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The Power of Trees

Agroforestry diffusion among small-scale farmers in Uganda

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ABSTRACT

Uganda previously had the reputation of being Africa's food basket, which unfortunately no longer is the case. To mitigate the downwards spiral of soil depletion many organisations, both governmental and non-governmental, introduce land-management systems to farmers, with agroforestry being one example.

This study aims to elucidate the importance of the dissemination of information in the context of agroforestry among small-scale farmers in Southern Uganda. More precisely, we focus on impacting factors such as sources and channels of knowledge and information about agroforestry in relation to farmers' situation and preferences. To that end, we employ Everett Rogers' diffusion of innovation theory, while including a power aspect in the equation. Through a qualitative case study we found that a lack of knowledge within the target group and lack of acknowledgement of the power dynamics, do impede the diffusion process. While many farmers do adopt agroforestry techniques, they do so without including the core element; trees. This may improve farming practices on a short-term, however, the potential benefits and long-term sustainability of the NRM system is questionable.

Keywords: Diffusion of Innovations, Agroforestry, Small-Scale Farmers, Uganda

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We have constructed all the figures, however, when based on others ideas this will be mentioned. Furthermore, all photos are taken by us during the period in the field.

FOREWORD

We would like to thank the staff at SCC-Vi Uganda who made us feel very welcome, and especially our supervisor while in the field, Cotilda Nakyeyune, without whom this research would not have been possible. Her openness, assistance and good spirit during the process have been of great importance to the final product.

A special thanks also goes to the participating farmers for providing us with crucial raw information. We hope that they appreciated this experience as much as we did and that this report will provide all of the above with valuable information to continue their good work in the future.

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Malmö, May 18th 2010

Abbreviations & Acronyms

DAO	District Agricultural Officer
DOI	Diffusion of Innovation
FG a/b	Focus Group a/b
GDP	Gross Domestic Product
HDI	Human Development Index
HIV	Human Immunodeficiency Virus
ICRAF	World Agroforestry Centre
IDP	Innovation-Decision Process
ILO	International Labour Organisation
KAP-gap	Knowledge, Attributes, Practice - gap
MAAIF	Ministry of Agriculture Animal Industry and Fisheries
MoFPED	Ministry of Finance, Planning and Economic Development
NAADS	National Agricultural Advisory Services
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NRM	Natural Resource Management
R#	Respondent semi-structured interviews
RDLG	Rakai District Local Government
RS#	Respondent Staff or Official
SCC-Vi	Swedish Cooperative Centre - Vi Agroforestry
UBOS	Uganda Bureau of Statistics
UN	United Nations
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environmental Programme
VASAT	A Virtual Academy for the Semi-Arid Tropics

1. INTRODUCTION

Since the early 1960s more than an estimated 1.2 billion hectares of arable land have been degraded as a result of human activity (Freeman *et al.* 2005:4). More than half of the ecosystems in the world are unable to support society due to their decline and degradation, and people can no longer rely on their services (UNEP 2005:32).

Soils in Africa generally tend to lack fertility, making them sensitive to human activities such as farming (Nyang'oro 2001:232). Uganda is no exception to this. For a long time the country was known for its fertile soils, however today, land degradation through depletion of crucial nutrients is among the highest in Sub-Saharan Africa (NEMA 2006/07:60). Both the national authorities (NEMA 2006/07:v, ix) and United Nations Development Programme (UNDP) (2005:vii) identify demographic pressure and lack of appropriate farming technologies as two of the major factors contributing to degradation of the soils in the country. In other words, an increasing population forces farmers to clear and cultivate marginal land, which are further worsened by the use of mediocre farming techniques (Nana-Sinkam 1995). Uganda's economy is primarily agricultural, with around 80% of the population relying on the access to and quality of natural resources (UBOS 2006 in NEMA 2006/07:57). The majority of these are small-scale farmers[1], whose most important capital is their land, as they are dependent on the outputs from their plots. The degradation of natural resources is especially affecting this group (Freeman *et al.* 2005:5), which emphasises why it is essential that efforts are made to prevent land degradation.

Within an agricultural context, natural resource management (NRM) refers to the administration and sustainable use of resources, e.g. when producing food and fuel (*Ibid.*:3). The concept of natural resources in the Ugandan context entails those resources affected by the production process, with soil being one of the major ones, together with water and biodiversity (*Ibid.*). A proper management of these and other natural resources is vital, as they provide a foundation for poverty reduction (*Ibid.*:4). During the last decade, the correlation between sustainable NRM and the positive effects it can have on poverty alleviation have been highlighted by both scholars and development agencies. According to Dixon *et al.*, rural development highly depends on the daily decisions of millions of individual rural inhabitants

[1] A small-scale farmer is here classified as a farmer with 0.5-5 acres of land (SCC-Vi Project Uganda 2008:5).

(2001:2). In order for small-scale farmers to gain and/or retain control over their situation and increase their agriculture production, the challenge for governments and non-governmental organisations (NGOs) alike, is to provide the conditions and incentives for those decisions to be made in a sustainable direction.

Agroforestry is a NRM system which since the late 1970s has been increasingly considered as a solution to some of the problems linked to environmental degradation, and thereby meet some of the challenges facing rural poor in developing countries (Franzel & Scheer 2002:11; Jama *et al.* 2006:53). Combining agriculture and forestry, by introducing trees in agricultural production, provides great potential for improving production and sustaining the environment at the same time. As Bene *et al.* put it: "Beyond question, agroforestry can greatly improve life for people in the developing world, and do so within a reasonably short time" (1977:49). Although this was stated over 30 years ago, agroforestry is still, and increasingly, regarded as a means to enrich "the asset base of poor households with farm-grown trees [and to balance] improved productivity with the sustainable management of natural resources" (ICRAF 2010).

Nonetheless, the success of an innovation, in this case agroforestry, depends to a great extent upon the process through which the innovation diffuses. In Uganda agroforestry practices have mainly been spread by governmental or NGO projects (Browder *et al.* 2005:100). In order to evaluate the impacts of such development projects, a classical diffusion model can be applied as a guiding framework, as has been the case in this study. Here we use Rogers' (2003) diffusion of innovations (DOI) theory to explore different factors affecting the process, and thus the outcome, i.e. the adoption of agroforestry.

1.1. Aim & Questions

Based on a field study on agroforestry adoption in Rakai District, Uganda, this thesis aims to contribute to the theory of innovation diffusion. By reconstructing small-scale farmers' decision making process regarding agroforestry adoption, we identify natural and social preconditions, incentive structures and preference patterns. This leads to the following research question:

- How has the diffusion process affected farmers' adoption of agroforestry, and thus their practices, in impoverished rural areas in Southern Uganda?

Two subquestions were formulated for addressing the overall question:

- How do small-scale farmers, in the communities under study, understand and perceive agroforestry?
- How do small-scale farmers, in the communities under study, perceive their agroforestry adoption?

1.1. Scope & Delimitations

In this study we collaborated closely with a Swedish NGO which has been operating in Rakai District between 1997 and 2008 (SCC Vi project Uganda 2008). The district was chosen for two reasons: (1) the NGO had promoted agroforestry in the district and left it recently and (2) the distance from the urban area of Masaka had to be great enough to enter a rural environment, while still being accessible. The district was visited four times during a time period of three months during the fall of 2009.

As Mercer states (2004), innovations emerging from the natural science often lack the support from social sciences when being diffused among possible adoption communities. There would be a range of available social approaches, including gender, for investigating the diffusion of agroforestry. We find that DOI is suitable as we want to elucidate the *actual* process. As for the NGO, it served as a gate opener, as well as facilitator in terms of transport and knowledgeable staff. As we for the aforementioned purpose are focused on the perception of agroforestry among farmers, we will only address specific agroforestry techniques if needed for the understanding of agroforestry as a NRM system.

The next section will describe the methodology and methods applied in this study followed by the context to show the setting within which these methods were applied. Then we will move on to the theoretical framework where we will describe the 'glasses' worn when collecting and analysing data, before arriving at the findings and analysis, and eventually the conclusions.

2. METHODOLOGY

In this study we employ a qualitative research strategy to identify the diffusion process' affect on the adoption of agroforestry. We explore individuals' perceptions of a concept in order to understand how they interpret their surroundings, and thus the explanation for their actions in

terms of the adoption of agroforestry (Bryman 2008:385, Cresswell 1998:51). Our use of applied qualitative methods allowed us to investigate deeper the realities and opinions of the involved parties, in order to get the farmers' views and perceptions of agroforestry. We were then able to interpret and theorise the data in relation to the DOI theory (Bryman 2008:554). The main reason for the suitability of qualitative research in our case, is the fact that we have looked at people's perception, getting their point of view and thereby not only been observers of the farmers' surroundings.

In the early phase we employed sustainable NRM and capacity development theories (see Appendix A). However, as the data collection continued it became evident that the DOI theory was a more suitable framework to explore and explain farmers' perceptions of the adoption of agroforestry.

As our choice of strategy indicates, our ontology is mainly constructionist as we believe that in order to study social phenomena and their meanings, those involved in the construction of them cannot be separated from the research (Bryman 2008:19, 366). In accordance to this, farmers who have been exposed to the concept of agroforestry, cannot be excluded from a study about adoption of agroforestry. Our main focus to understand and explain the adoption process of agroforestry and its implications on farming practice from farmers' point of view, reflects our interpretative epistemological stance (*Ibid.*:15-16, 385; Cresswell 1998:51).

An exemplifying case study design was applied for three reasons. Firstly, it strengthens the qualitative approach as it helps us to investigate a specific process in a specific setting (Bryman 2008:52-56). Secondly, the multiple sources of data collection applied within an exemplifying case study provide an in-depth understanding of the diffusion (*Ibid.*). Thirdly, the case was not chosen because it was unusual in any way but rather because it is representative for the promotion of agroforestry by the NGO in the district and for the aim of the research (*Ibid.*:56). The NGO has promoted agroforestry in various locations in Southern Uganda and their aim during the project period was to improve the livelihoods for poor small-scale farmers depending on agriculture, through capacity development in a NRM context (SCC-Vi Eastern Africa 2009:5-6). Case studies are often criticised to be subjective and for generating findings that can not be generalised to other settings (Bryman 2008:55). The aim

in this case is, however, to generalise about theory and supply existing theory with input from this exemplifying case.

2.1. Research Methods

This study was carried out among members of two farmer cooperatives in Byakabanda and Kacheera sub-counties, both situated in Kooki county in Rakai district. The two cooperatives had 286 and 390 members, respectively, and were chosen through purposive sampling, as they were considered representative for the district in regards to the aim of this research (Ragin 1994:85). The selection of farmers was in other words based on the precondition that they were members of groups which had been cooperating with the NGO advocating agroforestry as their core NRM system.

2.1.1. Interviews

We arranged interviews with various informants and respondents in order to gain a deep understanding of the perception of agroforestry from those involved in the adoption process. Semi-structured interviews with farmers have provided the main source of data for the study as they allow the respondents to express and elaborate on their own perceptions and perspectives of 'their lived world' (Kvale 1996:105).

As an entry point, we presented the research in an introductory letter which was brought to the communities, briefly describing the intentions while asking for permission to carry out the research among the community members. We chose systematic probability sampling (by choosing members at a certain interval) from the cooperatives' members lists, as our intention was to get a well represented view from the communities, represented by the cooperative members (Nichols 1991:59). This is likely to have guaranteed a less biased perception of agroforestry among the sample population, than, for example, having the cooperative select who should be interviewed (Bryman 2008:379). To a certain degree, this has enabled us to generalise the findings within the district .

We interviewed 30 farmers, respondents, in each cooperative (see Appendix B for list of respondents). The semi-structured interviews allowed the data collection to be structured according to certain areas of interest for the study, while at the same time providing room for the respondents to express their perception of their situation and experience. The interviews

were carried out in the homes of the respondents to minimise the time taken from them as they were visited in the middle of the planting season (see fig. 2.1).

Fig. 2.1: Interview situation: In the home of one of the respondents.

The interviews followed a guideline (see Appendix C) based on the 11 core capacities presented by Lavergne & Saxby (2001). These were grouped into five areas: (1) Expectations about the future, (2) surrounding environment and own part in it, (3) relations, (4) strategies, and (5) mobilise skills and resources. However, as the research proceeded, it became evident that our focus was more on the diffusion of agroforestry, than on the development of core capacities. As the elements in the two theories are similar, the DOI theory became the guiding framework for the analysis of the data (see section 4 and Appendix A).

