Analysis of the constraints and opportunities in South West Uganda for the adoption of a range of sustainable land management (SLM) practices using multi-level stakeholder analysis.

I certify that this dissertation is entirely my own work and no part of it has been submitted for a degree or other qualification in this or another institution. I also certify that I have not collected data nor shared data with another candidate at Exeter University without specific authorisation.

MSc in Sustainable Development at the University of Exeter

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ACKNOWLEDGEMENTS

ABSTRACT

With the continual rise of global commodity prices and increasing population pressures worldwide, the future of agriculture is looking increasingly unstable. As a result of this escalating demand and intensification of unsustainable agricultural techniques, natural resources are facing an increasing threat of depletion. Knowing this, the agricultural potential of sub-Saharan Africa has been relatively ignored and as a globally recognised process, Sustainable Land Management (SLM) will play an important role in addressing these pressures, without jeopardising the sustainability of the region. Although conceptually simple, the adoption of SLM is surrounded by many constraints embedded within the stakeholder levels, of policy makers, technocrats and farmers. The opportunities to address the reluctance of adoption SLM are also apparent at this same level, and the analysis therefore takes place across a multi-level stakeholder structure. This research piece highlights the region specific constraints and opportunities for implementing SLM whilst also offering recommendations and further research topics as a guideline for future management initiatives and policies.

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<u>Abbreviations</u>

SLM: Sustainable Land Management

CDO: Community Development Officer

RWF: Ruwandan Franc

UGX: Ugandan Shillings

AESA: Agro ecosystem analysis

FAO: Food and Agricultural Organisation

UN: United Nations

FFS: Farmer Feeder Schools

PNTD: Participatory and Negotiated Territorial Development

PES: Payment Ecosystem Services

TAMP: Trans boundary Agro-ecosystem Management Programme

NADS: Nation Agricultural Advisory Services

NRM: National Resistance Movement

LC: Local Council

NARO: National Agricultural Research Organisation

NSTIP: National Science, Technology and Innovation Policy

MFPED: Ministry of Finance, Planning and Economic Development

1. Introduction

Sharply rising commodity prices are currently foreshadowing the 2008 food crisis (Trostle *et al*., 2011); and with the ever expanding global population, there is projected to be a demand for double the global food production by 2050 (Bruinsma, 2009). The entire world is demanding more, and cheaper, food. It is predicted by 2050 that the world's population will reach 9.1 billion, 34% higher than today (FAO, 2009). 28% of the global poor are living in Sub-Saharan Africa (Sumner, 2010). However, global poverty is expected to be significantly reduced by 2050 (van der Mensbrugghe, 2009). Therefore, Sub-Saharan Africa is an extremely important area for contemporary research and development, and will play an important role in securing our future needs as Bruinsma (2009) graphically represents in figure 1.1.
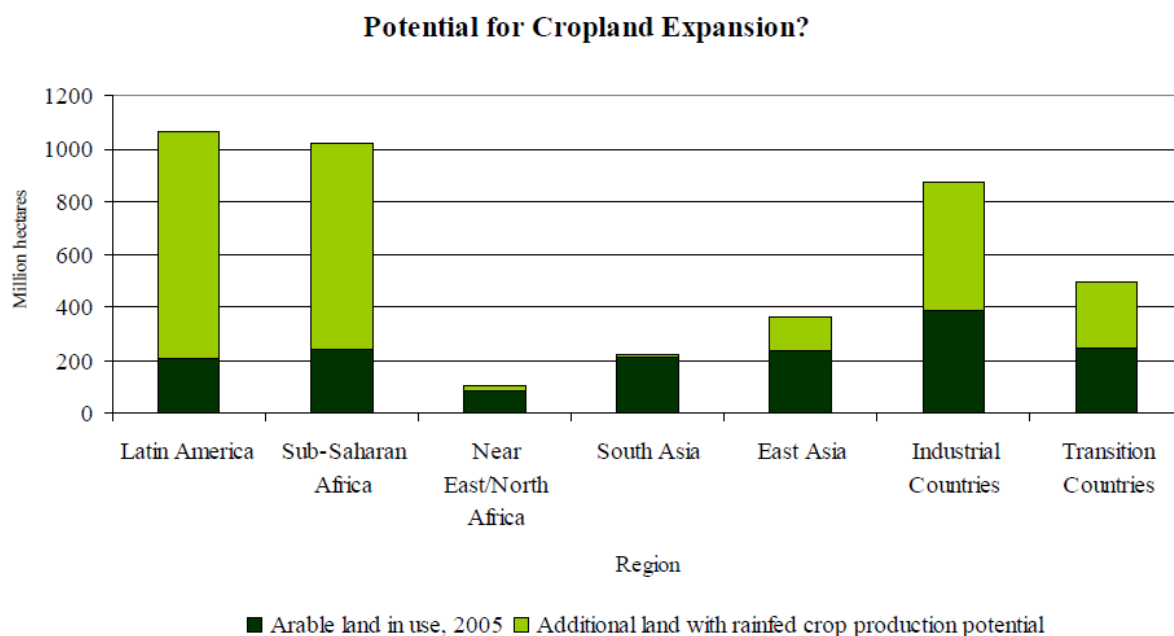
Figure 1.1: A graph showing the unlocked potential for cropland expansion in Sub-Saharan Africa. Bruinsma, (2009): The resource outlook to 2050.

Thurow & Kilman, (2009) stipulate that Africa will be essential for ensuring a sustainable future for global food security and that the agricultural potential of Africa is largely unrealised. Figure 1 shows the potential for sustainable growth in Sub-Saharan Africa, which has over 800 million hectares of additional rain fed land that is currently uncultivated. Some may argue, however, that the vast majority of unsustainably managed arable land that is currently being farmed in Africa is a far more important consideration (Diagana, 2003). The large proportion of economies in Sub-Saharan Africa are agriculturally based (Diagana, 2003) with over 80% of Ugandans dependent on subsistence farming (Lepp, 2007). The

concept of SLM aims to manage current farming practices and build a platform for the agricultural economy in a sustainable manner. Local and national government play a key role in achieving this goal and "should give high priority to rational land use, improved land management, and avoidance of degradation" (Young, 2000 Pg.I). Current rates of adopting improved management methods are extremely low (Barrett *et al.,* 2002a). This project aims to uncover the constraints farmers experience and identify any opportunities for increased adoption.

1.1 Project Background: The result of this work will be used by the Trans boundary Agro-ecosystem Management Programme for the Kagera River Basin in partnership with the Food and Agricultural Organisation (FAO) to target more effective support for promoting adoption of sustainable land management (SLM) practices across the basin. It will include a review of the constraints and opportunities for adopting improved practices that prevent land degradation and aim to ultimately give farmers a higher standard of living.

The project is currently in the preliminary stages of a four year process known as TAMP. The initial stage was to assign regional co-ordinators and to outline any underlying problems and issues in the areas to prepare for the implementation of Trans boundary Agro-ecosystem Management Programme. This research piece is a facilitator for the preliminary satge and will assist the co-ordinators in preparing assessments and diagnostics for the 59,800Km2 Kagera Basin area which is shared by the four countries; Uganda, Tanzania, Rwanda and Burundi. See website: www.fao.org/nr/kagera

1.2 Aims

- To explore the constraints and opportunities that face farmers in adopting sustainable land management techniques through a multi-level stakeholder perspective;
- To outline the main constraints and opportunities for the adoption of SLM and draw some district comparisons, and also general conclusions for the region;
- To develop a robustly structured questionnaire, interview and analytical process to enable its wider implementation from my initial research region (Kabale and Mbarara districts) to the overall Kagera river basin, for future research interns.

1.3 Objectives

- To construct, analyse and draw conclusions from a number of questionnaires from the Kabale and Mbarara districts in S-W Uganda thus identifying the adoption constraints and opportunities;
- To construct, analyse and draw conclusions from a number of semi-structured interviews, delivered both at sub-county and district level to identify the adoption constraints and opportunities that face technical experts and government officials;
- To identify the main opinions towards SLM adoption in both districts from farmers, technocrats and policy makers.
- To compare and contrast results from the two districts, Kabale and Mbarara;
- To gain a perspective from each stakeholder level on how SLM implementation is being managed, and identify the main constraints and opportunities within the communication pathway;
- To offer some recommendations for increasing SLM adoption in the region and assessing possible areas for future research.

1.4 Location map, District Information and Government Structure
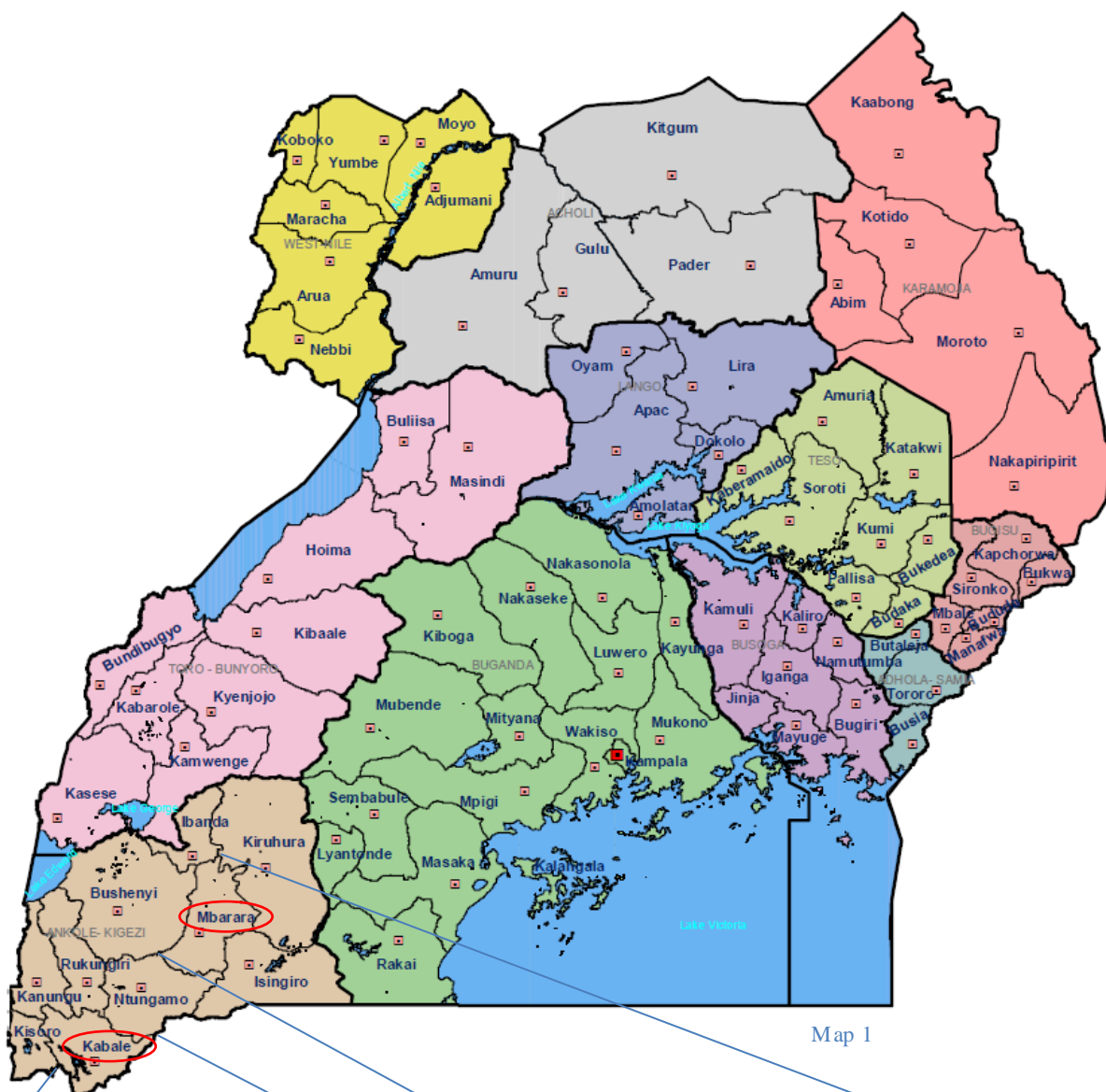
Map 1
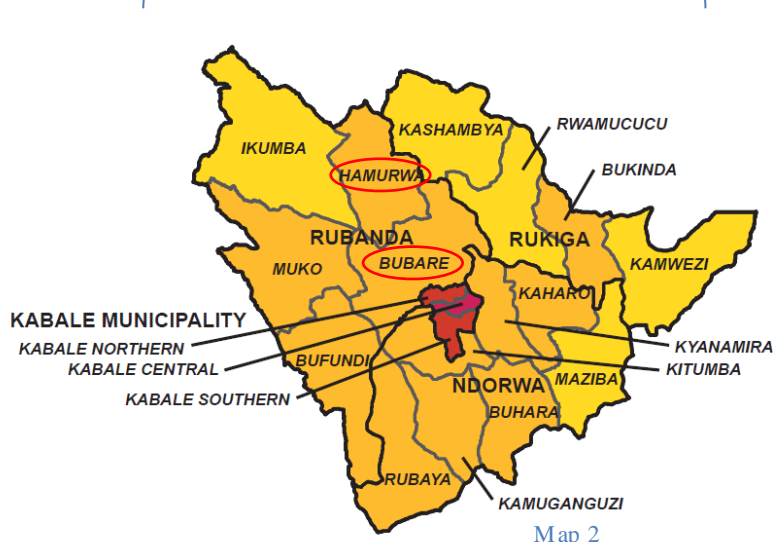
Map 2
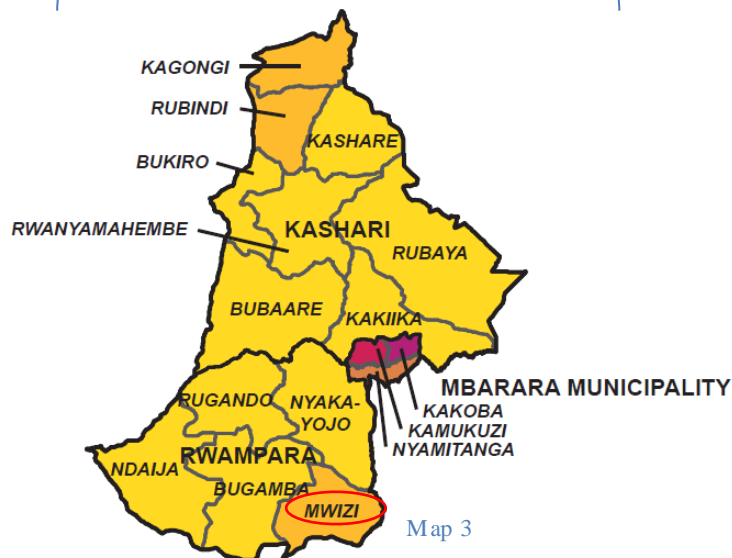
Map 3

Figure 1.2: Source: United Nations Office for the Coordination of Humanitarian Affairs showing the new 81 districts as of July, 2006. http://www.unocha.org/. Map 2 & 3: Source: Directorate of Water Development, Ministry of Water & Environment, 2010. http://www.mwe.go.ug/ The red circles show the sub-counties within each district where the questionnaires and interviews where carried out.

Uganda's main food crops are matoke, cassava, sweet potatoes, millet, sorghum, corn, beans, and groundnuts; grown mainly by smallholders on customary land. The major cash crops are coffee, cotton, tea, and tobacco which are usually grown on more commercial scales (ECA, 2005). Crop types across the district are relatively similar; however, Mbarara is specifically well-known for its Matoke growing. Mbarara has a slightly higher population at 82,000 in comparison to Kabale (58,200). Unsurprisingly, both rural populations are substantially higher at 431,800 and 345,200 for Kabale and Mbarara respectively (MWE, 2010). In terms of climate, NEMA, (1996) identifies five climatic zones. Kabale is in zone III with mean annual rainfall of around 1875mm. Mbarara sits in a lower, flatter region, and is described as zone V with around 1025mm annual rainfall per year (NEMA, 1996). Finally, Ferralsols are the dominant soil type for both districts and are characterised by both low pH and low organic content (Lemaga, 1999).

Prior to discussing the research methodology, it is important to have a clear view of the current government structure. This is with particular reference to the introduction of the decentralisation programme of 1992 (Jeppsson, 2001) and the enactment of the Local Government Act, 1997 (Saxena *et al.*, 2010), which Francis & James (2003, Pg.325) describe as "the most ambitious of Uganda's institutional reforms". The programme brought about a new system of elected councils of governance at various local levels (Jeppsson, 2001). The main rationale behind the decentralisation was to employ democracy, thus giving the people of Uganda a more prominent voice in political decisions (Mugabi, 2004). Mugabi, (2004) identified these local government councils as being the most influential political authority in their specific area of jurisdiction, with an overall general consistency to national policy. With this in mind, the local government are now empowered to implement new byelaws at any time. Overall, the decentralisation process aims to empower the people and increase their participation in the decision-making process, whilst also enhancing the government's responsiveness, transparency and accountability (Mugabi, 2004). Academics identify both successes (Saxena *et al.*, 2010) and pitfalls (Jeppsson, 2001), to this structure. Figure 1.3 gives an outline of the local council (LC) structure within the sub-counties and districts. In theory, the formal approach to planning within the local councils is argued to progress in an integrated bottom-up manner (Francis & James, 2003) based on the local needs and priorities from which a community action plan is formulated. This information is then disseminated up to the district council level and ratified. Francis & James recognise that (2003 Pg.331) "In practice, however, the system rarely actually incorporates sub-county plans".

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Increasing amount of face-to-face interaction with the local farmers
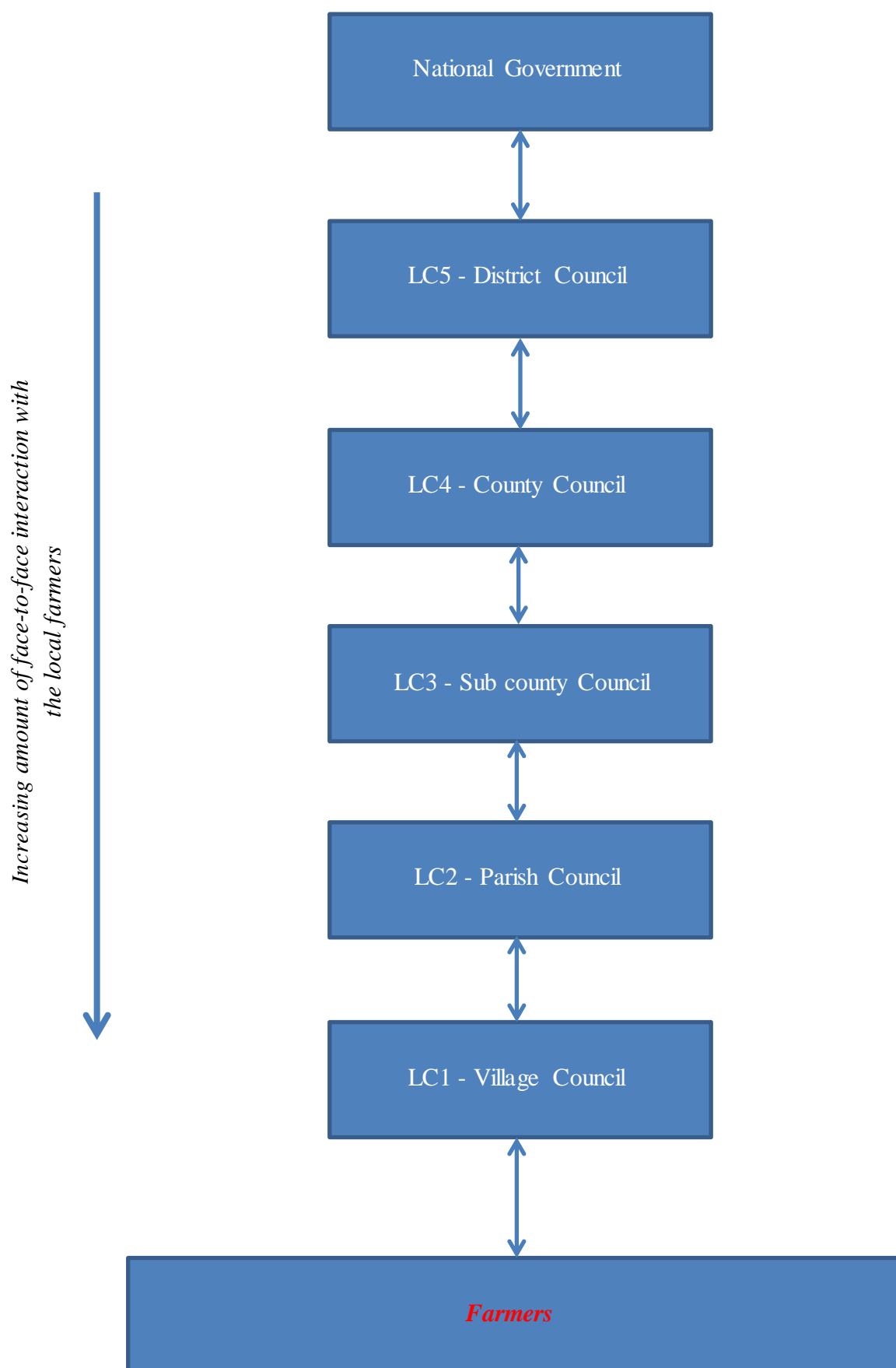
Figure 1.3: Outlines the structure of the decentralized government in Uganda. The double ended arrows represent the flow of information. It is important to point out that up to LC5 level there is face-to-face farmer interaction. However, the frequency reduces up the levels. At the district level there are

Source: Adapted from Francis & James, 2003 Page 328.

