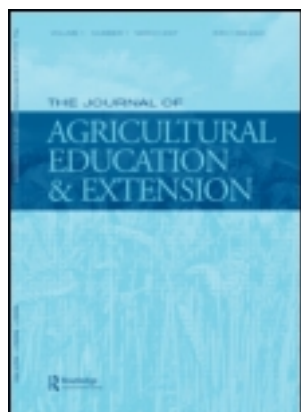


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Information and Communication for Rural Innovation and Development: Context, Quality and Priorities in Southeast Uganda

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ABSTRACT Purpose: *To examine the status and priorities for agricultural information generation, dissemination and utilization in the context of agricultural innovation systems in southeast Uganda.*

Design/Methodology/Approach: *Group discussions were conducted with six communities in Kamuli district, southeast Uganda. The focus was on information sources and linkages, reliability, applicability and gaps. Data were analyzed with NVIVO software.*

Findings: *Rural community members access information from a variety of sources but its reliability and application varies according to the nature of relations with and level of trust in the various sources. Further, community members lack means and capacity to hold accountable providers of low quality information. Information linkages among actors (farmers, extension, private sector and local leaders) were also minimal.*

Practical Implications: *Establishment of feedback loops and partnerships among actors is necessary to ensure improvements in information generation and dissemination for rural development.*

Originality/Value: *This study demonstrates the need for efforts to improve information and communication for rural development in developing countries. Trustworthiness of information sources, strengthening partnerships among actors, continuously reviewing approaches, and addressing emerging information gaps are key priorities. In agricultural innovation systems, involvement of multiple actors in information generation and dissemination is essential.*

KEY WORDS: Information, Communication, Innovations, Rural development, Developing countries

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Introduction

Access to information that can boost livelihoods plays a significant role in rural community development in sub-Saharan Africa (SSA). Changing circumstances of rural livelihoods such as climate change, globalization, commercialization and wider diffusion of information and communication technologies provide new challenges and opportunities. In the context of the new circumstances, farmers and other rural people require better access to information of various forms beyond agriculture, including nutrition, health, natural resources management, financial services and other programmes. This will enable them to access knowledge and acquire skills for decision-making and action, thereby enabling them to be more competitive (World Bank, 2006b). Recent analyses indicate that the new developments raise issues of relevance to research and policy such as: access to information and its quality; how to restructure and reorganize the spheres of information production and dissemination; and impacts of information and communication technologies on development (Anastasios et al., 2010; May et al., 2007; Ponniah et al., 2008).

In Uganda as elsewhere in SSA, the importance of information access is reinforced by recent policy reforms such as structural adjustment programmes (SAPs) in the 1980s and decentralization beginning in the 1990s. These reforms induced changes in roles of key stakeholders who provide information on farm inputs, markets, extension and related rural services. The emphasis of SAPs on elimination of subsidies and price controls, liberalization of trade and exchange transactions and privatization (Heidhues et al., 2004) implied that new actors such as private businesses assumed new information and communication roles in rural development. Decentralization of extension and other service delivery mandates also constrained an already inefficient system that provided inadequate information to rural communities, although the emergence of non-governmental organizations (NGOs) in the 1980s partly bridged the gap (Ponniah et al., 2008). The Ugandan Government's Poverty Eradication Action Plan and the National Development Plan that succeeded it in 2009 provided opportunities for local communities to actively participate in development interventions as key stakeholders (Bahigwa et al., 2005; NPA, 2010).

Since the 1950s, frameworks and strategies for promoting rural information access and communication in Uganda have shifted from national agricultural research systems (NARS) to agricultural knowledge and information systems (AKIS) and more recently, to agricultural innovation systems (AIS) (Ponniah et al., 2008). The key focus of NARS was the transfer of technologies whereby extension agents packaged information from researchers and presented it to farmers without feedback from the latter. Realizing the limitations of the technology transfer model, notably failure to link farmers with other actors as well as reflecting clients' needs and changing circumstances, new approaches were incorporated in the NARS, notably farming systems research and extension (FSR-E) and indigenous knowledge (IK) (Collinson, 2000). These approaches sought to involve farmers in technology development by seeking their input mainly in the form of knowledge and experiences, as well as channelling feedback from farmers to researchers and policy-makers.

