INTERNET-BASED INFORMATION COMMUNICATION TECHNOLOGIES FOR DEVELOPING AGRICULTURAL INFORMATION SYSTEMS IN DEVELOPING COUNTRIES : CHALLENGES AND OPPORTUNITIES

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Abstract

Internet-based information communication technologies (ICTs) have the potential to open new information channels to the information-poor rural areas of developing countries. New ICTs can educate and empower rural farmers and offer limited employment to locals but there are numerous constraints to the development of telecentres and utilization of the computer-based services that they offer. Most important of these limitations are the lack of information and computer skills in rural areas and the pressing survival needs of rural dwellers that relegate information to a luxury rather than a necessity. In this paper, the role of telecentres for making such ICTs available to rural inhabitants is considered. The limitations and constraints of telecentres are also highlighted and some guidelines for effective employment of telecentres in rural areas are noted.

Keywords: agricultural information system, farmers, ICTs, information delivery, internet, rural areas, telecentres

Introduction

In development discourse, information dissemination has long been seen as important to development in general. However, it is even more crucial in the particular case of rural development. In most rural areas, many people depend almost completely on commercializing their agricultural produce for income and in many areas the population lives on subsistence farming. Access to relevant technical and commercial agricultural information is often crucial to survival. In addition, information exchanges are instrumental to development efforts aimed at increasing people's capabilities to choose, or their individual freedoms. The dependency on agricultural information is true even in situations where people participate in seasonal migration to urban areas to generate extra income. This extra income is not only needed for agriculture related activities, but also for education and health care, i.e., in order to increase individual social freedoms. Unfortunately, relevant information is often not available where and when needed, inappropriate, or out of the financial or physical reach of people.

Munyua (2000), for example, regards information as the least expensive input for rural development and a basic ingredient for bringing about social and economic change in rural areas. Rural areas in developing countries are generally perceived to be an information desert that is becoming increasingly marginalized as the technology and information gap between rural and urban areas widens (Wakelin and Simelane 1995). Rural communities, where agriculture is commonly the main activity, require information on: supply of agricultural inputs (seed, fertilizer), new technologies and innovations, early warnings (pests, drought disease) and credit facilities, markets, etc. (Munyua 2000). Studies by (Kaniki 1989; Karlsson 1995; Leach 1999) have highlighted the shortcomings of traditional print- and library-based methods of disseminating information to rural farmers who are generally illiterate and relatively remote from formal sources of information (e.g. extension stations, libraries). Proponents of the new ICTs suggest that technology can overcome these barriers by delivering information right to the rural people via 'telecentres' improving the traditional rural agricultural information system. In this paper, the role of telecentres for making such ICTs available to rural inhabitants is considered. The limitations and

constraints of telecentres are also highlighted and some guidelines for effective employment of telecentres in rural areas are noted.

Traditional rural agricultural information systems

An agricultural information system can be defined as "a system in which agricultural information is generated, transformed, transferred, consolidated, received and fed back in such a manner that these processes function synergically to underpin knowledge utilisation by agricultural producers" (Röling 1988:). The agricultural information user community includes "persons whose work involves some part or the whole of the field of agriculture or its products, and therefore requires information to do their work" (Kaniki 1999). The agricultural information system therefore encompasses everyone from the researcher and policy maker, the information intermediary and development worker, to the end-user, i.e. the farmer. ICTs, such as internet, certainly provide an unprecedented and unparalleled medium for development and agricultural researchers and practitioners to share information and ideas. Carter (1999) notes, however, that there is an urgent need for agriculturists (especially researchers) to stop talking among themselves (and 'conferencing') and to expend greater effort in getting relevant information out to those who need it most (the farmers). The notion that "research creates knowledge, extension transfers it to farmers and farmers utilize it" underpins the "Training and Visit" (T and V) extension system employed by most countries (Röling 1988). However, designers and managers of agricultural support and extension services have realised the need to move from such a "transfer of knowledge" paradigm, where information is directed at a target audience to solve their problems, to a more interactive, two-way "dialogical" (Louw 1995) approach to communication where farmers participate in the identification of their information needs to solve their problems (Röling 1988). The need for collaboration, participation and interaction between all those involved at all stages of the RAIS, including the generation of information by research, is strongly emphasised in current paradigms of information flow in rural systems (Ison and Russell 2000). In sum, development support communication (DSC) should not be based on a "transmission mentality" but on collaborative partnerships to effect social and structural change in addition to communication (Burton1999).

