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Communication Networks as Resource for Development

A case study and network analysis of an informal communication network in peri-urban agriculture in Kampala / Uganda

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Abstract

From the network point of view an informal advice network of urban farmers in Kampala / Uganda has been analysed by network analysis on individual, group and entire network level. This case study took place during February and December 2002 in a peri-urban parish in Kampala*. Within this inter - personal communication network farmers shared information about problems with pests in crop production and gave advice about pest management strategies or methods of treatments. Results show that the advice network of farmers is weakly connected and divided into three components. On individual level five opinion leaders with special knowledge in pest management and influence could be identified. But the share of information is limited to two different neighbourhoods and within those to small groups of farmers with similar interests in crop production. Multiplex co-operative relations between farmers with high and intensive exchange of information in pest management took place seldom. Therefore information flow is sub-optimal, the usage of network linkages as individual resources is limited and could be a sign for existing competitive social contexts or obstacles. For extension work internal resources should be activated in the network, rules for individual contributions should be discussed, communication processes moderated so that an atmosphere of trust could generate in this network as a prerequisite for intensive information exchange. Selective and attractive informational incentives should be provided to increase individual contributions and information flow within the network. Networking processes on every level should be encouraged, common and co-operative strategies in pest management should be discussed as well as sustainable pest management strategies and strategies which include the poorest farmers.

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1. Introduction

Peri - urban farmers in Kampala play a vital role for the food supply and food security of the capital of Uganda. These farmers have to face distinct challenges in agriculture, in most cases they are small-scale farmers so that the level of income is low and is limiting necessary investments like improved seeds, tools, agricultural chemicals or storage facilities. Knowledge about pest management is poor, farmers are also not facilitated for appropriate treatments of pests. Consulting agricultural extension services are cost intensively and just a minority of farmers has access to external knowledge about pest management as consequence. In this case study* social networks of peri - urban farmers are in the field of interest and the major question raises from the network approach whether networks could function as a resource for agricultural development or not?

2. Objectives and Methods

Answer to this initial question should be provided by the analysis of the structure and extend of informal exchange and flow of information about pest management in an inter - personal communication network of farmers in a peri - urban area in Kampala. The structure of the flow of information in this network will be analysed at different levels, the level of individual farmers, of groups and the entire network.

Research Area and Sampling Method

This study had been carried out in 2002 in two phases as an explorative case study. The first phase extended from January to February and in a second phase from September to December 2002 interviews had been made by a standardised questionnaire with farmers in the research area. The peri - urban parish of Kalere in the northern part of Kampala was chosen as research area because of the intensive agricultural and horticultural land use and production. A sample of N=25 farmers was selected by random choice and a snow ball technique. Four farmers had been interviewed initially who are not neighbours directly. Following farmers were chosen by the snow ball technique using the names of farmers with whom the initial farmers are linked to in the communication network about pest management or with whom they do co-ordinate their agricultural production.

Methods of Data Analysis

In personal interviews with standardised questionnaires farmers were interviewed for their situation in agriculture, their problems in plant and livestock production and are asked for communication and co-operation linkages to other farmers in their neighbourhood in pest management, in labour co-operation and marketing of products. In this analysis communication activity of the farmers is focussed on the question if they have problems with pests on their fields. All personal communication linkages about pest problems between farmers of the sample could be categorised in two directions. Farmers could be chosen by others as an advice person (in-coming linkages) and in the other direction information seeking activity of farmers is measured (out-going linkages). The communication network about pest management is therefore analysed at three levels. At individual level relations between two farmers were focussed, further the network is analysed at group level and at the entire network level. For statistical analysis the software package for networks (UCINET 2002) is used.

At the level of individual farmers linkages between all pairs of farmers are defined as "dyads". All dyads are analysed whether they exist in a reciprocal or an asymmetric direction or are not existing (JANSEN 2003). The extent of all in-coming linkages are defined as the "indegree" of a single individual. The indegree indicates the influence of this farmer by giving advice in pest management in relation to other farmers in the network. The extend of out-going linkages, which is also be defined as the "outdegree", shows the communication activity and characterises how much a single farmer is participating in the network. Both indegree and outdegree are normalised in relation to all possible N*(N-1) links in a network with N farmers, if linkages of farmers to themselves are excluded. Additional qualitative data of personal attributes is used to identify influential farmers who have special knowledge in pest management or experiences in using synthetic chemicals, locally produced chemicals in pest management or who have access to extension services. Farmers with these attributes need to have a high indegree in relation to others to be defined as "resource persons" or "advice persons" with influence following ROGERS (1995) and his definition of opinion leaders in communication networks.