However, problems linked to involving more actors in information generation as well as acknowledging other sources of information as originators of ideas besides research and extension remained.

Beginning in the 1990s, new approaches such as AKIS were introduced in developing countries' extension systems. These approaches advocated for shifting of control of communication processes from agricultural research and extension experts to also include farmers and agricultural educators. The focus also shifted from agricultural systems to livelihood systems, implying a need for a change from simple to more complex systems and system interactions for better development outcomes (Ponniah et al., 2008). Critics of AKIS note that it does not consider the influence of political forces, global markets and consumer preferences in the system and therefore cannot yield a comprehensive analysis (Leeuwis and Van Den Ban, 2004). The approach also focuses more on links between research, education and extension, and identifying farmers' demands for new technology (Hall, 2006). Thus, it is suggested that focusing not only on the demand for research and technology but also on the development of innovation systems is necessary to address existing challenges to agricultural development. Strengthened research systems as promoted by AKIS may increase the supply of new knowledge and technology, but *per se* may not improve the capacity for innovation throughout the agricultural sector.

More recently, the Agricultural Innovation Systems (AIS) framework has been suggested as a means of understanding how better generation and use of information can be ensured. The World Bank (2006a: 5) defines AIS as 'the totality of organizations, enterprises, and individuals that demand and supply agricultural-related knowledge and technology, and the rules and mechanisms by which these different agents interact'. AIS incorporates insights from NARS and AKIS such as the role of interpersonal communication and linking actors in information processing and dissemination. However, it goes beyond NARS and AKIS by recognizing a broader range of actors and sectors as well as the need to create an enabling environment for generation and use of information (Hall, 2006). Thus, AIS differs from previous frameworks by drawing attention not only to the need for innovation but also to the pluralistic involvement of different actors/institutions in improvement of rural livelihoods.

As the World Bank (2006a) notes, AIS has been applied to agricultural and rural development only recently, leaving a number of issues unaddressed. This paper examines the status and priorities for agricultural information generation, dissemination and utilization in southeast Uganda. The ultimate purpose is to identify interventions that can assist realization of information and communication needs of the changing rural sector. The key questions addressed are: (i) Do effective linkages exist among AIS actors in Uganda? If not, are there initiatives in place that can support establishment of such linkages? (ii) How does the nature of interactions among AIS actors affect the quality of information accessed by rural Ugandan communities? (iii) Does AIS function well in Uganda's decentralized governance structures? (iv) How are information gaps and power relations addressed?

