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A network perspective filling a gap in assessment of agricultural advisory system performance

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ABSTRACT

Agricultural advisory systems aim to improve livelihoods and well-being of the rural community by enhancing information exchange and capacity for collective action. In East Africa, advisory systems are becoming more demand driven and are being provided by an increasingly complex range of actors using participatory approaches. Social network analysis (SNA) provides a tool to examine farmer networks for broad assessment of agricultural advisory systems. This paper proposes a framework linking social network measures to information flow and capacity for collective action and applies it to personal (egocentric) networks in 11 sites within East Africa. The results provide valuable insight into performance of existing advisory systems and areas for improvement. Limited capacity for collective action, based on information networks, anecdotal evidence and literature, within farmer groups and communities was found in the Rwanda and to some degree in the Kenyan sites. In Tanzania, few connections with external information sources were found, potentially limiting new innovations entering the communities. In applying the framework, consideration of external factors that can influence social network structures is required so that attribution is not overstated. Use of egocentric networks and recall error challenges exist but can be managed. The proposed SNA framework provides a new and useful assessment tool, particularly combined with broader frameworks, for government agriculture ministries, development practitioners and researchers to support the design and assessment of agricultural advisory systems.

1. Introduction

Functional advisory systems are seen as a key to unlocking sustainable agricultural productivity (Anderson, 2007; Anderson and Feder, 2004), as they bridge the gap between research and farmer practices in the field (Birkhaeuser et al., 1991; Faure et al., 2012). Within a farming community, multiple advisory systems and approaches are typically present and strongly influence each other, making it very difficult to evaluate the effectiveness of individual approaches in delivering on expected outcomes. The present paper is assessing the usefulness of Social Network Analysis (SNA) as a tool to assess the performance of agricultural advisory systems. This paper is the first to propose a framework outlining how network measures can be used for assessment of agricultural advisory systems.

We use the definition of advisory systems proposed by Birner et al. (2009) that include "the entire set of organizations that support and facilitate people engaged in agricultural production to solve problems and to obtain information, skills, and technologies to improve their livelihoods and well-being" (p342). Advisory systems are not only concerned with transfer of technology and knowledge, but also with empowering farmers to make joint decisions and cooperate in their implementation as well as forming effective institutions for managing collective activities (Birner et al., 2009; Oakley and Garforth, 1985). Additionally, knowledge and information should not only pass from researchers to farmers but also among farmers and from the community to the researchers (Anderson, 2007; Birkhaeuser et al., 1991). Advisory agents should strengthen ties between farmers and other actors in the agriculture sector (Faure et al., 2012). Approaches used to deliver advisory services have changed over time from technology transfer only to promoting both information flow and building capacity for collective action.

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Traditional research and advisory systems viewed farmers as end-users who must be persuaded into adopting research outputs, rather than as partners in the process (Padmaja, 2012). Centralised approaches for transferring technologies such as Training and Visit were widely used in Asia and Africa until the 1990s. The linear approach failed to deliver enhanced production and livelihoods, particularly for resource poor farmers (Black, 2000; Chambers and Jiggins, 1987). A progressive change in policy direction from centralised approaches towards more decentralised, participatory, demand-driven and market-oriented agricultural services was the result of this failure (Davis, 2008; Friis-Hansen and Duveskog, 2012). Over time, advisory systems have become more pluralistic, including a diverse range of options in the provision and funding of advisory services (Birner et al., 2009). Pluralism means that many actors, including government, private sector and civil society are now providing advisory services (Birner et al., 2009; Davis, 2008).

Most studies on agricultural advisory systems in Sub-Saharan Africa evaluate the performance or impact of one model, program or service provider and rarely consider multiple providers within a pluralistic system (Davis, 2008). Additionally, few studies globally discuss interactions between different actors within the systems (Faure et al., 2012). Pluralistic systems, involving hybrid governance structures and a range of delivery approaches, are complex to measure (Birner et al., 2009). A conceptual framework proposed by Birner et al. (2009) suggests an impact chain approach to analysing and designing pluralistic advisory systems. Before the proposed framework can be used however, information on the performance of existing complex systems must be collected. Tools to capture this complexity are however rare and even the Birner et al. (2009) framework, does not fully consider the elements of information flow and collective action.