In addition communication linkages are compared with links in another network which farmers are co-ordinating their agricultural production with each other in different forms

of crop rotation or common planning of inter-cropping systems. If farmers communicate about pest management and do co-ordinate in production these linkages are defined as multiplex linkages. These linkages indicate that communication between these farmers is less interference-prone and more stable.
At another level the network is blocked into homogenous groups of farmers by spatial nearness (neighbourhoods) or by personal attributes like similar interests in plant production. Farmers were asked for their main interests in crop production whether they concentrate on subsistence or market production or a mixture of both. This routine follows the analysis of structural blocks in networks in a modified way. All linkages within the blocks and all linkages which lie between different blocks are measured to get the densities of each block within or between two blocks. This routine constructs a correlation between the original network form and the network grouped in blocks following to Pearsons correlation, if the model fits totally to the original network r^2 is at a value of 1 and zero for absolute difference (SCHWEIZER 1996).

At the level of the entire network the density of communication in the network depends on the percentage of existing asymmetric or reciprocal linkages between the farmers in relation to all possible links N*(N-1). The extend of all reciprocal linkages in a network divided by N*(N-1) is defined as the value of integration of a network. Therefore an integrated network contains a great percentage of reciprocal links within intensively exchange of information and social support could be expected (JANSEN 2003).
The flow of information within a network is also determined by the number of unconnected components which limit the flow of information to farmers within these components which are bigger than one person.

3. Description of the Sample and Findings

The sample of 25 farmers in this case study consists of 16 male and 9 female farmers who are responsible for agriculture or the heads of the family. One male and six female farmers are the owner of more than 2 acres of land all the other dispose of land smaller than 2 acres. 18 of 25 farmers do agriculture mainly for reasons of subsistence production, some sell their surplus on the markets. Seven farmers do agriculture to produce only cash crops for the local or export market. Nearly all farmers (23 of 25) have often or very often problems with pests. But just nine use synthetic chemicals to treat pests, seven farmers use locally produced chemicals to treat pests. Only six farmers can afford or have access to agricultural extension services. Therefore problems with pest are in the centre of this analysis.

Structural analysis of communication linkages

The entire network (see also figure 1) consists of three components: farmers within these components do not have linkages to farmers of the other two components. The biggest component consists of 21 farmers, another one consists of three farmers and the last component has just one isolated farmer as a member. Communication takes place within these components. In total farmers communicate about pest problems and management 37 times. This corresponds to a density at network level of 0.0617 which means that 6.17 % of all possible linkages (N*(N-1)=600) are realised. Therefore the network is connected weakly.

The extent of the contribution of information to the network sets individual farmers apart from each other. The mean of individual communication activity is 1.48 linkages per individual which can be described as 0.062 times as a normalised value. Nine of 25 farmers are asking 2 or more other farmers for advice, 16 farmers just ask one or none farmer for advice. In the other direction the indegree of each farmer is measured by the extent of all in-coming choices. In that case farmers are asked for advice about special or general problems in pest management and contribute information to the opposite person. The communication structure shows an asymmetric flow of information and farmers who do communicate actively are not identical with farmers who are the most influential advice persons. Nine farmers have a higher indegree as the mean of 1.48, or

0.062 (normalised). To identify the most esteemed farmers in pest management the indegree of each farmer is measured, and additionally individual attributes are used as a prerequisite to define resource persons in pest management. In these cases just five of these nine farmers fulfil all the criteria of resource persons or influential advice persons. They are displayed in figure 1 as big circles in different colours related to their neighbourhood. Ten farmers have eight multiplex linkages in communication about pest management and co-ordination of plant production. This extent of multiplex linkages shows a density of 0.013 at network level and is much lower than the mean in communication linkages. Nevertheless, multiplex linkages are important because farmers exchange information in pest management intensively and in a group four female farmers share individual land rights to co-ordinate their vegetable production. They co-operate also in marketing of products and get access to extension services of an agricultural marketing organisation and external information about pest management.