Structured interviews were also carried out with staff members of the NGO, including coordinating staff based at the regional office; zone coordinators for the two sub-counties (field based) and field officers (field based). Furthermore we interviewed two officials in Rakai District: The district agricultural officer (DAO)[2] and the National Agricultural Advisory Services (NAADS)[3] officer (see Appendix D for list of respondents and Appendices G-I for interview guides). The purpose of these interviews was to identify external actors' perception of the adoption process of agroforestry.

2.1.2. Focus Groups

In order to investigate the role of agroforestry as perceived by farmers over time, two focus groups (FG a/b) with 7 and 5 farmers, respectively, were carried out, one in each sub-county (see Appendix H for list of participants). The participants were selected among the cooperatives members themselves with the condition that they should be practising agroforestry and have the time to participate in a focus group. The purpose of the focus

[2] Staff member within the local district government (RDLG 2009:ii-iv; RS5)

[3] NAADS is a programme put in place by the government of Uganda in 2002 in order to increase the efficiency and effectiveness of agricultural extension service (NAADS 2010).

groups was for the participants to discuss problems and solutions in relation to their agroforestry practice 15 and 5 years in the past, today and the problems they anticipate 5 years into the future (see Appendix I for focus group guide). These years were decided upon in forehand based on secondary data from the NGO and the semi-structured interviews already conducted. A trend analysis exercise was chosen with the main purpose to gain deeper understanding about the collective perception over time (Kumar 2002:118-188). It is a useful tool to gather data about how farmers interpret their surroundings and change over a period of time across certain intervals (Kumar 2003:143; Lloyd-Evans 2006:154). The trend analysis allowed the participants to (1) identify problems, (2) rank each problem over time to get a picture of the trend of each specific problem, and (3) rank each problem in relation to the other problems. Beans were used to rank the problems and the scale was decided upon by the participants themselves. Therefore, while the trends identified in each of the two focus groups can be compared, the actual numbers can not (see Appendix J).

2.1.3. Observations

We used observations as a method for getting an overview of the respondents' surrounding environment and to clarify and confirm the information gathered during the interviews. Two types of observations were undertaken as a part of the data collection. Firstly, unstructured observations were carried out during the initial semi-structured interviews, when visiting the respondents. Once we had identified the geographic distribution of the farmers, they were grouped to make it possible to walk between the households. This, in turn, created a great opportunity to observe their land.

Secondly, at the end of the data collection, planned observations of farmers whose land we wished to study further were carried out. Through purposive sampling, more specifically convenience sampling, five of the interviewed farmers within one village were chosen in each sub-county. The requirements were that they had a clear definition of their farming practices, in order to get a fuller picture of how well the farmers' definitions of agroforestry corresponds to the observed and the academic definition. Or in the words of Strauss & Corbin (1998), this meant going "to places, people... that will maximize opportunities to discover variations among concepts" (cited in Bryman 2008:415). These observations can be categorised as unstructured interviews while walking with the farmers on their land, as the intention was to get as detailed information as possible about their actual practices (Bryman 2008:438). The

approach was to ask the farmers to tell about their land; basically asking ‘what’ and ‘why’ in the structure of a conversation.

2.1.4. Challenges

We faced a number of challenges in terms of presence, language, subjectivity and credibility. Regarding presence, the concern was the number of people present during the interviews. In some cases the respondent spoke another language than Luganda and a second translator was needed, being the link between the respondent and our translator. This has likely resulted in some information getting lost in translation (Desai & Potter 2006: 172-179). More often, however, it was merely curious family or community members wishing to take part or listen: This did disturb some of the interviews as some answers may have been affected, e.g. the respondents may have given answers reflecting what they assumed the ‘audience’ wanted to hear; decreasing the credibility of the interview (Bryman 2008:377).

The issue of subjectivity also became apparent, especially regarding our relationship with the translators. Despite having gone through the interview guide with them and carried out a pre-test, it became clear that they in some cases selected what they considered important enough to be translated rather than neutrally translating everything and leaving it up to us to decide what was important (Desai & Potter 2006:176). To mitigate this, an independent translator was retrospectively asked to translate the recorded interviews and focus groups to maximise the correctness of the data.

Two of the challenges faced when conducting focus groups, which might have effected the credibility of the research, are the fact that (1) people tend to talk about the past in a more positive way than the future, and (2) the language barrier made it impossible for us to facilitate the exercise ourselves (Kumar 2002:143). However, an initial meeting with the translator limited the impact of the latter issue and by triangulation with the data from the semi-structured interviews, both problems have been limited.

2.2. Ethical Considerations

As informed consent was obtained from the communities before commencing the data collection, the communities were aware of our arrival and had chosen to participate in the

research. Regarding the four ethical principles set out by Bryman (2004:112-135)[4], we are certain that no harm was done to any of the respondents; that informed verbal consent from the respondents was obtained; and that no one was deceived regarding the aim of the research, at least not intentionally. Nonetheless, as the translators introduced us and our purpose of the visit in Luganda, without translating it back to us, it is unclear how we were being presented (Desai & Potter 2006:175). Regarding the invasion of privacy, it is also unclear how the participants felt our presence affected them. While the translators all claim that people were excited about the research and our interest in their point of view, in some cases we felt like we were intruders interrupting their daily lives.

2.3. Trustworthiness & Authenticity

We consider this study to have a high level of trustworthiness, due to a number of factors. First of all, triangulation of data and sources was carried out in order to limit the risks of misunderstandings and to strengthen the credibility of the research (Bryman 2008:377; Ragin 1994:100). Secondly, by taking detailed field notes and continually up-dating our progress during the data collection process, we strived to increase the dependability. Thirdly, by being aware of the fact that our personal values and beliefs might have influenced the results of the research, we were able to minimise this influence (Lincoln & Guba 1994 cited in Bryman 2008:377).

Another measurement that Lincoln & Guba use (Ibid.) is authenticity. As our sampling method allowed us to interview different members of the community, the study does fairly represent different viewpoints among the community members. Furthermore, the research process itself, especially the focus group exercise, has helped the farmers arrive at a better understanding of their reality, and given them a tool to do so in the future (Bryman 2008:379).

2.4. Data Analysis Process

The analysis of the collected data began on a small scale while in the field, as discussions about the interviews became a part of the daily routine. As the majority of the data collected was recorded, these recordings were listened to and to some extent transcribed in between periods in the field; initiating the creation of a database of information. After leaving the field,

[4] These are: (1) harm to the participants, (2) lack of informed consent, (3) invasion of privacy and (4) deception (Bryman 2008:112-135)

the 'real' analysis began. We developed codes to identify patterns in the data, the most prominent being: "What are farmers practicing" and "what do farmers say they are practicing" (Bryman 2008:550). These codes were later aligned with the elements provided by the IDP, as presented in section 4.

3. Research Context

The purpose of this section is to give an introduction to the greater context of the study in terms of the role of agriculture, demographic pressure and poverty level in Uganda. Following this is a description of the specific research context of Rakai District, after which we introduce the concept of agroforestry.

3.1. Country Context: Uganda

Uganda is a land-locked country in Sub-Saharan Africa situated on the equator (see fig. 3.1) (UNDP 2005:1). The country has one of the highest annual population growths in Sub-Saharan Africa (3.4%) with about 88% of the 31 million Ugandans living in rural areas, and approximately 3/4 of the total working population dependent on subsistence farming (Baffoe 2000; Tumuhairwe 2004:36; UNDP 2005:3, 38; World Bank 2009). Therefore, as Baffoe states, "sustainable agricultural development is imperative in Uganda's quest for economic development" (2000), as is the case in most Sub-Sahara Africa (DeLancey 2001:121-6). The food crops sector contributes 71% of the agricultural GDP with the output coming almost exclusively from small-scale farmers (MAAIF 1998:3 cited in Baffoe 2000). Since land is the main resource and capital for the majority of the population, the decreasing availability of land to an increasing population is a major problem as it often leads to increased poverty (MoFPED 2003; NEMA 2006/07:41).

Fig. 3.1: Map of Uganda: Showing the location of Rakai District (marked in red) in Uganda.

Uganda is still one of the poorest countries in the world, despite the fact that the number of people living below the poverty line is decreasing (UNDP 2005:5). A comparison between Uganda's human development index (HDI), where Uganda in 2007 was number 157 out of

184 (HDR 2009), and GDP per capita indicates that the country have failed to translate an economical growth into better living conditions for the people (*Ibid.*:201). Not surprisingly, given that Uganda's population is predominantly rural, so is poverty (UNDP 2005:28). At the United Nations' (UN) World Summit on Social Development in 1995, the Copenhagen Declaration described poverty as "a condition characterised by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information" (UN 1995). In other words, regardless of their income, people are considered poor when they are unable to eat or do not have access to school and/or health care. This is the definition applied in this study.

The agricultural sector in Uganda is almost exclusively rain fed with wet and dry seasons and the farmers are thus highly dependent on the climate. During the rainy season, large quantities of rain falls during a short period of time causing erosion of the fertile top-soils. Moreover, farmers have to cope with small quantities of rain during the dry seasons. Due to this, techniques that minimise the effects of varying rain patterns are of great importance (UNDP 2005).

Still, the challenge lies in finding solutions for poor populations to make the best use of the natural resources they have access to and/or control over. Focus should be on limiting soil degradation to support human development (MoFPED 2003; UNDP 2005:39). On a national level agroforestry has been seen as a means to stimulate private land owners to plant trees on their farms. Through agroforestry, the need to enhance peoples's knowledge about managing trees for economic and ecological benefits is addressed in order to increase the number of trees (Agea *et al.* 2007:5)

3.2. Rakai District

Approximately 96% of the population in Rakai District are rural dwellers and the main source of income comes from agriculture (RDLG 2009:iv-viii, for more detail see Box 3.1). Various environmental problems have been identified in the district, e.g. exploitation

Box 3.1: Facts about Rakai District

Population:	404.163
Annual growth rate (1991-2002):	1.8 %
Population density (persons/km2):	119.8
Age distribution (% under 15 years):	50 %
Literacy rate children aged 10:	56 %
Agriculture as main source of income:	90 %
Firewood/charcoal as cooking fuel:	98 %
HIV prevalence:	12 %
HDI:	0.489

(Source: RDLG 2009; UNDP 2005:26)

and degradation of natural resources through deforestation and soil erosion (*Ibid*.:59-60). Furthermore, the majority of the rural population is poor, which is strongly connected to their dependence on natural resources for survival and poor agricultural practices causing environmental problems in a mutually reinforcing relationship (*Ibid*.:47-57).

The visited part of Rakai district is hilly (see fig. 3.2), only interrupted by two major lakes and occasional wide flat valleys (RDLG 2009:31). The hills increase the risk of soil erosion and flooding of low areas, which negatively affects the infrastructure. This makes it difficult to access these areas at times, which poses a threat to good service delivery and to get products to markets (*Ibid*.). Despite the district generally having adequate surface and sub-surface water reserves, severe water shortages do occur during the dry season. This could be explained by poor exploitation of water resources, rather than scarcity (*Ibid*.:32). Comparing

Fig. 3.2: Landscape, Rakai District: The landscape during the dry season is shown to the left, while the photo to the right shows the landscape during the rainy season.

the HDI for Rakai District (0.489) to surrounding districts and to the country average (0.488) shows that the differences are minor[5] (UNDP 2005:23). Hence, Rakai district can be seen as relatively representative for Southern Uganda, despite some variations between the neighbouring districts regarding differences in rain pattern and specific characteristics of the landscape (UNDP 2005).

3.3. Agroforestry

Trees have always been important, especially in tropical regions, among other things for its fruits and medical products which have been extracted from indigenous trees (Sullivan

[5] Mbarara (HDI 0.489), Sembabule (HDI 0.496), Masaka (HDI 0.532), Mpigi (HDI 0.520) (UNDP 2005:23)

1999:24). Nonetheless, it is only during the last three decades that agroforestry has been recognised as a "science based pathway for achieving important objectives in natural resource management and poverty alleviation" (Garrity 2006:4-6).

