Constructing useful information for farmers– the role of IT

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Abstract
The Internet will be of most use to cropping farmers when providers of agricultural information use it less like a library and more like an interactive field day. It is not its scarcity but the local contextualization of information that makes it valuable for farmers. The huge volume of information available on the Internet is of less value to farmers than the opportunities for interactivity with others that it provides to help make local sense of that information. There is a mismatch between current content aimed at farmers and the way that farmers make decisions.

The high social and economic costs of Internet access mean that it must complement and supplement traditional low cost media if it is to be most useful. A comparison is made of rural Australia and rural Uganda: the constraints on Internet services and the need for cross-promotion and integration with other media. In both cases a positive policy environment has been vital to the successful development of rural Internet services.

Farmers need good access, a supportive peer group, personalized training and online mentors to make best use of the Internet. Developing online support groups based on existing farmer groups is a good way to help individuals develop their skills in a safe environment and to find practical uses for the Internet. Organizations providing online information to farmers could greatly improve its relevance if they invested in online extension services to help farmers find and interpret their information and to facilitate the development of online farmer groups.

Media summary
Online extension services and online farmer groups are needed to overcome the mismatch between how farmers learn and the current Internet information provided to them.

Key words
Rural Internet, online groups, access, facilitation

Introduction
The value of the Internet to cropping farmers is highly dependent on the particular context. This paper compares the value of the Internet for cropping farmers in two very different national contexts: Australia and Uganda, and two very different means of accessing it; via personal computers in the home and via community telecentres. In both countries there has been a positive policy environment, which has encouraged the development of rural Internet services.

The Internet is the newest form of Information and Communication Technologies (ICT) being used for rural information services and in both Australia and Uganda older forms of ICT such as radio have a much greater impact. The role of the Internet in providing information relevant to agricultural production is also only one aspect of its use. Other uses for providing health information or political empowerment may be of more general importance in both national contexts.

There are some powerful lessons emerging concerning the role of the Internet in supporting farmers' information seeking and learning, and the need to make much more use of the interactive capabilities of the Internet. This has implications for skill development of farmers, the role of online farmer groups and online extension services, and the need for more targeted and timely information provided by rural institutions.

Information must have value to make it worth seeking
Agricultural information is not inherently, or uniformly valuable – unlike oxygen which has a constant and uniform value to us as a means for sustaining our lives. The value of agricultural information is much more ephemeral, and depends on the policy environment and the social and individual context. Some societies and some individuals value it more than others, and at some times than at others. It is only when agricultural information is valued will farmers seek it and use it, and even try new means like the Internet to access it. It is only when it is valued will they consider paying for it.

The perceived value of agricultural information is strongly affected by the policy context. In Australia, governments fund research and extension services to help develop agricultural information because of its impact on national wealth. In contrast, the connections between the development of agricultural information and increasing national wealth in many developing societies are not as clear. Agricultural information often has a low status among both policymakers and farmers alike. This is because of weak linkages between information flows and agricultural development, and therefore this investment loses out compared to the many other societal needs that have to be met (Mchombu 2001).

The value of information also depends very much on the social and individual context and the degree that individual farmers perceive a need to learn. Information seeking by farmers has been variously related to their education level or the availability of information (Kilpatrick et al. 1999), risk preference, material possessions or extent of social interactions (Kadian et al. 2000).

In contrast, Dervin (1989) argues that by categorizing users in static terms such as demography, personality, psychology, literacy, purpose or other factors, such studies end up categorizing users into haves and have nots. Information is assumed to be finite and objective. Dervin argues that the result is an approach to information seeking research that can end up blaming the victim and by default assuming that the information world of the expert is the one that is sought (Dervin 1999). Rather, it can be more fruitful to view information as subjective and contextualized and therefore consider the individual actors' situation and their stated purpose, their gaps in sense-making and information traits (Dervin 1989). A person's information needs are therefore seen as strongly dependent on time and context, so that information only becomes valuable in specific situations.

The value of information to individuals can be altered, either by changes to their personal situation or context or by the influence of external agents. The behaviour or opinions of family members or peers can influence an individual's perceptions and extent of use of information products (Fulk et al. 1990). The perceived need for information can also be altered by the topic itself (Limberg 2000), or the way information is presented (Daniels 1988). Extension agents, merchants, bankers or other external agents can play a role in leading farmers to information and providing opportunities for users to identify the local applicability of information.