2. Research Context

2.1 Sustainable Land Management (SLM)

Soil degradation, water availability and loss of biodiversity (Hurni, 1997) are key issues threatening the global life support system. In principle, SLM is applicable worldwide and it has been developed as a concept in Australia (Bateson, 2000), Canada (Carter, 2002), USA (Kessler *et al.,* 1992) UK (Cowell, 2006), Vietnam, Indonesia and Thailand (Lefroy *et al.*, 2000). Much of the academic literatures focus has been on SLM implementation in SSA, whereas many of the global concepts and practices are transferrable and applicable. Globally, the health and wealth of people depends on sustainable and accessible land resources. In developing countries such as Uganda, the majority of the population work directly on the land and rely on the land's resources for the level of their livelihood and ultimately their survival (Olsena & Berry, 2003). The land lies at the heart of cultural, political, social, spiritual and economic life in Africa, and it is a principle dependence that is likely to remain for the foreseeable future (UNECA, 2008). Considering this, SLM is a growing concept that must be cautiously approached in terms of implementation, due to the multifaceted importance of land in Africa (UNECA, 2008).

The central principle of land management is sustainability; alongside the combination of production with conservation (Young, 2000). This concept and the components of SLM have received global recognition as a practical tool for achieving effective land management solutions (Shiferaw *et al.,* 2009). In the case of Uganda, the main concept of SLM is to increase production to satisfy the growing demand without jeopardising sustainability. However, the answer is not to simply acquire new land, but more to use the land available with greater efficiency. Young, (2000) explains that understanding the processes of soil, water, plant ecosystems and growing cycles; and by sustainably managing the use of a selected variety of inputs based on the specific area's climate, is the ultimate pathway to increased efficiency.

2.2 Land Degradation, Land Tenure and Food Security

Land degradation, low and declining agricultural productivity, poverty and population pressures are serious, interrelated issues in Uganda; and ones that are consistent across much of sub-Saharan Africa (Nkonya *et al.*, 2004). Since the early 1990's, most communities have been subject to low and decreasing crop productivity with land degradation and food

insecurity increasing (Pender *et al.,* 2001). Uganda has 7.2 million hectares of arable land that is currently under cultivation, which is less than 50% of the total available. Despite this apparent wealth of available arable land, it has still been suggested that the availability will be greatly reduced by 2022 (NEMA, 2008).

It is estimated that 4%-12% of GNP is lost due to environmental degradation of which 85% is accountable to soil erosion, change in the range of cultivated crops, and soil nutrient loss (Olsen & May, 2003). Fallow periods have either been significantly shortened or abandoned in many areas due to the increased demand. The effect on the land from both increased human populations and livestock has resulted in substantial degradation, particularly on livestock paths and hilltop areas (Photo 2.1&2.2).

Photo 2.1: Taken in Kabale and Photo 2.2 taken in Mbarrara: Two photos showing facilitated land degradation from increased activity from livestock and humans. As shown in photo 2.1, these footpaths act as run-off points for water which creates further water management problems. Photo 2.2 is an obvious example of a badly managed steep slope hill farm. As shown, obvious water relief channels have developed into a succession of serious erosion channels.

"Land tenure is the system of rights and institutions that govern access to, and the use of land, and other resources" (Maxwell & Wiebe, 1999.Pg.825). Land tenure therefore directly "affects equity and efficiency, determining among other things a households' ability to generate subsistence and income, their social and economic status, incentives to exert effort and make investments, and access to financial markets and consumption-smoothing

mechanisms" (Deininger & Feder, 2005.Pg.288). The issues surrounding land tenure are dynamic, and rights derive from statutory and customary law, as well as from institutions of marriage, of power and control, and inheritance (Maxwell & Wiebe, 1999). Land tenure is a key issue for a potentially changing rural livelihood, and previous reform strategies have been described as myopic in nature with no scope for transforming the issue of women's rights specifically (Ellis, 2003).

Finally, "food security is the state of having secure and sustainable access to sufficient food for an active and healthy life" and is described "in terms of food availability, stability, access, and utilization" (Maxwell & Wiebe, 1999.Pg.825,828). The Ugandan population is generally "food secure", however, there are pockets of famine and hunger across the country; as well as a more common issue due to a monotonous diet (NEMA, 2008). To stabilise food security for everyone therefore, access must be sufficient in the present and the future (Maxwell & Wiebe, 1999) which means securing a sustainable source. This is where land degradation becomes an issue as for many, meeting food requirements means depleting or degrading available resources, which ultimately results in unsustainable practices (Wiebe, 1994).

Farmer Field Schools (FFS)

Farmer field schools are an innovative approach that are used to increase the education and awareness of SLM practices. The traditional technique of providing extension workers who disseminate information are mostly common place, however the FFS approach allows farmers to have hands-on involvement, and develop "best practices" themselves (FAO, 2008). It is a useful tool to promote "learning from doing" within a group, which creates a multiplier effect of uptake, as knowledge is dispersed and shared. Figure 2.1 shows a graphical representation of this and is an example of successful implementation in Gako, Rusiga (Appendix 3). This case study was used as a pilot study to obtain knowledge on the best ways to interact with farmers, and the best way to approach my two data collection techniques.
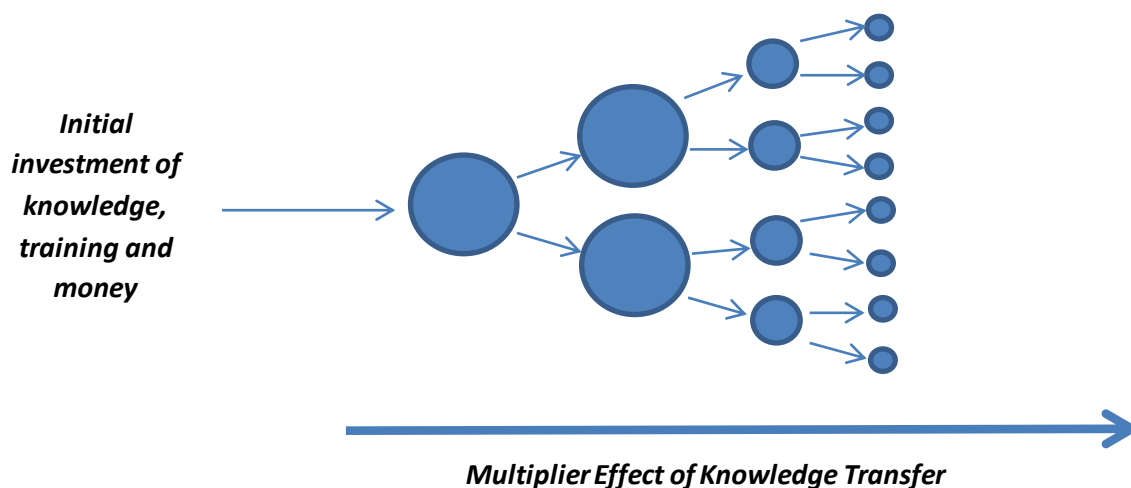
Figure 2.1: This figure shows the multiplier effect of knowledge transfer. A concept such as FFS aims to promote this kind of knowledge transfer and is a effective way to promote SLM.

Knowledge transfer and dialogue between farmers on a local scale as well as dialogue between government's, NGO's and technical experts is of huge importance for successful SLM adoption, and something I experienced first hand when observing the pilot study in Rwanda.

Hurni, (2000) emphasises the importance of local knowledge appraisal and through approaches such as FFS, how local knowledge can be actively guided. "Knowledge is not power, knowledge sharing is power" (Chong & Choi, 2005). Hatcher, (2009) agrees with Chong & Choi, (2005) and alludes to the promotion of social dialogue as a form of knowledge sharing as an essential tool for sustainable local development, whilst specifying that varying perspectives from all stakeholders should be regarded as mutually important thus encapsulating small-scale farmers up to national policy makers. Information flow and communication between these stakeholders is multi-directional (Schwilch *et al.*, 2009) and it is for this reason that this study takes a holistic approach to the analysis and stays away from the "one size fits all" approach of "best practice implementation" that is often adopted.

Woolcock, (2000) describes this importance of knowledge transfer and social connections as "social capital". Moser (1996) specifies the importance of this within communities, and that people with greater social capital are in a stronger position to confront poverty and circumstances of vulnerability. The notion of "social capital" as an important aid within development and is therefore a contemporary concept within development research and policy and an area with important implications and considerations (Woolcock, 2000).

2.4 Multi-Level Stakeholder Approach

Hurni, (2000) believes that a participatory, trans-disciplinary approach that evaluates all stakeholder levels will have the ability to enable appropriate local solutions. He also recognises that appropriate management solutions should follow five pillars of sustainability, as represented in figure 2.2 below.
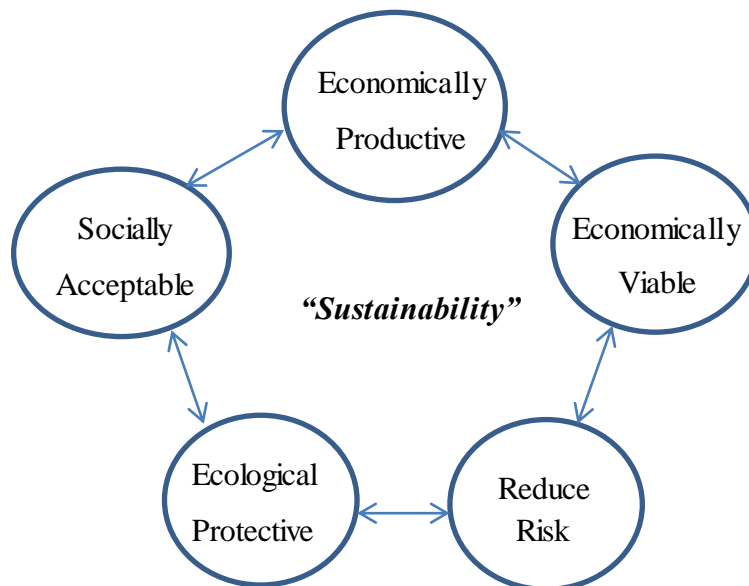
Figure 2.2: Adapted from Hurni, (2000). Five Pillars of "Sustainability". A vital component of the trans-disciplinary approach showing the mutually important variables for achieving sustainability.

An important point that Hurni, (1997) alludes to is that SLM is not applicable everywhere and must be adaptable to the region that is being managed, as far as land use, environment, policy, economics, culture, and use of the most optimal techniques for that region. Analysing two districts and two sub-counties within each will hopefully support the idea that management policies and techniques need to be bespoke and specific to a particular region's requirements. In context therefore, this framework identifies the need to learn from both scientific theory and current political guidelines, but also the century old indigenous knowledge of the local farmers themselves.

"SLM is a complex issue, which calls for collaboration at different levels of decision-making and action" (Schwilch *et al.*, 2009.Pg.324). Although there is plenty of literature outlining the importance of this multi-level structural analysis, Schwilch *et al.*, (2009) outlines a number of issues surrounding its application. Having a substantial understanding of the intricacies of each stakeholder level is essential to ensure holistic analysis occurs (Schwilch *et al.*, 2009). For this reason it is proposed that a carefully organised multi-level approach to the data collection process is required.
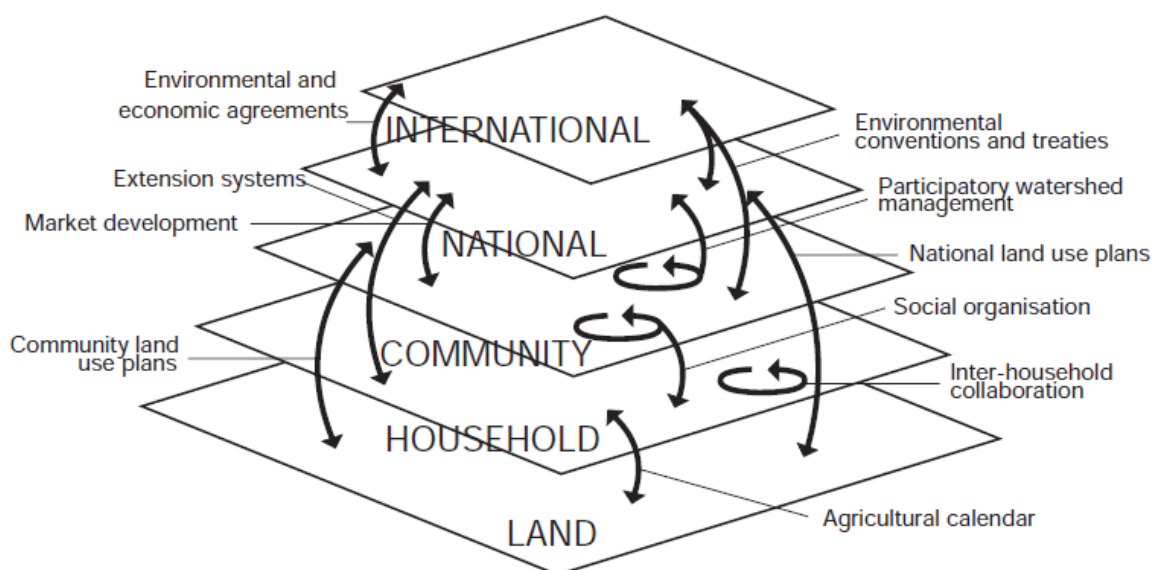
Figure 2.3: Intervention levels within the multi-level stakeholder approach to SLM. (Hurni, 1997 Pg.213). Provides a good visual representation of the multi-level structure that is relevant throughout Uganda.

The importance of knowledge exchange between the relevant stakeholders has been positively documented in the literature, and is therefore a critical component for successful SLM adoption. In figure 2.3, on each level, the circular arrows are used to represent dialogue between that specific level of stakeholder and across other levels; the significance of which has been documented by Schwilch *et al.*, (2009) and Groppo, (2005). The structure shown in figure 1.5 falls hand-in-hand with the current decentralised approach to environmental planning, and the importance of locally elected authorities (Bazaara, N, 2003). Bernard, (2002) is an advocate of this approach and believes it provides an avenue for information sharing at local levels, and acts as a bottom-up link to national policies. If enforced fairly and effectively, this multi-level structure and knowledge transfer gives low income farmers a fair involvement in their future development. However, is this theory a reality?

2.5 Sustainable Livelihood Analysis

When considering the stakeholder levels, sustainable livelihood analysis is a good tool in the research of humans within nature; providing a framework that incorporates the multidimensional and complex relationships between the social and physical environments, (Castro, 2002) as shown in figure 2.4. The analysis process is also useful and readily applicable across both broad spatial and temporal scales (Castro, 2002).
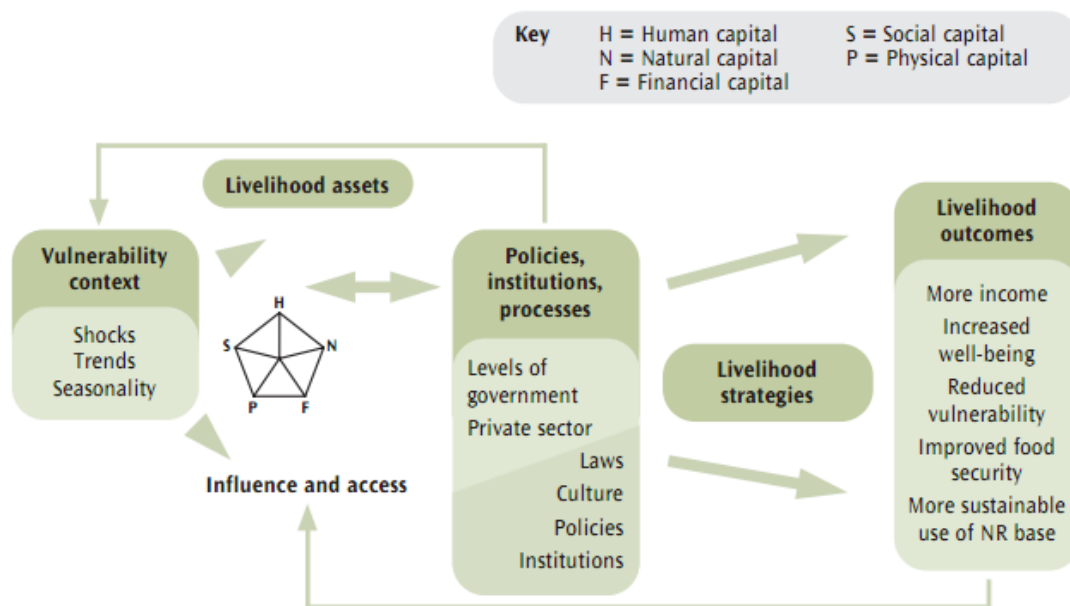
Figure 2.4: Sustainable Livelihoods Framework. Source: www.proventionconsortium.org (Guidance notes 10). http://www.proventionconsortium.org/themes/default/pdfs/tools_for_mainstreaming_GN10.pdf. Accessed on: 15/04/2011.

Chambers and Conway (1992) point out "a livelihood is sustainable when it can cope with, and recover from, shocks and stresses and maintain or enhance its capabilities and assets both now and into the future, while not undermining the natural resource base" (DFID, 1999). SLA concentrates on the absolute fundamental of life, which is the ability to support oneself, now and into future years (Castro, 2002). As Chamber and Conway (1992) recognise, sustainability relies on maintaining or enhancing its capabilities, however in reality this relies on an embedded capacity for adaptation which is not nesecarily available in many Ugandan households.

To implement successful land management practices; finding the balance between Hurni's, (1997) five pillars of sustainability within a multi-level stakeholder context and the five capitals of a sustainable livelihoods as outlined by Castro, (2002) is crucial, and is something I will be reflecting on in the conclusion and discussion sections.

2.6 Adoption & Uncertainty

"There is no such thing as average rainfall or stable market prices, and the burden on livelihood is often excessive" (Faures *et al.*,2010). When analysing a complex system such as agriculture where there are a huge number of relevant variables, uncertainty is a topic of huge importance and an embedded reality (Oberkampf *et al.*,2004). Managing uncertainty has always been at the core of agricultural practice in respect to climate variability (Faures *et al.*,2010) and farmers may in fact be content with their current subsistence living. A proposed change in practices or management will often give rise to a degree of uncertainty amongst the farmers, and as a result makes them unwilling to adopt proposed changes.

As a concept, SLM offers a sustainable solution to many of the issues outlined, however adoption of the technique is surrounded by a number of constraints. Linger *et al.,* (2011) covers the main constraints in the most recent FAO publication on the topic. This stipulates that to make a successful impact, SLM must be integrated within national and regional priorities with major efforts in knowledge management and an overall increased engagement from civil society and empowering stakeholders (Linger *et al.*, 2011). Although this is conceptually flawless, in reality, the impact of SLM and the resulting adoption and the ultimate adoption of better practice has been relatively unrealised. This study aims to uncover and address some of the more fundamental and interlinked natural, financial, human, physical and social constraints facing the adoption of SLM whilst also uncovering possibilities to increase the adoption rate.

2.7 Motivation for Study

"Scientists need to take these social and economic features of farm-level natural resource management more seriously than they have in the past" (Barrett *et al*., 2002b Pg.2). More specifically for Uganda, Pender *et al*., (2004) alludes to the fact that effective development strategies are critical in achieving sustainable rural development and go beyond more simple subsistence living in the region.

"The key to sustainable rural development in Uganda is for both public and private stakeholders to invest in an appropriate and socially profitable mix of physical, human, financial, natural and social capital in rural areas, taking into account the diversity of situations" (Pender *et al*., 2004 Pg.768). Hurni, (2000 Pg.90) firmly agrees with Pender *et al.,* (2004) and identifies that in order to accomplish democratically acceptable solutions, "multi-stakeholder negotiations will be instrumental". A number of local studies outlining the importance of decentralisation in Uganda (Ekongot, 2000) and the integration of participatory management (Hassan, 2008) have been undertaken and support the importance of extensive multi-level communication between all stakeholders. In terms of SLM adoption, a limited amount of study has been carried out on the opportunities and constraints whilst incorporating the three-tiered network, on which its success relies. Incorporating these dimensions will therefore be the focus of this study.

2.8 Examples of SLM within context

Many of the SLM practices are focused on arable land management, as a significant majority of the interviewed demographic where arable farmers with a limited number of livestock. Below are some of the main types of SLM employed across the two districts with the aim of providing the reader with some of the practical context, prior to the methodology and analysis stages.

Terracing and Fanya Juu: Terracing is an essential technique to enable cultivation of steep land and helps to substantially decrease run-off, erosion and land degradation (Haigh, 2000). It is, however, extremely expensive to implement and is very labour intensive. For this reason, terracing is usually implemented by a government supported scheme. In Kabale, there are many terraces from previous mandated government initiatives (Bazaara, 2003) (Photo 2.3). Mbarrara, on the other hand, has less but there is far more evidence of the development of Fanya Juu terracing (Photo 2.4), which are constructed by digging a ditch and depositing the soil up slope; over time this technique will form a terraced effect. For Fanya Juu terracing the distance between the banks depends on the general steepness of the slopes (Harper & Brown, 1999) and planting grass along the edge of the banks to stabilise the bunds may be necessary; as shown in photo 2.4 (Mbura,2006). Fanya Juu terracing is now becoming a more dominant feature in East Africa and is a common terracing technique used by smallholder farmers (Mbura, 2006).

Photo 2.3 (On the left): Taken on 30/06/2011. Terracing in Kabale district. Photo 2.4 (On the right): Shows a developed Fanya Juu Terrace in Mbarrara district.

Agroforestry: Agroforestry is essentially the growing of trees in conjunction with agricultural crops, and is an ancient practice that farmers use throughout the world (Nair, 1993). Trees have a positive association with crops, which Nair, (1993 Pg.13) considers as a "successful form of land use which achieves increased production and ecological stability". Understanding the interaction between different biophysical systems to ensure sustainability and productivity is extremely complex (Boffa, 1999). The main benefits of agroforestry are that it controls run-off and soil erosion which helps to increase soil fertility (Boffa, 1999). However, it must be remembered that bad management, lack of motivation, lack of understanding the technique and a poor choice of species combination will cause agroforestry to fail just as for the bad management of any other SLM practice (Nair, 1993). Agroforestry, therefore, demands good practical local knowledge and appropriate teaching for the respective area.