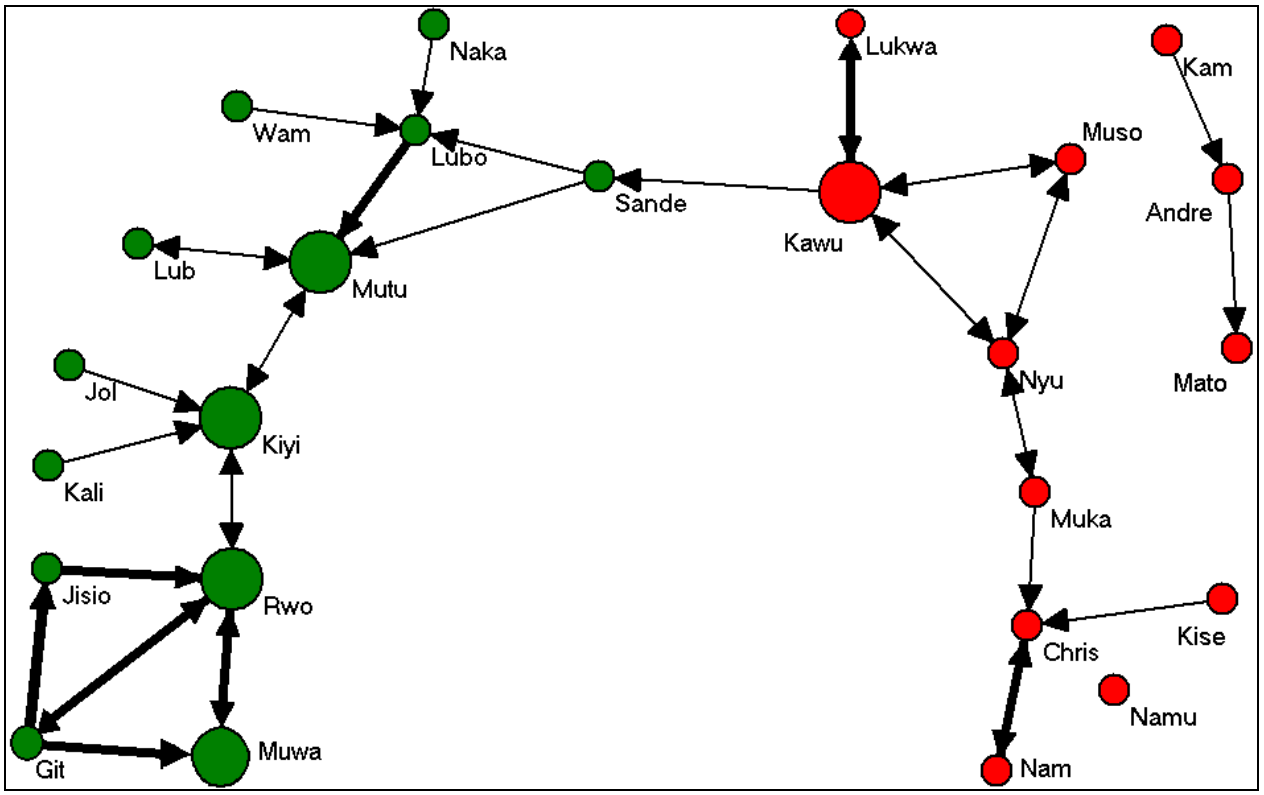
Another level of analysis comes from grouping farmers into homogenous blocks and helps to build a model of grouped network structure which is compared to the original network structure. For this reason farmers are joined together in blocks of their spatial nearness. The structure of information flow shows that communication just takes place within two spatial different neighbourhoods except only one weak tie between two farmers. The density of communication in each neighbourhood raises to values of 0.128 in the first and 0.121 in the second neighbourhood. These values are twice as high than the mean of 0.0617 in the entire network and demonstrate that farmers limits the exchange of information to their neighbourhoods. Within the first neighbourhood four farmers could be identified as influential resource persons in pest management, within the second one only one farmer fulfils all the criteria of an influential farmer with the highest value of indegree in his neighbourhood knowledge in pest management.

For following steps of network analysis concerning the individual attributes additionally are used to form further blocks of farmers with homogenous interests in crop production following BURT (1982) and ROGERS (1995). Results of this grouping display that farmers contribute information or ask for advice mainly within these groups of farmers with similar interests in crop production. Following ROGERS (1995) and WEILIGMANN

(1999) these communication links could be described as homophilous communication linkages. The extent of these homophilous links is much higher than the extent of links between different groups within each neighbourhood at a level of significance of 0.05. Blocking the network structure by these homogenous groups fits better than blocking the network by spatial attributes. Values of Pearsons correlation index demonstrate this relationship by $r^2=0.33$ for blocking into groups of farmers with similar interests in relation to a much lower value of $r^2=0.08$ blocking the network only into two different neighbourhoods.