A major investment by such external agents may be needed in marketing the value of information in rural communities where its connection to desired social or individual aspirations may not be immediately obvious. In their review of the ACACIA project which provided telecentres in southwestern Uganda, Stroud and Ocilaje (2003) concluded that investment must be made in building capacities to seek, select and use information, and to build the rural population's appreciation so they place a value on information.

Why the interest in using Internet to provide agricultural information?
The Internet is still an elitist communication media for most people, but because of its unique capabilities, and some positive impacts of it, there are great expectations of its value to rural communities – but most have yet to be realized. Although more than 56% of the Australian population has access to the Internet, only 1.3 % of Africans are online (International Telecommunications Union 2003). Half of these African subscribers are in South Africa, and virtually none are in rural areas (International Fund for Agricultural Development 2003). So why the interest in what is essentially a new and elitist form of communication?

Communications technologies, along with transportation technologies, are seen as "enabling technologies" for rural communities in terms of reducing the effects of distance. (Dicken 1992). In rural Australia the magnitude of its impact is likened to the introduction of telephone services as a means of reducing the tyranny of distance' (Simpson 1999). The Internet provides access to a vast amount of

information, with potential to help overcome the social and economic inequalities between industrialized and developing countries (Digital Opportunities Task Force 2001).

Rural Internet access has rapidly expanded in Australia and in the process has changed from a community service focused around telecentres in the early 1990s (Crellin 1994), to a home service as more farmers have opted to buy their own computers. The rapid increase in the percentage of farmers with home access from 11% in 1998 to 34% in 2000 (Simpson 2001) provides a convenient measure of the impact of the Internet, and implicitly of social progress. Comparisons between rural and urban levels of home access are seen as one key measure of social equity (Curtin 2001), providing justification for improving rural Internet services.

The Australian preoccupation with individual access to the Internet on the farm tends to de-emphasize the broader impact that it can have on farmer decision making and community development through its use by extension workers, farmer organizations or merchants that serve farmers. In developing nations, even a small percentage of this group with Internet access can have a significant multiplier impact. Enhancing the skills of such groups in Australia or Uganda may have more impact than increasing the actual numbers of farmers with Internet access.

The Internet can contribute to individual farm profit through direct marketing and selling, lowering costs of business transactions, assisting in supply chain management and improving coordination and communication within organizations (Gregor et al. 1998). It is widely used to access weather, market and technical information (Simpson 1999). As access skills develop there is also more interest in using it to communicate with other people (Easdown 1999), and over 46% of 1000 farmers connected to the Internet in the national "Farmwide" programme used e-mail regularly (Simpson 1999).

In rural Africa, most farms are far too small and poor to be able to afford access to telecommunication services, and so the main form of community Internet access has been through rural telecentres. Despite their mixed track record and difficulties with Internet connections (high costs as well as unreliable services), telecentres remain one of the most practical options for rural communities (Gerster and Zimmerman 2003).

Because rural Internet services are developed as public community resources in Africa, the benefits are seen more in terms of community development, rather than individual economic impact. In their review of the impacts of ICTs for poverty reduction in Africa, Gerster and Zimmerman (2003) found that there were four types of positive impact:

- Improved opportunities for income generation through such things as improved market information and the creation of employment opportunities.
- Strengthening good governance through increasing knowledge of human and constitutional rights.
- Improved health interventions.
- Providing opportunities for capacity building through local training.

So despite the limited access to the Internet in developing countries, and limited widespread demonstrable benefits (information benefits are by their very nature particular), there is strong interest in using the Internet for agricultural information both because of successful case studies and the perceived social benefits in reducing inequities. However, there are many social and technical barriers to be overcome for farmers accessing the Internet or using it effectively for specific problem solving and this depends on a favourable policy environment.

Providing a suitable policy environment for the development of rural IT uses
The importance of a favourable policy environment to support rural Internet use cannot be underestimated. This involves policies to encourage the development of rural telecommunication services at affordable prices and programmes to develop rural skills and appropriate content.

In Australia, the Rural Telecommunications Infrastructure Fund ensures that rural telecommunication services are subsidized, and there have been specific initiatives to support rural connectivity. The Farmwide program ran from 1996 to 2001 and was an initiative of the National Farmers Federation and

Telstra. It connected over 1000 farmers across Australia to the Internet and developed support services to encourage their use of the medium, while also researching technical and social constraints on its use (Simpson 1999, 2001). The "Networking the Nation" programme run by the Federal government has provided over USD100 million from the partial sale of Telstra to rural communities to improve infrastructure and stimulate Internet service delivery (Networking the Nation 2004).