Unlike more traditional assessment methods that focus on the analysis of the attributes of actors (individuals, groups or organisations in a community), SNA pays attention to the structure of the relationships between actors (Davies, 2009) within the community. In SNA, individual actors are presented as **nodes**, which are linked to each other by **ties**, which represent relationships and/or information flows between the actors (nodes). SNA has been used to show how actors interact, how resources and information moves among them and how roles and relationships are structured (Spielman et al., 2011).

SNA has recently been applied to agricultural systems in developing countries (Spielman et al., 2011) and in turn, smallholder farming communities. For example, Misra et al. (2014) proposed SNA for the study of livelihood systems, Padmaja (2012) analysed village vulnerability to climate change by mapping social networks for information access, technologies and resources and Spielman et al. (2011) used SNA to study agricultural innovation processes.

The framework proposed in this paper is focusing on measuring both information flow and capacity for collective action, as the enhancement of these two elements are key aims of a modern advisory system. The framework proposed is applied to 11 sites with smallholder farmer communities in three East African countries. Each site is exposed to different advisory approaches, providers and arrangements. The application to multiple sites, demonstrates that our framework provides valuable insights into the influence and potential of existing agricultural advisory systems. While the authors consider capacity for collective action and information flow to be essential areas for advisory system support they are rarely studied (Faure et al., 2012). A network perspective could add significant value in assessing these elements, as they cannot be measured at individual actor level but rather at a community level considering relationships between actors. Our approach allows the identification of gaps and opportunities and thus provides a tool for development practitioners to find leverage points within the existing advisory systems.

The paper first introduces the analytical framework, where SNA terminology is introduced and explained. The framework is then applied to the study site networks. The paper discusses the advisory systems at each site and the value and challenges in applying SNA using the proposed framework.

2. Framework

The recent application of SNA to horizontal farmer networks in developing countries has entailed discussion on which network measures are applicable and useful (Padmaja, 2012; Spielman et al., 2011). The framework we propose adds to the discussion and uniquely considers information flows as well as capacity for collective action, within the context of agricultural advisory systems.

In this section of the paper we briefly review key elements of information transfer and collective action related to agricultural advisory systems and then link these concepts to various SNA measures that can be used to quantitatively represent them. A summary of the key network measures that provide information on characteristics of rural advisory systems is provided in Table 1.

As highlighted by Newman and Dale (2005) not all networks are the same and arrangements that may be beneficial in one network or for one group of people may be detrimental in another context. Smallholder farmers need social networks suitable for both information exchange and collective action to varying degrees. Further, the structural attributes of social networks considered important for information flow may not always be consistent with those for collective action. One network feature may in fact inhibit another and there is need to balance, often opposing, structural characteristics to ensure a beneficial outcome (Bodin and Crona, 2009).

2.1. Social Network Analysis (SNA) brief overview

The origins of SNA include sociology and mathematics (graph theory) with influence from educational and developmental psychology (Freeman, 2004). It is now applied across many disciplines including healthcare (Chambers et al., 2012) and education (Kapucu et al., 2010). More recently, SNA methods and theories have been used to provide insights into the complex nature of rural development (Murdoch, 2000; Oreszczyn et al., 2010), management of natural resources (Bodin et al., 2006) and knowledge transfer of agroforestry management practices (Isaac et al., 2007).

SNA is a body of research methods comprising of network diagrams, network matrices, and mathematical measures to represent the structure of social networks. A number of papers describe in detail the origins and definitions used in SNA and can provide more information in this area (Borgatti et al., 1998; Butts, 2008; Spielman et al., 2011; Wasserman and Faust, 1994). The SNA process analyses and produces 'relational' data between individuals, groups, or organisations and the measurable structural properties that impact the way information flow takes place (Edwards, 2010).

Some structural features of a network can only be interpreted correctly when analysing 'whole networks' where data has been gathered from all members in the network of concern. In the context of farming communities a whole network would be an entire village or all members of a farming cooperative (Borgatti et al., 1998). To collect data on entire networks within a farming community is only feasible with well-defined network boundaries (who is in and who is out). For farmer networks the boundaries are often difficult to determine and due to the nature of the networks they often involve a very large number of actors, making it very time consuming and expensive to assess the whole network (Spielman et al., 2011). Alternatively, one can look at 'personal' or