A clear understanding of traditional modes of information transfer within, and dissemination to, rural communities is required if improved information systems are to be developed. Oral communication is the dominant form of information sharing in rural areas (Sturges and Neill 1998) and is therefore the main means by which many organisations disseminate information (Leach 1999). Other media, such as print (books, information pamphlets), visual (posters, slides), audio (radio), audio-visual (television, video, films) and drama, dance and folklore are also used to get the message across, but usually in a supportive role to a verbal message or as a means of initiating person-to-person discussions or group discussions at a workshop, meeting or demonstration (Leach 1999; Munyua 2000). Farmer networks (e.g. study groups) are common among commercial farmers in South Africa and also occur in some developing rural areas (Carter 1999). Farmers commonly support each other through such interest groups within which they share any available printed information material or just their experience and local ('indigenous') knowledge. Internet, especially electronic mail (e-mail), has the potential to radically improve the speed and ease of communication within and among farmer groups and to make new information channels available to rural communities (Munyua 2000).

Telecentres for rural information delivery

The paper proposes new ICTs that are usually made available to rural inhabitants at a centralised venue or building, commonly called a telecentre. Telecentres ('telecottages', 'telelearning centres', 'virtual village halls') are a relatively new phenomenon. A telecentre may offer a variety of communication and electronic services, including telephones, fax, photocopying, printing, computers with word-processing, spreadsheet, scanning and presentation applications, as well as internet for e-mail and world wide web (*www*) access. Connections to libraries, cooperative catalogues and other bibliographic databases may also be available at a telecentre. Other services that could be offered via a telecentre include helping clients with various administrative tasks such as filling out forms, preparing a curriculum vitae etc., maintaining a skills/qualification database for potential employees and training in the use of computers and other technology.

Potentially, a rural telecentre could become the information 'hub' or centre of the RAIS that captures, repackages and disseminates information to rural inhabitants (Munyua 2000). Munyua (2000) and Conradie (1988) note the following examples of areas where ICTs at a telecentre can play an important role in rural development.

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Decision-making

Farmers require timely and up-to-date information to make sound decisions. Such information can be made available via e-mail or the www at a telecentre. To be most valuable, this information needs to be offered on a local, or at least regional scale (Purnell, 2000).

Marketing

Advertising and ordering of produce (usually with off-line transactions) can give communities efficient access to new regional and global markets.

Empowerment

Richardson (1996), in a seminal study on the role of the internet in rural development, noted that Internet is the first medium that allows every user to be a sender, receiver, narrowcaster and broadcaster. Internet can therefore give communities a "voice" to open up dialogue and interaction with their peers and all other actors in the development process (Munyua 2000). Communities can also have a say over the form and content of information systems developed to meet their needs.

Employment

A telecentre, depending on its sophistication, might require a manager, subject matter specialist(s), translator and information technology technicians. Local people could potentially be trained to fulfil one or more of these roles and thereby reduce the flow of human capacity towards urban centres (Munyua 2000). Telecentres could also provide computer and information skills training to create rural entrepreneurs.

Education

New ICTs have the potential "... to enhance education through distance learning" (Munyua 2000). Telematics, or distance learning through the internet, is currently being employed to assist with the upgrading of agricultural researchers in previously-disadvantaged universities in South Africa (RDISAT project -http://rdisat.uzulu.ac.za), but could potentially be extended to include the training of extentionists and farmers. Post-literacy material could also be made available to neo-literates via Internet.

Constraints to the development and utilization of rural telecentres

Anderson *et al* (1999) warn that lessons learned from implementing other information technology need to be applied when introducing new ICTs otherwise the rush to 'wire' rural areas may result in development 'short circuits'. The following limitations and constraints need to be addressed if telecentres are to contribute positively to food security, increased agricultural production and to rural development in general.

(1)   Lack of infrastructure

Electricity to power ICTs is obviously the primary constraint to developing a telecentre. However electric generators could be used if power point is not available. Additionally, rural areas commonly lack communication (telephone) lines. Low band-width, congestion and high costs for international calls further constrain telecommunications in developing countries. Therefore, the new ICTs are not such a cheap means of expanding rural information systems (Munyua 2000).

(2)   Illiteracy

It is frequently maintained that "illiteracy is a fundamental barrier to participation in knowledge societies" (Mansell and When 1998). However, recent research suggests that illiteracy is not a real obstacle to using print material, or text in an electronic format, as someone can usually be found to read for a person or group (Carter 1999; Leach 1999). However, information available on the www is mostly in English and text therefore needs to be translated into the local vernacular before presentation to be most effective.

(3)   Lack of information skills

The technological skills and 'information literacy' to make effective use of sophisticated ICTs are particularly low in rural communities. It is difficult to find information on the internet, even for computer-literate users, as

information on the internet is not organised logically or indexed systematically. Skills are needed to interrogate the system and to effectively use the information found to meet an information need, assuming even that this need has been identified and clearly articulated (Kaniki 1996). Information intermediaries are therefore crucial to assist and train telecentre users. A key lesson learned from employing sophisticated agricultural information systems in developed countries is that training is important to provide farmers with the concepts and criteria with which to assess the information they receive or find (Röling 1988).