Uganda has a progressive policy on the development of rural Internet services compared with many African nations (Ofir 2003). In 2002, out of 53 African countries, 16 had an ICT policy in place and 21 were in the process of developing a policy. The remaining 16 had no policies and virtually none were aiming to respond to the challenge to develop a pro-poor regulatory and policies environment in ICTs. Because the majority of the poor are rural, this means that there has been a limited focus on the use of ICTs for rural information delivery in Africa (Gerster and Zimmerman 2003).

Despite positive policy environments in both countries, the levels of relative access to the Internet are vastly different between rural communities in Australia and Uganda.

Table 1. Relative measures of Internet access between Uganda and Australia. 2002

Communications measure	Uganda	Australia
Computers per 100 people	0.33	56.51
Internet hosts per 10,000 people	0.91	1304.21
Internet users per 10,000 people	40.49	4817.41

(International Telecommunication Union 2004)

Appropriate policies and investment can ensure that rural Internet access can grow. But this is just the first step. There is a need for more emphasis on the actual content and its usefulness, and developing the human capital of communities to absorb, evaluate and use information (World Bank 1998/99).

The Internet is a costly medium for accessing information
There are many barriers to Internet access and use that have to be overcome before it becomes an integral part of an individuals' means of communication. There is not one digital divide between those who can use it and those who cannot but diverse fissures caused by the limitations of the telecommunications infrastructure, the skills and time needed, and gender issues.

Technical infrastructure
There are many technical links in the chain needed to connect a rural person to the Internet, and no-one takes responsibility for all of them. A lack of access may be caused by problems with the national or local telecommunications infrastructure, the ISP, the computer or the software being used (Easdown 1999). In rural Australia this is enough to put farmers off using the Internet, but it can be a major headache for Internet project managers in Africa.

Poor, or non-existent telecommunications infrastructure is a fact of life for most rural African communities, where there are only three telephones for every 100 people (International Telecommunications Union 2003). Rural telecentre projects can have to overcome a lot of technical problems just to get the Internet connected. In the Ugandan ACACIA telecentre project for instance, Stroud and Ocilaje (2003) found that phone services and electricity did not exist in the rural areas targeted and even in the larger towns there were intermittent disruptions to the phone and Internet links. Management limitations and staff turnover led to problems getting services from the telephone and server companies, trouble shooting was difficult from a distance, billing was irregular and technical support was often poor.

A promising alternative for some rural communities in Africa is the use of mobile telephony to access the Internet (Gerster and Zimmerman 2003). In Uganda the mobile phone services of MTN are widespread even in remote rural areas, and in many African countries the number of mobile subscribers exceeds those linked to the fixed network. Innovative African projects such as Foodnet in Uganda have made use of this to develop an online system using mobile telephony for farmers to access price information via messages (SMS) and information on commodity prices can easily be sent via teletext.

Cost of access
The cost of Internet access is a significant issue affecting its uptake by rural users. Within wealthy rural communities such as Australia there is a clear correlation between income level and the level of Internet access (Lloyd and Hellwig 2000). In African rural communities the costs of information have to be subsidized to make it available to women and the poor (Stroud and Ocilaje 2003). Despite widespread access to mobile telephony in Uganda and the success of pilot projects to provide Internet services via this media, the poor cannot utilize this opportunity because of the high costs of the handsets and service fees, as well as their lack of skills to use phones (Gerster and Zimmermann 2003).

Time and skills needed
Effective Internet use requires both time and skills. Starasts (2004) found that the key factors affecting Queensland rural users' ability to access and use Internet information were their awareness of relevant websites, and the limited time to explore the Internet in the hope of locating relevant information. There appears a clear expectation of the rural community of the role of extension and Governments to provide pointers to relevant online information. The skills needed to use the Internet effectively also increase in going from accessing static webpages though to e-mailing colleagues to interacting with others via online forums to collaboratively solve problems. Salmon (2001) has shown that users need different types, and increasing degrees of both technical and social support to be able to move through these skill levels. These skills are not the same as those used by extension workers to facilitate face-to-face interactions between farmers. They are however being used by online educators and those running commercial online communities.