Photo 2.5: Taken in Mbarrara district. This is an example of two separate types of SLM practices, both agroforestry and multi-storey gardens are being used here. On the lowest level there are beans, followed by coffee, matoke and then the larger tree level. Multi-storey gardens allow the farmer to benefit from a more diverse diet, increased nutritional education, and the generation of a more diverse source of income (Corbett, 2009).

Rainwater harvesting & trenches: In SSA, rainfall is highly erratic, of high intensity and has extreme spatial and temporal variability; consequently there is a high risk of drought and intra-seasonal dry spells (Rockström, 2000), which makes the instigation of water harvesting practices necessary. Water harvesting pits (as shown in photo 2.7) are used to store water for irrigation purposes whereas trenches are used to channel water to avoid run-off and the development of erosion channels (Photo 2.6). Using bespoke water harvesting technologies ultimately lowers the risk of crop failure and acts as a further investment to increase soil fertility (Rockström, 2000).

Photos 2.6&2.7 Both photos taken in Mbarrara district. Photo 2.6 is an example of a trench within a large plot of matoke crops and photo 2.7 is an example of a water harvesting pit that has been dug by the farmer to collect and store water during dry periods.

Increasing soil fertility: Intensive agriculture in SSA cannot be sustained without increased soil nutrient input using organic and inorganic fertilisers (Morris, 2007), both of which have advantages and disadvantages. Although the advantages of increased nutrient availability maybe obvious, the disadvantages must also be considered. Fertilising fields is highly labour intensive; inorganic fertilisers are expensive and if managed badly can be ineffective (Morris, 2007) and in addition, the rate of nutrient release is hard to control (Hadderlein *et al.*, 2001). Introducing nitrogen-fixing legumes with the use of scattered trees is another sustainable practice used to increase fertility. Finally, placing mulch over the soil to prevent evaporation is a good way to increase fertility and retain moisture (Morris, 2007).

Photos 2.8 & 2.9 Both photos taken in Kable district. Photo 2.8, on the left shows an example of introducing scattered trees onto a plot. Not only does it increase fertility but it also provides shelter and decreases the impact of soil erosion. Photo 2.9, below, shows an example of mulching which as aforementioned is a way of maintaining soil moisture at a period of no crop growth.

General land management: Construction of fences and hedgerows are other more general land management practices. They create a boundary between neighbouring plots, which aids the implementation "zero grazing" byelaws. Creation of boundaries also helps to avoid land ownership disputes and restrict thieving.

Photo 2.10&2.11 Both photos taken in Kabale district. Photo 2.10 shows the use of homemade fencing and photo 2.11 shows an example of hedgerow management which also acts as a boundary to reduce grazing from neighbours animals as well as decreasing run-off and soil erosion.

3. Methodology

3.1 Implementation

Before undertaking my research, I decided on the most suitable research technique (Beiske, 2002) to justify the intricate aims and objectives of my study. To achieve this, I invited farmers to respond to questionnaires at selected study sites for in-depth quantitative research; and supporting qualitative research in the form of technical expert and policy maker interviews, for the specific sub counties and districts. Bryman, (2006), stipulates that using this approach of several analysis techniques is extremely useful when validating conclusions. This combination of different methodologies is described as "triangulation" (Jick, 1979). Oppenheim, (2003) alludes that the advantages and disadvantages of questionnaires and interviews are almost a mirror image. For this reason, the multi-method triangulation approach (Valentine, 1997) seems to be the ultimate research strategy to reduce the limitations and critiques of both methods.

3.2 Pilot Study

Extensively piloting a study is an imperative part of the research process in order to identify issues that were not previously considered as well as addressing the general feasibility, structure and length of a study (Oppenheim, 2003). For both the questionnaires and interviews, it is important that the language, layout and deliverance do not make unacceptable assumptions about the specific respondents and interviewees (Cloke, 2004).

In order to avoid such assumptions, pilot studies were conducted for both the questionnaire and interview elements of the research. For the questionnaire pilot I spent a day with two representatives of a FFS based in Gako, Rusiga, Rulindo district – 25Km North of Kigali, Rwanda (Full report available in Appendix 3). These initial face-to-face interviews with the farmers gave me an insight into the best way to take the project analysis forward. My prototype questionnaire was a relatively unstructured document that yielded some interesting results. However, I later decided on a more structured format (Appendix 1) with mainly closed questions and a small number of open questions. I also thought that this would make the coding and analysis process easier and more astute. The main issue here, however, was communication. I quickly realised that I needed some help to communicate with the farmers in their local language. I initially had a translator but this meant that the interviews took twice as long and sometimes the interviewees would get restless. I therefore decided to employ

some help from local university students who where both fluent in English and the local language, Rukiga. This was organised by my supervisor at the FAO who had used the students help on previous research pieces. We gave the 6 students a half-day briefing on how we wanted each question to be approached and asked which was run by myself with translating assistance from my supervisor. I ensured that we used the same students between districts to maintain consistency.

Valentine, (1997) describes the interview process as a "fluid form based around dialogue rather than interrogation". For the interview process, I essentially just wanted a semi-structured document with a number of open questions that would aid and promote this idea and guide a more informal discussion. This semi-structured approach to the interview process aims to give an authentic account of the interviewee's subjective experience and will "delve deep beneath the surface of superficial responses" (Klenke, 2008 Pg.125). I tested the interviews on two members of the Africa 2000 organisation and on completion of the pilot, amended a number of questions but essentially kept the same structure (Appendix 2).

3.3 Feasibility

The smooth running of logistics, transport and stakeholder contacts from the range of farmer groups to technocrats and policy makers was available with support from a local NGO. The FAO's affiliation with Africa 2000, a well-established local NGO made the local contacts feasible. The field sites were chosen by Africa 2000 as a solid representation of the two districts. *Please see website:* http://www.a2n.org.ug/

3.4 Questionnaire

Full questionnaire available in Appendix 1. Electronic data available in Appendix 4

The questionnaires where aimed specifically at the farmers across the three sub counties and two research districts. I implemented 30 interviews across the four locations giving a total of 120 respondents with 60 respondents from each district respectively. The full sampling structure is graphically represented in figure 3.1

3.4.1 Questionnaire Design

The questionnaire design starts with a small section on household demographics. The bulk of the questionnaire covers SLM and the ways in which practices where employed on each separate plot for each specific respondent. It also covers what farmers think are the main constraints to adoption, which are then grouped more specifically as **Natural Constraints, Financial Constraints, Human Constraints, Social Constraints and Physical Constraints.** The final questions aimed to explore possible opportunities for increasing the adoption of SLM whilst also giving the farmers an opportunity to express what they would change or improve in terms of SLM implementation and the current democratic government structure in a more general fashion.

3.5 Interviews

Full interview structure available in Appendix 2. Electronic data available in Appendix 4

My initial intention was to interview 5 technical experts and officials from sub-county level and 5 policy makers from district level. In practice, due to unavailability of the officials this was not completely feasible. Therefore, I have 3-8 interviews from each of the sub counties and 3-4 from each district. I will go on to specify the exact sample sizes in the proceeding sampling structure section. It must also be noted that each interviewee was asked permission for their names and titles to be used within this research.

3.5.1 Interview Design

As aforementioned, the pilot study gave me an opportunity to tailor the interview structure for the most optimal results. I decided on a semi-structured interview design and grouped the conversation into five main categories. These were: **Land Use Policy, Adoption of SLM, Economics, Knowledge and Culture.** These five categories acted as a loose guideline to aid dialogue within the main topics and themes for each interview.

3.6 Questionnaire and Interview Sampling Structure

Districts

Kabale

Mbarara

District Interviews

- **Chairman: Patrick Besigye**
- **Vice-chairperson: Mary Beebwajuba**
- **Forestry officer: Adios Kyomukama**
- **Production officer: Jennifer Twebaze**

- **Environmental Officer: Musingwe Jeconias**
- **District Vice Chairperson: Mr Baryomunsi**
- **Agricultural Officer: Robert Tumwesigye**
- **Veterinary Officer: Dr. Barigye**

Sub Counties

Bubare

Hamurwa

Mwizi *

Sub County Interviews

-**Chairman**

-**Sub-county Chief**

-**CDO**

-**Agricultural Advisor**

-**Fisheries Officer**

-**Accountant**

-**Sub-county Chief**

-**CDO**

-**Agricultural Advisor**

-**Extension Worker**

-**Chairman**

-**Sub-county Chief**

-**CDO**

-**NRM Chairman**

-**Agricultural Advisor**

-**Farmers Forum Chairman**

Farmer Questionnaires

25 Questionnaires

33 Questionnaires

30 Questionnaires

32 Questionnaires

Kabale District Sample Size Total: 58

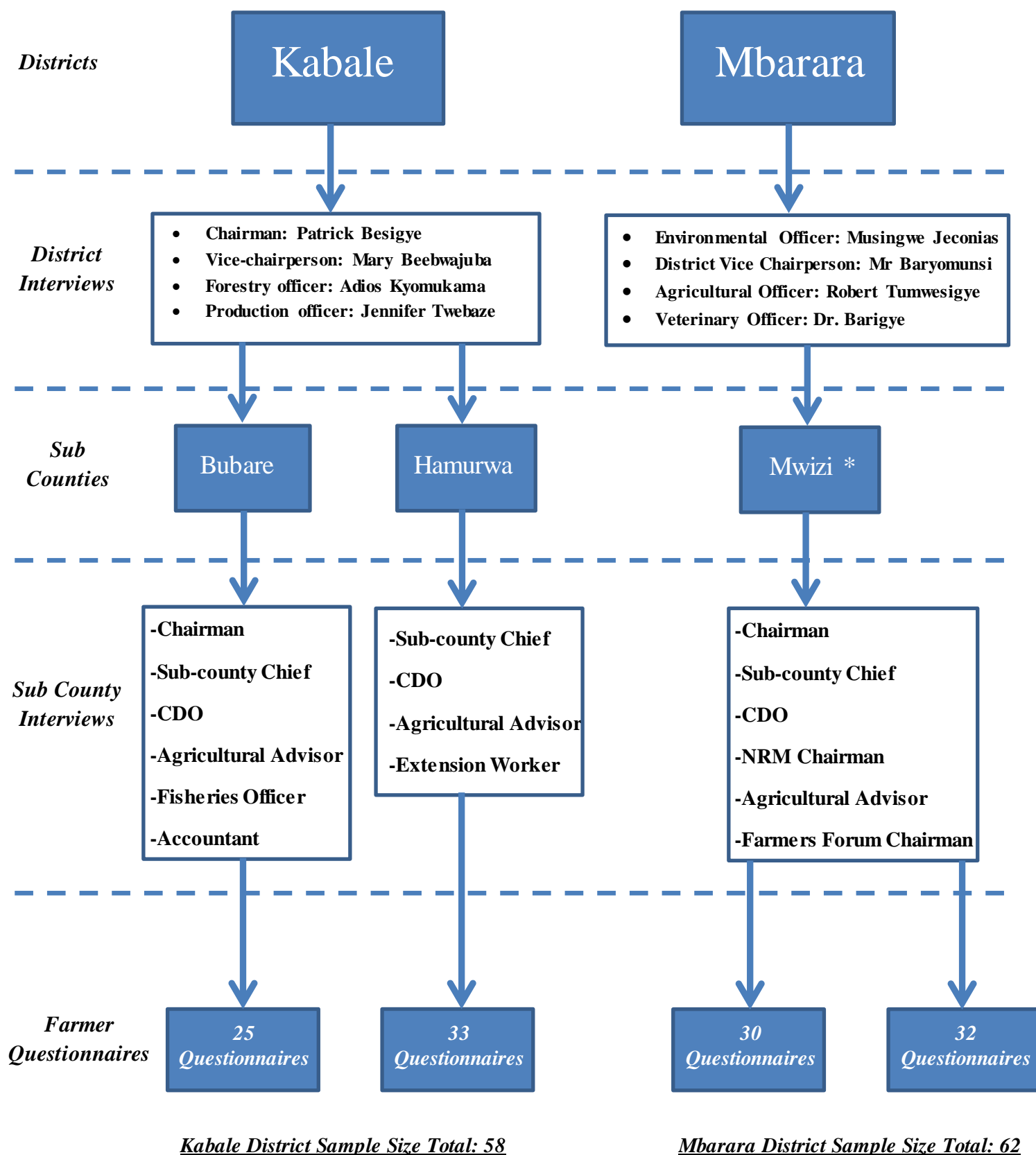*Mbarara District Sample Size Total: 62*

Figure 3.1: Sampling Structure for the questionnaire and interviews. Total Sample Size: 120

*In the Mbarara district I only worked in a single sub county. This was due to accessibility and time constraints. Mwizi was also a large sub county an targeted two contrasting regions within the sub county and for purposes of contrast against the Kabale district.

4. Analysis

It can be reasonably well accepted that success in sustainable agricultural development will depend on the use of a variety of agro ecological improvements (SLM) that will rely on the empowerment of rural communities, diversification from traditional practices and increased efficiency with local resources. This will occur through region specific, up-to-date training and participatory methods which are supported by conducive policies. In addition to this, increased access to markets, credit and income generation activities must occur (Koohsfksn & Altieri, 2010). Although this seems like a solid framework for implementing SLM, within the definition hides a multitude of caveats and constraints, and also less obvious opportunities.

The quantitative data from the questionnaires will be analysed through coding the responses and generating statistical conclusions in SPSS and Excel. The qualitative interview scripts will support this analysis with key quotations and opinions.

Meier *et al.*, (2008) believe that one of the biggest mistakes that analysts make when working on data is running more complex statistical tests without first running descriptive statistics that "help us organize and describe the data" (Frankfort-Nachmias *et al.*, 2010 Pg.18). I will therefore start by looking at some general descriptive statistics for the sampled data. It must be noted that the descriptive data simply gives an overview of the households that took part in the research. Each questionnaire was carried out with the head of the household and the proceeding analysis to the descriptive data is on SLM adoption constraints and opportunities based on their singular viewpoint as a representation of the household.

Although I have separate data for each sub-county, as I proposed in my aims and objectives section I will be analysing and comparing the district constraints initially, and then draw some general conclusions for the entire sample. The reason I did not carry out any substantial analysis at sub-county level was because I felt the samples were not large enough to draw statistical conclusions. However, I did carry out some demographic analysis on the sub-counties to ensure that there were no major differences. This can be found in appendix 5.

In all statistical tests throughout the analysis section, I will be using a significance level of either 0.05 or 0.01, which gives me 95% confidence or 99% confidence respectively if the resulting P-Value is <0.05 or <0.01. Therefore, I will also assume that there is either a 5% or 1% probability that the resulting test statistic is due to chance.

4.1 District Comparisons

4.1.1 Demographic comparisons

Total Sample: 385	Grouped Ages for Kabale District		Average Age	24

Education Level	%
No Education	17%
Primary	69%
Secondary	10%
Tertiary (University)	4%

	Leadership Role	Member of Organisation	Off-farm Employment	Work on Farm		Plots
Yes	19%	41%	27%	73%	Average No.	4.2 Plots
No	81%	59%	73%	27%	Average Size	1.7 Hectares

Removed anyone under 10 years old or over 60 from this anlysis. Sample Total: 384

Figure 4.1: This figure shows the main demographic descriptive statistics for the Kabale district.

Total Sample: 379	Grouped Ages for Mbarara District		Average Age	21

Education Level	%
No Education	20%
Primary	60%
Secondary	15%
Tertiary (University)	4%

	Leadership Role	Member of Organisation	Off-farm Employment	Work on Farm		Plots
Yes	15%	30%	15%	43%	Average No.	2.7 Plots
No	85%	70%	85%	57%	Average Size	3.7 Hectares

Removed anyone under 10 years old or over 60 from this anlysis. Sample Total: 377

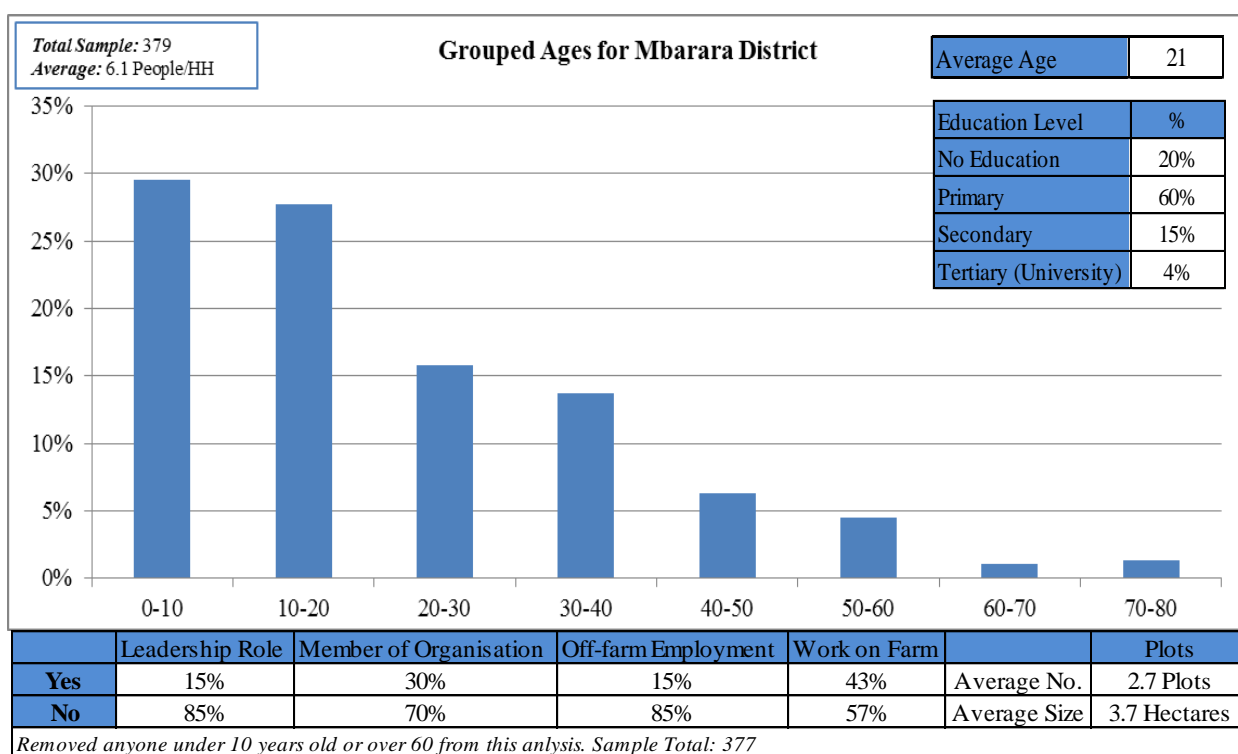**Figure 4.2: This figure shows the main demographic descriptive statistics for the Mbarara district.**

Figures 4.1 and 4.2 summarise the significant demographic characteristics of each district. Points of special note are; the average ages are similar at 24 and 21 respectively with a larger younger dependent population in Mbarara which may indicate a more rapidly increasing population than Kabale. There is a slightly larger amount of people per household in Kabale, but a similar spread of education levels. Other obvious similarities are the percentage of people who hold a leadership role within the community, those who have off-farm employment and those who are member of an organisation; however Mbarara has slightly higher percentage of negative responses for each of these categories. The data shows that on average, a household in Kabale will have 1.5 more plots than an average household in Mbarara. Knowing this however, the average plot size in Mbarara is 2 hectares larger. Therefore, in Kabale the average size of a farm is 7.14 hectares/household and in Mbarara its 9.99 hectares/household. Although there is a larger number of plots in Kabale, Mbarara still has a larger average area/household. This may lead to the conclusion that there is more fragmentation in the Kabale region.

"We are hindered hugely by the fragmentation of land" (District Vice-Chairperson, Kabale, 2011). Fragmentation has been described as "one of the main constraints facing adoption" (CDO, Hamurwa sub-county, 2011) in Kabale, but it is also an embedded constraint in Mbarara which has developed from "a huge population pressure on the land"…"acting as a huge barrier to SLM adoption" (CDO, Mwizi sub-county, 2011). Although fragmentation is an obvious constraint in both districts, the descriptive statistics and increased interviewee reference shows that it is a greater constraint in the Kabale district.

4.1.2 Plot Characteristics

Topographic Location		District	
		Kabale	Mbarara
Topographic Location	Hilltop	25%	48%
	Mid-slope	54%	44%
	Valley Bottom	21%	8%

Fertility of Plot		District	
		Kabale	Mbarara
Fertility of Plot	Very Fertile	20%	8%
	Fertile	26%	40%
	Moderate	38%	30%
	Poor	15%	21%
	Very Poor	1%	1%

Visited by extension?		District	
		Kabale	Mbarara
Visited by extension?	Yes	32%	25%
	No	68%	75%

Slope		District	
		Kabale	Mbarara
Slope	Flat	29%	13%
	Gentle	44%	47%
	Moderate	26%	38%
	Steep	0%	3%

Stoniness of Plot		District	
		Kabale	Mbarara
Stoniness of Plot	No Stones	49%	28%
	Few Stones	38%	52%
	Moderate	6%	14%
	Stony	7%	4%
	Rocky and Stony	1%	1%

Table 4.1: Table showing a comparison of plot characteristics between the two districts. The percentage is based on the responses from the household head when describing each plot.

Table 4.1 shows a breakdown and district comparison of the main plot characteristics as a percentage of the total number of sampled plots for the respective regions, and summarises the following; there are a number of obvious observations; Mbarara has a larger number of plots with a hilltop location. When comparing land slope characteristics, the topography for Kabale was mostly gentle/mid-slope and for Mbarara it was gentle/hilltop. From personal observation, I noted that the landscape was steeper in the Kabale region and had less flat area at the hilltop location in comparison to Mbarara. Average fertility is relatively similar; there is significant difference with the percentage of "very fertile" plots with 20% in Kabale and 8% in Mbarara.