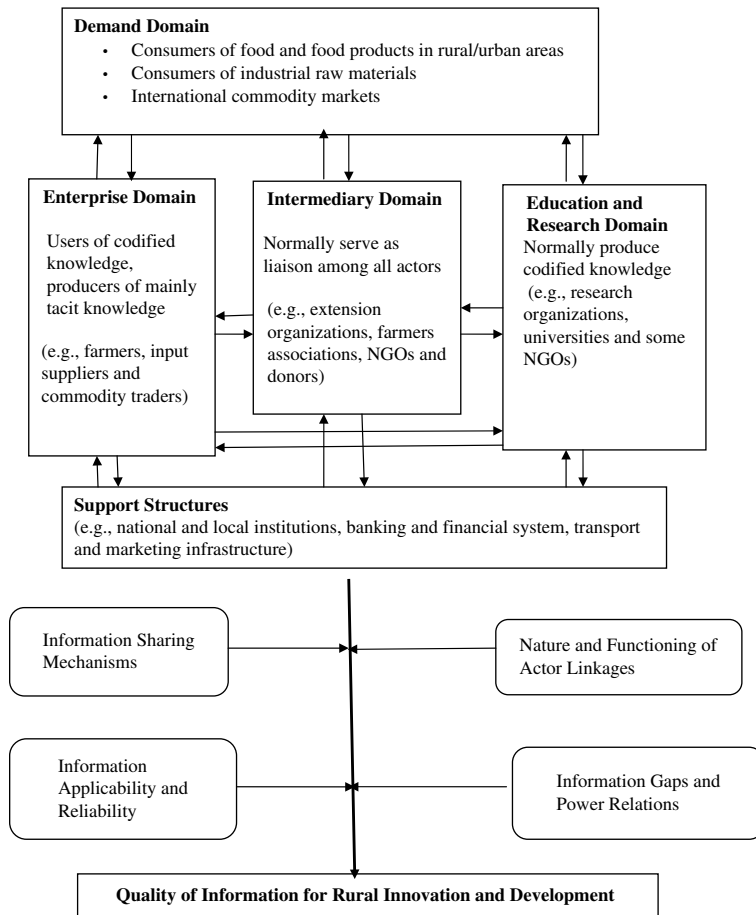


Figure 1. Conceptual framework for AIS and quality of information for rural innovation and development.

Sources: Rajalahti et al. (2008); authors.

Conceptual Framework

Figure 1 shows the conceptual framework. Rajalahti et al. (2008) identify four domains together with support structures that constitute the main elements of AIS. The domains include education and research, enterprise, demand and intermediaries. The support structures are the institutions and policies that constitute the enabling environment for innovation.

During their interactions, the actors create and disseminate information that contributes to rural innovation and development. The actors also aspire to ensure that the information flow structures are sustained. Underlying the quality of the information is a number of key factors. For purposes of this study, the principal factors are: (i) information sharing mechanisms (who shares with whom and how); (ii) information applicability and reliability; (iii) information gaps and power relations (whether and how they are identified and addressed), and (iv) nature and functioning of actor linkages.

Methodology

Sample Selection

Data were collected in six sub-counties in Kamuli district, southeastern Uganda (Figure 2). Communities in three sub-counties (Namasagali, Butansi and Bugulumbya) are participating in a livelihoods improvement programme involving Iowa State University (ISU, USA), Makerere University (Uganda) and a Ugandan NGO, Volunteer Efforts for Development Concerns (VEDCO), since 2004. The other three sub-counties (Namwendwa, Balawoli and Kisozi) were originally selected for comparison purposes. However, results did not reflect a marked difference because these sub-counties also had similar programmes being implemented. Nevertheless, results from all the six sub-counties are presented. The authors are affiliated with ISU and Makerere; VEDCO is the implementing organization for programme activities. Although the authors' institutions provide technical assistance, community members' responses were quite candid.

From each sub-county, the study team purposively selected community representatives consisting of local leaders (local council committee members, teachers, religious leaders) and community members (farmers, livestock keepers, local fishermen and local traders) to participate in community meetings. In each sub-county, 30 representatives were invited, with each category represented by approximately four