Supportive social networks
Strong social networks can positively affect how well the Internet is used. Singh and Slegers (1998) found that advice from knowledgeable family members, colleagues and contacts had an important impact on how effectively people used the Internet.

Gender
Gender can play a large part in influencing access to the Internet. Singh and Ryan (1999) identified gender differences in access between rural and urban regions of Australia. In urban households men dominated Internet use, while in farm households women were the main users. In Australian rural communities women tend to have higher education levels than men and traditionally play a greater role in information gathering, although as Daniels and Wood (1997) found, that doesn't necessarily translate into changing management decisions which are male-dominated.

A lack of necessary infrastructure, the cost of access, the time and skills needed, the degree of supportive social networks and gender can all influence the degree of digital divide between those with useful access to the Internet and those without. For a whole variety of reasons, Internet access is virtually absent from most of rural Africa, while it continues to grow rapidly in rural areas of developed countries like Australia. Increased use of the technology by the 'haves' and a lack of support for and use by the 'have nots' will increase the degree of this difference.

Farmers' learning is situated and experiential
Recent studies of farmers' learning and information seeking have highlighted that these processes are highly situational and experiential. In her study of Queensland farmers' information seeking within an online environment Starasts (2004) found that farmers see their information needs as highly specific in terms of their physical, social, personal and environmental context. They would seek information in relation to their available time, current problem-based needs, past experiences and social connections and physical environments. Online mass information approaches often did not meet users' situated information needs.

The main focus of their learning was their individual experiences or accessing information from others about their experiences. Participants' assimilated and evaluated new information through reflecting on their experiences, comparing these with others and judging the relevance of others' context and experiences relative to their own. Experience is a fundamental key to individual learning as well as a means of assessing the value of external information sources such as newspapers, advisors or workshops (Millar and Curtis 1997; Kilpatrick et al. 1999).

A study of Northern Territory pastoralists' approaches to learning also identified the importance of concrete individual actions and specific contexts to the degree of learning (Arnott Fell and Benson 2001). Information to support learning needed to be personalized and timely. Farmer groups could provide credible sources of information and opportunities for information exchange.

Internet technology has provided opportunities for learners to seek individualized information through the use of electronic mail and to access and share information about individual experiences through online formal interactions, but most rural Internet services are not designed to support individualized situation-specific learning exercises. Rather, the Internet tends to be seen as a more effective way of getting out existing information to a mass audience. There is a mismatch between what farmers need from the Internet to be able to learn, and what most providers of information across the Internet are aiming to deliver.

A mismatch between mass delivery of Internet information and situated learning needs
The high cost of the Internet in terms of preparing and updating information, as well as a lack of policies on how to target information has meant that Internet information for rural communities has often been derived from content developed for other media and directed by default to a mass audience. Content is often copied from existing paper materials because it is costly to develop new content specifically for the web (Easdown et al. 2002; Starasts, 2004). So the easiest option is to use the Internet as a secondary distribution medium. The problem arises that a new and innovative medium tends to raise expectations of new and innovative content amongst users.

The mass approach to providing online cropping information is of limited value to farmers looking for contextualized answers. Queensland rural Internet users have found it difficult to access technical information at the required level of detail from online sources (Easdown et al. 2002; Starasts 2004). They had difficulty finding useful information at the appropriate level of technical detail to answer their practical queries about topics such as insect management, new computer technologies and products, nutrition and soil management.

Mass distribution of online information is more likely when content is relatively cheap to develop, where there are low web management budgets and there are significant social benefits from publishing it as widely as possible or target audiences have not been clearly defined. More targeted or closed distribution systems are more likely to be developed when the content would be potentially damaging if it got into the hands of competitors, those opposed to the particular practices being promoted or where it might lead to loss of expensive intellectual property (Easdown and Colliver 2002). There may also be attempts to add value to the information by restricting its availability to those who have paid an access fee.

The need to develop contextualized content that will complement that available via other media has to be balanced against the costs of doing so. The most valuable targeted use of the Internet is when it complements other information media that the targeted users can access. This means designing its use from the users' perspective, and involving industry and community groups in the design and development of Internet information services.

The Internet as one part of a rural information ecology
Many different sources of information can influence a farmer's decision making, and the Internet is competing for farmers' attention alongside other more familiar media. These include face-to-face interaction with peers, extension agents and merchants, as well as radio, newspapers, magazines, TV and the Internet. Together they form an "information ecology" in which time, cost, skills needed and context all interact to determine which source will be used and their relative degree of influence.