Finally, 32% of Kabale's plots have been visited by extension in the last five years in comparison to 25% in Mbarara. This difference could be down to a number of reasons, however it does give an approximation that one third of the plots across the two regions have been visited by and extension officer in the last 5 years which is although not perfect it is still substantial. To analyse the extensions effectiveness, table 4.2 and 4.3 look at the types of SLM that have been implemented across the two districts.

4.1.3 Type of SLM Practices in use

Kabale District				
Rank	SLM Type	Pratice	Yes	No
1	**Water Conservation**	Terraces	45%	55%
2	**Water Conservation**	Orgnaic Fertiliser	27%	73%
3	**Sustainable Grazing**	Pasture Cropping	19%	81%
4	**Water Conservation**	Trenches	18%	82%
5	**Water Conservation**	Diversion Channels	16%	84%
6	**Water Conservation**	Earth Bunds	15%	85%
7	**Water Conservation**	Mulching	13%	87%
8	**Agroforestry**	Scattered Trees	13%	87%
9	**Water Conservation**	Fanya Ju	12%	88%
10	**Water Conservation**	Water Harvesting	11%	89%
11	**Agroforestry**	Hedges	10%	90%
12	**Agroforestry**	Tree Crops	9%	91%
13	**Water Conservation**	Inorganic Fertiliser	8%	92%
14	**Sustainable Grazing**	Rotational Grazing	8%	92%
15	**Agroforestry**	Orchards	6%	94%
16	**Sustainable Grazing**	Improved Pasture	3%	97%
17	**Sustainable Grazing**	Zero Grazing	3%	97%
18	**Agroforestry**	Multi-storey Gardens	2%	98%
19	**Sustainable Grazing**	Herd Management	1%	99%

Mbarara District				
Rank	SLM Type	Pratice	Yes	No
1	**Water Conservation**	Mulching	46%	54%
2	**Water Conservation**	Terraces	35%	65%
3	**Water Conservation**	Trenches	29%	71%
4	**Water Conservation**	Orgnaic Fertiliser	27%	73%
5	**Agroforestry**	Scattered Trees	24%	76%
6	**Agroforestry**	Tree Crops	23%	77%
7	**Water Conservation**	Water Harvesting	21%	79%
8	**Sustainable Grazing**	Herd Management	17%	83%
9	**Agroforestry**	Orchards	13%	87%
10	**Water Conservation**	Diversion Channels	13%	87%
11	**Water Conservation**	Inorganic Fertiliser	12%	88%
12	**Water Conservation**	Fanya Ju	12%	88%
13	**Agroforestry**	Hedges	9%	91%
14	**Agroforestry**	Multi-storey Gardens	8%	92%
15	**Sustainable Grazing**	Rotational Grazing	6%	94%
16	**Sustainable Grazing**	Pasture Cropping	5%	95%
17	**Sustainable Grazing**	Improved Pasture	4%	96%
18	**Water Conservation**	Earth Bunds	3%	97%
19	**Sustainable Grazing**	Zero Grazing	1%	99%

Table 4.2: Table showing the percentage of SLM practices in Kabale based on the total amount of plots from question 7 of the questionnaire. Total number of plots: 211

Table 4.3: Table showing the percentage of SLM practices in Mbarara based on the total amount of plots from question 7 of the questionnaire. Total number of plots: 153

Table 4.2 and 4.3 show the main types of SLM practices that have been engaged as a percentage of the total amount of plots for each. It can be concluded that Mbarara has a greater number of SLM plots with 16% having at least one of the mentioned practices, whereas Kabale is at 12%. Mulching is the most common practice in Mbarara being carried out on 46% of the plots in comparison to 13% of Kabales' plots. As a relatively easy practice to implement, it may be assumed that the extension and teaching of this technique in Mbarara has been more efficient. It is also interesting to note that although extension officers have visited more plots in Kabale, the uptake in Mbarara has been greater. This may suggest that other approaches maybe more effective.

As aforementioned, terracing is more extensive in Kabale and is present on 45% of the plots with 12% Fanya Ju in both regions, which contradicts my earlier assumptions. The sustainable grazing figures are based only on those farmers who have livestock and it is specifically interesting to note that zero grazing is extremely low at 1% and 3% for Mbarara and Kabale respectively. As a byelaw for both regions, it is obvious that this specific bye-law is not being enforced as expected. It is encouraging that there is a 27% implementation rate of organic fertiliser use across the two districts and not surprising to see the use of inorganic fertiliser much lower, possible due to both price and common miss-conceptions with its application.

4.1.4 Opinions towards SLM

Before analysing what farmers think are the main constraints facing adoption, I will firstly analyse their opinions towards SLM. As shown in table 4.4, 42 people (72%) of Kabale believe that the benefits outweigh the costs of implementation and 55 (89%) of the Mbarara sample hold the same view. This shows that there has been relatively good exposure to SLM and the benefits that it can bring in both regions. This leaves a small proportion (19%) of the two districts that believe that there are more costs associated with SLM adoption. This percentage may represent some embedded misconceptions that were noted by a number of technocrats and policy makers. For example; "Many elders feel that by planting in rows and fertilising that they are actually degrading the land, which is an extremely important misconception"

	Do the benefits outweigh the costs?	
	Kabale	Mbarara
Yes	42	55
No	16	7
Total	**58**	**62**

Table 4.4: Opinion on whether benefits of SLM outweigh the costs. Each number represents a single respondent.

	Would you like to expand through the use of SLM?	
	Kabale	Mbarara
Yes	52	61
No	6	1
Total	**58**	**62**

Table 4.5: Opinion on whether people would ultimately like to expand their practices though the use of SLM.

(Vice-Chair Person, Kabale, 2011). A number of these misconceptions were raised by technocrats in the Kabale district with no similar comments in Mbarara, this supports the fact that 38% of Kabale feel there are more costs associated with SLM in comparison to 13% of the Mbarara sample. In conjunction with this however, there seems to be an overwhelming willingness to expand using these practices. Over 90% of both districts would like to expand through the use of SLM with only 1 person from Mbarara district responding that they didn't want to expand this way. The increased negativity in the Kabale region is seen again with 6 times more people not wanting to expand their practices through SLM technologies.

Table 4.6 analyses the two districts views towards whether there are more constraints or opportunities with the adoption of SLM. The results show a similar view from both districts, with 29% of Kabale and 39% of Mbarara feeling that there are more constraints. This negative viewpoint from the farmers gives further reasoning to analyse what the main constraints are and begin to confront these issues by also assessing the possible opportunities.

	Do you think there are more constraints or opportunities with SLM?	
	Kabale	Mbarara
Constraints	17	23
Opportunities	41	39
Total	58	62

Table 4.6: Opinion on whether the are more constraints or opportunities for with the implementation of SLM.
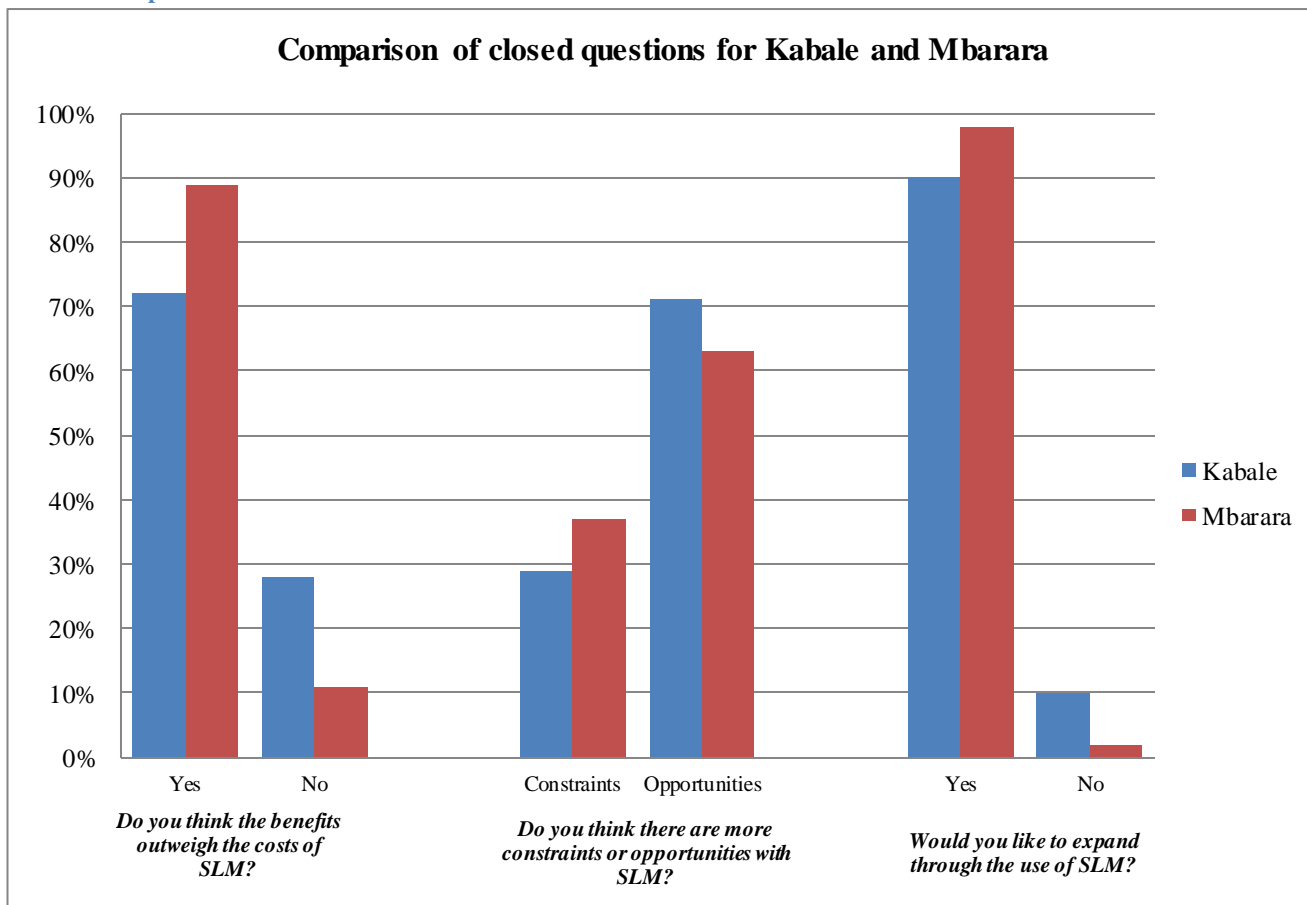

Figure 4.3: Graph showing the opinions towards SLM across the two districts.

Figure 4.3 is a graphical representation of the last three tables and essentially shows that there is a trend in opinions across the two districts. For the statistical test, I have decided to use a 99% confidence limit. Statistically, the Chi-Squared test in table 4.7 shows that each p-value is greater than 0.01. I can therefore assume with 99% confidence that there is no significant difference between the answers from Kabale and Mbarara.

	Benefits/Costs	Constaints/Opporunities	Expansion
Chi-Squared Value	5.094	2.06	4.125
P-Value	0.024	0.151	0.042
Grouping Variable: Districts			

Table 4.7: Chi-Squared test to show if there is significant difference between the responses from the two districts

The reasoning behind some of the more negative opinions towards adopting SLM practices have been alluded to by some of the interviewees. The Bubare sub-county chief, (2011) points out that "farmers need to know that the process is ultimately for their benefit". The Bubare Fisheries Officer, (2011) stipulates, "People are just interested on just getting a quick fix such as getting seed". Knowing this, "Motivation needs to occur across the board with all stakeholders and is very important part of SLM implementation phase" (Sub-County Chief, Bubare sub-county, 2011). Trust is another issue that needs to be approached; "There may be a new project but people don't seem to get interested because they have been disappointed so many times in the past" (CDO, Hamurwa sub-county, 2011). Motivating farmers, addressing some embedded misconceptions and regaining some trust surrounding SLM benefits are therefore key building blocks for increasing adoption in both districts.

4.1.4 Constraints to adopting SLM

Null Hypothesis: There is no significant difference between the constraints facing adoption in Kabale to that of Mbarara.

The previous opinion analysis uncovered the fact that 34% of the sample believe that there are more constraints than opportunities to adopting SLM and that only 14% of all plots have some form of SLM practice on them. Question 8 of the questionnaire asks farmers to rank the different types of constraints facing the adoption of SLM from the greatest constraint (1) to the smallest constraint (5). Each constraint was decided through the research context and academic literature review. Figure 4.4 and 4.5 show the percentage of responses to the second part of question 8, giving us a high-level ranked representation of the main constraints that farmers face. The key corresponds to **natural constraints, financial constraints, human constraints, physical constraints** and **social constraints** respectively.

Figure 4.4: Graph showing the spread of which constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Kabale district.
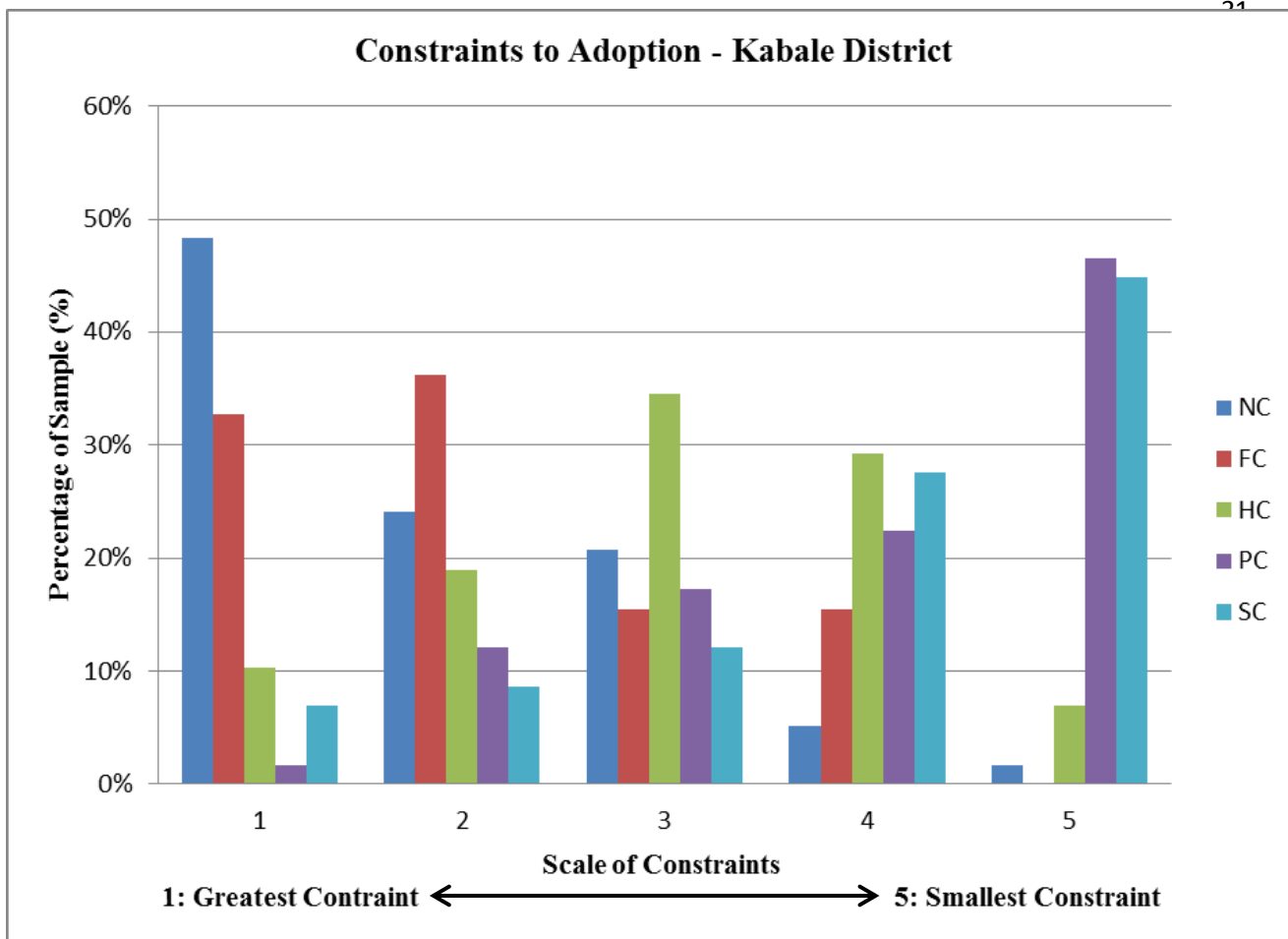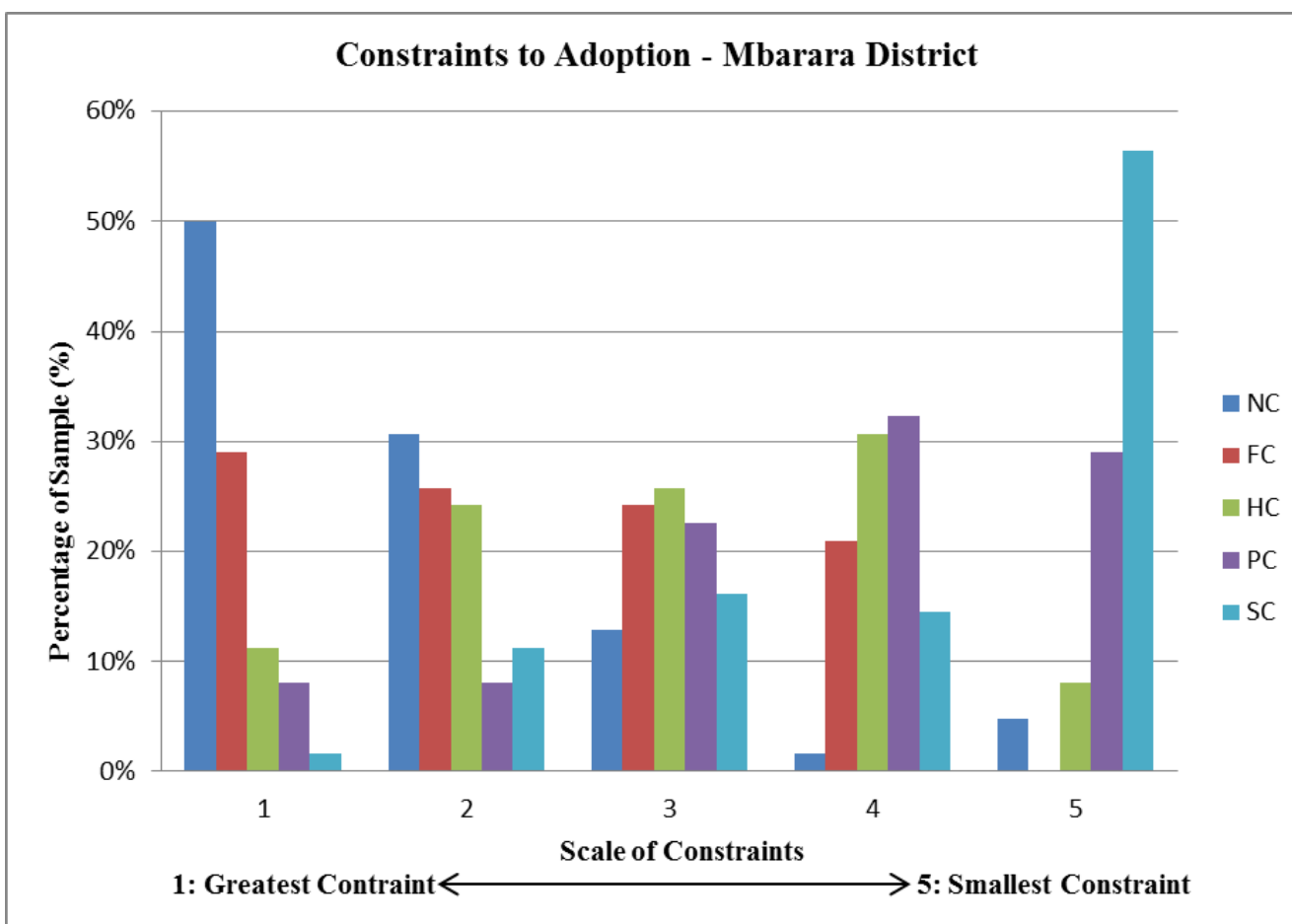

Figure 4.5: Graph showing the spread of which constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Mbarara district.

As a trend, figure 4.4 and 4.5 show that the greatest constraints facing adoption are natural and financial and the smallest constraints are physical and social, with human constraints showing an average distribution. Both districts had approximately 50% of the population responding that they thought natural constraints where the greatest constraint facing adoption. In Kabale, both physical and social constraints were the smallest issue by a majority of around 45% and in Mbarara 56% believe that social constraints are the least relevant. Knowing this, I carried out a t-test to see if there was a statistical difference between the average responses from the two districts. Table 4.8 shows that each p-value of the test is greater than 0.01 and therefore the test is insignificant to a confidence limit of 99%. This means I can accept the null hypothesis that there is no significant difference between the two districts.

Constraint	District	Mean	p-value
NC	Kabale	1.88	0.702
	Mbarara	1.81	
FC	Kabale	3.03	0.867
	Mbarara	3	
HC	Kabale	2.14	0.243
	Mbarara	2.37	
PC	Kabale	3.95	0.411
	Mbarara	4.13	
SC	Kabale	4	0.118
	Mbarara	3.66	

Table 4.8: Independent sample t-test to look to see if there is any statistical difference between the average response from Kabale and the average response from Mbarara.