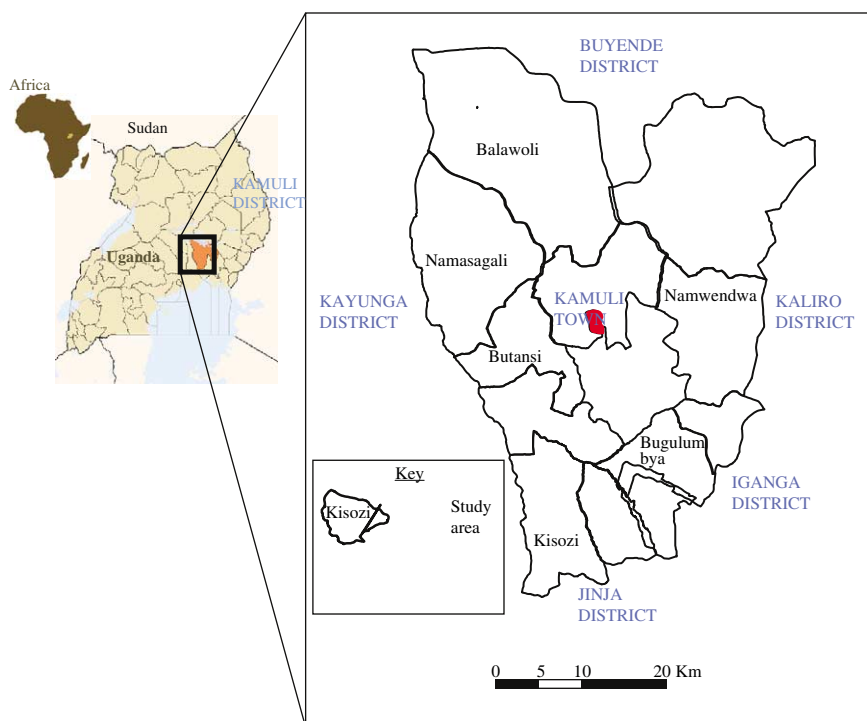


Figure 2. Location of study sub-counties in Kamuli district, Uganda.
Sources: Central Intelligence Agency (2011); and UBOS (2010).

members in each community. In all data collection scenarios, the turn up rate of invited representatives was 100%. The principle criteria used to select participants included gender and number of years of residence in the communities. In terms of gender, we planned to maintain an equal ratio of males to females but this was not possible because there were categories where females were not represented, such as religious leaders and local fishermen. The eventual ratio realized was two females for three males. All respondents had been residents in their respective communities for at least four years. Data was also collected from VEDCO's field programme leader in Kamuli.

Data Collection and Analysis

Data from community representatives were collected through community discussions between November 2008 and February 2009. For each sub-county, all 30 participants were involved in an open discussion about the issues of interest for the study. For the field programme leader, a face-to-face interview was held. Information was collected on sources and types of information for community members, its reliability and application, information linkages between community members and each source, and among the sources, and existing information gaps. The discussions were digitally recorded as audio files after obtaining community members' permission. Field notes on the nature and progress of interactions during the interview were also taken. The recorded information was translated and transcribed into English for analysis.

The data were analyzed manually and with NVIVO software (Bazeley, 2007). Five categories (nodes) were developed *ex-ante* on the basis of information required to support the study purpose, namely: (i) community context, (ii) information sources and changes, (iii) information reliability and application, (iv) actor linkages, and (v) information gaps and power relations. Initial coding was done using NVIVO software and a coding summary report was generated. Sections of each discussion transcript were coded under appropriate codes and citations to support the categories extracted for subsequent use in discussing results. Initial data analysis focused on each transcript separately, followed by a combined analysis across communities which focused on discerning patterns from the categories. From these patterns, the major axial codes were identified (Table 1). Axial coding involves identifying and exploring interrelationships of categories earlier generated in open coding. Information is organized in a hierarchy of factors that influence the central phenomena, the strategies for addressing the phenomena, the context and intervening conditions that shape the strategies, and the consequences of undertaking the strategies (Creswell, 2005).

Findings and Discussion

Context of the Communities

Most of the communities were characterized by a diversity of ethnic (the range was 17) and religious groups. In all the sub-counties, five major religious denominations existed: Catholics, Protestants, Seventh Day Adventists, Muslims and African traditionalists—African traditionalists were a minority in all cases. While the sub-counties had diverse ethnic and religious groups, discussions indicated that it was

Table 1. Thematic and axial categories of the study data.

Thematic categories	Axial codes
Context	<ol style="list-style-type: none"> 1. Diversity 2. Community members' orientation 3. Accessibility 4. Governance features
Information sources and changes	<ol style="list-style-type: none"> 1. Multiplicity 2. Actor roles 3. Adaptation
Information reliability and application	<ol style="list-style-type: none"> 1. Quality 2. Timeliness 3. Trust 4. Follow-up 5. Contact 6. Clarity
Actor linkages	<ol style="list-style-type: none"> 1. Neglect 2. Jurisdiction 3. Resources
Information gaps	<ol style="list-style-type: none"> 1. Accountability 2. Consultation 3. Regulation 4. Specific competencies

unusual for a member of a different ethnic or religious group to withhold information from another one from a different group.

One of the major features that characterize rural communities in Uganda is the governance structure of decentralization under which citizens are expected to select local leaders and actively participate in implementing and monitoring development programmes (Bahiigwa et al., 2005). However, in all communities, members were largely dissatisfied with the lack of positive impact of decentralization on their welfare. Community members noted that initially (in the 1990s) decentralized governance had led to improved quality of services. In the recent past (2003 onwards), however, local leaders had developed a tendency to collaborate with technical staff to capture resources to their own personal gain, resulting in poor quality services. Unfortunately, community members do not have the capacity to demand accountability from these leaders.