3.3.1. Defining Agroforestry

Regarding the concept of agroforestry, a wide variety of definitions exist, which all have in common that woody perennials are the core element. However, while some argue that this definition suffices, others claim that the bare presence of woody perennials is not adequate, but that it should be *deliberate* (Nair 1993:13-14). The most widely used definition, and the one we use here, is the one put forward by Leakey (1996): "Agroforestry is a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the landscape, diversifies and sustains production for increased social, economic and ecological benefits" (cited in: Kho 2000:87; Franzel & Scheer 2002:1; Swallow & Boffa 2006:96). The definition by Leakey was adopted for this study as it covers all relevant aspects, such as the NRM system being deliberate and the inclusion of all three elements of sustainable development, i.e. social, economic and ecological (McConville & Mihelcic 2007:940).

Trees are known to play a crucial role in almost all terrestrial ecosystems and for people who are depending on fragile ecosystems for survival, trees have been identified to play a particularly decisive role (Garrity 2006:4). Agroforestry can lead to more sustainable cultivation practices in rural areas, and thus ease the pressure on existing natural resources and in the best cases restore them. The potential for trees to improve and sustain agriculture production is through the wide range of services and products they can provide (Agea *et al.* 2007:3-4; Garrity 2006:1). The World Agroforestry Centre (ICRAF) has identified different groups of trees according to their function:

> Fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition; fodder trees that improve smallholder livestock production; timber and fuelwood trees for shelter and energy; medicinal trees to combat disease [...] Many of these trees are multipurpose, providing a range of benefits. (ICRAF 2010)

However, the adoption of agroforestry has been considered to be more complex than adopting other agricultural practices as it includes the introduction of new inputs (trees) and the creation of new outputs (e.g. fodder) (Rafiq *et al.* 2000 cited in Mercer 2004:311). The fact

that agroforestry is a multi-component innovation can limit the adoption rate "due to the complex management requirements and the long period of testing and modification that is required compared to annual cropping technologies" (Franzel & Scherr 2002). On the other hand, the variety of characteristics of agroforestry may enhance the adoption rate as farmers are free to experiment and adapt the innovation to fit their individual needs (Vosti *et al.* 1998:206). Hence, compared to more conventional farming practices, the possibility for farmers to receive education, as well as having the opportunity to experiment and modify acquired knowledge, is highly important in the diffusion process of agroforestry to ensure satisfactory results (Mercer 2004:311-312).

Fig. 3.3. Positive interaction between crops: Coffee seedlings are often planted close to a banana plant, as the banana will provide shade, moist and nutrients in this initial crucial phase.

3.3.2.Agroforestry Systems

The core element of agroforestry is the mixture of various crops with trees, all of which have different growing conditions. This minimises the spread of pests and diseases, while maintaining the fertility of the soil (Agea *et al.* 2007:5). It is a valuable risk-aversion strategy for farmers, because "if one crop suffers from drought or pest attack, there will be others to supply household food needs" (Potter *et al.* 2004:438). The inclusion of trees which can efficiently use resources beyond the reach of crops, leads to improved conditions for neighbouring crops, e.g. a tree with long roots will bring moisture and nutrients from deeper soils to the top soils within reach for the crops and/or provide shade. This is an example of positive interactions between different elements within in a agroforestry system, as shown in fig. 3.3 (Agea *et al.* 2007:13-14; Kho 2000).

However, sometimes negative or no interactions occur between elements within a system, e.g. when trees over-reduce the available sunlight for crops or compete with crops over water resources (Agea *et al.* 2007:13; Kho 2000).

Nonetheless, when positive interactions are created, these factors contributes to making the ecological system less vulnerable and dependent on irrigation and commercial pesticides, while at the same time reducing the risk of soil exhaustion (Agea *et al.* 2007:5-6, 8).

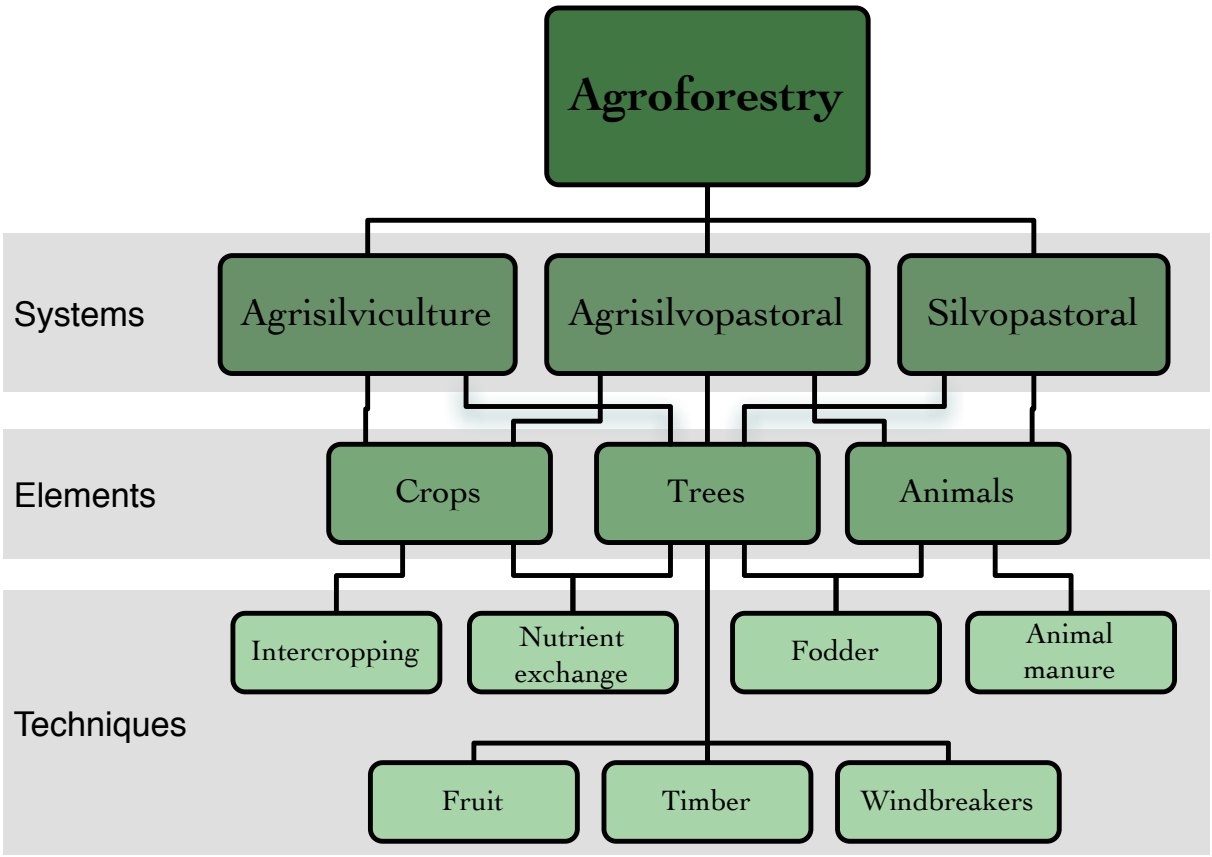

Fig. 3.4: Agroforestry systems: Within the field of agroforestry, three levels can be identified: First level consists of the three systems, agrisilviculture, silvopastoral and agrisilvopastoral; the second level presents the three elements: crops, trees and animals; while the third level gives examples of different techniques (Constructed on the basis of Agea *et al.* 2007).

As shown in fig. 3.4 above, agroforestry encompasses three distinct systems: agrisilviculture, agrisilvopastoral and silvopastoral. These systems can be either simultaneous system, when trees and crops are grown on the same piece of land at the same time, or sequential, grown on the same land at different periods in time (Agea *et al.* 2007:9-10).The most common example of both an agrisilvicultural and agrisilvopastoral system is the home garden, where trees, animals and crops are simultaneously combined around the house. An example of the silvopastoral system, is when trees have the function of fodder banks for animals and thus supplement or replace other fodder sources (Agea *et al.* 2007:9-10).

Intercropping and mixed cropping are the two crop growing techniques found within agroforestry systems. While there are differences between the two, these differences are of less importance for this study as both systems involve the mixing of different crops on the same piece of land, only in different formations (intercropping follows patterns such as borders or interval rows, while mixed cropping does not), and are practices used to improve soil and yield (VASAT 2010; Tutorvista; Rocheleau *et al.* 1988).

Furthermore, planting trees for fruit, firewood and timber production is one way of establishing a more permanent farming system, which increases the possibilities for farmers who aim for income generating activities (Agea *et al.* 2007:6; Potter *et al.* 2004:439). On a more basic level, trees can provide shade and function as wind breaks limiting crop destruction and evapotranspiration, just as the gradual removal of trees on farms and pastures will increase soil degradation. Deforestation leads to the soil being exposed to high temperatures, which in turn leads to the break down of organic matter and increased evaporation; making the soil vulnerable to erosion (Nana-Sinkam 1995). Planting trees can thus reinforce soil conservation by reducing and eventually prevent soil erosion. The adoption of agroforestry on a larger scale can enhance the well being of a larger ecosystem through the planting of multiple purpose trees, e.g. by reducing the pressure on natural forests as a source of firewood of, and thus conserve biodiversity (Agea *et al.* 2007:7).

As mentioned above, agroforestry is a complex NRM system and the ways in which it diffuses among potential adopters may have a great impact on the adoption rate. The following section will investigate the theoretical aspects of this process.

4. THEORETICAL FRAMEWORK

The theoretical framework applied is the diffusion of innovations (DOI) theory, and more specifically the time element within it.

4.1. Diffusion of Innovations

According to Everett Rogers, who is one of the most prominent scholars within the diffusion discourse, the DOI theory offers a way of explaining social change (Evans 1988:46, Rogers 2003). This concept broadly refers to the changes within a social system, such as the change from one agricultural practice to another, which involves interpersonal communication relationships (Rogers 2003:19). Basically, Rogers deals with patterns that have been found

across cultures, innovations and the people that adopt them (*Ibid.*:xvii-xviii). For this reason, Rogers' framework was deemed useful to elucidate patterns among small-scale farmers and their adoption of agroforestry.

During the past five decades, the diffusion model has been widely applied as a framework to the development process in developing countries, in order to evaluate impacts of development programs across different sectors (*Ibid.*:xix). Despite its popularity, the DOI model has nonetheless been criticised, among other things for implying that the innovation should be diffused rapidly and without reinvention to all members of a system; known as the *pro-innovation bias* (*Ibid.*:106). According to Rogers, too many diffusion studies are affected by this bias, leading to much more being known about "(1) the diffusion of rapidly spreading innovations than about the diffusion of slowly diffusing innovations, (2) adoption than about rejection, and (3) continued used than about discontinuance" (*Ibid.*:111). By being aware of this from the outset of this study, and by not neglecting the presence of reinvention and discontinuances, we have been able to minimise the presence of this bias resulting in a more holistic analysis.

Another issue that often occurs in diffusion studies is the *recall problem*. As the data is provided by the adopters reconstructing their adoption process, inaccuracy in respondents replies are common. We encountered this problem during the interviews, especially when trying to grasp the time aspect and content of the received trainings. A way to overcome this is by triangulating different data, as we have done in this study. These issues have, however, not diminished the use of the diffusion theory model within different research arenas as it does contribute greatly to the understanding of the diffusion process.

In general, four main elements of the diffusion process can be identified (see fig. 4.1): (1) The innovation, (2) the communication channels, (3) the social system, and (4) time (Rogers 2003: 11, 23). The key element guiding this study is *time*, or more specifically the *innovation-decision process* (IDP). However, as all four elements are closely interrelated, and thus relevant for this study, a brief introduction to the other three elements will forego a deeper exploration of the IDP.