From this analysis, I have uncovered that natural constraints are the greatest for both districts, and physical and social constraints are the smallest constraint for Kabale and Mbarara respectively. I will now go on to examine these high-level categories in some more detail. Although I am only examining the three most influential constraint categories now, I will look at the intricacies of the remaining high-level constraints when I start drawing some conclusions from the two districts as a whole.
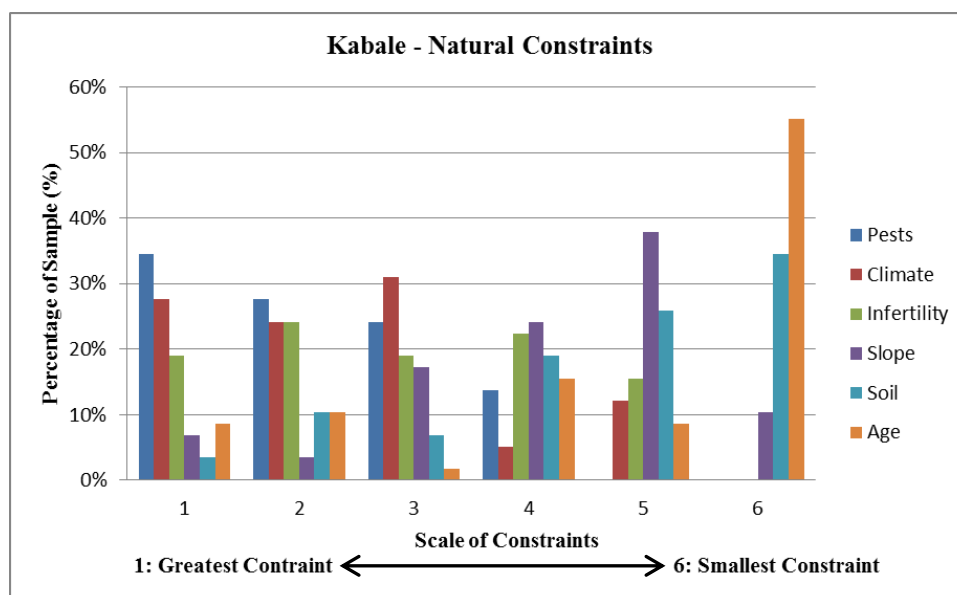

Figure 4.6: Graph showing the spread of which natural constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Kabale district.
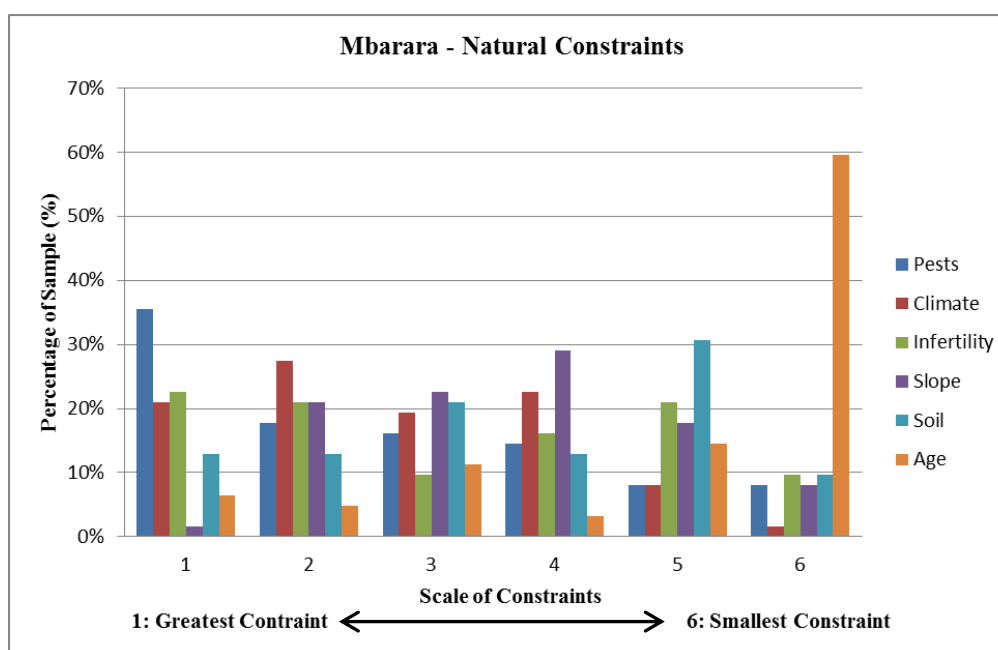
Figure 4.7: Graph showing the spread of which natural constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Mbarara district.

Figure 4.6 and 4.7 show a more even spread for each constraint. An obvious outlier for both districts is that age is the smallest issue, with over 50% of both samples giving it the smallest constraint rating. Similarly, 34% of Kabale and 35% of Mbarara believe that pests/disease is the greatest natural constraint. It can therefore be concluded that natural constraints are the biggest issue and that within this, pests and diseases are the greatest constraint for adopting SLM practices in both districts.

To statistically compare the two districts, I carried out a Chi-squared test to test for significant difference between the samples (Table 4.9). For age (p-value: 0.501), climate (p-value: 0.31), infertility (p-value: 0.379) and pests (p-value: 0.22) the p-values are greater than 0.05 and I can therefore accept the null hypothesis to a 95% confidence in the fact that there is no difference between districts for these four variables. It also shows that slope (p-value: 0.019) and soil type (p-value: 0.001) show a significant difference between districts with p-values less than 0.05 and therefore I can reject the null hypothesis with 95% confidence. For soil type, there seems to be a relatively even spread of opinion in the Mbarara district whereas in Kabale it is thought to be a smaller constraint (This can also be noted in the higher soil fertility rating of Kabale, as shown in table 2.6). As aforementioned, the major soil type in both regions is ferrasols, which is a conducive soil type to wilt bacterium and other diseases, due to the low pH and organic content (Lemaga, 1999). Although the Kabale district is characterised my steeper slopes than Mbarara, the results show that Mbarara finds slope a larger constraint. This maybe due to the lack of slope management and terracing in Mbarara compared with Kabale.

	Age	Climate	Infertility	Pests	Slope	Soil
Chi-Squared	0.452	1.032	0.775	1.507	5.547	10.798
p-value	0.501	0.31	0.379	0.22	0.019	0.001

Table 4.9: Chi-Squared test to see if there is any statistical difference between the average response from Kabale and the average response from Mbarara for the intricate natural constraints.
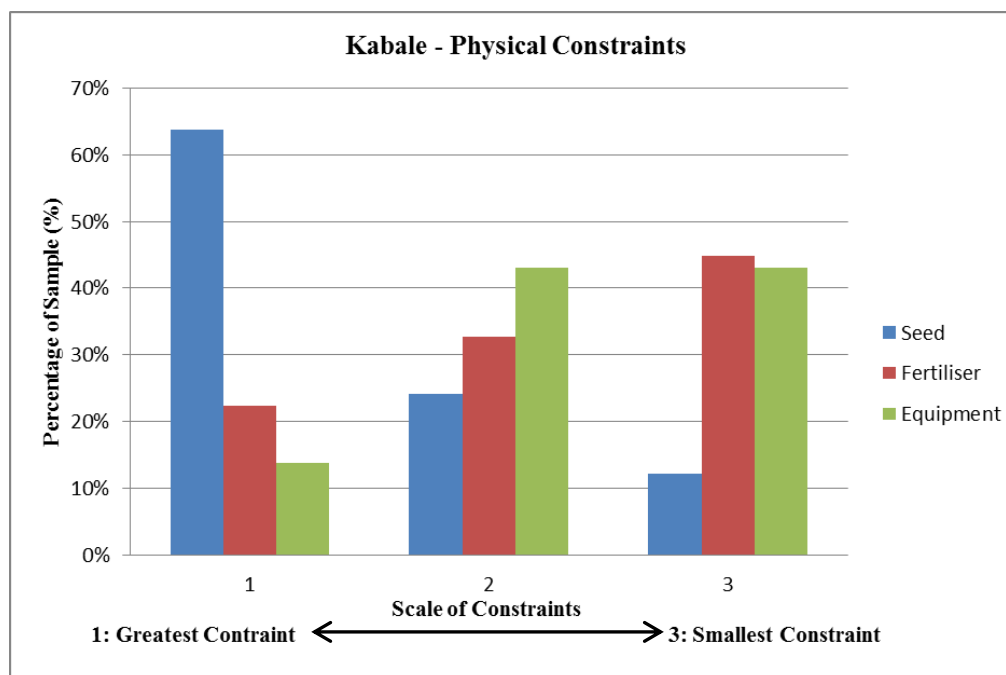
Figure 4.8: Graph showing the spread of which physical constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Kabale district.
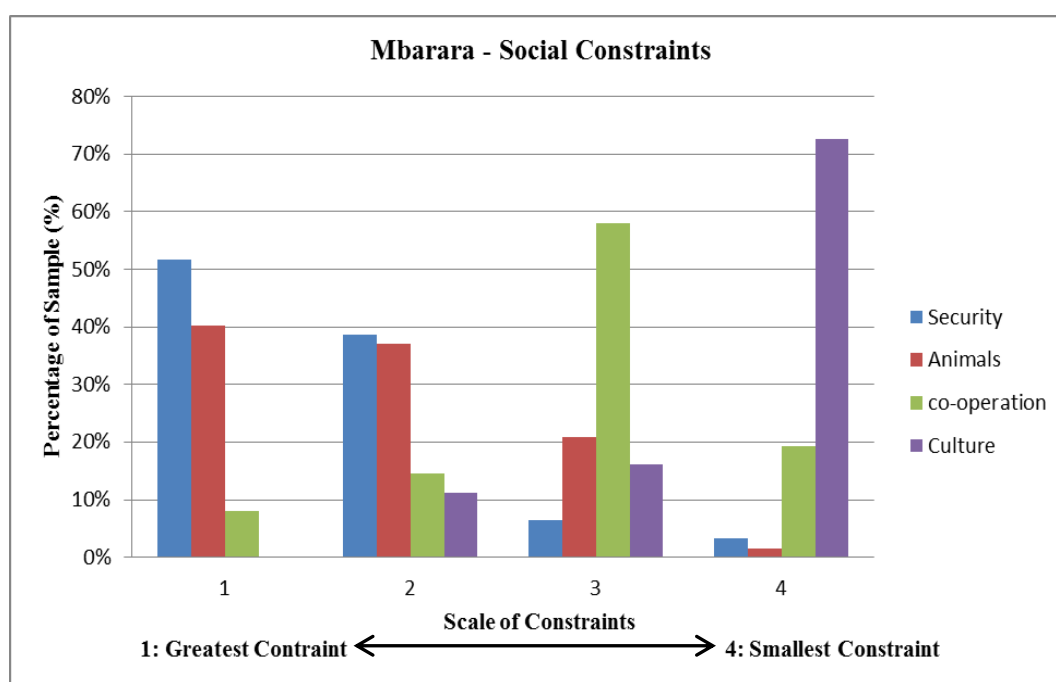
Figure 4.9: Graph showing the spread of which social constraints farmers believe are either the greatest or smallest in terms of adopting SLM practices in the Mbarara district.

Figures 4.8 and 4.9 show a breakdown of the two smallest adoption constraints for Kabale and Mbarara respectively. Figure 4.8 shows that equipment and fertiliser are the smallest constraints, and seed the largest. Figure 4.9 shows that for Mbarara culture is the overall smallest constraint by a significant level and security and thieving is the greatest.

	SC - Neighbour co-operation	SC - Neighbours animals	SC - Security	SC - Culture	PC - Equipment	PC - Seed	PC - Fertiliser
Chi-Squared Value	0.31	1.432	1.494	0.044	0.178	11.448	6.789
P-Value	0.859	0.231	0.222	0.834	0.673	0.001	0.009

Table 4.10: Chi-Squared test to look to see if there is any statistical difference between the average response from Kabale and the average response from Mbarara for the intricate social and physical constraints.

Table 4.10 shows the Chi-squared comparisons for social and physical constraints between the two districts. For the social constraints, p-values are greater than 0.01 and therefore with 99% confidence it can be assumed that there is no significant difference between the two districts. This is also the same for opinions of equipment as an adoption constraint. However, the views on seed and fertiliser give a p-value of less than 0.01 (0.001 and 0.009 respectively) which are both less than 0.01 and therefore it can be assumed that there is a significant difference between the two district opinions. 64% of the kabale sample feel that seed is the greatest constraint whereas in Mbarara, fertiliser is thought to be the most significant constraint (42%). There is obviously a more even spread of results for the Mbarara region. It must also be remembered that both physical and social constraints are overall the smallest constraints for the adoption of SLM across both regions.

Although some differences have emerged, the main trends from this analysis are that there are no major differences between the constraints facing adoption for each district. Knowing this, I have decided to asses the main opportunities as a grouped sample whilst also assessing the constraints in some more detail.

4.2 Grouped Sample

4.2.1 Demographics & opinions towards SLM

			Average Age	22

Total Sample: 764
Average: 6.2 People/HH

Grouped Ages for Sampled Households Kabale & Mbarara Districts

Education Level	%
No Education	19%
Primary	64%
Secondary	14%
Tertiary (University)	4%

	Leadership Role	Member of Organisation	Off-farm Employment	Work on Farm		Plots
Yes	22%	46%	28%	81%	Average No.	3.45 Plots
No	78%	54%	72%	19%	Average Size	2.7 Hectares

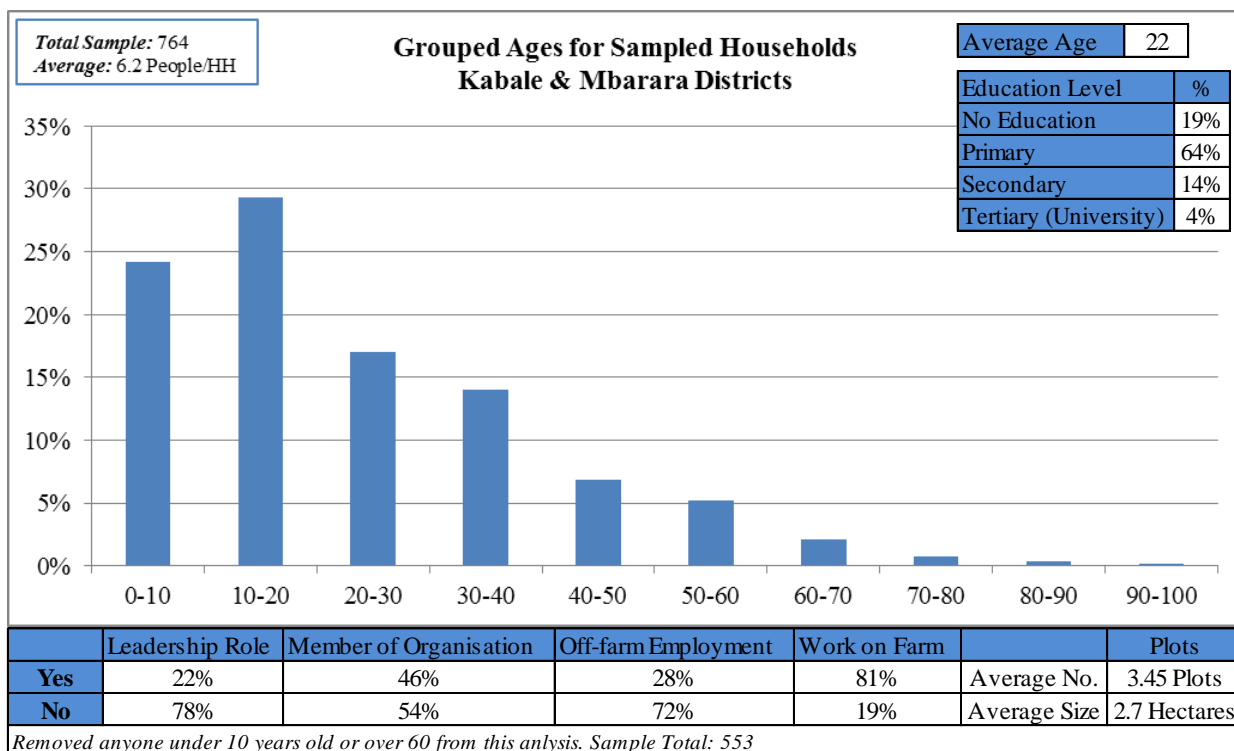*Removed anyone under 10 years old or over 60 from this anlysis. Sample Total: 553*

Figure 4.10: This figure shows the main demographic descriptive statistics for the entire sample

As expected in SSA due to high fertility rates, high death rates, bad health, HIV and diseases (Jamison, 2006) the population distribution is positively skewed. There are no major changes to the data from the previous demographic figures (Figures 4.1, 4.2) apart from the influence of average plot number and size, which are important variable to consider. Again, it is first crucial to gain a perspective of the main opinions from the grouped sample. The following three pie charts show the general opinions of the sample. These were constructed by constructing a 2X2 contingency table in SPSS and then transferring the results to excel (Table 4.11).

Closed Question Comparison

- Benefits outwiegh costs and want to expand
- Costs outweigh benefits and want to expand
- Benefits outwiegh costs and don't want to expand
- Costs outweigh benefits and don't want to expand

Figure 4.11: This pie chart shows a comparison between how the household head responded to two questions: "Do the benefits of SLM outweigh the costs?" and "Do you want to expand your practices through SLM?"

Closed Question Comparison

- Benefits outwiegh costs and more opportunities — 53%
- Benefits outwiegh costs and more constraints — 28%
- Costs outweigh benefits and more constraints — 11%
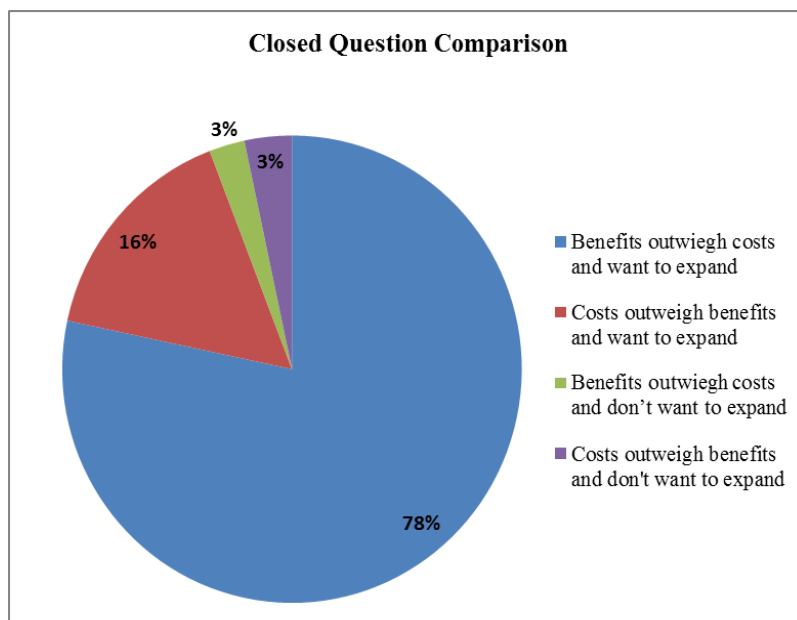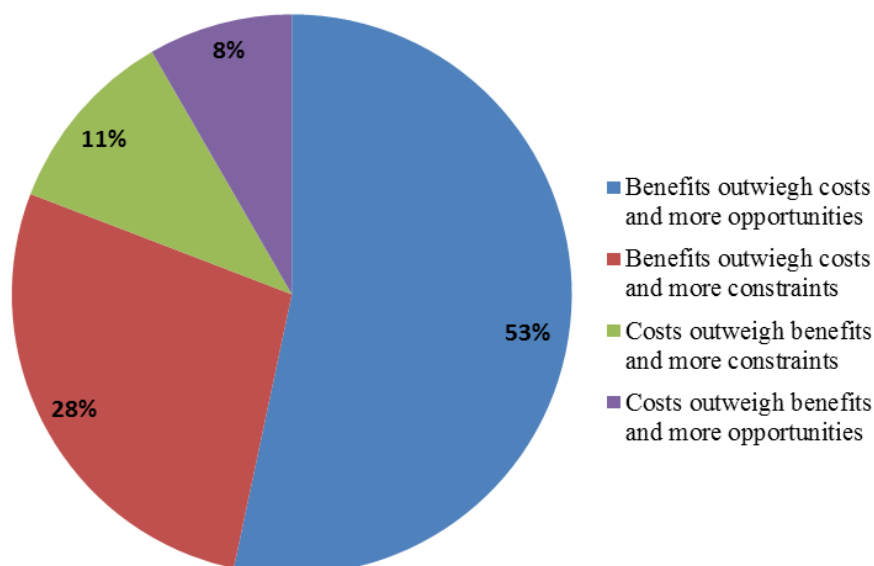- Costs outweigh benefits and more opportunities — 8%

Figure 4.12: This pie chart shows a comparison between how the household head responded to two questions: "Do the benefits of SLM outweigh the costs?" and "Are there more constraints or opportunities associated with SLM?"

Closed Question Comparison

- More opportunities and want to expand — 58%
- More constraints and want to expand — 36%
- More opportunities and don't want to expand — 6%
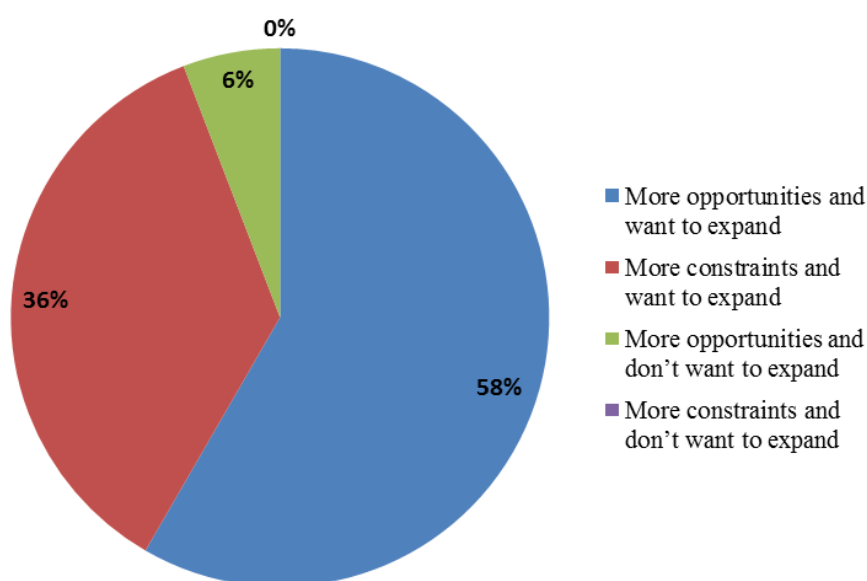- More constraints and don't want to expand — 0%

Figure 4.13: This pie chart shows a comparison between how the household head responded to two questions: ""Are there more constraints or opportunities associated with SLM?" and "Do you want to expand your practices through SLM?"