To elaborate on the situation, under the local government development programme (LGDP), a component of decentralized governance, community members participate in developing programmes and monitoring the activities through parish development committees. On these issues, community members noted that:

Local leaders and technical staff never consult communities regarding the needs to be considered as part of the annual development programs. Even when the needs are assessed, priority ones may not be considered. It is the perceived political benefit that prevails ... For instance road maintenance may be approved when the community members' priority is school furniture,

if local leaders believe that roads would lead to better opportunities for winning the next election (community member, Namasagali sub-county, 16 December 2008).

We have development committees that are supposed to monitor local development activities but they are weak, with inadequate orientation, support and influence over technical staff and local leaders (community member, Butansi sub-county, 9 January 2009).

This indicates that decentralized governance, which was conceived as a means of improving quality of services for local development, has not lived up to its promise in the communities. The causes relate to poor facilitation, inadequate supervision and monitoring on the part of the technical staff and selfish tendencies among local leaders. In their analysis of decentralization and citizen participation in local development interventions in Uganda, Francis and James (2003), and Kakumba (2010) note three major factors that have led to disappointing results: inadequate capacity, insufficient fiscal decentralization, and a lack of accountability to citizens, the latter being the most challenging. As Winter (2004) asserts, access to information about activities conducted by local leaders or staff as well as the outcomes achieved is a key dimension of accountability, yet it is not well addressed in Kamuli district. This study corroborates earlier results, although it would have benefitted from obtaining the perspective of local leaders and technical staff who were not systematically consulted.

Information Sources and Changes

Information on a range of rural issues is accessed from an array of sources (Table 2). The main themes on which information was accessed in all the communities included agricultural technologies (crop varieties, livestock breeds, farm equipment and attendant skills and knowledge), produce markets, credit, health and natural resources management.

Information on agricultural technologies was accessed from virtually all the actors: community members, local leaders, radio, local businesses, NGOs and government departments. Changes have occurred in the sources since 1997 when decentralized governance was introduced in the country, with past efforts relying more on fellow community members, local businesses and government staff. With increasing involvement of NGOs in rural development efforts, most communities reported increasing reliance on NGOs and community members as major sources of agricultural technologies.

Other changes relate to information from community members to other actors. In the three sub-counties participating in the livelihoods improvement programme (Namasagali, Butansi and Bugulumbya), community members were regularly consulted regarding the performance of technologies and adaptations based on members' responses incorporated in programme activities. For instance, in Namasagali, VEDCO programme staff suggested use of spear grass (*Imperata cylindrica*) to mulch bananas. Farmers, however, realized that this type of mulch was susceptible to termites that also affect other crop enterprises such as maize. Farmers suggested use

Table 2. Major sources of information in Kamuli district*.

Sub-county	Information themes				
	Agricultural technologies	Produce markets	Financial services	Health	Natural resources management
Bugulumbya	VEDCO, NAADS, radio, local leaders, extension staff, community members, local businesses	Local businesses, radio, community members	Friends, groups	Local leaders, health centres, VEDCO	VEDCO, NAADS, radio
Butansi	VEDCO, radio, local leaders, extension staff, community members, local businesses	Local businesses, radio, community members	Friends, village banks, radio	Local leaders, VEDCO, health centres	VEDCO, NAADS, radio
Namasagali	VEDCO, NAADS, IRDI, IFDI, SPW, radio, local leaders, extension staff, community members, local businesses	Local businesses, radio, community members	Friends, groups, radio	Local leaders, VEDCO, health centres	VEDCO, NAADS, IRDI, IFDI, radio
Balawoli	SHI, NAADS, radio, local leaders, extension staff, community members, local businesses	SHI, Local businesses, radio, community members	Banks, friends, village banks	Local leaders, SHI, health centres	SHI, NAADS, radio
Kisozi	KCT, radio, local leaders, extension staff, community members, local businesses	Local businesses, radio, community members	Friends, groups, radio	Local leaders, health centres	KCT, NAADS, IRDI, IFDI, radio
Namwendwa	SHI, NAADS, radio, local leaders, extension staff, community members, local businesses	Local businesses, SHI, radio, community members	SHI, friends, groups, radio	Local leaders, SHI, health centres	SHI, NAADS, radio

Notes: *NGO—acronyms: VEDCO: Volunteer Efforts for Development Concerns; SHI: Self-Help International; IFDI: Integrated Family Development Initiative; IRDI: Integrated Rural Development Initiative; KCT: Kulika Charitable Trust; SPW: Student Partnerships Worldwide.