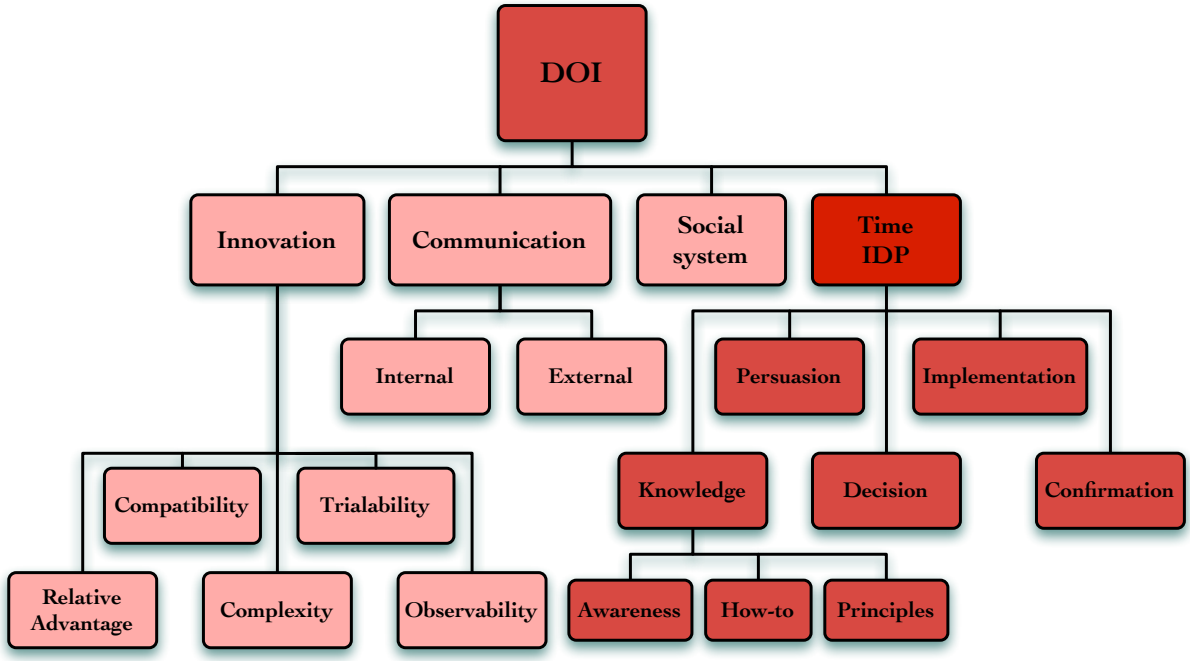

Fig. 4.1: Overview of the DOI theory: The time element and its stages are highlighted to the right (Constructed on the basis of Rogers 2003)

4.1.1. The Innovation

The term innovation is used to describe an idea, practice or object perceived as new by an individual. It is irrelevant how 'new' the innovation is itself, as the emphasis is on how it is *perceived* by the members of the social system in question (Rogers 2003:12). In the case of agroforestry, even though it is a well known NRM system within the natural science sphere, and some techniques might have been known to the farmers before the NGO started to promote it in the district, it was perceived as new by the majority of farmers. As shown in fig. 4.1, the five most important attributes of innovations are: (1) *Relative advantage*, (2) *compatibility*, (3) *complexity*, (4) *trialability*, and (5) *observability* (*Ibid.*:15-17; Surry 1997). These all help to explain the differences in adoption rates. Basically, this means that, an innovation is more likely to be adopted if potential adopters perceive the innovation as one which (1) has an advantage relative to other innovations (or the status quo), (2) is compatible with existing practices and values, (3) is not too complex, (4) can be tried on a limited basis before adoption, and (5) offers observable results (Surry 1997). For an innovation to be successfully adopted it has to be compatible with context norms, values, beliefs and past experiences in the social system (Rogers 2003:4).

Diffusion refers to the process, which can be both planned and spontaneous, of communicating an innovation through certain channels over time among members of a social system (*Ibid.*:5). Diffusion is thus a special type of communication as the message is about new ideas for the receiver of the message, meaning that some degree of uncertainty is involved. Communicating information is a means to reduce this uncertainty (*Ibid.*:6).

4.1.2. The Communication Channels

Communication tends to be more effective when engaging with those more similar to one self, i.e. when two individuals are *homophilous* (Gabriel Tarde 1903:64; Rogers 2003:19, 305-6). This basically means, that when possible adopters are similar to the people communicating the innovation, they benefit more than those being more different, *heterophilous*, as is the case in most DOI campaigns. The ideal situation, which would almost ensure effective diffusion, is when everybody is homophilous on all variables, except regarding the innovation itself, which is usually not the case (Rogers 2003:19). In this situation everybody would share the same norms, values, beliefs and past experience, facilitating the DOI process. The only difference between individuals would be that one or more have knowledge about the innovation.

Fig. 4.2: Roles of different actors: The pillar to the left shows the theoretical actors and the most common communication channels between them. The pillar to the right shows the identified actors in the specific context of this study. (Constructed on the basis of Rogers 2003 and primary data)

The role of the different actors is an important factor in the DOI process, as the interpersonal network highly influences an individual in the process of deciding whether to adopt or reject an innovation (*Ibid.*:300). In our context the actors are represented as shown in fig. 4.2. In this study, the *opinion leaders* are regarded as the centre of this communication chain, and focus will therefore be on them.

Possible communication channels can be divided into two groups: *External* and *internal* channels (Delre *et al.* 2010:12). Examples from our context of the external channels are radio programs and NGO staff, while examples of the latter are cooperative leaders, neighbours and

family. Furthermore, the external channels are often heterophilous in relation to the possible adopters, while the internal channels more often are homophilous (*Ibid.*).

4.1.3. The Social System

As previously mentioned, diffusion occurs in a social system. The structure of the system affects the DOI in several ways, as it can either facilitate or impede the process (Rogers 2003: 24-25). An example of a structure within a social system is the concept of norms within a group, as they represent an established set of rules and behaviour patterns for the members of a social system (*Ibid.*:26). In this context we refer to communities, where the cooperatives function and the farmers live, as social systems, which basically can be defined as a "set of interrelated units engaged in joint problem solving to accomplish a common goal" (*Ibid.*:11, 23).

Opinion leaders are individuals in the centre of the interpersonal communication networks. They have earned and maintained an informal degree of leadership due to their technical competence, social accessibility or the like, as the community members have confidence in them. They can often be 'worn out' by change agents who overuse them in diffusion activities (*Ibid.*:27). An example of this, is when change agents employ opinion leaders in the diffusion process to such a degree that the opinion leaders, who previously were relatively homophilous in relation to the potential adopters, now are perceived more as one of the change agents and thus more heterophilous in relation to the potential adopters (*Ibid.*). In other words, they have become useless for the change agency and have lost their status within the community. Change agents often employ aides to contact the clients in order to influence their IDP, as these aides often are more homophilous in relation to the average potential adopter and thus provides a means of bridging the heterophilous gap between the change agents and the possible adopters (*Ibid.*:28). In our case this would be the early adopters or innovative farmers.

Basically, the heart of the diffusion process consists of interpersonal network exchanges and social modelling by those individuals who have already adopted an innovation to those who are influenced to follow their lead (*Ibid.*:35).

4.2. Time: The Innovation-Decision Process (IDP)

Innovation diffusion is a process that occurs over time and can be seen as having five distinct stages which are (see fig. 4.1 above): (1) *Knowledge*, (2) *persuasion*, (3) *decision*, (4) *implementation*, and (5) *confirmation* (Rogers 2003:168-69).

The perceived newness of an innovation, and the uncertainty associated with this newness, is a distinctive aspect of innovation decision making (*Ibid.*:168). The IDP is thus essentially "an information-seeking and information-processing activity in which an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (*Ibid.*:172). In the context of this study, the farmers were exposed to and processed information about the advantages and disadvantages of agroforestry in order to make a decision of whether to adopt or not. This process starts with the knowledge stage.

4.2.1. Knowledge Stage

This knowledge stage refers to when an individual is exposed to an innovation's existence and its functions. This exposition can be either passive or active, i.e. either by coincidence or by active information seeking, respectively (*Ibid.*:171). The predisposition of individuals influence their behaviour, and they consciously or unconsciously avoid messages in conflict with their existing predispositions, a phenomena known as selective exposure (e.g. a farmer sees his/her neighbour practising agroforestry, but does not believe that trees should be mixed with crops and thus avoid getting any information about it) (*Ibid.*). Selective perception, on the other hand, is the tendency to interpret communication messages in terms of the individual's existing attitudes and beliefs (e.g. a farmer sees his/her neighbour practising agroforestry, but does not make any notice of it) (*Ibid.*). Both selective exposure and selective perception "act as particularly tight shutters on the windows of our minds in the case of innovation messages, because such ideas are new" (*Ibid.*:171-2). While a perceived need can lead to an innovation, the opposite is often the case as well, where the knowledge of an innovation is creating a need for it (*Ibid.*:172).

Rogers identifies three types of knowledge (see fig. 4.1 above). First of all, *awareness knowledge*, which is when an individual first learns about the existence of an innovation. Secondly, the *how-to knowledge*, referring to information on how to use the innovation properly, and thirdly, *principles knowledge*, regarding information on the functioning

principles of how an innovation works (e.g. the functioning principles behind agroforestry is soil composition) (Rocheleau *et al.* 1988). While awareness knowledge often is more efficient when given by mass media such as radio, how-to and principles knowledge tend to be more efficient when given by change agents and opinion leaders (Rogers 2003:173). Furthermore, while it is possible to adopt an innovation properly without deeper principles knowledge, there is a risk of not understanding the principles behind ones' practices leading to poor long-term results (*Ibid.*).

4.2.2. Persuasion Stage

During this stage the individual creates an attitude towards the innovation, which can be either favourable or unfavourable. This is when the searching for information becomes active and a general perception of the innovation is created based on the aforementioned attributes of the innovation (relative advantage, compatibility, complexity, trialability and observability). It is about being able to think hypothetically and imagine the possible effects, as well as the advantages and disadvantages accompanying the innovation if implemented. This is referred to as innovation evaluation information which is also a big part of the following decision stage. (Rogers 2003:174-5)

4.2.3. Decision Stage

Based on the attitude formed during the persuasion stage, the individual will engage in activities leading to either adoption or rejection of the innovation. Most individuals prefer to try out an innovation before deciding to adopt it, or, if not possible, observe someone else engaged in it (Rogers 2003:177). This stage is the core of the IDP, as by deciding to adopt, an individual decides to "make full use of a new idea as the best course of action available" (Rogers & Shoemaker 1971). However, sometimes there may be a discrepancy between attitudes and action, for example, when the attitude is positive towards the innovation, but no actions are taken towards actually implementing it. This is commonly referred to as the "*KAP-gap*" (Knowledge, Attributes, Practice) (Rogers 2003:176). In other words, an individual's attitude towards an innovation does not always lead to a direct adoption or rejection.

4.2.4. Implementation Stage

Until this stage, the IDP "has been a strictly mental exercise of thinking and deciding" (*Ibid.*: 179), but at this point the individual puts the innovation to use if the decision was to adopt. The implementation stage may continue for a lengthy period of time, and eventually become a part of everyday practice and thereby lose its separate identity. This is the end of this stage, and the end of the IDP for many adopters (*Ibid.*:180).

Adopting an innovation is the process of using an existing idea. But the choice available to a potential adopter is not just adoption or rejection. On the contrary, as an innovation is not a fixed entity, it is often *reinvented* in one aspect or another, either by modification or selective rejection of some components of the innovation (*Ibid.*:186). A basic reason for reinvention is that each individual matches the innovation to a specific problem. When an innovation is implemented in order to solve several problems, reinvention is more likely to occur. Reinvention is measured by how core elements of an innovation are implemented, which in our case is the role of trees (Rocheleau *et al.* 1988:15; Rogers 2003:185). A higher degree of reinvention during the adoption and implementation process leads to a faster rate of adoption and a higher degree of sustainability, as the innovation is more likely to be institutionalised (Rogers 2003:183-5). Innovations that are relatively more complex and difficult to understand are also more likely to be reinvented. In such cases reinvention can occur due to an adopter's lack of detailed how-to knowledge about the innovation, but more often it is reinvented as adopters shape it to give it meaning in their specific context.

4.2.5. Confirmation Stage

This stage represents the point when individuals seek additional information regarding the decision already made (Rogers 2003:189). This can result in either confirmation of the decision to adopt or to discontinuation of the innovation, which can be due to either dissatisfaction regarding the innovation or replacement by newer innovations (*Ibid.*:190).

Having presented the methods, context and theoretical framework of the study, we will now dive into the analysis of our findings.

5. Empirical Findings & Analysis

The time element of the DOI process, i.e. the innovation-decision process (IDP), has guided the analysis of the collected data, therefore this section will be presented in a similar manner. However, as the time element is closely linked to the other elements, these will occur frequently in the analysis.