Each pie chart shows an overall positive view towards SLM with 78% of the sample believing that the benefits outweigh costs and want to expand through SLM technologies. 94% of the sample want to expand through SLM, however, 36% of these people think that they face more constraints than opportunities in achieving this. Similarly, of the 82% of people that believethe benefits outweigh the costs, 28% of them feel that there are more constraints.

		Do you want to expand through SLM?	
		Yes	No
Do you feel that the benefits outweigh the costs?	Yes	93	3
	No	19	4
Spearman Value		0.239	
Sig. Value		0.009	

		Do you want to expand through SLM?	
		Yes	No
Are there more opportunities or constraints when considering SLM?	Opporunities	69	7
	Constraints	43	0
Spearman Value		-0.188	
Sig. Value		0.041	

		Do you feel that the benefits outweigh the costs?	
		Yes	No
Are there more opportunities or constraints when considering SLM?	Opporunities	64	13
	Constraints	33	10
Spearman Value		-0.078	
Sig. Value		0.399	

Table 4.11: Transferred 2X2 contingency table from SPSS highlighting a statistical significance value of correlation between the questions.

Table 4.11 shows the tables used to generate the pie charts with also a spearman's correlation value for each. With a p-value of 0.009 being less than 0.01, I can conclude with 99% confidence, that there is a significant correlation between those who want to expand and those who feel that there are more benefits associated with SLM. A p-value of 0.041 is less than 0.05, therefore I can conclude with 95% confidence that there is a significant correlation between those who want to expand and those who believe there are more opportunities. Lastly when considering the correlation between benefit and constraints opinions and opportunity and constraints, p-value of 0.399 was produced, which is greater than 0.05; therefore there is no significant correlation between the two responses, however, table 4.11 shows that there is a heavy weighting of those who feel that there are more opportunities and that there are more benefits. As discussed, motivation, trust and knowledge are three embedded constraints. "Many people like to be given what to drink and what to eat rather than be told how to make it themselves" (Agricultural Advisory Officer, Bubare sub-county, 2011). Although this may be true in some circumstances, the quantitative data shows that there is an overwhelming majority of people who actually want to expand, and recognise the opportunities and benefits that SLM brings.

Consequently, it can be concluded that there is an overall positive opinion towards SLM, however, there is a possible misconception between the farmer and technocrat level.

The number of plots for each household and the number of people within each household are key variables to consider when analysing the constraints. On average across the sample, there are 6 people/household and 3.4 plots/household giving 0.6 plots/person. I wanted to run a number of tests to see if the management of land has a significant effect on the sustainability of food for consumption and sale in relation to the size and number of plots/household.

		Sustaianble Food Consumtion	
		Yes	No
Sustainable Sale for Income	Yes	52%	0%
	No	16%	33%

Table 4.12: 2X2 contingency table for those whos size of farm currently sustains the familys needs for food consumption against sale for income.

Table 4.12 shows an expected spread of responses. 52% of people have a large enough farm for a sustainable source of food and income. 33% have unsustainability for both and 16% have a sustainable source of food but an unsustainable source of income. These responses must now be linked with the number of people per household and the number of plots within each.

	Number of Plots vs. Number of People in Household
Correlation Coefficient	0.266
Significance Value	0.003

Table 4.13: Spearman's Correlation test for Number of Plots vs. People in Household

Table 4.13 shows the results for a Spearman's rank correlation test between number of plots/household and number of people, to first see if larger families have more plots. The p-value of 0.03 is less than 0.01, therefore, I can conclude with 99% confidence that there is a moderately positive correlation between the number of plots/household and the number of people/household. Although there is significant positive correlation, the correlation coefficient is still moderately low (0.226). The Spearman's test simply looks for a general positive or negative monotonic relationship and is relatively robust against outliers in comparison to Pearson's test (Reimann, 2008). For example, in the Ihombya village, Mwizi Sub-county, Mbarara district there is a family of ten with only a single plot, and in the Hataba village, Hamurwa Sub-county, Kabale district, there is a single female with three plots. Accordingly, it can be assumed that the management of someone's land has a huge impact on its productivity and ultimately its capacity to provide food for the household.

To further this theory, I decided to run a correlation test for the number of plots/person in each household against whether the size of the family's farm currently sustains their food consumption and sale for income. Table 4.14 shows p values of 0.834 and 0.911 which are greater that 0.05. I can therefore conclude with 95% confidence that there is no significant correlation between the number of plots per person and whether the size of the farm sustains their family's needs.

	Sustaianble Income vs. Plots/Person	Sustainable Food Source vs. Plots/Person
Spearmans	-0.019	0.01
P-Value	0.834	0.911

Table 4.14: Spearmans correlation test for sustainable source of income and food vs. number of plots per person.

Therefore, because having a large number of plots doesn't necessarily mean that there they have a large amount of land; these tests have shown that there is no link with the size of the family, the size of the farm and whether they have a sustainable food supply for consumption and sale. It can be concluded that there are other variables to be considered such as the effective management of their land.

4.2.2 Constraints to adopting SLM

Figure 4.14 shows the high-level constraints of the grouped sample and the following page gives a ranked breakdown of the more intricate constraints within these high-level categories (Figure 4.15). Following on from this, I will link this with some of the other embedded constraints from the interview analysis.
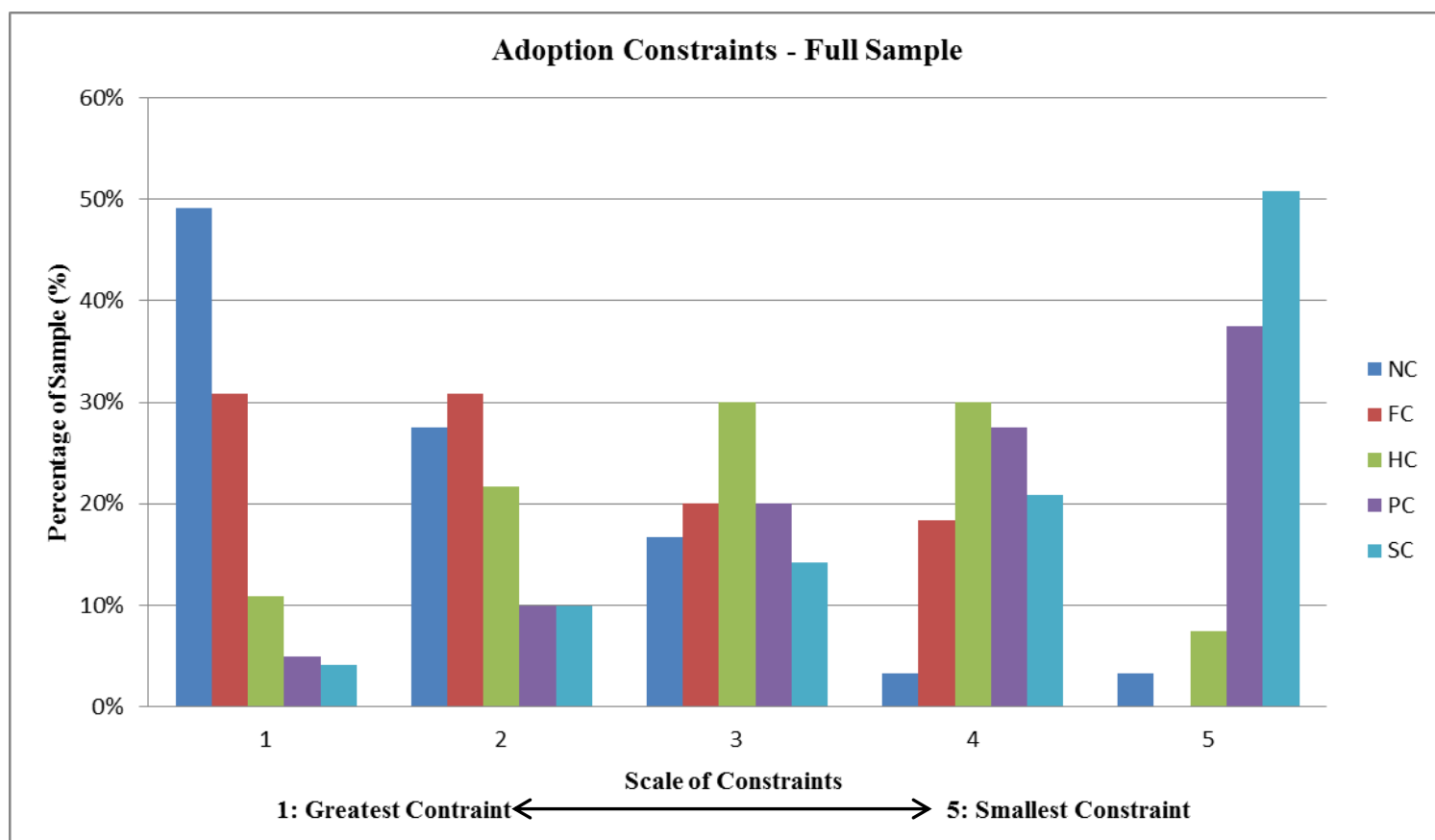

Figure 4.14: High-level constraints facing adoption of SLM

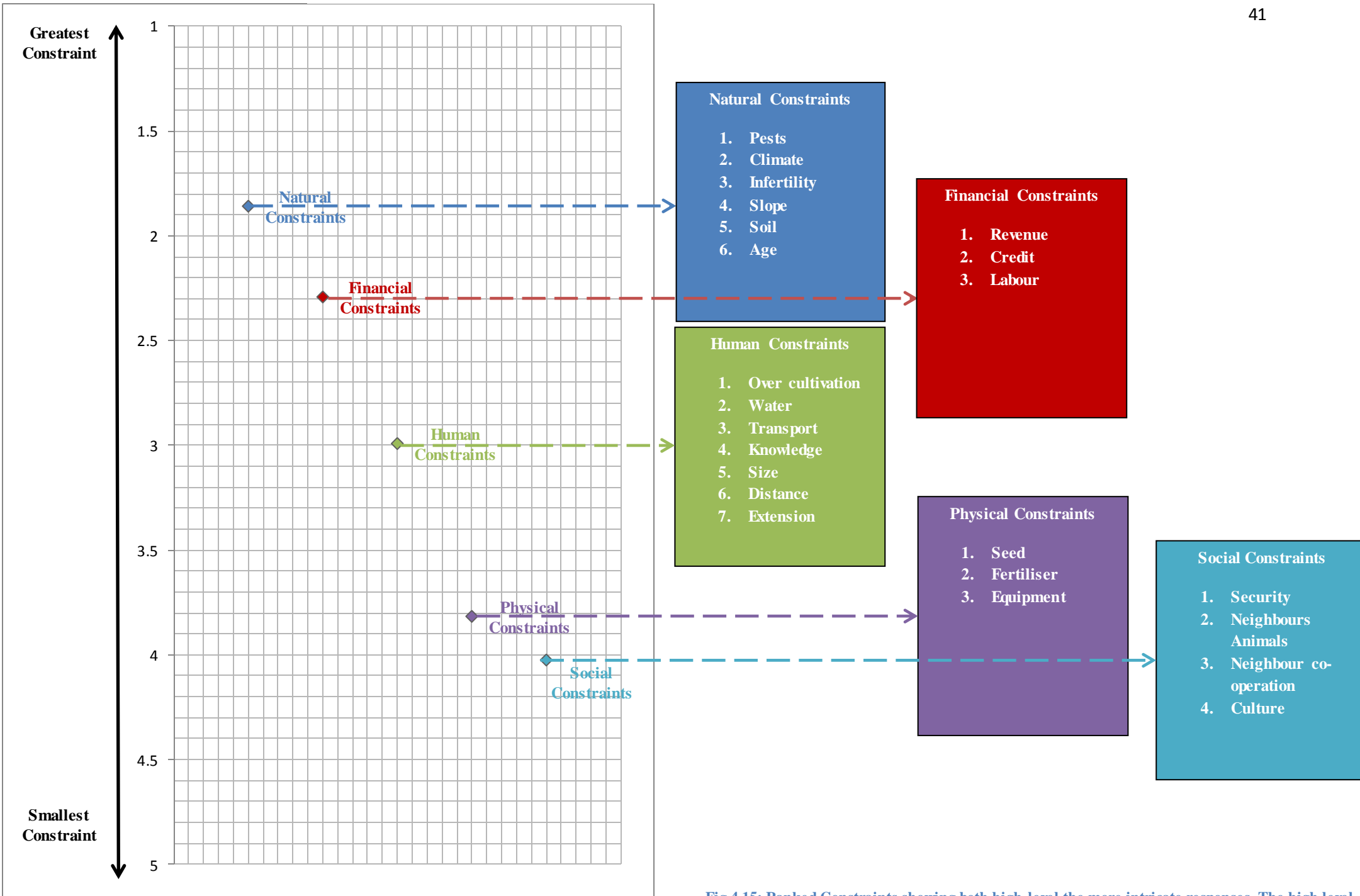# Ranked constraints based on the average response from sample

Fig 4.15: Ranked Constraints showing both high-level the more intricate responses. The high level constraint figure are based on the average response from the sample.

Photo 4.1 shows a common type of "Black Sigatoka"; an air-borne fungal disease that is described by Kikulwe *et a*l., (2008) as one of the most severe constraints to implementing appropriate land management techniques. Although pests and disease has come up as the largest constraint facing adoption for farmers, it is a topic that wasn't mentioned once throughout the entire series of interviews that I undertook. It can therefore be assumed that although it is the

Photo 4.1: Showing a common type of air-borne fungal disease taken in Mwizi sub-county, Mbarara.

most significant constraint for farmers and has had wide recognition in the academic literature (Nyeko *et al*., 2002; Schroth *et al*., 2000); it has gone relatively unnoticed by technocrats and policy makers across the two districts.

Climate variability was noted as the second greatest constraint, however only a single agricultural officer alluded to its relevance: "Noticeably in recent years, some months we expect rain to be reducing and rain is heavy and some months we expect sunshine to be coming and rain is heavy, so people are not getting the yields they are expecting to get as agriculture depends heavily on climate. It is a problem of uncertainty in predictions and people are not informed on how to predict these changes" (Agricultural Advisory Officer, Bubare sub-county, 2011). This opinion is similar to that of Faures *et al*., (2010), which was mentioned in section 2.6, noting that there is no such thing as average rainfall and that uncertainty is at the core of all agricultural practices and an embedded reality (Oberkampf *et al.,*2004).

Knowledge and its dissemination is a constraint that was highlighted on multiple occasions with technocrats and policy makers. It became obvious that these key members of the districts and local councils thought that this was a poignant and embedded constraint facing adoption: "People say if you give an African some information then you have hidden it (laugh)" (District Production Officer, Kabale, 2011). Although comical, this idea relates to the lack of motivation that I mentioned earlier; "They don't see knowledge as power and believe that it is a waste of their time. Instead they will just sit and wait for the rain" (Agricultural Advisory Officer, Hamurwa sub-county, 2011). An extension worker must therefore "Keep going to parishes and keep them interested. If you go this month, you must

keep returning because many people forget" (CDO, Hamurwa sub-county, 2011). Gaining trust and building a solid relationship between the extension staff and farmers is therefore pivotal for SLM success and further highlights the importance of LC1 involvement. As Chong & Choi, (2005) earlier alluded to, knowledge alone is not necessarily power, but knowledge sharing is power. The Agricultural Advisory Officer at Hamurwa sub-county highlights this well, mentioning: "We learn from the farmer and they learn from us" (2011). In some instances, however, it is not simply the relationship between the extension staff and farmers that is an issue; "Some are selfish and won't tell their neighbours about the good things that they have got out of land management" (Agricultural Advisory Officer, Hamurwa sub-county, 2011) and it is thought that farmers are constantly in conflicts due to bad management practices and they are not working in harmony. Although social constraints are ranked as the smallest constraint for farmers, they ultimately have a huge importance in concern to increasing SLM adoption, but also more general community cohesion.

Financial revenue for farmers is obviously a big constraint, however, key stakeholders also believe that national funding is also insufficient; "NAADS is heavily funded but it is still not enough" (District Vice-Chairperson, Kabale, 2011). This problem multiplies to the sub-county level and as funds are disseminated, there appears to be a distinct lack of support: "It is not enough. There is supposed to be an increase in the budget but before it reaches sub county level it is already finished, (laugh)" (Chairman of NRM, Mwizi sub-county, 2011); "The money we get is not normally enough and therefore very few farmers are supported with the necessary inputs" (CDO, Bubare sub-county, 2011) and "It is insufficient; it is not adequate at all; a drop in the ocean once the money filters down to sub-county level" (Sub-County Chief, Bubare sub-county, 2011). Although this maybe true, the lack of transparency has also lead to corruption claims (Gonsalves *et al.*, 2008) with Habati, (2009) believing that there is little to show on the ground from the billions of UGX invested. When the topic was raised during the district interview at Kabale I received the reply: "Many of the NADS co-coordinators have not had any financial management training which is important for sustainability"… "Sometimes they miss-manage funds; this is not from their own making but more a general lack of financial knowledge" (District Vice-Chairperson, Kabale, 2011). This issue is extremely difficult to manage and while it may simply be down to the bad management of funds, this view is hugely optimistic, and relatively unlikely. Corruption is hard to manage but it could be suggested that the district and sub-county workers received a refresher course in financial management.

Culture identity is a constraint that has been dismissed by farmers as the smallest constraint facing adoption (Figure 4.15), and is a view that is agreed by the NAADS co-ordinator at Hamurwa sub-county, (2011) saying: "It is there, but negligible and not really a problem. There is a strong willingness to diversify. Motivation is very important in comparison. Many are not motivated enough". On the other hand however, some technocrats believe that it's an embedded issue: "Culturally, many people don't want to adopt new practices" (Sub-County Chief, Hamurwa sub-county, 2011) and "Some farmers are adamant and they don't want to change from traditional ways of farming to more modern techniques" (Agricultural Advisory Officer, Bubare sub-county, 2011). It may be concluded therefore, that the constraint is there but relatively negligible in comparison to other constraints.

4.2.3 Further Constraints

4.2.4 Extension knowledge

An overwhelming topic that repeatedly emerged within the interview process was the need for staff training. The figure below shows a handful of quotes relating to this issue:

The need for increased training of technocrats and policy makers	
Source	Quote
CDO, Hamurwaza sub-county, (2011)	"We haven't received any training under land management; anyone who says they have is lying…I would have course go, I would not miss that chance"
Fisheries Officer, Bubare sub-county, (2011)	"We don't have adequate up-to-date knowledge and we are not given refresher courses"
CDO, Bubare sub-county, (2011)	"I have the knowledge but it's not enough…We can do better if we have increased training in specifically soil management issues…Learning is continuous"
NAADS Co-ordinator, Hamurwa sub-county, (2011)	"We have been urging them to bring in refresher courses. I have used the same knowledge that I learnt 20 years ago which isn't applicable to current practices"
Agricultural Advisory Officer, Hamurwa sub-county, (2011)	"They are rare occurrences and I off course would want more training. Practices change and new technologies are being invented all the time"
Sub-County Chief, Bubare sub-county, (2011)	"I don't even remember. Training from governments is very very rare"
District Vice-Chairperson, Kabale District, (2011)	"Extension workers are not competent in all areas. If they could be trained more this would be better"
District Production Officer, Kabale District, (2011)	"I also have limited exposure and we have not been to neighbouring countries to see what they have done to succeed"

Table 4.15: Box showing a handful of quotes relating to the need for an increase amount of training of technocrats and policy makers, Sub-county (blue) and district (red).

Table 4.15 represents the fact that there is an extremely deficient amount of training occurring throughout the stakeholder levels in concern to land management. Technological change within agricultural practices is a constant and dynamic process (Barghouti *et al.*, 1993) which is also climate and region specific (Sinha, 1998). Therefore, up-to-date location specific training is an absolute necessity. In conjunction with this; "The monitoring of low level officers from the top level is not good" (District Forestry Officer, Kabale, 2011) calling for better communication between the stakeholder levels. The training issue is popular opinion across the sub-county and district stakeholders and national implementation should be a top priority to increase the efficiency of the work force.

4.2.5 Mobilisation

Mobilisation of farmers can be quite laborious for a number of reasons (Kripa & Natraj, 1993). As aforementioned, motivation and trust are issues; but also transport, infrastructure and communication are other considerations. The NAADS Co-ordinator, Hamurwa sub-county, (2011) mentions that "Some farmers don't have access to demonstrations because of topography and distance". Further to this, the Agricultural Advisory Officer, Bubare sub-county, (2011) mentions that "Many times I am expecting to meet five and I may only meet two which breaks down the necessary communication network". On a more inspirational note however, the CDO of Hamurwa sub-county recently used their initiative to travel to a less visited parish in the sub-county: "There is a parish on the other side of the sub-county which is so big and so hilly. I went on my own and when I visited this area deep in the forest the turn up was so good. More than the normal centres and in fact I got around 200 people and normally I would get around 30-50 max. Now I try to visit these areas more". It is therefore obvious that a large number of farmers aren't getting the facilitation that they need but more worrying maybe is why there are only 30-50 farmers on a normal parish visit and when an officer visits an area that is far from a parish demonstration site, then almost 200 people will attend. It may be assumed that the facilitation process has lost interest with the farmers and is not evenly reaching all areas of the districts.