(4)   Inappropriate modes of information transfer

Provision of information via internet is largely one-way, from the source to a passive receiver, offering little or no feedback to the user. This amounts to an electronic form of the outdated and ineffective 'top-down, transfer-of-knowledge' model for agricultural information systems. There is a danger that information delivered in such a manner may assume an "aura of truth" in the mind of the user so that he or she will not question its validity or applicability. Software needs to be developed that allows the user to interact with information system, by, for example, adding content (local knowledge) or giving feedback to the developer/provider. Khumalo (1998) emphasises that the software and communication equipment must not be subject to repeated failures (e.g. network downtime) otherwise clients will not trust, and therefore make continued use of, the ICTs provided.

(5)   Inequitable information provision

Because effective use of ICTs available in telecentres requires information need(s) awareness and a minimum level of computer and information literacy, there is the danger of telecentre-based RAIs reaching only the most progressive and skilled farmers who know their needs and invest time in learning how to use the new technology. The poorest and most destitute (especially women and the disabled) can thus be completely missed (Munyua 2000). Non-adopters of the new information technology may be limited by ecological conditions and a lack of capacity to innovate, or simply by more pressing survival needs (Röling 1988). Information could become "power" for information gatekeepers in certain communities and information workers therefore need to be aware of the "power dimensions of knowledge utilization" (Röling 1988) that might impede information diffusion. However, traditional means of sharing information that exist within communities can, and should, be harnessed to ensure that information provided via an electronic medium eventually reaches the whole community (Burton 1999).

Guidelines for establishing effective rural telecentres

Any strategy for developing rural telecentres needs should consider at least the following:

i.   A telecentre needs to be located at the most convenient point of access for rural communities (Anderson *et al* 1999). If an existing structure such as a school building, an extension office or a community centre is not available and suitable to house the telecentre then a permanent or semi-permanent (e.g. shipping container) will have to be built.

ii.   Before establishing a telecentre, the information needs of the community need to be assessed. Community profiling and information needs and skills assessment are crucial to the success of any rural information system (Kaniki 1999).

iii.   Information workers need to "listen" to what people already know, what they aspire to become, what they perceive is possible and what they can productively sustain. Therefore, participatory methods (e.g. Participatory Rural Communication Appraisal (PRCA); Anderson *et al* 1999) should be employed to understand the information needs and communication patterns of communities (where and how people communicate, what is communicated, and by whom) as well as to conduct regular assessments of the use of the telecentre by the community members (e.g. number of users, which services most used. Monitoring allows for the system to evolve to best meet the (ever changing) information needs of the community.

iv.   Training and capacity-building must be an integral part of all ICT projects so as to create and maintain the critical mass of users needed to sustain the project (Munyua 2000). At the onset of the project, rural inhabitants need to be familiarised with the equipment and services offered so that the technology will not remain "alien" to them (Anderson *et al* 1999). Ongoing training will also be required in the management and use of various ICTs available at a telecentre (Richardson 1996; Khumalo 1998).

v.   The content of the message delivered by ICTs at a rural telecentre should be adapted for specific target categories (e.g. subsistence farmers, women, etc.) (Röling 1988). Indigenous knowledge can be fused with exotic (outside) information into something new, what Karlsson (1995) refers to as synergistic knowledge. Numerous authors (e.g. Richardson 1996; Carter 1999; Munyua 2000) note the importance of including local content, preferably rich in pictures and audio-visual assists, in all extension material including those delivered electronically.

vi.   Communities need to be intricately involved in the development and repackaging of information to harness their indigenous (local) knowledge and to ensure the relevance of the information to their local situation (Stilwell 1999) Conventional ('old') information technology can be linked to the new ICTs by, for example, making radio programs available via Internet for people to access after the farm work has been done. The particular mix or combination of media used will depend on the actual community as "rural communities are not all the same" (Leach 1999).

vii. Long-term funding for the telecentre needs to be secured at its inception. Users need to pay according to their means for services rendered by a telecentre (Munyua 2000) but such funds will not support all the costs of the telecentre, especially staff salaries (Khumalo 1998). For telecentres to be successful it is necessary that they form part of a multipurpose community centre (MPCC) which provides many community services (e.g. for meetings, workshops etc) apart from information and telecommunication (Gericke 1998; Miller 1999).

These MPCCs ideally need to be multi-sectoral (for researchers, extentionists, trainers, educationist) and multidisciplinary (agriculture, health, business, etc). They could become a local gathering place for sharing information and for self-education.

ICT architecture for agricultural information systems

Figure 1 illustrates the physical link that connects together with stations or nodes. A station is a point in a network that communicates with another point in the network. Alternative words for station are node and receiver or transmitter. From the figure above agricultural Information is sent through satellite to various stations where the information can be accessed.