Because the Internet is an unfamiliar medium for many rural people, its use can be greatly enhanced by cross-promotion using other older and more familiar media. Where there are major divisions in the community between rich and poor, or urban and rural communities, it is essential that the Internet be integrated with other media if it is to have a positive impact on community development.

In Queensland, Starasts (2004) found that cross-promotion of relevant online information through newspapers and radio as well as within industry and social networks and by extension and commercial operators saved searching time and were important factors facilitating farmers' use of the Internet. Conversely, over-reliance on search engines, along with difficulty navigating websites were deterrents to using the technology.

In Africa, the cross-promotion and integration of Internet services with those provided by other ICTs – radio in particular is seen as essential for it to support community development. In a review of the development potential of ICTs in sub-Saharan Africa, Gerster and Zimmermann (2003) found that many projects were successfully using combinations of radio and Internet to positively address development issues, as well as combinations of radio and print media, radio and mobile phones, print media and Internet, print media and e-mail. These were often provided within the same telecentre. Because Internet access rarely makes a profit they also provide other information services such as telephony, photocopying, printing, publishing or training. Far from making older media such as radio less important, the Internet is opening up new possibilities, so that even without direct access by the poor the Internet can positively impact on their livelihoods.

To be a successful source of information the Internet needs to provide either different content or a different quality of content delivery. In Queensland, Starasts (2004), found that farmers believed that the Internet provided useful background information on key agricultural topics at times which were more convenient than via other media. The information was seen to be more recent than via other media, and its hyperlinked structure often led to other information sources so that is acted as a one-stop-shop for researching particular topics.

A successful case study - The Evergreen Farming Group in Western Australia
The Evergreen Farming group (EGF) has successfully used the Internet to support its activities and the learning of its members and this was assisted through their participation in a project to enhance farmers' use of the Internet during 2001-2002. It is reported in Easdown and Colliver (2002).

The EGF is a network of farmers interested in perennial pastures and summer crops that started in the early 1990s. They conduct trials on their farms and provide information to each other on a subject that is of little interest to mainstream research and extension agencies. Early members were located on the sandy coastal plain of the West Midlands region of Western Australia, north of Perth, from Gingin to Three Springs, over a distance of 200 kilometers. In June 2001, there were 30 farmers in the group, with about 15 of them active. During the research period, the group consolidated and expanded its reach to other parts of Western Australia. A consultant was appointed to handle administration, the number of field days increased and a group website was established. By mid 2002 the group had 117 members, 75% of whom had email.

The Internet was a minor means of group interaction and problem solving at the start of the research project. These were usually done at field days, over the telephone and through conversations within the family or with their local extension officer. There were a small number of "Regular users" in the group who visited a small number of websites to check the weather or prices. Only a few used e-mail. There were "once-bitten" users had tried using the web and found it difficult to get connected or find what they wanted, so they were content to ignore it. Then there were those users "waiting in the wings" who were going to get on the Internet sometime, but they never got around to it.

A number of activities were implemented with the group over a 12 month period which resulted in a substantial change in the use of the Internet for individual learning amongst group members.

Initial activities to develop the group's Internet use
Four proposals to improve the group's use of the Internet were accepted by them:
- Building a group website using the facilities of www.communityzero.com. This provides inexpensive customizable websites to facilitate group interactions via discussions and chats, posting notes and sharing documents and photographs.
- Organizing an online discussion on the establishment of perennial pastures, which was an activity they were about to start.

- Planning a field day online**:** the group organizers were helped to use the website's discussion facilities to plan activities prior to the next face-to-face meeting.
- Posting notes to develop Internet skills: a rolling series of notes were posted to the group website on different topics to build the Internet skills of members.

Follow-up activities to consolidate and expand group Internet use
The group's use of the Internet jumped following these initiatives, but technical problems with the site and seasonal work pressure reduced interest after a couple of months. Six months later three further initiatives helped develop a stronger foundation for practical Internet use:
- Personalized Internet training for up to four hours in their homes was provided to the EGF committee members and others who were particularly active in using the Internet.
- Digital cameras were provided to the group so that participants could post photos of the trials on their properties on the group website.
- Walking the wider group through the website: 110 members were introduced to the website during a field day when its use for sharing photos of trial work was discussed.