Government programme acronym—NAADS: National Agricultural Advisory Services.

of other types of mulch such as elephant grass (*Pennisetum purpureum*) and crop residues (especially maize stover and bean residues). When they informed the field staff about this challenge, the message was integrated into the training curriculum for the rest of the programme's area of operation (Grace Babirye —VEDCO field staff, personal communication, 19 December 2008). In the case of Bugulumbya farmers were encouraged to test cultural control of banana nematodes on their own and later share results with programme staff. Successful practices such as use of 'plant tea',

a mixture of various herbs that can repel the pests, were shared with other programme participants.

Another important feature of changes in information sources was indicated by the approach used to introduce new technologies into the communities. NGOs operating in the communities introduced these by providing farmers with small amounts of materials to try out in their respective farms. This was in contrast to the local business people who introduced new technologies without providing opportunities for farmers to test them first. In one of the communities, it was indicated that:

Before VEDCO started operating in this area, there were input supply shops but only a few people used to buy seeds because of our ignorance about the merits . . . but also most of the seeds were fake. It was hard to ascertain the merits of new seed varieties when it was possible to find mixed [good and bad] results in the same village. When VEDCO started operating in this area, the seed varieties we got from the NGO were consistently good. We were also first given some small amounts to try out. If one wanted to produce on a bigger scale, one now knew what one wanted from the input supply shops (community member, Bugulumbya sub-county, 10 December 2008).

AIS advocates for involvement of different actors in exchange of useful information and the foregoing statements imply this. Farmers need to be provided with opportunities for testing and adapting new information and technologies that are potentially relevant to their situations as well as for providing feedback to other stakeholders in the AIS, thereby boosting the virtue of development interventions. Only NGOs seem to be deliberately involved in supporting farmers to test and adapt new information and technologies.

Information on credit was generally the hardest to obtain, with most community members relying on local networks of friends and relatives for help when they got a problem. Information on markets was mainly accessed from local businesses, radio and fellow community members, but it was noted that the existing marketing mechanisms were exploitative. Middlemen earn most of the final market price. Health information was accessed from NGOs, health centres, local leaders and fellow community members. Information on natural resource management was a domain of NGOs, with only two exclusively focusing on natural resource management matters such as using energy saving stoves, agroforestry and soil conservation.

Information Reliability and Application

Regarding reliability, information of all forms from NGOs was rated highly, in relative terms, by all communities because of its timeliness, good quality and regular follow-up by NGO staff as compared to government departments. It was noted that

Production information from NAADS [a government programme] is not reliable and not easily accessible—the programme staff members develop with

communities programs which are not implemented. Most of the staff members do not know what they are doing. They give contradicting information and their activities are not monitored (community member, Namasagali sub-county, 17 December 2008).

Oh ... it is all praises for [the NGO] Kulika. They regularly visit us in our homes for guidance and are friendly when interacting with us and are good listeners (community member, Kisozi sub-county, 13 November 2008).

Government has constructed health facilities but the health workers are irregular and there are inadequate medical supplies. Even if I am informed now that there are good services at the government health centre, I cannot trust that information because I have on many occasions failed to get any services at the facility (community member, Balawoli sub-county, 6 November 2008).

Although not all NGO services are well monitored and evaluated (Gugerty, 2008), these statements point to a problem of poor monitoring and evaluation of government-led programmes compared to NGOs in several African countries. Community members in four of the sub-counties indicated that the problem of unreliability of information from government staff is a result of recruiting poorly qualified staff and lack of supervision of their work by the more qualified technical staff. However, some information from NGOs, especially regarding timely delivery of seed and fertilizers to farmers, was noted as being erratic in three sub-counties. Timely access to technologies is important since agricultural production is rain-fed. Any delay from the time of onset of rains affects production levels.