Conclusions

The prevailing "contemporary vision of the power of communications [telephone, radio, TV, internet] to propel the poor and marginalized into the mainstream of economic activity..." (Burton 1999) needs to be tempered by a sober and clear understanding of the socio-economic and environmental conditions that constrain development in rural areas. A key lesson is that information by itself is not enough Munyua 2000) and communication on its own leads nowhere (Communication for Development Group 1998), i.e. relevant information clearly communicated is a necessary but not sufficient condition for rural development. Anderson et al (1999:1) encapsulate this by noting that "In the enthusiasm for [new] ICTs and their potential, we should not forget that the focus should be on [developing] people, organisations and processes rather than on the technologies themselves."
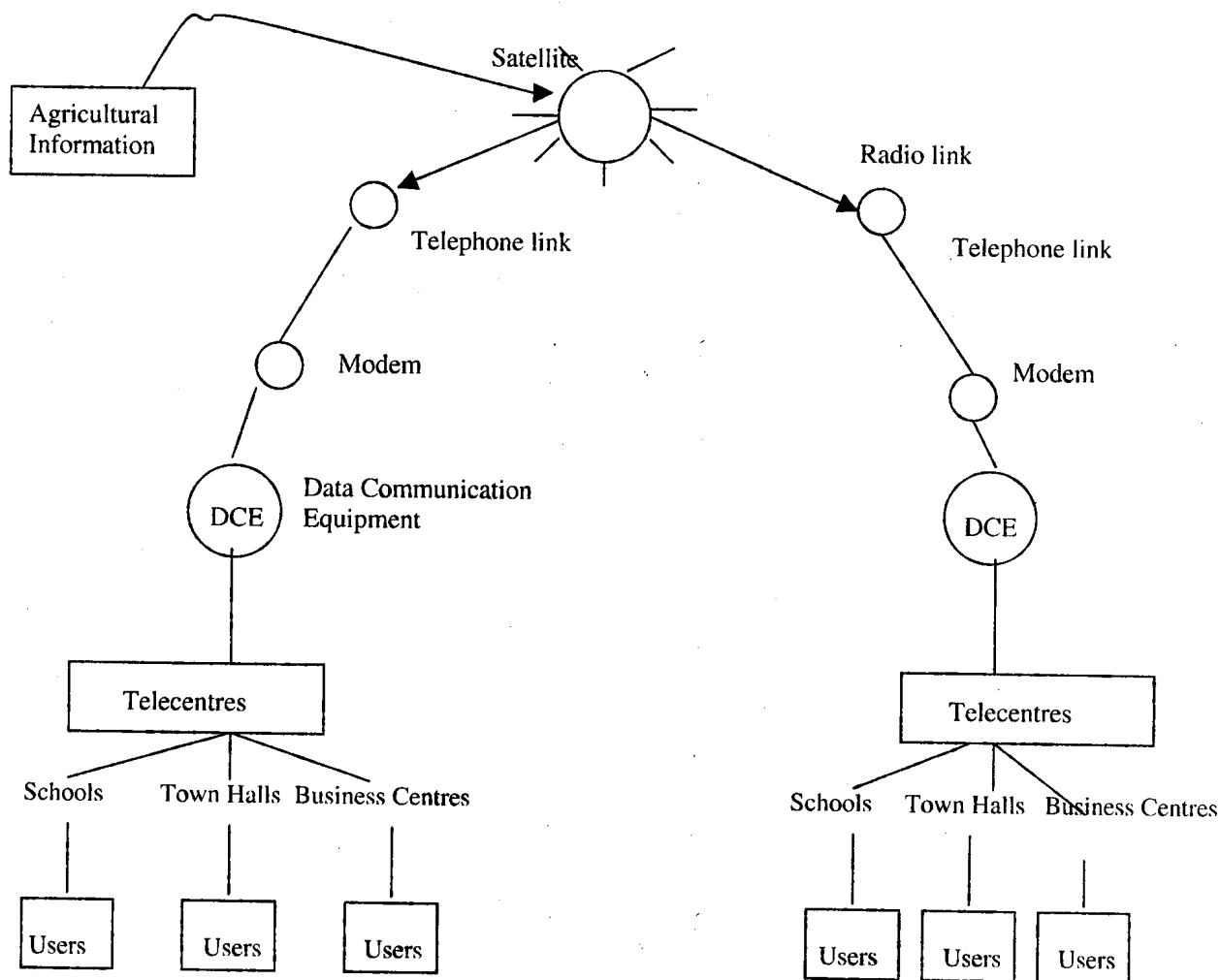
Figure 1: ICT Architecture Structure for Agricultural Information System.

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