it allows the investigation of a phenomenon within its real-life context. Case studies are useful especially when the boundaries between the phenomenon and context are not clearly evident or where contextual conditions are being investigated (Yin, 1994). An interpretive case study based within phenomenological traditions (Schutz, 1970) and using ethnographic descriptive styles (Geertz, 1973) captured growers' information seeking activities in the form of protocols and their interpretations through interviews. The emphasis in this research was on how growers apprehended and acted upon their information-seeking experiences.

4.1 Participants

Sixteen growers (fourteen male and 2 female) were purposively chosen from varied locations, farm sizes and industries (cotton and grain) in south Queensland in order to provide a wealth of information seeking experiences. Fourteen of the 16 participants indicated they regularly sought farm-related information and communicated within online environments.

Each grower participant nominated a self-directed learning project they were undertaking on their farm which formed the basis for this investigation into their information seeking. These projects involved learning and information seeking in the areas of no-tillage, farm expansion, monitoring and improving production and budgeting, marketing, growing genetically-modified cotton, fine-tuning crop rotations, grain handling, production and marketing of organic grains and cotton, managing nitrogen, growing new crops, and precision farming.

4.2 Data collection and analysis

Data was gathered from two semi-structured interviews over an 18-month period which included capturing information seeking activities as protocols, and reflecting on these. Interviews were recorded and written notes were taken. Participants were asked open-ended questions including:

- How are you accessing information within your (farm-based) learning project?
- What is the most important source of information for you?
- Which sources of information are more important and which are less important and why?

Prompting questions were asked of growers to clarify or expand on their statements to include reasons, beliefs, feelings or the outcome of their information-seeking activities in terms of learning and progression of their farm-based projects. Transcripts including growers' information-seeking protocols were analysed using a grounded theory approach (Strauss and Corbin, 1998) and coded to:

- Identify key contexts within which information seeking operated
- Build descriptions of these contextual dimensions
- Explore relationships between these contexts and information seeking

Data was collected and constantly compared with other data, with the emerging categories and codes (Urquhart, 2001), and with the emerging relationships between these. This process progressed understandings of farmers' information seeking contexts beyond descriptions, but towards the ability to explain and predict information preferences and use at a more substantive level (Glaser & Strauss, 1967).

5. Findings

A number of key dimensions of growers' information seeking contexts emerged from the data analysis. These dimensions played important roles in guiding growers' information seeking in terms of the what and how, and in defining what growers saw as 'information'. Dimensions include the situated nature of their information seeking, the experiential nature of information and information seeking, and the social nature of information and information seeking. Growers' needs for familiarity in the information seeking process and their readiness to learn and seek information, along with work commitments meant that there were limitations and an apparent isolation for many in their learning and information seeking. Each of these is discussed with supporting quotes from participants, and in relation to how these interplayed with participants' information seeking especially in digital and online environments.

5.1 Situated information seeking and needs

A major dimension to growers' information seeking contexts was the strong sense of their specific and individual 'situation' that defined their information needs and guided their information seeking. Growers' information needs were highly specific to their farm, farming system and location. Their business, climate, soil types, farming equipment, skills, need for detail and motivation for learning all were situational parameters that contributed to their unique information needs. Consequently their information seeking activities were very considered and targeted in order to meet these needs as the following examples show.

Duncan was establishing a permanent bedding system for his cotton crops. He saw his information needs as very specific because of his combination of farming equipment and widths of his equipment, and therefore hadn't sought information from anyone. *'It's the first year, and I'm making a few refinements, semi-permanent bedding....I'm always thinking of things that are relevant. I haven't talked to anyone else, but I would like to talk to them if they were farming at 24 m strips, even if they were at Moree (300 km away).'*

Joel was fine-tuning nitrogen management in his cropping system and only looked to local sources of information rather than the regional grains trials as he saw his combination of soils, cropping system and climate as different: *'I'll only study [experiences] in our area. Nindigully (~250km) and the Darling Downs (~300km) are too far away.'*

Unique information needs emerged in terms of their differing requirements for detail when sharing information with other growers in terms of finances, production statistics and technical and scientific facts. This was a limitation to all growers' information seeking. Within digital and online environments, growers sought information and tools specific to their location and climate or they saw much information as of little value as the following quotes indicate:

John: *'(We were) disappointed that there was no data for our nearest centre (6 km away) in the (software) program'.*

Jim: *'We've looked at cropping software for this region – but we are not Dalby (135 km away) or Warwick (60km away). We didn't feel the information coming out of the program was good enough (accurate enough) for our area'.*