Information from private businesses was also rated low in terms of reliability in all communities. Input sellers tend to supply fake seeds, whereas those who buy farmers' produce usually offer comparatively low prices such that they gain bigger profit margins.

For input supply shops, the information is not reliable; they sell poor quality seeds, some of it rotten. Unfortunately, we cannot report them anywhere (community member, Namasagali sub-county, 17 December 2008).

Local business people are exploitative. They offer low prices for our produce and there are no alternative markets where we can sell (community member, Butansi sub-county, 8 January 2009).

Reliability of the information goes hand-in-hand with its application. Most of the information that was perceived as unreliable was also reported to be difficult to apply because of the mistrust existing between the source and users. The most trusted sources of information were NGOs and community members, while government programmes and private businesses were the least trusted, and their information consequently least applied. For instance, in the case of NAADS staff members most of who were viewed as lacking in professional skills, community members were hesitant to apply the information. Relations between farmers and other information

sources were also viewed as a constraining factor as reflected in the following statement:

NAADS officials are hypocrites; when they select a farmer to be a recipient of some farm materials on behalf of the group or community, they usually do not deliver on the promise—yet by this time, the farmer may have already put in a lot of effort into implementing the preliminary activities such as land preparation (community member, Namasagali sub-county, 16 December 2008).

A similar situation of mistrust applied to utilization of farm inputs from private business people who tend to supply poor quality materials. This is reflected in the statement below:

For input supply shops, the information is not easy to apply—they sell poor quality seeds. We need to first confirm with VEDCO staff, who we know are well trained and will provide good guidance to us as needed (community member, Bugulumbya sub-county, 9 December 2008).

Linkages between Information Providers

Though information linkages among different actors are necessary for coordination, lesson learning and reduced duplication of efforts, they were either non-existent or very limited in all the communities. There appeared to be a high level of indifference among all actors in the AIS regarding information sharing. For instance, apart from introducing themselves to local leaders when launching activities in new areas of operation, NGOs rarely worked with government extension staff or other NGOs with similar mandates. This situation was similar in all the communities. In one of the meetings, community members noted:

When VEDCO started operating in our area, government extension staff thought that somebody else was doing their work and they relaxed... (community member, Butansi sub-county, 8 January 2009).

Francis and James (2003) note that public extension staff are not provided with enough resources to run programmes leading to their failure to serve most of the clients in their areas of jurisdiction compared to NGO staff. This statement is a pointer to a lack of coordination between the different information sources that could have taken advantage of the synergies that existed between the sources.

Information Gaps

A range of information gaps existed in all the communities, and these can be considered under the general categories of accountability, consultation and specific competencies. Community members felt frustrated that they could not hold to account sources of information that provided poor quality services. This was especially the case with public extension staff, government programmes and local leaders.

In the circumstances, members had no idea what could be done to remedy the situation. As one member pointed out:

When a community member raises any issue on anything that is not going well, local leaders and staff take it personal and tend to react angrily to the complaint. Members therefore just back off to stay 'in harmony' with the local leaders and staff (community member, Namasagali sub-county, 16 December 2008).

Related to lack of accountability is a mechanism providing feedback to supervisors and a system of sanctions for errant staff behaviour. Two examples were cited: private business people who supply poor quality seeds and civil servants (extension staff and health workers) who do not report to work. It was noted that in such cases there are no regulations or agency where one can report in a confidential manner such problems and expect that some action will be taken to improve the situation.

Another information gap concerns consultation of community members on the efficacy of technologies and skills introduced in the communities by other actors. With the exception of NGO staff, government departments and private dealers rarely facilitate integration of community members' feedback and possible adaptations made in development programmes. It was noted that the efforts of NGOs are good, but the geographic areas of operation for NGOs are relatively small. In all communities, it was noted that NGO coverage is less than 30% of households in each sub-county, indicating that efforts to scale-up good practices through complementation between the different actors are necessary. Information gaps also existed in relation to specific technical competencies and skills that could lead to better development outcomes in the communities. Main gaps were identified in relation to savings and credit management, conflict management and marketing skills. It was noted that information on production technologies was readily accessed from the various information sources, with only the quality dimensions requiring additional efforts.