During the analytical stage of this study, the power aspect became apparent. According to Avelino & Rotmans, change processes, such as the DOI, rarely take this aspect into account despite being highly affected by power relations (2010:544). To explain the relations between the DOI actors, we have adopted the definition of power as "the ability of actors to mobilize resources to achieve a certain goal" (*Ibid.*:550). Basically, there are four conditions for power: (1) the access to resources, (2) the strategies to mobilise them, (3) the skills to apply those methods, and (4) the willingness to do so (*Ibid.*:551, 556). The resources in question can be either human, artifactual, mental, monetary or natural and are in themselves power neutral, as only by being mobilised by actors do they become power-laden (*Ibid.*: 552).

The NGO's aim to get individual farmers to use more sustainable practices by engaging as many as possible in agroforestry, can from a power perspective be seen as an attempt to increase "the 'combined' capacity of actors to mobilise resources for the survival of a societal system", known as systematic power (Avelino & Rotmans 2010:553). When systematic power is present, it becomes a collective way to prevent degradation of the soils, which the society is dependent on. The members of the community gain more power over their natural resources which directly and/or indirectly affects other resources.

According to Evans, the key to the success of agroforestry depends on whether the individual farmer believes in its potential for economic return or not (1988:52). Katz *et al.* demonstrated as early as 1963, that "even poor, illiterate rural populations are responsive to economics and that the economic attributes of innovations are very important with regards to rate of adoption" (in Evans 1988:47). This has also been the case for farmers in Rakai District. The majority of reasons given for adopting agroforestry are either directly or indirectly connected to increasing their income in order to obtain other goods or services, or as the power definition suggests; to mobilise resources in order to achieve a goal.

A generally accepted definition of the term income is provided by the International Labour Organisation (ILO), which states that income (household) encompasses "all receipts whether monetary or in kind (goods and services) that are received by the household or by individual members of the household at annual or more frequent intervals" (2003). Income could thus mean anything from exchanging vegetables for fruits, as it happens within subsistence farming, to being paid in a currency for ones labour or products.

A vast majority of the respondents stated farming as their main source of income, however, trees were only mentioned by a few. This could be regarded as a worrisome sign as the majority of the respondents claim to be practising agroforestry, where trees are the key element. However, a logical explanation to this low number could be that many of the benefits from including trees in the production system have to do with providing shade and nutrients for the crops, and thus only indirectly contributing to the main source of income. Furthermore, the adopters might not be aware of how trees contribute to the production. This leads us into the first stage of the IDP, which is the creation of knowledge.

5.1. Knowledge

In order to establish an understanding of farmers' knowledge level regarding agroforestry, they were asked to define agroforestry. All respondents had heard about agroforestry, which indicates a high degree of awareness knowledge in the community. On the other hand, less than half of the respondents defined agroforestry in a relatively 'academically correct manner', i.e. the deliberate inclusion of trees. Regarding the how-to knowledge, there seems to be a gap: The fact that trees were not mentioned in the definitions by a majority of respondents indicates that they are not aware of the actual way agroforestry functions. However, some respondents indicated a higher level of how-to knowledge, such as respondent 7b who seems to be practising agrosilvipastural agroforestry based on the techniques she is practising: "I use manure from goats and cows to increase fertility; mulching and trenches to conserve water; and boundaries to prevent soil erosion and movement". Her explanation indicates that she is aware of the benefits attached to the different techniques. At the same time, her definition of agroforestry only concerns trees and crops, thus being agrosilviculture.

A problem that occurred during the research was that in Luganda (the language that most of the interviews were conducted in), the word for agroforestry, "ennima ey'ekintabuli", literally

means intercropping and/or mixed cropping (see fig. 5.1). While these practises can be a part of agroforestry systems, none of them can on their own be labelled as agroforestry if the core element, trees, are missing. The majority of the definitions given during the interviews described intercropping and/or mixed cropping, such as respondent 19b, who said that agroforestry "is the growing of different crops on the same field". This could be the major

Fig. 5.1: Intercropping vs mixed cropping: To the left an example of intercropping, where banana is planted in intervals among beans. Furthermore, terraces have been dug to minimise soil erosion. To the right an example of mixed cropping, where the planting system is more haphazardly.

reason for the low level of 'correct' definitions. However, since we became aware of this, follow-up questions were asked regarding whether trees were part of their intercropping/ mixed cropping practice. Furthermore, just because the Luganda word is translated into an English word not including trees, this does not necessarily mean that the Luganda word is understood as a concept not including trees. Put differently, if the only context farmers have heard the concept "ennima ey'ekintabuli" is during trainings highlighting the importance of trees, then farmers are likely to associate the term with trees. During observations intercropping and mixed cropping were observed, both with and without the integration of trees.

In the knowledge stage the farmers can either passively or actively expose themselves to an innovation (Rogers 2003:171). When agroforestry was first introduced in Rakai District, the farmers did not perceive trees as compatible with crops and, hence, did not attend trainings arranged by the NGO (RS2). A reason for this may have been that farmers avoided the message since it was in conflict with their existing predisposition, i.e. they were selective regarding what they were exposed to (Rogers 2003:171), and that the NGO was too heterophilous in relation to the farmers. Furthermore, the district agriculture officer (DAO)

suggested that farmers are mostly interesting in fast results and 'easy cash', making the idea of planting trees hard to sell (RS1). The reluctance from farmers regarding the application of trees could thus be explained by a perceived lack of sufficient short-term economic return as stated by Evans and Katz *et al.* above (in Evans 1988:47).

Another challenge experienced by the NGO staff when informing farmers about the benefits from incorporating trees in their agricultural practices, was the negative attitudes towards certain tree species (RS2; RS3; RS4; RS6). This was regarded as especially hard to overcome, because changing attitudes and beliefs is a time consuming process. Still, an interesting finding by Roling *et al.* (1976) regarding the DOI, is that "rural populations are not bound by tradition", but rather "restricted by lack of opportunity and economics" (in Evans 1988:47). This contradicts previous suggestions by implying that marginalised farmers are not practicing inferior farming practices because this is what they have always done, but rather because they do not have the possibility to adopt other and better practices. One of the various reasons for this could be lack of knowledge at different levels.

The DAO and NAADS coordinators confirmed the initial negative attitude towards planting trees. According to them, what farmers appreciate most about trees, is the possible supply of firewood (RS1; RS5). This was supported by several farmers, among others one who said that "I plant trees as I want to increase firewood production" (R7a). One respondent had started his own tree nursery (see fig. 5.2) and was now teaching people to plant trees as he believed "that if you don't grow trees you will lack firewood. [...] People not involved in agroforestry don't know the importance that trees have on their land, they think we are wasting our time" (R3b).

Fig. 5.2: Tree nursery: The seedlings are protected from the sun by the overhanging leaves and conserve water by keeping the evaporation under the plastic.

He was one of the few farmers acknowledging the indirect social benefits of planting trees as he during the interview added that "by planting trees, the children don't have to collect

firewood" (R3b). While the benefits of agroforestry do go far beyond supplying firewood, this is an important first acknowledgement of agroforestry being a possible remedy to land degradation and deforestation. Most trees have multiple purposes; nonetheless, most farmers are only aware of one or two and thus neglect others (Agea *et al.* 2007:6; Omont & Nichlas 2006:28; Garrity *et al.* 2006). This could be indicating a lack of knowledge regarding tree management and agroforestry among small-scale farmers.

Since knowledge can be viewed as a way to mobilise mental resources in order to achieve a certain goal, it is important to recognise the correlation between knowledge and power (Avelino & Rotmans 2010:558) While the creation and communication of knowledge is a power exercise in itself, it also includes an exercise of power in terms of influencing other actors to mobilise their resources (*Ibid.*). As such, knowledge is directly connected to the four conditions for power (see fig. 5.3), since all these conditions are largely dependent on the gathering and possession of knowledge (*Ibid.*). As seen in our context, during the initial phase the NGO tried to mobilise the farmers' mental resources in order to create a change towards more sustainable NRM.

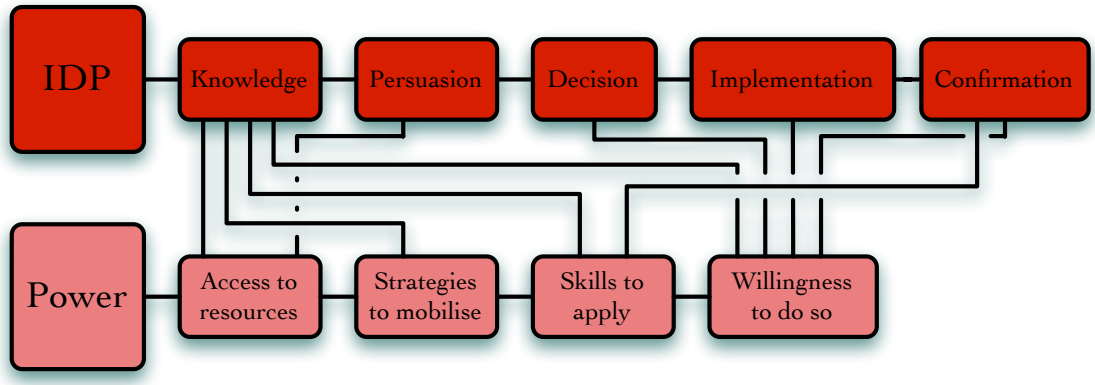

Fig. 5.3: The connection between the IDP and Power. (Constructed on the basis of Avelino & Rotmans 2010; Rogers 2003)

5.2. Persuasion

After having acquired a minimum level of knowledge about the innovation, either passively or actively, the active information searching begins. This is when farmers seek out information persuading them to either adopt or reject the innovation (Rogers 2003:174). More specifically, we have attempted to identify *who* and *what* persuaded the respondents to adopt agroforestry. As most respondents claim to be practising agroforestry, the innovation must

have been in line with their existing attitudes and beliefs, as they chose to expose themselves to knowledge about the innovation (*Ibid.*:171). As one respondent said:

> Well, it was [the NGO] which came and gave to us some seminars. Nevertheless, it was out of personal interest that one came to attend these seminars. They were not compulsory to any of us neither were they imposed. It's basically out of the desire to meet my needs that I decided to engage in it [i.e. agroforestry] (R4a)

However, it may not be this straightforward. A great uncertainty exists regarding the agroforestry promoted by the change agency and its agents, and the agroforestry the respondents are practising, as a discrepancy between the two seems to exist. This discrepancy was first noticed during an observation tour with a change agent (RS4), who described what appeared to be agroforestry, as 'accidental agroforestry', i.e. not deliberate.

Every other farmer was inspired by the organised trainings; highlighting their direct role. Trainings can be a way to learn more about an innovation one has become aware of, in order to create an opinion of its advantages and disadvantages. In other words; training is an active way of investigating further, if the potential of an innovation can be developed into a decision to implement (*Ibid.*:175). This was confirmed by respondent 4a who said: "I got the inspiration to adopt agroforestry from the regular visits and trainings that we used to receive from the [NGO] staff". It is likely that the indirect role is equally important, as those having undertaken agroforestry training can share their knowledge with peers. A few of the respondents mentioned friends and/or neighbours as a source of inspiration, for example respondent 1a who got inspiration "from a friend that practises these techniques and I worked for him so I learned". Depending on (1) the ability of the trainer to teach, (2) the capacity of the friend to correctly adopt good agroforestry practices, and (3) the capacity of the friend to spread his/her knowledge; this sort of diffusion can replace going to trainings. One respondent who has not received any training, but had learned how to practice agroforestry from family members, appeared to have both good awareness and how-to knowledge (R14a). Nonetheless, the interviews did show that when comparing farmers who had participated in trainings with those who had not, the former group generally gave better definitions of agroforestry and practice better agroforestry. Despite women being slightly overrepresented in the sampling group, equally many men and women had not received trainings. This contradicts the study by

Adesina & Chianu, who state that men are more likely to undertake trainings than women (2002:106).