The results of this research showed that with these inputs the group's use of the Internet expanded significantly and it became an important part of the group's identity, communications and learning – so much so that access to the group website was soon restricted to only financial members of the group. The Communityzero site was relatively easy to use and the number of features could be expanded as group skills expanded. Management of the site was taken over by the group itself and the digital cameras provided a potent source of material for discussions.

Groups use the Internet for needs unmet by existing means of communication
- Farmers are wary of information overload and wasting time trying to use the Internet.
- The Internet was a favoured form of communication where long distances made other forms of communication either expensive or inconvenient.
- The Internet is a good medium for supporting the activities of a growing group, sharing information with many people simultaneously and keeping everyone informed.
- Eavesdropping on the high quality conversations of peers provided valuable learning at a time of one's choosing with no obligation on those with less Internet skills to contribute.
- Images provided a lot of information and stimulated interest, as well as adding a degree of ownership when family photos are posted along with photos of pasture trials.

Groups use the Internet more effectively as they develop a culture of Internet use
- Farmers use the Internet when they see their peers using it in a safe group environment.
- Farmer groups discover how to use the Internet through many small experiments often done by enthusiasts whose playful activities were important to everyone's skill development.

Groups use the Internet when members have basic skills in using the technologies.
- Getting connected and learning how to use it are not simple tasks.
- Basic non-interactive computer skills were needed before interactive skills developed.
- Work habits that use computers and skills for online interaction develop very slowly

Groups use the Internet for effective learning when someone leads and facilitates
- Leaders model behaviours for a group and help support and bring in the right expertise.
- The facilitators were important to developing practical activities, providing connection to outside skills and creating a welcoming atmosphere in the online environment.
- Existing extension workers did not have the time or focused expertise to act as continuing online facilitators for such groups.

Providers of Internet information do not have groups or contextualized learning in mind.
Interviews with providers of online information accessed by the group found that the quality of information was limited by institutional fears of litigation and a lack of clear targeting. Information wasn't always easy to find because small web budgets limited the investment in good indexing software,

and there were no institutional facilities to handle interactivity, which may have been able to complement a limited indexing service.

The case study showed that the Internet could be a potent resource to help the learning of groups of cropping farmers. There is a mismatch between what the providers of Internet information are developing, what farmers really need for decision making and their needs to contextualize information to make it useful – often through the help of their peers.

Conclusions

For the Internet to be an effective means for farmers to access useful information three complementary things need to be in place. Government policies are needed to support and develop physical Internet access in rural areas. Farmers need to be skilled and supported in learning how to use the Internet and contextualizing its information, and institutions need to produce information in forms that are compatible with the way that farmers learn.

The Australian emphasis on measuring the number of farmers with private individual Internet access in their homes can be counter-productive. Farmer groups are an important means of facilitating the adoption of innovations and are greatly under-utilized in developing farmers' use of the Internet. It would be more useful to measure the number of farmers being supported in using the Internet through such community groups. In rural Africa, where community telecentres are the main means of Internet access, the focus continues to be on communities and community development.

Farmers value contextualized information that has been validated by others' experience and can be applied in their personalized situation. This can only be done through interaction with the receiver of information.. It is far easier for the institutional developers of information for farmers to broadcast a product to a mass audience, often derived from existing print material, than to contextualize it and enter into interpretive online conversations about it. This interpretation is what happens during field days and in interactions between farmers and this is how they are used in gathering and refining useful information.

Developers of Internet information could assist its on-farm application through the development of complementary online extension services. These could facilitate groups of farmers to find the information they need, help interpret it or point them to other information or individuals. A small number of specialized online extension workers could have a large impact on many groups. Facilitating online groups is a time-intensive, highly focused and skilled activity. Current extension workers are not trained for this role and the skills needed are not the same as those needed for facilitating face-to-face interactions.

Online groups of farmers are important to skill development and helping to make local sense of Internet information and they can complement face-to-face groups. Both online extension services and online groups are important means of supporting the uptake of innovative practices.

The potential for the use of the Internet to support farmer learning has only been partially realized. Most content for farmers is mass-marketed information designed for self-serve clients working on their own. There is great potential to make more use of targeted information and to utilize the interactive potential of the Internet. This requires skill development amongst farmers, the introduction of online facilitation skills into agriculture from professions such as online education or commercial online communities and more support for online groups.

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