Conclusion and Practical Implications

Table 3 summarizes the status of AIS with respect to information access, quality and priorities in rural Uganda.

Access to information is one of the demands for agricultural innovation. In this study, it was established that community members in Kamuli district access information on a range of livelihood improvement issues from other community members, local leaders, private businesses, radio, NGOs and government departments. However, some of the information is not reliable and difficult to apply as a result of community members mistrusting the sources. Community members' involvement in sharing information with other actors is also still low, implying the entrenchment of the 'technology transfer' approach that has been implemented by research, extension and development professionals since the 1950s. Other actors in the AIS should aspire to genuinely involve local community members in communication activities that have a feedback loop. For instance, all NGOs, the private sector and government staff should seek feedback on the technologies, skills and knowledge

Table 3. Summary of level of AIS functioning in southeast Uganda.

Dimensions	Actors			
	Enterprise domain	Intermediary domain	Education and research domain	Support structures
Context	Farmers and local people involved in participatory needs assessment and monitoring	Public extension agents facilitate decentralized rural development but services are poor	Schools and research organizations influence access to information, mostly through intermediaries	Local leaders were supportive in early stages of decentralized governance. Currently do not prioritize community needs
Information sources and changes	Farmers access information from various sources	NGOs pioneered sharing information with farmers and providing opportunities for adaptations	Schools provide information to community members directly. Research institutions not directly involved in information sharing	
Reliability and applicability of information		Most reliable information is from NGOs compared to public extension staff.		
Actor linkages	Poor for all categories	Poor for all categories	Poor for all categories	Poor for all categories
Information gaps	Community members lack information on savings, credit, conflict management and markets	Information on technologies is available, of varying quality		
Power relations	Other actors not accountable to community members	Public extension staff not accountable to community members		Local leaders not accountable to community members

that are introduced in the communities; some NGOs already do so. To ensure improvements in information quality, actors—especially researchers and extensionists—need to change their attitudes towards community members, valuing them as stakeholders, not mere beneficiaries. This also requires building mutual trust and understanding between the actors. Farmer experimentation and seeking of

indigenous knowledge that could be integrated in development programmes need to be embraced by other actors in the AIS, especially extension staff and agricultural researchers, with policy support in the existing structure of decentralized governance. This also requires a change in methodology of information production from extraction to co-production that draws on strengths of the different actors. There are promising initiatives in Uganda such as PROLINNOVA (Promoting Local Innovation) established in 2003 as a national learning network for the promotion of local innovation in ecologically oriented agriculture and natural resource management (PROLINNOVA, 2011). The current membership of the initiative is comprised of both government programmes and NGOs. It is built on three pillars: (i) identifying and working with farmer innovators; (ii) exchange and networking; and (iii) institutionalization. Knowledge and lessons from PROLINNOVA would provide a blueprint for realizing the goal of improving information quality.

In addition, partnerships among actors are a vital component of a vibrant AIS. At planning level, all actors in the AIS can be effectively involved in planning activities of other actors such as technical planning sessions for local governments, stakeholders' workshops for NGOs, research, and so on. At implementation level, actors could be coordinated at district level by a select team from among themselves such that a forum for sharing lessons and plans is created. When implemented, inefficiencies and duplication of efforts will be reduced at the same time as synergies between various actors are enhanced. Efforts of government staff, who are usually poorly equipped, would be put to better use when they work closely with NGO staff that may not be as poorly equipped.

Some of the specific information gaps require specific interventions. For instance, in all communities, access to produce markets (sources and best prices) is an information challenge. Potential solutions for such a problem include establishing parish-level marketing associations for major enterprises to help community members access better bulk markets and construction of storage and/or processing facilities. In addition, new information and communication technologies, such as internet and mobile phones, could be harnessed to link farmers to domestic and international markets as evidenced by recent research (e.g., Babcock, 2011; Kaganzi et al., 2009).

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