As different stages in the IDP demand different approaches, it is interesting to look at the approaches, and more specifically the methods, used to spread knowledge. Initially, a weekly radio programme was used to spread awareness knowledge. To increase the level of how-to knowledge, both practical and theoretical methods were utilised by the NGO when attempting to persuade the farmers to engage themselves in agroforestry. The practical methods included touring in the communities, demonstrations of techniques and visits to farms with good agroforestry practices, while the theoretical methods included a combination of classroom teaching, showing pictures, taking notes and circle studies. We asked the respondents to evaluate the training methods by identifying the method they benefitted from the most and the least. Despite a relatively low respondent rate, the answers clearly indicated that practical teaching methods were appreciated and valued the most, as "one is prone to forget what she may learn from the blackboard, yet it so easy to recall what one may learn from the practical" (R30a). A number of interrelated factors could explain this: First of all, the majority of respondents are most likely used to practical learning, also known as 'learning by doing' (Connor *et al.* 1996:9; Vark 2010). Secondly, the perceptual modality, i.e. the way people take in information, of the majority of respondents could be kinaesthetic, being that they learn best by doing (Connor *et al.* 1996:11-13). Thirdly, the step into a classroom might have been overwhelming with the experience in itself taking energy that should have been used to process theoretical information. All three factors can be condensed into, and backed-up by, what Eduard Lindeman as early as 1926 stated: "Experience is an adult's living textbook" (1926:7).

Among the reasons given by the farmers for preferring practical methods were: "someone physically *shows* what to do" (R24a), so "you can *see* exactly what to do" (R10b). Among the few preferring theoretical methods, the reasons were, that "during classroom trainings I got knowledge" (R11a) and "all areas were dealt with" (R29b). Despite the majority preferring practical methods, a few respondents highlighted the importance of a mix of theoretical and practical methods, due to the fact that "from the classroom I got the knowledge and by demonstration I could do it in practise" (R18a). The role of training methods will be elaborated further in the following section.

5.3. Decision

Stage three in the IDP is when the individual, after getting the initial knowledge and creating a positive or negative attitude towards the innovation, now has to decide whether to adopt or reject the innovation. By making this decision, a farmer practices power over his/her resources and exert the power to act, i.e. mobilising these resources (Avelino & Rotmans 2010:555-558). In the case of agroforestry, the act of power consists of changing from old farming practices and destructive power (depleting the soils) to new practices through innovative power (sustaining and/or improving fertility through agroforestry) (Ibid.:552).

The fact that a large majority of the respondents, according to their perception, has adopted agroforestry, shows that the communities have an overall positive attitude towards agroforestry. The farmers have evaluated the information obtained during the knowledge and persuasion stages which has created a positive attitude resulting in the decision to implement agroforestry. The adopters have received information about agroforestry practices from different sources and through different channels; they have then decided to adopt one or more elements and techniques; and now describe their farming practices as agroforestry. Nonetheless, the numbers could be misleading: While a certain element or technique can be a part of agroforestry, it might not be sufficient to be agroforestry. For example, as previously mentioned, many of the farmers practice intercropping/mixed cropping and many apply manure. However, trees are often missing.

5.3.1. Innovation Attributes

What affects the decision to be made is the five innovation attributes (observability, trialability, relative advantage, complexity, compatibility), out of which the most obvious explaining the adoption rate in the communities visited, is observability. Additionally, as observations and demonstrations, especially by peers, can replace the need for an innovation to be tried personally, the trialability of agroforestry is also likely to have influenced the adoption rate (Evans 1988:52; Rogers 2003:177). This is supported by the study of Delre *et al.* who, in their research about adopter attributes and the topology of communication networks within the DOI, found that individuals prefer having neighbours or someone else in their social network who have adopted (2010:29). Examples of this has been given above, when farmers have been inspired by people in their surroundings such as family and friends. Nonetheless, most farmers mentioned getting inspiration from trainings by the NGO, as the

main reason for deciding to implement. However, with the NGO no longer being around, the social network will probably gain more importance.

The use of practical training methods is an efficient way to demonstrate the relative advantage of agroforestry showing the compatibility of trees with crops, and comparing agroforestry to other farming practices (Evans 1988:52). One of the most likely explanations to the relatively low tree planting rate among farmers claiming to be practicing agroforestry, could be that trees take longer to implement than other elements of agroforestry. In general, it takes from two to six years before the benefits from an agroforestry system becomes evident (Franzel & Scherr 2002). Hence, the attributes take longer to be identified (e.g. the relative advantage of planting fewer crops to give space for a tree. With the right combination of crops and trees this will increase the total yield of the crops, despite the crops being fewer, as each plant will produce more). Sirrine *et al.* (2010) confirm this trend, stating that farmers are more likely to decide to adopt agroforestry techniques that satisfy immediate livelihoods needs, than techniques targeting long-term soil quality improvements.

Many of the respondents said that agroforestry seemed more complex when just hearing about it (theory in classroom), than when actually seeing it (demonstrations in the field). This is connected to the complexity attribute, explained by Rogers as "the degree to which an innovation is perceived as relatively difficult to understand and to use" (2003:266). As agroforestry is a complex innovation in itself, the methods and channels used to diffuse it among small-scale farmers are of highest importance. Insufficiency in either can result in farmers not getting the practices right. This was recognised by one of the farmers stating that "agroforestry has been good, provided you follow the procedure. But if you do not follow the process, it gives negative effects" (R4a).

Regarding topics of the trainings, an interesting finding was that despite more than half of the respondents having been trained in either tree planting or agroforestry, surprisingly few mentioned trees as part of their practices. One explanation to this discrepancy may be the KAP-gap: The farmers know about the advantages of trees and would like to implement agroforestry, however, they have not yet made the decision to do so (Rogers 2003:69). In other words, despite a positive attitude, a lack of seedlings and/or other resources is halting the decision and/or implementation.

As a part of the decision-making process the potential adopter weighs the advantages and disadvantages related to a possible adoption. Among the Rakai farmers, the main expected advantage they foresee is improving their income (which is a precondition for almost all other expected benefits) to "take care of my children, give them education and food. The goal is to get more money" (R4b) in order to "live a better life and get a better life for my children" (R20a). The main problems and risks identified by the respondents and focus group participants (see Appendix J) in relation to agroforestry, are the issues of small plots, pests & diseases, and drought, followed by too much sunshine, lack of resources, access to market and poor yields. However, these risks do not appear to be specific to agroforestry, but rather risks that exist within all types of farming systems. Put differently, even cash crop farmers are dealing with the difficulties of drought, sunshine and pests, just as other small scale farmers are facing issues of lack of resources, access to market and poor yields.

Despite agroforestry being a NRM system especially suitable for small plots, and thus promoted to farmers having small plots, there is a minimum plot size required to sustain a family (World Bank 2008:90). In fact, the population increase was perceived as a growing problem by one of the focus groups:

> When we become many, everyone want to carry out animal husbandry. Now when it comes to animal husbandry, there will be so many animals in the small grazing area, and at the same time many people in the same small area. (FGa)

Furthermore, the problem of land ownership was mentioned by a number of respondents, as many were either renting land, or owned split plots. One of the farmers in this situation was respondent 13a who said: "I have four gardens. I own one of them and rent the other three, but I would prefer to have one bigger piece instead of many small" (R13a). This is a recognised problem in the district, as well as in the rest of Uganda (UNECA 2005 in NEMA 2006/07:57; RDLG 2009:60), and it is likely to affect the adoption of agroforestry. According to Adesina & Chianu (2002:106) this is especially a problem for female farmers due to a gender bias favouring men in regards of inheritance and secure ownership of land. However, as mentioned earlier, the complexity of gender aspects is beyond the scope of this study.

The benefits from adopting agroforestry practises do not occur over night, so farmers who do not own their land might be less prone to make the decision to implement, as long-term investments does not look appealing when possesing land on a short-term basis. In other

words, when farmer A plants a tree on a piece of rented land with the plan to later sell the fruits, he/she runs the risk of the land owner reclaiming the plot before farmer A can harvest any fruits.

Diseases affecting both people, animals and crops, was an issue mentioned by both focus groups, as "diseases are a big problem [and] in the future, there will be more diseases" (FGb). According to one of the participants in FGb:

> What has brought diseases these days is that in those days we had rains, the dry season was not long, we had water. But now when a cow fails to get enough food it becomes susceptible to diseases. Even when a doctor treats it, it remains sick. Because it's not getting enough feeds, even when a doctor treats it, it will still die. (FGb)

As this quote shows, farmers are aware of the connection between different issues such as drought and diseases, however, in this discussion none of the participants mentioned the role of trees as possible sources of fodder and shade, which could help mitigate the interrelated problems of drought and diseases. The solution suggested by FGa is for more organisations to come in the area,

> because we have talked about diseases, but we have strong diseases [...] and we need serious sensitisation. It [i.e. fighting diseases] needs special assistance because if a person is healthy, they will be able to get treatment for the animals. (FGa)

Furthermore, while FGa anticipated that the issue of diseases will be approximately the same in five years, FGb believed that "it will be severe in the future because the increase in animal numbers and the congestion of people and animals together will lead to more pests and diseases" (FGb). When asked why they thought drought had become more of a problem today than in the past, one of the participant said that it is

> because of climate change. I can say that 15 years ago drought wasn't as much. And I give a reason that in the past people did not cut down trees. And then I say that 5 years ago, it was there but not much, because people were still few, and trees were still there. But now, there is drought because people have cut down the trees and we have no rain. Therefore, that is the cause of drought (FGb)

In FGa, the answer was strikingly similar:

> The first reason that I think could be the cause, is because this area has no trees. There are many people, they use the trees as fuelwood, lack of land has also brought about the decrease in trees. When one thinks of planting trees on the small piece of land where they are to grow bananas, they feel it would not work out. So that has also contributed towards the lack of trees and the destruction of the environment (FGa).

They furthermore agreed upon the fact that if nothing is done, the few trees left will continue to be cut down and "drought will greatly increase" (FGb). This indicates that the farmers are well aware of the fact that trees have an impact on their environment, and the effects this has on animals and people. Nonetheless, the tree planting rate is low in the district. This could be an example of collective KAP-gap in that they think trees should be present in their environment to minimise drought, but very few are actually planting trees. And again, the issue of insecure land tenure could also be a reason for the low tree planting rate.

The risk of drought provides an example of the indicated lack of power, as almost all the respondents and participants said that drought is one of the major disadvantages with farming and thus also with agroforestry. Despite the fact that many of the techniques within the elements of agroforestry work directly or indirectly with mitigating the effects of long periods without rain, the majority said that when it comes to drought, there is nothing they can do; that they feel powerless. But at the same time they practice different water conservation techniques, such as rainwater harvesting. In this regard, it is not the lack of power as such, that seems to be the issue, as they have the possibilities and tools to better their situation. On the contrary, it is an issue of being aware of the power they actually possess: That they to a certain extent can take control over the situation.

5.3.2. Actors

Regarding the different actors in the knowledge stage of the IDP, the NGO staff are the ones in the social system who have the knowledge and the ability to influence others' opinion about agroforestry (Rogers 2003:300). However, as knowledge spreads to the leaders in the community, in our case cooperative chairmen and other board members, they take over the role of spreading the information in their capacity of opinion leaders. These individuals are often first in accessing the external mass media communication chain, meaning that "ideas often *flow* from radio and print *to* opinion leaders and *from* these to the less active sections of the population" (Lazarsfeld *et al.* 1944:151 cited in Rogers 2003:304). Hence, the role of the

opinion leaders is firstly to access information and secondly to spread it and thus influence people (Rogers 2003:304). What appears to have happened in both communities, is that the opinion leaders have successfully accessed information, but for various reasons they have not been as successful in spreading it. This became evident through the interviews and observations, as people with specific roles in the cooperatives also had the most developed agroforestry practices.

When relating this to the power aspect, the NGO can be seen has having the power over knowledge when initially entering the district, but not the power to efficiently influence the farmers to mobilise their resources in favour of the adoption of agroforestry. By realising this, and then use opinion leaders to spread the knowledge, the NGO can increase the diffusion of knowledge, and thus innovative power, among the farmers. The power aspect can particularly be seen in the complexity attribute, as the more complex an innovation is, the more knowledge does one need to use the innovation properly. As such, the actors with most knowledge are likely to become those with most power, leaving individuals with less knowledge in a situation of less power. The opposite can also be the case: The more power an individual possesses, the more likely this person is to get access to knowledge. Either way, it can be an excluding process as those lacking knowledge or power can be left outside the DOI process, despite probably being those needing it the most (Avelino & Rotmans 2010; Rogers 2003:257).