5.2 Experiential information seeking and needs

Growers' information seeking was highly experiential – having an experience, and then reflecting on and sharing this, were planned and deliberate 'information seeking' activities as described in the following quotes:

Darren: *'I'm really trying to work out a crop rotation. Six months ago I designed one, now I've thrown it out the door, it's not practical, a lot is based on this harvest, grain out of lucerne.'*

Jim: *'We belong to (Conservation Farmers group) We used demonstrator planting equipment. We didn't plan a range of information sources, but a range of experiences.'*

Doug: *'My most valuable source of information has been my own experience, what I have learned myself. Watching soil (move) from sitting on the back of the planter.'*

The interplay of growers' experiences in different seasonal or environmental contexts allowed for the development of richer understandings about particular phenomenon. Beyond having experiences, sharing experiences with other growers and advisers was an important form of information seeking. Most growers had sought information about others' past experiences and their current activities from within online environments, mostly with limited results:

Robert: *' I chased around a little bit on the web to see if anything happened in the first year it was grown ... There's not too much information getting around'*.

5.3 Seeking information socially, from people

Growers' information seeking was social and people-based by necessity as there were largely no other sources of locally situated, experiential information. Social networks mostly included family, other growers, and advisers with whom growers shared, discussed and reflected on experiences and perceptions:

Jim: *'We've been talking to a network of people....comparing our end of financial year figures and production..... Our son has a number of people he spends lots of time on the phone at night with discussing what they're doing.'*

Their situated and specific needs meant that some growers found it difficult to seek and share the information and detail they required:

David: *(I find it) 'impossible to talk to those people who keep it all in their head (productivity, budgets and performance).'*

Joe: *'... it's pretty hard to find other people doing the same things as you.'*

Few participants had online social information seeking experiences that had made significant contributions to their farm-based learning projects. Positive and negative views emerged in regards to the value of online social networking for farm-related information seeking:

Robert had found it a waste of time: *'I don't use chat anymore, there's nothing pertaining to my industry. I just lost interest in chat things – silly people butt in. Everyone's had their go at chatting on-line.'*

Gillian spoke positively of her husband's industry discussion group: *'...They talk about big time issues, level playing fields, tariffs, and industrial relations...There's a range of farmers and others.. it keeps him abreast of changes, so he can go off sideways to access information.'*

Electronic newsletters had widened participants' knowledge of who's who in the industry which they felt would facilitate future information seeking:

Duncan: *'I've become more familiar with the cotton researchers through their regular email reports....If I did have a question now, I may ring them direct...I still like to talk to a person (rather than email) because that helps to build up my network...'*

Many participants indicated that finding other growers and people with whom to share and seek information within online environments was difficult:

David: *'... people's email addresses would be horribly handy....It's a little bit frustrating... you've got to ring someone to find out their email address.'*

Gillian: *'In terms of accessing information, I need a network, I'd say I'm interested in doing that and then ask is anyone else? I'd like to know more email addresses.'*

5.4 Familiar places and spaces

Growers in this study mostly chose a small number of familiar sources, contacts and channels (including other growers, advisers and specialists) for seeking information. This sometimes meant ignoring opportunities to discuss their projects with their neighbours or other people in the industry. Some therefore appeared to be learning in isolation of their local or industry networks.

5.5 Readiness, time and timeliness in information seeking

Growers needed to be ready to identify their information needs and seek information. The specific timing of their information needs along with work commitments limited information seeking and their ability to use new information:

Bernie: *'I probably don't spend a lot of time chasing it [new information] because the cotton side is pretty stressful, it's high pressure, and time consuming. Living and working at home, it's difficult to find time.'*

Paul: *'There's apathy against good information here as you can't do anything with it. We're treading water until it rains. Most operations are treading water.'*

Most growers indicated how online information sources facilitated timely access for information on weather, markets, farm machinery, and for enabling them to seek new information (beyond their local sources) at a convenient time. Finding *relevant* information, however, took time.

Joe: *'Unless it's easy and quick and simple, your time is too precious and if you get on [the internet] and can't find anything (relevant)..you give up.'*

5.6 Seeking information in isolation

The situated nature of growers' information needs, need for familiarity, and time commitments meant that they were often seeking information in isolation. Growers indicated that local, social

activities and information seeking opportunities were declining. Farm commitments and drought had contributed to this:

Doug: *'Our local [Grower association folded]...everyone has been sourcing their own information. There's not many meetings ...I could go to a lot more field days.'*

Although internet connections had provided social support to farming families, online networking among growers did not emerge as a major channel of information seeking to support growers' farm-related learning projects in this study.