4.2.6 Policy

The implementation of policy and byelaws was another common topic of conversation throughout the interview process. At this stage, it was interesting to see the different viewpoints from the various elected representatives and those who are simply employed by the government. The District Vice-Chairperson, Kabale, (2011) revealed, "Political leaders are usually compromised". I therefore had reservations about not receiving convincing answers from the political leaders on this sensitive topic; however, my reservations were unexpectedly unrealised. An example of some of the byelaws that the districts are "enforcing" are zero grazing, increased tree planting, increased terracing and no open bars before lunchtime. A big shock was that no one at the district level could reproduce a list of the local byelaws, when asked, and many technocrats at the sub-county level didn't know that some byelaws were even in place.

The need for better policy enforcement	
Source	Quote
CDO, Hamurwaza sub-county, (2011)	"Policies are there but they are not very strict"
Fisheries Officer, Bubare sub-county, (2011)	"The government should be stricter with the set by-laws within the community. When the farmers go to local councils nothing is done to sort zero grazing for example. Therefore people will just continue because nothing is being done"
CDO, Mwizi sub-county, (2011)	"Laws don't work because of poor leadership, especially concerning the government. For us as technocrats you will find that you put your job at stake if you do not follow the orders from the government leaders".."The policies are very good on paper but the implementation is extremely poor. Leaders will look at you as if you are harassing the system. The problem with law is that you put it there today and then tomorrow it effects you and then you try to dodge it"
Fisheries Officer, Bubare sub-county, (2011)	"The sub-county pushes it to the district and many leaders don't mind about the problems. They don't take it seriously; when someone does the wrong they say you bring me one jerry can of local alcohol and we will settle the matter. So they don't take it seriously"
District Production Officer, Kabale District, (2011)	"Many of the higher government officials are reluctant to enforce some bye-laws because it takes away voters"

Table 4.16: Box showing a handful of quotes relating to the need for better policy implementation, Sub-county (blue) and district (red).

The Fisheries Officer, Bubare sub-county, (2011) goes on to say that, "Poor policy implementation is one of the most challenging issues we face". Many of these quotes and opinions are from technocrats and non-elected officials. However, the Chairman of the National Resistance Movement, Mwizi sub-county openly mentioned, "Laws are there. The thinking is that if we implement these policies then at a future period we will fail to get votes, so we leave them". Essentially, this shows that local elected officials who hold ultimate jurisdiction in the area are lenient with the local byelaws because it doesn't make political sense to enforce them. During the interview with the LC5 chairperson, I aimed to ask some probing questions, however they were answered with relatively generic responses. He noted that high population and land shortage were big issues and that sensitisation through the LC chain was vital. When asked about the enforcement of policy he replied, "When they are in the know then they will be able to follow. We are making sure that our local community development officers are being able to reach out to our farmers to make it easier" (LC5, NRM Chairman, Kabale, 2011). There is therefore either complete lack of communication from the LC5 level to the CDO's which is not evidential, or that the Chairman simply knows that implementing these unpopular bye-laws will inevitably push him out of office.

Unfortunately, the enforcement of all of these byelaws is crucial for the effective adoption of land management and the law relating to alcohol consumption has been notoriously hard to implement.

4.2.7 Alcoholism: Case Study – Mwizi sub-county, Mbarara

Venesio Byamutama has been a Community Development Officer for the last five years in the Mwizi sub-county, Mbarara, and is the longest standing council representative that I spoke to throughout my research. His view was that alcohol is by far the greatest challenge facing the adoption of SLM practices

"This is a big challenge for us. People have a lot of free time and they don't bother to work. Especially the men and they end up on the street. They take the majority of their time taking alcohol. Alcohol is the biggest issue here because if you are mobilising for a busy programme and you don't get support by men then they may not even let the women go. SLM constitute alot of separate things. Mostly the land is owned by the men and they have the ultimate say. Men may say; don't you plant trees and don't put trenches because that is my piece of land. Although the women have access to the land they don't have decisions. A women might go somewhere, see a practice, likes the practice, studies the practice, sees the benefits of the practice. She has access to the land but the man will choose not to put the practice on the land"…. "When we are mobilising, 80-90% are women and among the farmer groups we have 90% are women. If it is a day when we disseminate inputs then men will sneak in (laugh). Men not working on the land is culture, and this happens in a very good number of families"

Quote from: Venesio Byamutama, Community Development Officer, Mwizi sub-county, (2011)

The way in which Venesio talks about these issues, you can tell that the problems are very much embedded and hard to control without severe law enforcement. Rural women are responsible for upto 80% of food production in developing countries such as Uganda (Ehiri, 2009). The gender equality that Venesio talks about has been previously extensively documented in the academic literature. Ellis *et al*., (2006) writes that gender inequality dramatically affects growth, output, and productivity in the agricultural sector. As the main carers for the gardens, women are highly constrained by labour whereas men are more worried about financial inputs (Ellis *et al*., 2006).

Figure 4.16: Alcoholism case study. Mwizi sub-county, Mbarara

The adoption of some SLM practices is extremely labour intensive (Pender *et al*., 2004). The Hamurwa sub-county chief (2011) alludes to this, saying, "You find that many given activities needs the intervention of a man but the man is nowhere to be seen". Alcoholism is therefore a substantial problem in the area, and is an issue that only further exacerbates gender inequality. The District Vice-Chairperson, Kabale, (2011) alludes to this, saying, "Most of the work is usually done by women as many of the men are in bars. Even as I talk now, (11am) many are drunk".

Further to this, the agricultural Advisory Officer, Hamurwa sub-county says, "When I'm training I will call a group. Let's say I invite 30 people and they all come. At least ten will come drunk" (2011). It seems that the only way to approach this issue is to increase the effectiveness of enforcement. In my opinion, this will only be achievable through stricter punishment and regulation. However, I was told from district level that many of the LC1's are the people who brew the beer and "As long as we still brew it, alcohol will still be an issue" (District Vice-Chairperson, Kabale, 2011). There seems to be a multitude of variables related to this problem and it seems realistic to suggest that successful adoption throughout the districts will only ensue that once these variables begin to be addressed.

4.3 Opportunities for increasing the adoption of SLM

So what are the opportunities for addressing some of these embedded constraints?

"Adoption is a slow process" (District Production Officer, Kabale, 2011), and from what I have seen and studied, immediate change cannot be expected. There are, however, a number of opportunities that may positively modify the process. It has been noted that the role of social learning in technology adoption is well recognised but the constraining factors are less obvious (Katungi *et al.*, 2008). Therefore, after extensively analysing the main constraints, it gives me good grounding to asses the possible opportunities that were expressed from across each stakeholder level. Agriculture has become increasingly knowledge intensive due to the multitude of challenges that are currently being faced (Katungi *et al.*, 2008). 80% of the total sample said that there is a community exchange of knowledge within their community and figure 4.17 shows the farmers opinion on the ranked benefits of this interaction. Unsurprisingly, the benefit of increased agricultural knowledge is the greatest, with increased marketing information, the smallest. 28% of the sample rated an increased sense of community as the third greatest benefit, which is a good sign for local community development. As aforementioned, the Agricultural Advisory Officer for Bubare sub-county, (2011) believes that "Farmers are constantly in conflicts due to bad management practices

Is there a community exchange of knowledge and farming techniques?	
Yes	80%
No	20%

Table 4.17: The percentage of people that actively partake in knowledge exchange within the local community
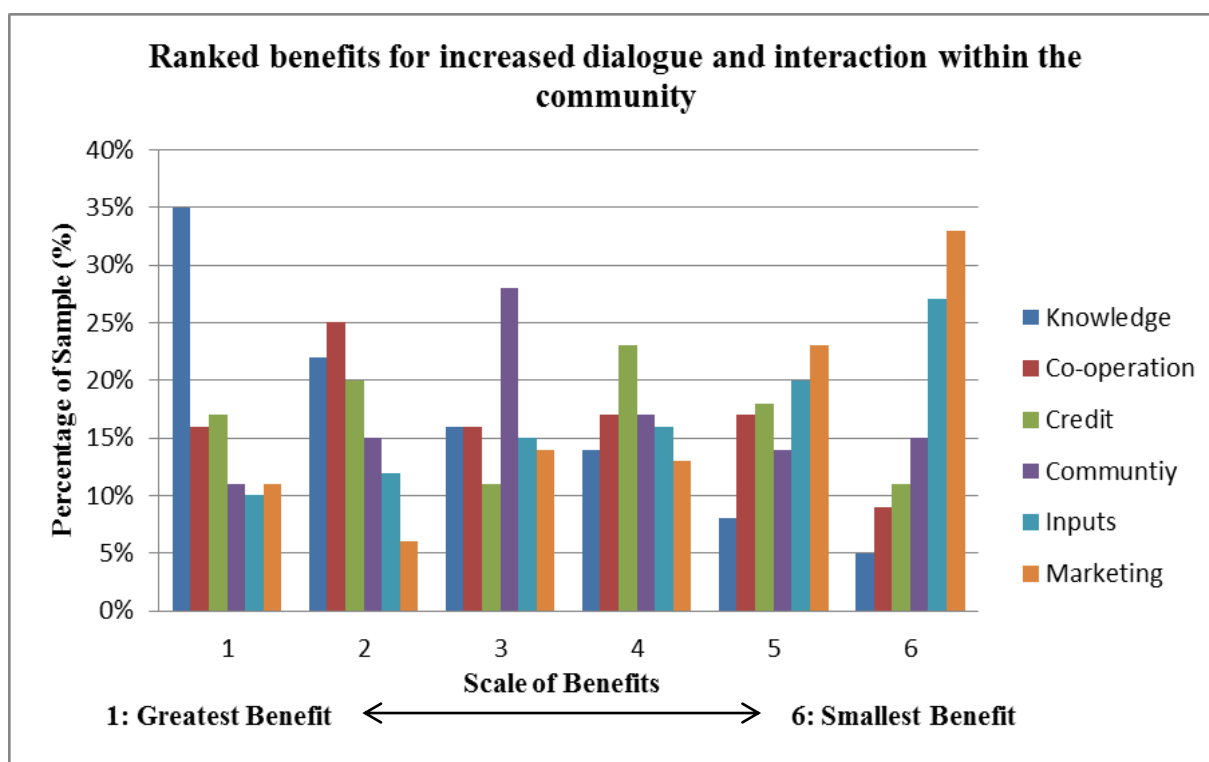

Figure 4.17: Ranked benefits of community interaction

and are not working together in a good harmony". I believe that achieving this "good harmony" between farmers is a prerequisite for the successful adoption of SLM and the development of a more sustainable livelihood. The resulting benefit of a greater sense of community due to increased community interaction and co-operation will therefore increase adoption and help to minimise social conflicts.

Figure 4.18 shows a number of community benefits and the percentage of people that receive them. This was an important question to gauge what is currently in place across the two districts. Most noticeably, over 80% of people don't benefit from FFS, PES and banking.
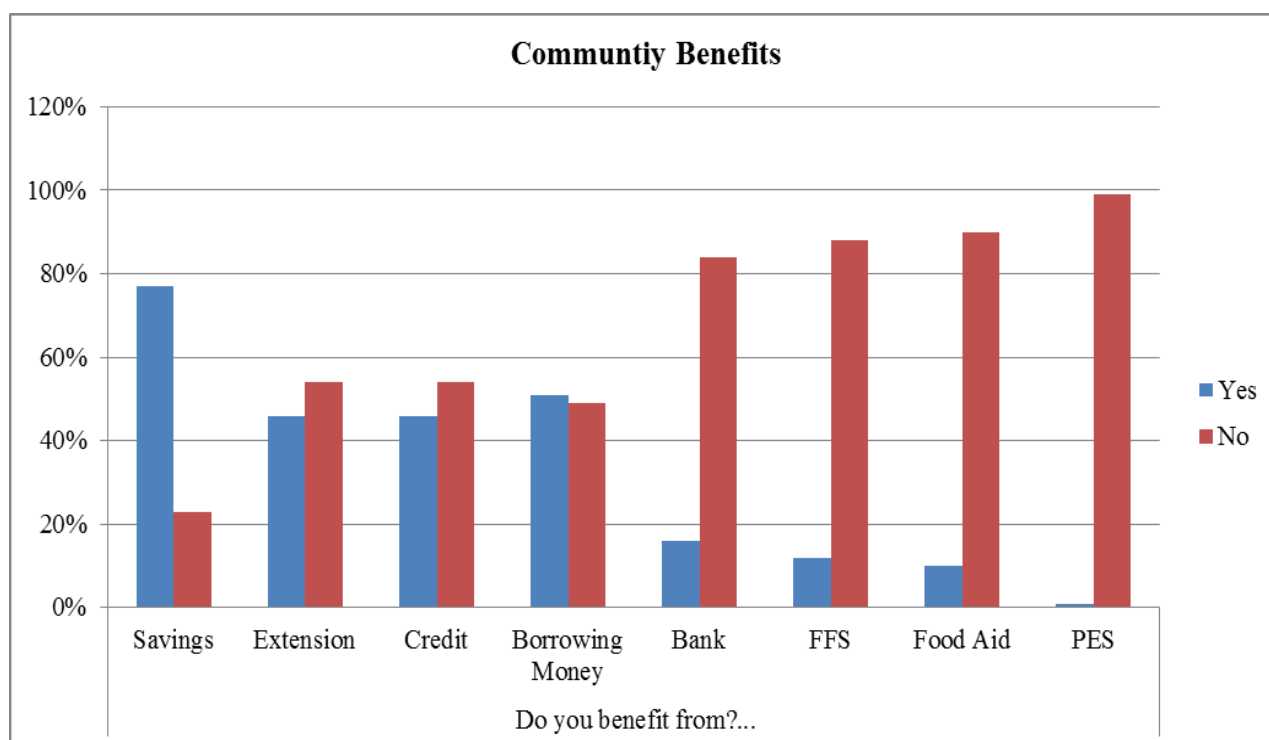

Figure 4.18: Graph showing the percentage of people that receive certain type of community benefits.

4.3.1 FFS & PES

Figure 4.18 shows that there are a number of benefits are being received within the community. However, out of the 120 households, 15 have received benefit from FFS and 1 household has taken part in a PES scheme. As stated to in the research context, FFS is a great way of "learning by doing" and there is documented evidence of its successes (Appendix 3). An underlying constraint has been that although some farmers may attend extension sessions and commit to adoption, many discard the practice when the extension staff leave. It is therefore well accepted that "We must keep involving them, reminding them, and sensitising them" (CDO, Mwizi sub-county, 2011). "FFS are good and most of these farmers pick up

technologies because they run for over 2 years"…"You cannot just go in for one season and that is it because people will just simply resort back to there old way of practice" (District Production Officer, Kabale, 2011). FFS is a more hands-on initiative that takes into account this embedded problem.

"Although they are very good they are very expensive" (District Production Officer, Kabale, 2011) and this is the underlying issue with FFS projects. While they are expensive, the main benefits and ideas are transferable to smaller and less expensive scales. As dissemination of knowledge multiplies, the projects will eventually be run and initiated by the farmers themselves, and is a process that reaches many more farmers than by direct contact alone (Fox, 1985) and ultimately something that should be increasingly promoted across the two districts. The farmer-to-farmer knowledge dissemination is where FFS will prove to be most important and ultimately least expensive. "The one person who has learnt well will take over and then others will learn off him. This is a good way" (Agricultural Advisory Officer, Hamurwa sub-county, 2011). The agroforestry project, a case study on page 56 is a fantastic example of this, although it is very rare in the region. Increasing these avenues of development is a great way to sustainably develop improved practices and relationships within the community.

4.3.2 Innovation Platform

Uganda is currently in NAADS phase two, which focusses on the household level, "However, in some areas me maybe only taking 3 members per village" (District Vice-Chairperson, Kabale, 2011). Although this is good for a few, it is obviously only targeting a small number of farmers. It is currently too early to see if this knowledge is being disseminated, however, it is a promising sign that initiatives are changing, as I believe that innovations are an important way to develop the currently stagnant adoption rate.

"I think we need a new approach, but we can build on what we already have, and we should asses the gaps and then more forward" (CDO, Mwizi sub-county, 2011). Many technocrats where unaware of innovation initiatives, however the District Production Officer, Kabale, (2011) briefly alluded to the innovation platform, which aims to develop innovation across Uganda and begin to identify some common challenges that farmers face. The most recent National Science, Technology, and Innovation Policy (MFPED, 2009) outlines the governments' policy commitments to research and develop the human capital that Uganda requires to fuel its knowledge-based economy (Brar *et al.*, 2011) and innovatively develop.

4.3.3 Alliance of Initiatives

If organisations could all come together and emphasise on some specific trainings then adoption may be easier. The opinion emerged across all stakeholder levels that there is no real co-ordination between different NGO's and government initiatives, creating substantial confusion for some farmers.

The Uganda National NGO Forum is an organisation that was set-up in 1997 and was finally ratified in 2001 to pursue a "collective agenda of engagement with government and other development actors" (www.ngoforum.or.ug, 2011) and solve this issue. Nevertheless, from discussions throughout the stakeholder levels, the NGO forum is an organisation that has yet to fully affirm its goals and objectives with local technocrats', government representatives, (Table 4.18) and farmers.

Lack of co-operation between organisations	
Source	Quote
Agricultural Advisory Officer, Mwizi sub-county, (2011)	"Once one organisation starts, another organisation should enter and integrate through work that has also happened"…"Each organisation wants to do there own thing which is a problem. If they could come together then it would be more effective"
Sub-County Chief, Bubare sub-county, (2011)	"We need to harmonise our motivation practices and approaches; we will then know what different organisations are doing and there will be a common strategy across the board"

Table 4.18: Box showing some opinions from sub-county level towards the lack of co-operation between organisations.

The NGO forum is an opportunity to "see true models of partnerships between NGO and private sectors as apposed to profit driven philanthropy" (Director of NGO Forum, www.pepal.org, 2010). To ensure that everyone is working towards a similar goal, initiatives should be constantly relevant and have in-line objectives. The forum is an organisation that has the capability to achieve this, but is currently going unnoticed throughout the stakeholder chain in both Kabale and Mbarara.

4.3.4 Importance of LC1 level

"If we can secure LC1 knowledge dissemination then there will be larger mobilisation" (CDO, Mwizi sub-county, 2011). As mentioned when discussing the importance of knowledge dissemination, the role of LC1's will be vital for increasing

adoption in the region. LC1's are both leaders and farmers within their community and their suitable appointment is is of invaluable importance. "This idea is currently not being implemented and I think is the best way to increase adoption by focussing on LC1's" (NAADS Co-ordinator, Hamurwa sub-county, 2011).

It was widely accepted at both district levels that LC1 representatives have been neglected for some time and that their role within the community is potentially very significant as they know what is happening in the village, who is trustworthy, and who is a hard worker. Therefore, concentrating on specifics, from the bottom-up, is the ultimate approach and the LC1 level is invaluable in this method as the closest formal representation of the farmer's needs (Baker, 2005).

4.3.5 Possible Innovations

As discussed the current approach for promoting increased adoption of SLM isn't working effectively. I believe that innovative approaches are therefore essential to bring fresh and exciting ideas to motivate both the farmers and extension officers.

Talking with churches is an interesting avenue because "Religion is a focal point within society and people go weekly" (Agricultural Advisory Officer, Bubare sub-county, 2011)…"It is most defiantly the best way or place to mobilise people but church leaders are not keen" (District Vice-Chairperson, Mbarara, 2011). For the obvious issues of mobilisation, having a group session after church or placing an FFS initiative near-by could be an effective avenue. I was told that successful initiatives had been run in the past in conjunction with the church but not especially for SLM. Knowing that such a high proportion of the population attend church on a weekly basis, high impact is possible.

Another idea was offered by the District Production Officer, Kabale, (2011) mentioning the possibility of introducing a short film to be shown at the parishes. The District Agricultural Officer, Mabarara, (2011) had a similar idea and wants to promote the use of agricultural radio talk shows to reach out to the farmers. Innovations are a good way to keep the sensitisation relevant and up-to-date whilst also maintaining the farmer's interest. It is encouraging that these sorts of innovation practices are being referenced at district level.

4.3.6 Bi-annual Leaflet

In accordance from the possible opportunities that have been mentioned so far, I developed a personal idea to bring sub-county relevant information to the farmers. This is the production of a bi-annual leaflet in Rukiga (the native language), pictorially showing case studies of successful farmers and projects in the sub-county. "The dissemination of information is key and there is often a language barrier with the information as many books and leaflets are in English" (District Vice-Chairperson, Kabale, 2011); and, "If this information is passed through with diagrams and photographs and people enjoy seeing these with examples and case studies of people being successful then it will take root" (Sub-county chief, Mwizi sub-county, 2011). The leaflet could be developed at district level and then disseminated through sub-county parishes by the technocrats and extension workers. When I put the idea to a handful of the sub-county and district representatives there was a conclusively positive response across both districts. The District Vice Chairperson and Agricultural Officer for Mbarara district both referred to the importance of increasing the amount of information, education and communication materials, and that introducing a leaflet or something similar would be a substantial step in the right direction.

It seems that there is a general support for specific bottom-up initiatives and similar ideas would be welcomed and supported by sub-county representatives and government officials.