Results of analysis at individual and group level point out that the flow of information follows paths of spatial nearness and paths between farmers of similar interests in crop production. Five farmers are identified as resource persons in pest management and their influence is based on their centrality and highest indegree of values between 0.125 and 0.167 (normalised values) in relation to the mean of 0.0617 in the entire network. Concluding this results farmers ask for advice within small homogenous groups in their neighbourhoods and concentrate their information seeking activities mainly to these few farmers who are highly esteemed in pest management. In the first neighbourhood communication beyond these groups is depending on few linkages between these influential farmers who are described as resource persons (see also linkages between the farmers Mutu, Kiyi and Rwo in figure 1). Following ROGERS (1995) these linkages could be called heterophilous linkages. In the second neighbourhood heterophilous communication linkages do not follow this paths in a such clear way. But the only resource person in this neighbourhood plays a vital part for the flow of information because he is the one with the highest outdegree of 0.167 of all farmers and the only one of the second who asks another farmer in the first neighbourhood for advice. Therefore this farmer connects both and acts like a bridge for communication.

Figure 1: Informal Advice Network of farmers in Kampala / Uganda



Legend:

- **Circles are symbols for farmers**
- **Big circles are symbols for farmers who are influential opinion leaders and have special knowledge in pest management**
- **The names are not the real ones**
- **The colours are symbolising two different neighbourhoods in the research area**
- **The thin arrows are symbolising the communication about pest management**
- **The direction shows who is asking whom for advice**
- **Thick arrows show that farmers communicate and co-operate in pest management and crop production**

4. Strength and Weakness of the communication network

Facing the challenges and conditions of agricultural production of the small scale farmers in peri-urban agriculture in Kampala communication plays a small but vital role in farmers struggle to manage pests. Within these inter - personal communication network five farmers could be identified as resource persons in pest management. If farmers have problems with pests on their fields they could ask these persons for advice how to manage pests or to treat them in a appropriate ways. Existing communication linkages between farmers demonstrate that farmers seek for information within their neighbourhoods and within small groups of farmers with similar interests in crop production. This structure differentiates farmers into persons with influence and knowledge in pest management and those who lack influence and knowledge in pest management. Those farmers depend on the ability and willingness of these resource persons. Creating blocks in the communication network by groups of farmers with similar interests in crop production, the flow of information is nearly limited to linkages between farmers within these groups who are interested either in subsistence or market production or in a mixture of both. But in regard to all possible links only 6 % are realised, so that communication in the entire network is weak. In addition, the network is divided into three components. The exchange of information is sub-optimal and informational benefits appear seldom.

The few cases of multiplex linkages between farmers point out that informational benefits could be generated by communication, and farmers participate commonly by exchange in information. But in general these multiplex linkages are exceptional, knowledge and experiences in common pest management are limited within small groups and informational potentials for other farmers lie fallow. These aspects of communication emphasise that communication structure impedes intensive exchange of information beyond these small groups indicating a sub-optimal atmosphere for the willingness of individuals to contribute information and could be described as a situation of competition. Opposite of this situation trust between farmers and transparency of information are prerequisites for an optimal atmosphere for communication.

5. Recommendations

The existing multiplex linkages and the generated informational benefits in pest management could encourage other farmers within the same neighbourhood to participate in communication. These examples could be discussed with other farmers to increase their willingness to contribute their knowledge and experiences in pest management in the network to realise informational benefits or to minimise risks and costs of appropriate pest management strategies.

A key role to initiate communication linkages and to increase informational exchange between farmers could be played by non-governmental organisations (NGO), in cause of their supportive and neutral relationship to farmers and independence. The main function of these actors is to join farmers together and moderate and initiate communication processes between them in order to activate existing potentials for other farmers. A NGO could build a bridge between the sample of 25 farmers in the network, and resource persons in pest management within the capital of Kampala to attract farmers, initiate vital discussions among the farmers themselves and between different interest groups. NGOs could support these farmers in that way with a minimum of financial costs and remain neutral between interest groups. Starting these processes in an atmosphere of participation and in relation to farmers demands, a NGO can emphasise new strategies of pest management like organic pest control or aspects in the improvements in breeding or production of staple crops for subsistence production. Attracting farmers and taking the needs and demands of farmers seriously could reduce obstacles, ease communication, increase informational exchange and create an atmosphere of trust within the network.

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