The relationship between different sorts of power plays an important role as well. While the NGO promoting a sustainable NRM system has the power over knowledge, this does not necessarily mean that it is superior in power over the farmers, only that it has power over something that the farmers do not. The farmers, on the other hand, have power over the natural resources the NGO seeks to improve, which once again does not mean that the farmers have power over the NGO. The NGO and farmers can have ‘equal’ power, although over different resources and/or to do different activities (Avelino & Rotmans 2010:556). However, the relationship might not have been in balance. The most outstanding example of power relations in imbalance found in this study, is concerning the opinion leaders. As earlier mentioned, opinion leaders appear to be practicing better agroforestry than other farmers, which illustrates the power imbalance between leaders and the rest of the community

members, both regarding the difference in knowledge level and the amount of resources they are in control over.

This could be related to the characteristics and relations of the different actors within the IDP, since, by definition, the social relations between homophilous individuals are better than those between heterophilous. While the cooperative chairmen and other board members in their role as opinion leaders might initially have been heterophilous in relation to the change agents and homophilous in relation to the potential adopters, the reverse situation now seems to be the case (see fig. 5.4).

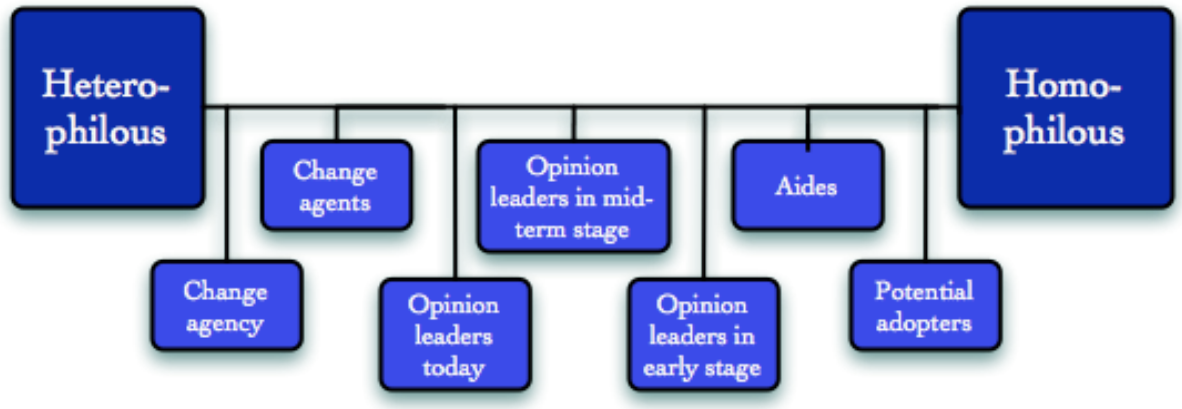

Fig. 5.4: The heterophilous-homophilous continuum (Constructed on the basis of Rogers 2003).

If unaware of this risk during the different stages of the IDP it could be regarded as a natural consequence as the opinion leaders often find themselves in the middle of two sphere's: The traditional practices and the new innovation. Being the middleman of information requires a balancing act between passing on information and adapting it to a different audience. Hence, despite the farmers and cooperative chairmen initially having more similar competences, socioeconomic status, beliefs etc., there is a risk of a growing divergence between the higher level in the cooperatives (board members) and the members. The former often become more inclined to interact among themselves and innovations are rather spread horizontally than vertically, preventing different agroforestry practices to diffuse (Rogers 2003:306-307).

5.4. Implementation

While it is one thing for an individual to decide to adopt a new idea, it is quite different to take the step and put it into use. The implementation stage may take a lengthy period of time, as it continues until the innovation is not perceived as new anymore. (Rogers 2003:179-180)

When looking into which techniques farmers say they practice, no one appears to be practicing the exact same, however, the most common techniques such as mulching, manure and trenches are widely spread (see fig. 5.5).

Fig. 5.5: Common agroforestry techniques: To the left: Goats providing direct manure to trees in a silvopastoral agroforestry system. To the right: Trenches conserving the water on the plot of respondent 12a. Alongside the trenches are banana and coffee plants intercropped.

Despite the variety of techniques adopted, trees were not the first mentioned by any of the respondents. This can be explained by different factors, one of the greatest being the basket of options offered to farmers by the NGO when they entered the area (RS4). The farmers may have chosen techniques from the basket appearing to be perfect for their individual problem and then reinvented agroforestry to fit their needs. As Rogers also states, a "basic reason for re-invention is that each individual matches the innovation with a different problem than does another" (2003:186). The lack of deliberate use of trees among the respondents could be a result of the farmers having reinvented to such an extent that the key element is missing, making their initial intent to implement agroforestry result in an improvement of farming

practices, but not agroforestry. So while they believe that they are practicing agroforestry, as they use techniques obtained at an agroforestry seminar, this is often not the case.

This suggests that most farmers might lack proper how-to and principles knowledge, despite the fact that a majority are capable of explaining the purpose of the different techniques. One such example is respondent 13b who said that "I do mulching to preserve water and improve yields, green manure to fertilise the soil and dig trenches to ensure that the water does not wash away, so the garden has water". In many cases, this is sufficient knowledge to successfully practice techniques within agroforestry. But, by knowing exactly what to do and the underlying functional principles as to why, Rogers argues that one minimises the dangers of misuse and discontinuance (2003:173).

5.5. Confirmation

When asked whether agroforestry was a part of their future plans, the majority stated that it was and thus confirmed the adoption of the innovation and thereby the decision to implement. It is likely that the farmers' decision to adopt agroforestry, and confirmation to continue with agroforestry, were based on the fact that agroforestry, at both times, was the best available alternative. Only one respondent has discontinued the practice of agroforestry and in this case the reason was dissatisfaction with the outcome, as "I tried agroforestry 4 years but I stopped due to competition between crops" (R18b). In other words, he must have created negative relationships between crops, leading to his decision to abandon the innovation after previously having implemented it, which falls under the label of disenchantment discontinuation (Rogers 2003:190). This could be connected to a variety of explanations: (1) too high expectations on his behalf, (2) lack of knowledge, and/or (3) the complexity of agroforestry. Whatever the explanation, he might not have received sufficient and/or right information about agroforestry. If he had, positive relations between crops should have happened instead of competition (Agea *et al.* 2007:13-14; Kho 2000).

Regarding the respondents not specifying whether they plan to continue with agroforestry or not, it seems likely that they plan to continue with agroforestry as everybody, except respondent 18b, stated that implementing agroforestry made them feel good. Among these were respondent 4a:

> When I try to compare myself with other people, I find myself in a better position because of what I have achieved. This has kept me hopeful because I operate on a system which enables me to co-operate with the seasons. Like I know what to plant and when it should be planted. I know how to maintain my garden. (R4a)

Despite the discrepancy between the academic definition and farmers' definitions of agroforestry, by applying a social approach, we found that farmers are satisfied with 'their' agroforestry. Nonetheless, as (1) definitions vary; (2) one farmer has discontinued with agroforestry; and (3) many more are neglecting the core element, the agroforestry diffusion cannot have been optimal.

6. CONCLUSIONS

Our main finding is, that the complex network of communication channels through which the knowledge about an innovation must travel, to a great extent affects the adoption process. In other words, the success of an innovation is not just a simple question of the quality and suitability of the innovation itself, but rather of the diffusion of it. Without paying sufficient attention to the communication network, and especially the power relations within it, an innovation might fail to be adopted despite its obvious benefits. It is thus crucial to be aware of power relations between actors when attempting to spread an innovation, and thus for innovation diffusion studies to include the power relation dimension.

The opinion leader is found to have a determining role in the middle of the communication and power relations network. This central position demands extra attention, as her/his actions highly affect the diffusion process. Hence, any change agency involved in DOI needs to be aware of the opinion leader's distinctive position within the community, as this position could be jeopardised during the diffusion process.

Another identified problem for farmers in Rakai District is the knowledge gaps regarding the details concerning agroforestry, a problem which could create unintentional negative relationships among different techniques. In this regard, the power over resources is worth little without the power over knowledge. The direct role of training, as well as the indirect, is important, as it is an active way for farmers to obtain knowledge and thus investigate, whether the potential of an innovation can be developed into a decision to implement or not.

Despite the initial negative attitude towards planting trees (certain species in particular) and the lack of acknowledgement of power relations, agroforestry has spread as a NRM system available for small-scale farmers within Rakai District. Not at its full potential, but since agroforestry allows farmers to make better use of small plots and financial resources, the adoption of agroforestry in the district should be viewed as successful despite the low number of trees. Improving a situation without reaching the final goal should not be seen as a failure, especially not when almost all involved farmers said that adopting agroforestry, has made them feel better. On the contrary, it is a success in the meaning that the farmers have adopted techniques promoted for a complex NRM system, which is an important first acknowledgement of agroforestry being a possible and accepted remedy to land degradation. Improved farming practices leads to better yield, which in turn can ameliorate living standards and in the end help decrease poverty.

The future challenges for the advocates of agroforestry in Rakai District, is to keep stressing the importance of implementing the core element; trees. Despite the improvements noticed by farmers when implementing techniques not involving trees, the long-term sustainability of their efforts is uncertain without trees. In order to further promote trees, more attention should be paid to the underlying principles knowledge when training farmers, as this could help diffuse the importance of the tree component if adjusted to farmers learning modalities.

Nonetheless, it is important to keep in mind that agroforestry is not a simple practice of just mixing different crops and then add some trees, but a science of which crops positively affect each other and which trees can add to this positive relationship. Agroforestry is not a miracle ‘fix-it-all’ approach, but rather a system that, if diffused and implemented correctly and with the right levels of training, can minimise the effects of risks, although not eliminating them.

7. IMPLICATIONS

The findings from this research have implications for future change agencies and their strive to spread innovations. In particular, this study shows:

- The significance of addressing the issue of introducing a long-term NRM system in a community dominated by insecure land tenure;
- The importance of a proper knowledge development strategy among and between potential adopters of an innovation;

By addressing these two issues, the contribution from this research to the theoretical framework is thus to highlight:

- The significance of paying attention to power relations in the DOI theory

7.1. Suggestions for Further Research

As mentioned in the limitations of this study, other social approaches, such as gender, may play an important role in the DOI process. A next step would thus be to investigate if this is the case or not, e.g. by identifying any differences between how men and women perceive the diffusion process, and the implications of such differences. For this purpose, in-depth studies are needed where particular attention is paid to the everyday lives of the community members; investigating cultural norms for which a suitable method would be participant observations. Another interesting aspect would be to investigate the reason for the phenomena of the stigmatisation some farmers in this research expressed that they had experienced from those not involved in agroforestry. This stigmatisation may prevent some farmers from investing more time and effort than necessary as they might prefer not to be involved in farming at all.

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Appendix A – Connection between Theories

This table shows the initial framework in the column to the left. These were grouped into the five interview areas shown in the middle, which were translated into the themes of analysis in the right column.

Core Capacities by Lavergne & Saxby (2001)	Interview Areas (see Appendix B)	IDP Context
to be guided by key values and a sense of purpose	Expectation about the future	Expectations connected to agroforestry
to define and analyse their environment and their own place in the greater scheme of things	Surrounding environment and own part in it	Establish 'level' of knowledge, norms, beliefs etc
to define the issues and reach working agreements on purposes or mandates	Relations	Identify information channels and sources, and general milieu for DOI to take place
to manage and resolve conflicts		
to build supporting relationships with other parties		
to formulate strategies	Strategies	Knowledge, adoption rate, strategies
to plan, and act on those plans		
to assess performance and make adjustments		
to meet new challenges proactively, by adjusting agendas, approaches and strategies		
to acquire and mobilize resources	Mobilise skills and resources	Knowledge, norms
to learn new skills and approaches on a continuous basis		

Appendix B – List of Respondents

These tables show the semi-structured interviews respondents from each community, including details about sex, age, household size, years involved in agroforestry and whether they have received training form the NGO or not.