4.4 Case studies:

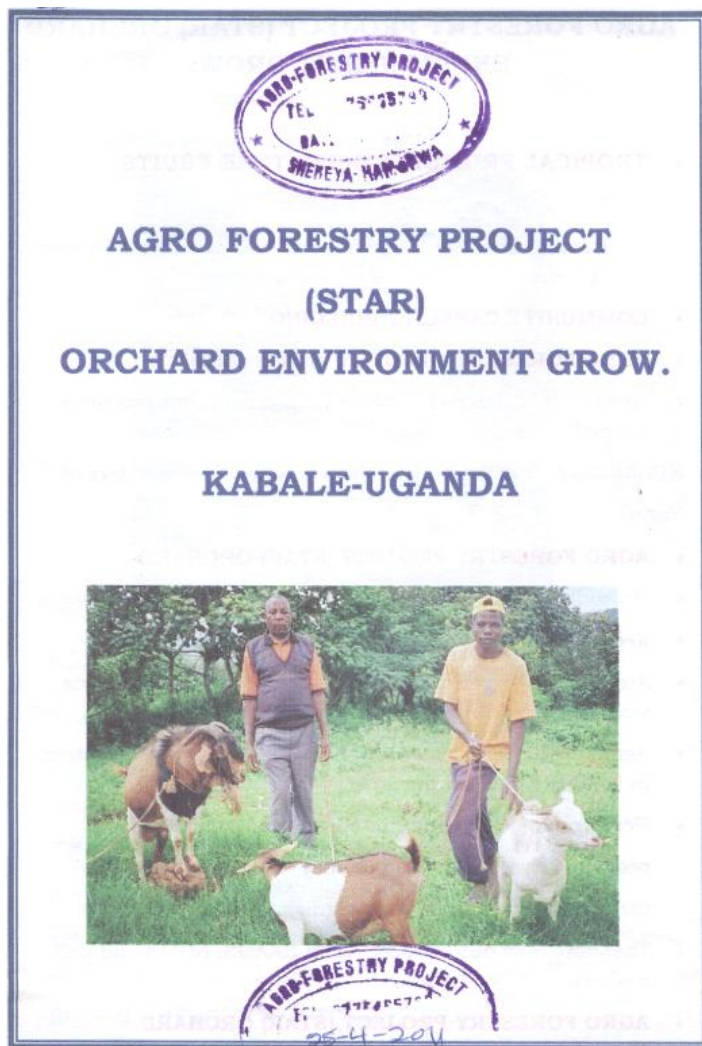**4.4.1 Agroforestry Project – Hamurwa sub-county, Kabale District**

"We must help people to love themselves then they will love their neighbour and ultimately the environment as well" (Agricultural Advisory Officer, Bubare sub-county, 2011)

The Sub-County Chief, Hamurwa sub-county, (2011) raised an important point to "Use the people who are already in the system who are adopting highly in the county to attract people who aren't adopting" for which this case study is a fantastic example.

As aforementioned "trainers of trainers" are a substantial step for the effective dissemination of information and improved farming methods. Christopher Buhnzi, a farmer from Hamurwa sub-county, Kabale district, is an outstanding example of the success from such a programme. Mr Buhanzi has developed his own training school to share his knowledge and expertise with the local community. From adopting agroforestry management practices, Mr Buhanzi has become incredibly enthusiastic and personally proud of the scheme, engaging his achievements and knowledge throughout the community. This case study highlights a perfect example of the "trainers of trainers' idea" by promoting the learning by doing approach (Fox, 1985). Although not necessarily innovative, this approach is simply effective and is a great example of success and community spirit.

Photo 4.2: Mr Buhanzis' Agroforestry Project Office. Mr Buhnzi built this office to host any visiting extension officers and to store any official documentation and books.

AGRO FORESTRY PROJECT

(STAR)

ORCHARD ENVIRONMENT GROW.

KABALE-UGANDA

AGROFORESTRY PROJECT (STAR) ORCHARD

SHEBEYA– IKUMBA VILLAGE HAMURWA **KABALE DISTRICT UGANDA.**

Phone:256775465793
Email:buhazichristopher@yahoo.com

BUHAZI CHRISTOPHER
MANAGING DIRECTOR

AGRO FORESTRY PROJECT (STAR) ORCHARD ENVIRONMENT GROW:

- **TROPICAL FRUITS, TEMPERATURE FRUITS.**
- Grown on the Swaziland Farm.
- Ikumba, Shebeya Hamurwa sub-county, Kabale District Uganda.
- **COMMUNITY CAPACITY BUILDING**
- **AGRO FORESTRY OROJECT (STAR) ORCHARD.**
- Located on 17km from Kabale Town near Hamurwa town council.

Kihihi Road. It is the perfect place to experience wonders of Nature.

- **AGRO FORESTRY PROJECT (STAR) ORCHARD**
- Growing fruit trees on the farm to save environment
- Keeping Animals (Improved Animals), Bee keeping.
- Any assistance funding to project the environment of our world is highly welcome to improve.
- Agro Forestry Project women hand craft group Association in (cottage office) on the farm.
- Here in Kabale-Uganda there is over population where people do not have enough money to pay school fees for their children to finish their studies.
- Therefore they need support from NAADS, NGO's and well wishers.
- **AGRO FORESTRY PROJECT (STAR) ORCHARD.**

- Support community development, Education, hand crafts, PMA etc

At the Switzerland farm.

PROGRESS: Nature and perfect etc.
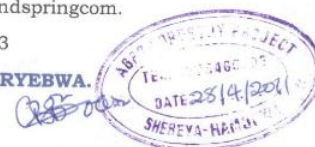

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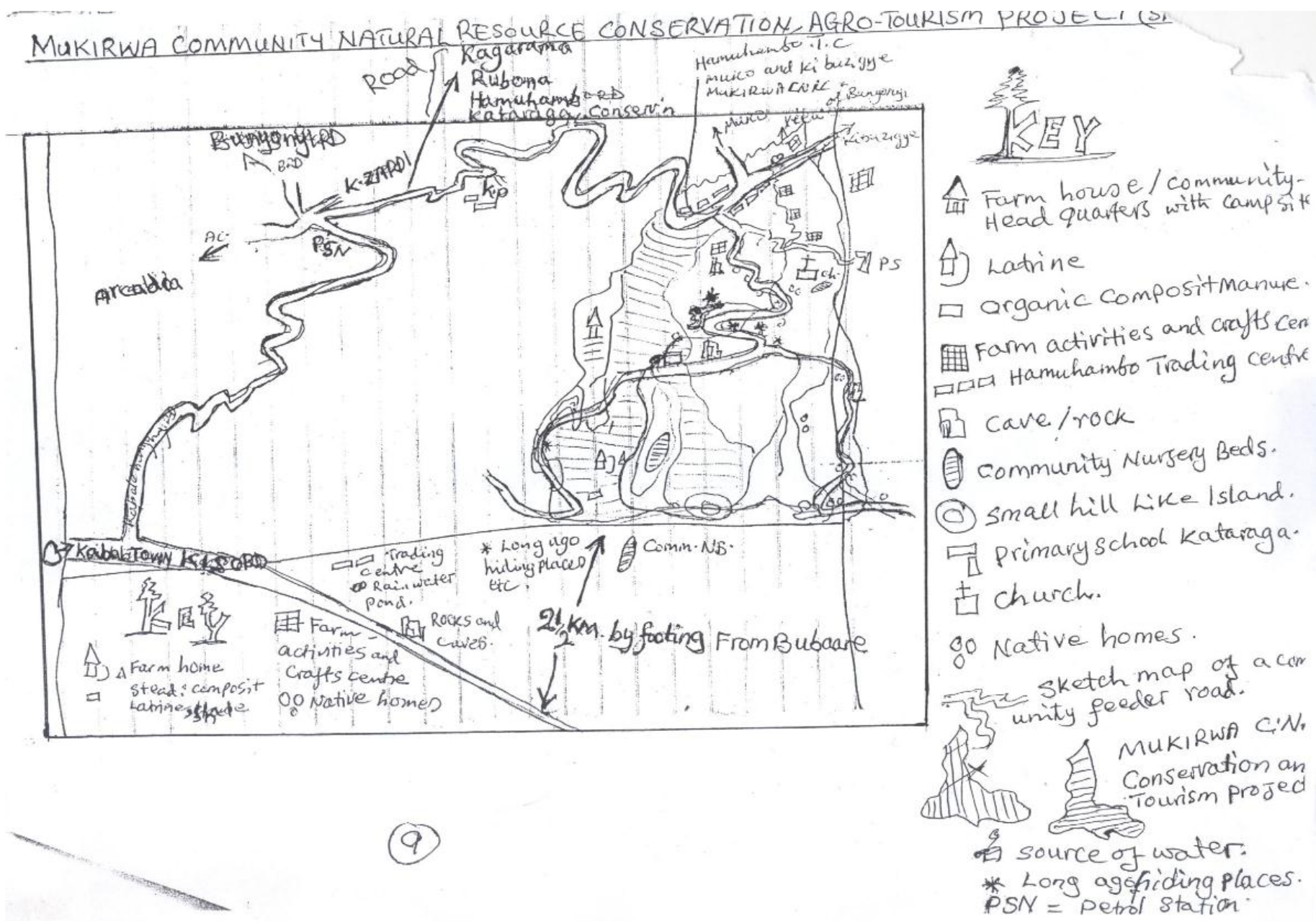Managing Director 0775 465793

BUHAZI CHRISTOPHER TIBARYEBWA.

Figure 4.20: Figure showing Agro-tourism proposal for the Mukirwa community due to their unique location an view of lake Bunyonyi.

Agro-tourism is a type of tourism that has specific agricultural focus (Holland *et al.*, 2003). Due to the Mukirwa communities' exclusive location next to Lake Bunyonyi, which is a local tourism hotspot for backpackers, the agro-tourism business has the potential for gradual and sustainable expansion. Figure 4.22 shows some of the major plans for the region, including tours of the local native homes and unique topographic features. The project was instigated by Henry Turyatemba and constitutes 22 other members. The group has been running since 1999 with some good farmer training initiatives in place, similar to the previous case study. Its unique location gives it breadth for the possible agro-tourism project and the group has further goals for 2016, including embedding a savings and credit scheme and developing a training resources sector.

The two case studies give examples of possible avenues for successful adoption and can be learnt from and developed to influence other future projects in the region.

5. Discussion & Conclusions

5.1 Oil

In the opening statement of the first African Ministerial Conference on the Environment in Cairo, 1985, it was stipulated that "the roots of Africa's enduring crisis lie in the interaction of a number of complex factors: rapid population growth, an unfavourable international economic situation, harsh climatic conditions, and in many cases unsustainable development policies" (Tolba, 1987 Pg.207). However, much substantial work and development has been carried out over the past 26 years, and this can still be observed in much of Africa and most definitely in Uganda. "Management of land, of its soil, water, forests, pastures, and wildlife, has been central to human society from its earliest times" (Young, 2000 Pg. I) and it remains a central feature for over 80% of Ugandans who are dependent on subsistent farming (Lepp, 2007). Improving agricultural systems is a priority that has been relatively neglected in recent years, as the service industry and oil sector take centre stage in Uganda's development discourse (Kashambuzi, 2011). Kashambuzi, (2011) stipulates that the agricultural revolution was a significant step for many of todays developed countries and that taking shortcuts towards the affluent attraction of the oil industry will be ultimately negative for both society and the economy. I find it hard not to agree with this opinion.

In 2009, an estimated 2.5 billion barrels of oil were located in the Albertine Lakes Basin (Gelb & Majerowicz). As seen in other developing countries around the world, it is extremely important to avoid what Veit *et al.* (2011) describe as the "resource curse". This is relevant to developing countries with a large natural resource base and is attributed to the decline in economic competitiveness as the developing economy is established, along with market volatility, ineffective and potentially corrupt governance (Veit *et al.*, 2011). To date, there are no clear policy objectives relating to the management of oil revenues with large companies such as Total who are building a $4.6 billion oil refinery in Kabale (Tumusiime, 2011). Interestingly, while the NRM President Museveni claims that the government will get 70% of countries oil proceeds, the government is not willing to publish sharing agreements in detail (Morgan, 2010). It has been suggested that this deal could be as low as 47% (Morgan, 2010), which may potentially be due to the lack of management objectives and over hasty policy decisions.

Development of the oil industry in Uganda is an unavoidable reality; therefore, progress must be sustainable to avoid further extension of the gap between the rural poor and urban rich which dramatically affects local livelihoods. "Livelihoods are not simply a localized phenomenon, but connected by environmental, economic, political and cultural processes to wider national, regional and global arenas. The sustainability of a livelihood is ascertained by its sensitivity, hardiness and resiliency in the face of short- and long-term challenges" Castro, (2002). This definition shows an interesting connection with possible economic prosperity in the oil industry. Livelihoods may be affected with changes in the larger global arena and represent a cause for concern. SLA was something that I touched upon in the opening research context. Here, Castro, (2002) depicts the main factors that may affect a sustainable livelihood (figure 2.4). In relation to the two districts I studied, most aspect of the framework need to be investigated. As discussed, vulnerability from seasonality and climate change is an on going an unavoidable issue, however adaptation schemes may be influential. Apart from the obvious livelihood asset constraints; policies, institutions and processes are the other obvious areas for development. The importance of the multi-level stakeholder approach in line with Hurni, (2000) five pillars of sustainability are approaches that have been referenced as pivotal by farmers, technocrats and government alike.

5.2 Disease & Pests

The earth is a myriad of intricate, local agricultural systems (Koohafkan & Altieri, 2010) and within that, "Crops and their environments are highly complex systems with a multitude of variables" (Van Herwaarden *et al.,* 2003 Pg.13). As shown, this gives rise to a large number of constraints and opportunities for adopting better land management practices. Diseases and pests are the greatest problem for farmers. The most common pests that cause the largest amount of yield damage are weevils and nematodes; the most common diseases are the soil-borne fungal Panama disease, or bacterial wilt, and the air-borne black leaf spot disease (Kikulwe *et al.*, 2008) (as shown previously in photo 4.1). My findings agree with Kasssie *et al.*, (2011) as they mention that loss of yield from pests and diseases generally exceeds the relative loss from drought, bad management and poor soil. Diseases and pests are therefore issues that must be primarily controlled before more substantial SLM practices can be introduced. For example, Van Herwaarden *et al.*, (2003) stipulate that when trying to introduce nitrogen fixing strategies, the basics of good seedling establishment and control of disease and weeds must be the first priority.

5.3 Decentralisation & Alcoholism

In some cases, decentralisation is thought of as a cost-effective way of reducing the size of central bureaucracies. It shortens the decision-making chain and essentially makes the decisions increasingly relevant at a local level (Acker & Gasperini, 2009). The importance of LC1's involvement in increasing adoption has been noted by academics (Baker, 2005) and the majority of the technocrat and government interviewees. Most noticeably, there has been significant reference towards LC1's capability to increase the local enforcement of bye-laws. The decentralised programme and the LC structure offers huge opportunity to influence policy at a local level (Sanginga *et al.*, 2004) "However, in practice, the system rarely actually incorporates sub-county plans" (Francis & James, 2003 Pg.331). This lack of communication between the LC chain is something that has become evident from the interviews and is an issue that ultimately defeats the decentralised approach. The LC1 level is therefore essential as the main point of contact with the farmers. The representative of this role must be subject knowledgeable, law abiding and ultimately have the farmers best interests at the forefront of his/her plans. If the population does not receive the level of support and protection that it demands and expects, the legitimacy and credibility of decision makers and relevant stakeholders may be compromised and give way to cynicism.

What has been described as the "largest constraint facing adoption" by many of the technocrats and officials is the affect of alcoholism. A significant conversation with the District Vice-Chairperson, Kabale, (2011) yielded information that the LC1's are in many cases the people who brew the alcohol for the farmers. It is this, and similar issues that make successful policy enforcement and adoption wholly unrealistic.

5.4 Motivation & Knowledge

"The majority are not motivated and it is a sensitive issue to be considered" (CDO, Bubare sub-county, 2011). As mentioned in the analysis section, motivation was recognised as a key issue facing SLM adoption. The analysis uncovered opposing opinion to that of the CDO of Bubare as the majority of people said that they are motivated and knowledgeable about concepts of SLM. It is unclear whether farmers are simply saying that they are keen to expand through SLM practices or whether they will actually be prepared to implement them, and it is in fact guidance and knowledge issues that are the greater problem.

Every interview including a question about successful adoption occurring in this area. At the Kabale district level, the District Vice-Chairperson noted 70% adoption, whereas the Forestry Officer said 30%. At the local sub-county level, more realistic responses where given. The CDO's for both Humurwa and Bubare sub-counties said there had been 10-20% successful adoption with similar responses for the other sub-county representatives. The answers show not only a lack of communication throughout the stakeholder levels but also at the district level itself. Groppo, (2005) alludes to The Participatory and Negotiated Territorial Development (PNTD) approach as a useful tool for improving these issues. The PNTD approach aims to strengthen social cohesion throughout the stakeholder chain from a bottom-up approach and is similar to other approaches that I have mentioned including the multi-stakeholder approach by Hurni, (1997).

5.5 Education

"Illiteracy is strongly correlated with hunger and is mainly a rural phenomenon hindering rural development and the wealth of each nation, threatening productivity and health, and limiting opportunities to improve livelihoods" (Acker & Gasperini, 2009. Pg.14). A number of research pieces have outlined the relevance of basic educational services and their positive contribution to improved productivity, food security and livelihoods. The results have been accepted for many years (Moock, 1981, Acker & Gasperini, 2009).

Overall, education levels in Kabale and Mbarara are low; however, 65% of the sample is educated to primary school level. Schools can play an important role within the community by not only educating children on basic agricultural techniques but by also involving their parents, "becoming a community change agent" (Prain, 2010 Pg.125). I believe that innovative ideas such as church mobilisation, leaflet dissemination and radio features are good ways to improve currently slow adoption rates. Similarly, to mobilisation after church services, Prain, (2010) states that schools are a good place to stage agricultural demonstrations for both children and parents alike.

5.6 Recommendations

Given the agricultural diversity and size of Uganda, Hurni, (1997) alludes that SLM is not applicable everywhere and must be adaptable to the region that is being managed in concern to land use, environment, policy, economics, culture, uncertainty and ultimately the most optimal techniques for that specific agricultural zone. I would agree with this statement and believe that assessing the local needs of the farmers is critically important. Although this has been employed to a certain level, there is a need for increased ratification of these bottom-up approaches.

Drawing on the specific areas outlined in the analysis and conclusion sections and from my experience in the field, I have compiled a number of recommendations to possibly increase adoption in the area (Table 4.19).

	Reccomendations
1	Maintain parish specific extension and teaching. In Kabale and Mbarara districts, increase training on disease and pests as the greatest constraint facing farmers adoption
2	Offer farmers increased knolwedge on future climate variability, how to measure risk and gauge possible adaptation capabilities.
3	Increase FFS and farmer-to-farmer interaction to produce a larger network of "trainers of trainers".
4	Methodologically change the location of demonstration areas to encompass all areas of the sub-counties and districts.
5	Introduce innovative approaches to extension to maintain interest and involvement from farmers and extension workers alike. Eg. Flyers, radio shows, TV screenings, church services etc.
6	Promote focus groups across the stakeholder levels to develop innovative and cost effective ways of increasing adoption.
7	Increase byelaw enforcement from an LC1 and sub-county level. The greatest constraint at this level is the consumption of alcohol.
8	Increase both technocrat and policy maker training on both agricultural techniques and also account management. Make national government officals aware of the impact that this lack of training is having both socially and economically.
9	Introduce a stricter screening process for some of the more technical roles of agricultural advisory as some representatives had no agricultural background and therefore were not suitable for the role.
10	Increase the opportunities for academia, industry and government to create linkages and share knowledge on contemporary SLM practices

Table 4.19: Recommendations.

Learning from other countries about the best possible approaches to increasing adoption may bring about some more effective and innovative ideas. Although this is present in a variety of academic publications, the ultimate decision lies with the local councils who have little access to these materials. The support for this approach is represented in table 4.19.

Possibility of learning form neighbouring countries	
Source	Quote
Agricultural Advisory Officer, Hamurwa sub-county, (2011)	"Obviously, alcohol is a big problem"…"You don't need a license and they must be a lot stricter. Like in Rwanda they will imprison you for sure if you drink at this time"…"In Rwanda the law is very tough and it works well but here the bye-laws are not serious because they havn't faced a serious enough problem to see the reasoning to"
District Production Officer, Kabale District, (2011)	"I also have limited exposure and we have not been to neighbouring countries to see what they have done to succeed"

Table 4.20: Table showing the support from both district and sub-county level to learn from other countries in the way they approach policy implementation and enforcement.

Recent oil discoveries on the western border of Uganda have the potential to disrupt future agricultural sustainability. Sporadic skirmishes have also been occurring between the Democratic Republic of Congo and Ugandan government forces since the oil discovery in 2006 (Habati, 2011). Internal corruption, which in turn, produces an increasingly autocratic relationship with the public and political opponents, is also an issue (Habati, 2011). Knowing this, the next few years will be a pivotal period for the sustainable development of agriculture in Uganda. This will not only effect agronomy in Uganda but will also have global repercussions.

5.7 Critiques to Method

- In some cases farmers may not be willing to supply in-depth information on their behaviours and strategies especially relating to costs, benefits or cultural issues.
- For some interviews a translator was necessary and therefore transcripts where based on the translated version. However, to ensure consistency throughout the study I used the same translator for all interviews.
- There are so many intricate issues within the process of adopting land management practices and therefore time was a slight constraint. I do however feel that this process identified the key aims and objectives.

5.8 Future Research

One of my aims was to make the research process adaptable to other regions in the Kagaera Basin. I believe that my questionnaire is adaptable to the other regions and the general structure of the interview process is also transferable. I would suggest that comparative studies where carried out for the areas within the remaining three countries of the TAMP area. Comparative projects will then hopefully generate transferable ideas for policy implementation and solutions to increasing SLM. This approach is supported by many of the technocrats and policy makers, as shown in table 4.19.

In Uganda specifically further research into Pests and diseases as the number one constraint to SLM adoption would also be a beneficial study. Natural constraints were the greatest high-level constraint and for this reason I would also recommend future research on climate variability and the adaptive capacity of the region.

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