6. Discussion

Contextual dimensions of growers' information seeking unearthed formed a framework for creating meaning (Johnson, 2003) and 'sense-making' (Dervin, 1999) for growers. Information channels, sources, and content that incorporated these dimensions enabled growers to make sense of new information in meeting their knowledge gaps and facilitate progression in their self-directed learning.

These dimensions strongly contributed to defining the type of information most growers sought and their information seeking activities. They appeared to put some boundaries around where most growers were prepared to seek information to support their own learning for making system changes on-farm. The situated, experiential and social dimensions together characterised what growers considered as 'information'.

Growers' information seeking contexts formed the 'lens' through which they interfaced with new information available through their industries, formed a grounding for development of their information needs, and guided information seeking, and learning. They formed the criteria that allowed growers used to judge new information in terms of its usefulness.

Growers' highly specific information needs (and difficulty finding people with whom to share information), along with their strong need for local, situated, experiential and social contexts (and lack of these in online environments) meant that in a sense growers were knowingly and happily (for some) and frustratedly (for others) living in Chatman's small world (1991).

The personalised and social nature of growers' information seeking through the sharing of experiences and perceptions was related to their highly specific and unique information needs. Leckie, Pettigrew & Sylvain (1996) similarly found engineers' information seeking to be focused on sharing experiences due to the problem-based and complex nature of their learning topics.

6.1 Farmers' information seeking – a construct

The dimensions of context surrounding growers' information seeking were strongly represented in all participants' experiences in the study. The combination and interrelations of these dimensions provide a unique, yet repeatable construct that guided growers' information seeking. Whilst each grower differed in their extent of needs for sharing experiences, or situational detail, each dimension was operating and impacting on each, and the relationships between dimensions and their impact on information seeking were similar for each growers' situation.

Contextual effects on growers' information seeking, and the relationships between them have informed understandings of farmers' information seeking and learning. The contexts identified in this study go beyond individual descriptions, but towards a construct for farmers' information seeking that has wider application beyond the participants in this study.

6.2 Information seeking within technology-based environments

Growers' need for these contexts in their information seeking had significant effects on their ability to seek and use information from within online environments. Their strong ties to their specific farm and its situational parameters, and their need to learn through experiences and sharing these, defined both their approaches to information seeking, and their information needs. They found much information available within online environments to be devoid of these important contexts. Information about other growers' experiences (e.g. YouTube videos, case studies) along with contact details of other growers with similar interests were the information growers were seeking from online environments.

Much information seeking in online environments therefore seemed limited, rather than empowered in terms of facilitating their learning. This finding supports the current global questioning around the role of information technology in facilitating agricultural development (Sulaiman et al., 2012; Glendenning & Ficarelli, 2012). This role should be redefined as facilitative, enabling and inclusive, rather than simply *supply* of information and data.

7. Conclusions

Growers' information seeking to support their self-directed on-farm learning occur within contexts that are highly situated, experiential and social. Consideration of the key role of these contexts in relation to guiding information seeking and use is vital in designing agricultural information and communications systems that support industry development.

This research calls for a shift in focus in agricultural information systems designed to facilitate industry development and innovation from beyond *supply* of information and communications to *facilitate and empower* information sharing and discourse about specific issues in specific locations.

The following strategies will enhance capacity for information seeking within online environments in agriculture:

- Online databases and systems that deliver information to farming businesses with specific locations, soils and climate parameters; along with the ability to locate other growers with similar situational parameters or learning projects to enhance communication between people on specific issues.
- Online, *ongoing* networking, dialogue and sharing of experiences with a focus on specific issues – that is community led rather than corporate or project-led, audio-visual, and linked to a place, a type of farming system or climate.

- More online and local events that enhance interactions between industry members to enable information seeking.
- Ensure industry members are equipped with the digital literacies necessary to seek, curate, and use new systems and content, and partake in relevant, useful online, social activities.

This research explored growers' information seeking related to their own learning projects. It is considered that the information seeking contexts identified in this study transcend into other situations of information seeking, learning and education in agriculture, beyond the realms of just self-directed learning.

Future research could see effort placed into developing and testing such systems that are more in line with growers' and industry members' needs for building new knowledge at farm, community and industry levels. Consideration of these findings in future information systems development will facilitate access, evaluation and use of industry and research information in agricultural business and industry development.

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University of Southern Queensland
ann.starasts@usq.edu.au

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University of Southern Queensland
ann.starasts@usq.edu.au

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