Cooperative A:

Respondent	Sex	Age	Household size	Years with agroforestry	Training from NGO
1a	M	30	6	2	Yes
2a	F	55	9	37	No
3a	F	30	8	8	Yes
4a	F	49	9	10	Yes
5a	F	21	5	5	Yes
6a	M	25	3	3	Yes
7a	F	32	8	8	Yes
8a	F	65	7	4	Yes
9a	M	–	7	2	Yes
10a	F	–	7	3	Yes
11a	F	28	7	7	Yes
12a	M	49	5	8	Yes
13a	F	36	5	2	Yes
14a	M	45	10	20	No
15a	M	31	5	6	Yes
16a	F	61	8	43	Yes
17a	F	27	7	15	Yes
18a	F	36	12	3	Yes
19a	F	51	7	3	Yes
20a	M	40	10	2	No
21a	F	54	3	18	No
22a	F	60	3	0.5	–
23a	F	49	5	–	Yes
24a	F	35	8	4	Yes
25a	F	27	9	5	Yes
26a	F	28	7	5	Yes
27a	M	28	4	4	Yes
28a	F	30	6	7	Yes
29a	F	58	4	30	Yes
30a	F	60	4	5	Yes
	73%	**40.7**	**6.6**	**9.3**	**Yes: 24/29**
F as % of total		Average	Average	Average	

Cooperative B:

Respondent	Sex	Age	Household size	Years with agroforestry	Training from NGO
1b	M	20	4	5	No
2b	F	30	5	3	No
3b	M	38	8	5	Yes
4b	F	90	7	4	No
5b	M	45	8	–	No
6b	F	45	7	3	Yes
7b	F	48	7	5	Yes
8b	M	40	7	5	Yes
9b	M	28	2	3	Yes
10b	F	39	7	3	Yes
11b	F	26	7	14	Yes
12b	M	51	5	1	Yes
13b	F	27	6	10	Yes
14b	F	40	8	2	Yes
15b	F	30	4	2	Yes
16b	M	32	4	4	Yes
17b	F	40	13	20	No
18b	M	28	5	4	No
19b	F	30	13	3	Yes
20b	M	38	5	3	No
21b	F	27	5	–	Yes
22b	F	36	10	–	No
23b	M	47	5	6	Yes
24b	F	32	6	2	Yes
25b	M	35	12	–	Yes
26b	M	43	24	2	No
27b	F	42	8	5	Yes
28b	M	58	8	2.5	Yes
29b	M	47	6	4	Yes
30b	M	53	5	3	Yes
	50%	**39.5**	**7.4**	**4.8**	**Yes: 21/30**
	F % of total	Average	Average	Average	

Appendix C – Farmer Interview Guide

Date: Time: Zone:
Name: Sex: Age:
Cooperative name: Village:
Group:

Introduction of ourselves, the purpose of these questions, the importance of talking to them, confidentiality, taping.

1. **General conversation** about the persons living situation
   a. How many members are you currently in the household? (Adults + children)
   b. What is your main source of income?
   c. If explaining agroforestry to me, how will you describe it?
   d. How long have you been involved in agroforestry?
   e. How did you first hear about agroforestry?
   f. How did you first hear about SCC Vi?
   g. Are you involved in SCC Vi activities besides agroforestry?
   h. If yes, how has this affected your agroforestry practice/outcome?

2. **Expectation about the future**
   a. What are your hopes for the future? (dream)
   b. Where do you see yourself in 5-10 years? (realistic) Agroforestry part of plan? Why, why not?
   c. What are your main driving forces? (children to be better off, improved living standards)

3. **Surrounding environment and own part in it**
   a. How has adopting agroforestry techniques made you feel?
   b. Is everybody in the village involved in agroforestry?
   c. If not, what do people not engaged in agroforestry think of people who are involved in agroforestry?
   d. Do you feel you have affected community? In what way?

4. **Relations**
   a. Do you share your agroforestry experience with other people in your community? (How, when, where)?
   b. Has being involved in agroforestry helped you build relationships with other people/ groups/institutions in general? (Do you know more people now)

5. **Strategies**
   a. Why did you decide to adopt agroforestry techniques?
   b. Which resources did you need to adopt agroforestry?
   c. How did you get these?
   d. Which elements/techniques of agroforestry do you practice? (What & why)
   e. Where did you get the inspiration to choose these particular elements/techniques?

f. What were/are the expected benefits with your agroforestry practices?
g. What are the possible risks with your investment in agroforestry?
h. If the investment/plan goes wrong do you have a plan B? (To minimise risks)
i. Have you ever had a bad outcome of an agroforestry investment? Why was it bad? How did you manage it?
j. Do you keep records of your agroforestry products/produce?

6. Mobilise skills and resources

a. What have you been trained in by SCC Vi?
b. How long was the training? When was this?
c. Which methods were used for the training?
d. Which method of the training have you enjoyed/benefitted from the most? Why?
e. Which method of the training have you enjoyed/benefitted from the least? Why?
f. Which improvements do the training need to be successful? (Methods/content)
g. What other skills do you need to succeed in agroforestry?
h. How will you require the skills you need in agroforestry?
i. Do you think the Farmer Trainers or other community members can help you to require these skills?

Appendix D – List of Respondents, Staff & Officials

This table gives an overview of the staff and officials interviewed.

Respondent	Role	Sex
S1	NAADS Coordinator	M
S2	Zone Coordinator	M
S3	Zone Coordinator/Field Officer	M
S4	Regional Office Staff	F
S5	District Agricultural Officer	M
S6	Field Officer	F

Appendix E - Zone Coordinator Interview Guide

Date: Time: Zone:
Name: Sex:

1. **General**
   a. When did you work in X zone and for how long did you work as a ZC?
   b. What did you work with prior to becoming a ZC/what kind of education did/do you have?
   c. What were the main responsibilities/tasks when you worked as a ZC?
   d. What kind of activities have SCC Vi implemented in Rakai and Lyantonde, when and why?
   e. When did SCC Vi start to promote agroforestry in the area? What was the purpose?

2. **Received training**
   a. What have you been trained in as ZC?
   b. How long was the training?
   c. Which methods were used for the training?
   d. Which element of the training have you enjoyed/benefitted from the most?
   e. Which element of the training have you enjoyed/benefitted from the least?
   f. Which changes/improvements do you think the training needs to be successful?

3. **Training Field Officers**
   a. What did you train Field Officer in as ZC?
   b. For how long a period?
   c. Which methods do/did you use for the training?
   d. How did you give feedback to the Field Officers and how did you monitoring the process of farmers adopting agroforestry techniques?
   e. Which changes/improvements do you think the training needs to be successful?

Appendix F – Field Officer Interview Guide

Date: Time: Zone:
Name: Sex:

1. **General**
   a. When did you work in X zone and for how long did you work as a FO?
   b. What did you work with prior to becoming a FO/what kind of education did/do you have?
   c. What were the main responsibilities/tasks when you worked as a FO?

2. **Received training**
   a. What have you been trained in as FO?
   b. How long was the training?
   c. Which methods were used for the training?
   d. Which element of the training have you enjoyed/benefitted from the most?
   e. Which element of the training have you enjoyed/benefitted from the least?
   f. Which changes/improvements do you think the training needs to be successful?

3. **Training groups**
   a. What did you train farmers in as FO?
   b. For how long a period?
   c. How was the selection process for choosing which groups/individuals that participate in the trainings?
   d. Which methods do/did you use for the training?
   e. Which element of the training do you feel the farmers enjoy/benefit from the most?
   f. Which element of the training do you feel the farmers enjoy/benefit from the least?
   g. How did you give feedback to the farmers on their progress of adopting agroforestry techniques?
   h. Which changes/improvements do you think the training needs to be successful?

Appendix G – NAADS & DAO Interview Guide

Date: Time: Zone:
Name: Sex:

1. **General**
   a. What are your main responsibilities/tasks as a DAO/NAADS Officer?
   b. Could you briefly explain the structure of how you work?

2. **Contact with the farmers in the district**
   a. How do you work with the farmers in the district?
   b. Which methods do you use?
   c. How do you select farmers involved?
   d. Which changes/improvements do you think could be needed to become more successful?

3. **Collaboration**
   a. Which institution do you collaborate with?
   b. What are the purposes of the collaborations?
   c. Have you heard about SCC Vi?
   d. What do you know about the work the have been doing in the district?
   e. What do you think about the work they have been doing?
   f. What do you think is the strength/weaknesses in SCC Vi's work?

4. **Agroforestry**
   a. How would you explain agroforestry?
   b. How do you work with agroforestry?
   c. What is your opinion on the greatest benefits for farmers to adopt agroforestry?
   d. What, in your opinion, are the biggest obstacles to over come when it comes to farmers adopting agroforestry?

Appendix H - Focus Groups Participants

These tables show the participants from the two focus groups, one in each community.

Focus group a (FGa):

Respondent	Sex
FGa1	M
FGa2	F
FGa3	F
FGa4	M
FGa5	M
FGa6	M
FGa7	M

Focus group b (FGb):

Respondent	Sex
FGb1	M
FGb2	M
FGb3	M
FGb4	F
FGb5	F

Appendix I - Focus Group Guide

Trend analysis, from Kumar (2002:118-188)
Material needed: Cards, Chart paper, bold markers of different colours and beans
Time: 2-2 ½ hour

1. Initiate a discussion, tell the participants that:
   a. This is a part of the research that we initiated with the interviews a couple weeks ago and that the focus for this exercise is their agroforestry practises.
   b. The exercise is called a problem trend analysis and that I would like them to talk about different problems that they experience with their agroforestry (trees, animals and crops) practices during a certain period of time. The problems to discuss will be decided by them but the time period is already set.
   c. Explain that you (the translator) will facilitate the exercise but that you will translate for me, during the exercise. Ask if anyone have an objection to that I record the exercise.

2. Facilitate the exercise further to arrive at the aspects/problems of trend analysis. Ask the participants to brainstorm and come up with a list of problems (at least three each) related to their agroforestry practices they would like to talk about and then ask them to together select the most dominant ones, about 5 problems. ***Ensure that the participants themselves arrive at the aspects to be discussed*** Ask the participants to ***describe*** the problem selected and write them done on card (symbols or visuals)

3. Explain the selection of time landmarks across which the trends are going to be studied: 15 years ago, 5 years ago, Now and 5 years. Ask the participants to discuss and describe the selected landmarks years already in the matrix and write them done on the chart paper.

4. Ask participants to write the problems in the matrix, left to right at the top.

5. Take up one problem, at the time. Ask the participants to first describe the present situation **Now** in the relevant cell using the beans (ask them to come up with a scoring system, e.g one bean = not a big problem, 5 beans = very big problem). ***Leave the chose to the participants.*** Move to the next time landmark and so on. For the future landmark ask them to discuss how severe the problem would be if nothing is changed.

6. After the completion of one problem, move to the next one and follow the same process until all the cells are done.

7. When the matrix is done, ask the participants whether they are satisfied with it or whether they would like to make any changes and ask if they would like to add new aspects that have come up during the process. ***This is the time to ask them to describe certain aspects which did not figure in their list but still might be relevant for the aim of the research.***

8. Ask the participants to explain the matrix. Encourage them to discuss their findings and reflect on them. Some key questions for the discussion:
   a. Major trends and findings
   b. Cause of the trends
   c. What can be done?
   d. Who can play a role in it? (No NGO in the area for the moment)
   e. What can the participants and local people do themselves?
   f. What can they do with little assistance from outside?

9. Interview the matrix. Ask questions to clarify doubts and gain an in-depth understanding of the trend.

10. Finalise the matrix, with details of the legend, the scoring system, the participants and facilitators, and the location and the date.

11. Thank the participants for their involvement and for their time!

Appendix J - Focus Groups Results

The tables show the trends on scales decided upon by the participants themselves. The two focus groups can thus not be compared in numbers, only in trends.

Table 2a: Focus group a

	15 years ago	5 years ago	Today	5 years from today
Drought	2	7	16	20
Lack of capital	1	4	10	8
Lack of seeds	0	13	12	7
Diseases (People, crops, animals)	8	17	18	17
Small plots	1	18	25	25
Lack of fertilizer	0	2	5	10

Table 2b: Focus group b

	15 years ago	5 years ago	Today	5 years from today
Diseases (People, crops, animals)	6	11	19	42
Lack of enough training	27	15	6	2
Poor roads	22	14	11	7
Lack of market	12	15	42	7
Drought	8	13	28	44
Lack of enough capital	34	15	9	3