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# **The role of institutions in natural resource management in the context of agroecosystems sustainability.**

Cases from peri-urban Masaka, Uganda

A master's thesis in agroecology written by Pernilla Denker

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## **Title**

**Institutioners roll i naturresursförvaltning i kontexten hållbara agroekosystem – case från peri-urban Masaka, Uganda**

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## **Abstract**

In this thesis the roles which institutions play in the management of natural resources are explored. These management strategies and the natural resources were put in the context of sustainable agroecosystems and the components were looked at from a systems perspective. The study has the structure of an embedded multiple case design and conducted through participatory methods: semi-structured interviews, transect walks and focus groups. The results were analyzed using theories on resource governance and management, institutions, agroecosystems sustainability and agroecological systems. Several institutions were identified as playing a more or less important role: family; the law; national, parastatal and government organizations and the informal economy. The most frequently mentioned and discussed natural resources and resource systems were trees, the wetlands, agricultural land, pasture and soil. The study concludes that there is a lack of local natural resource management institutions which connects to the human capital and the absence of facilitation to support such capital in the management of natural resources.

## **Definitions**

Exotic cattle	Breeds brought from other continent, usually Europe. In cows 'exotic' typically means Friesian, Jersey and Guernsey. Often interbred with a domestic breed
NAADS	National Agricultural Advisory Service
NGO	Non-governmental organization
PRA	Participatory rural appraisal
USD	Prices are given in US dollars instead of Ugandan Schillings. 1 USD $\approx$ 2 500 UGX
Zero-grazer	Animal kept in a confined space, such as a pen, around the clock all year without access to pasture

## Foreword

When I started the Agroecology program in the fall of 2010 I was very green – in two senses of the word. As a business student turned green from the realization that the way the global economy works is not long term profitable to anyone, I thought conservation was key to the future. Also green in the sense that I was naïve enough to believe that sustainability could be reached through such methods. I wanted, and thought it could be done, to put nature first. I also believed that it is up to every individual to take on this responsibility and that, food-wise, buying organic local produce is the only right thing to do. During the course of the program these beliefs have at times grown stronger, but have in the long run actually – to my own amazement and relief and sometimes appall – settled in a more detached and, I think, more rational place. The concept of emergence, and its endogenous versus exogenous properties, very well illustrates these conflicts, i.e. the different and equally legitimate views of one phenomenon.

I have for a long time been aware of and understood the meaning of adaptive management in the abstract. During my field study in Uganda I became profoundly aware of its implications, that one thing can actually be two different things when placed in two different contexts. Sweden and Uganda are two very different countries. In having tried to answer questions from farmers and new found friends at Uganda Martyrs about life in Sweden and how it got to where it is now, I have realized that Sweden has actually been where Uganda is now not too long ago. During my visits many farmers have asked for my advice on how they can develop as a community and develop their farming methods. I hope that this study will provide insights to people who have the ability and mandate to translate theory into practice.

I would like to direct my deepest gratitude to all of the farmers and expert informants in peri-urban Masaka who were so generous with their time and information. My supervisor, Örjan Bartholdson, and assistant supervisor, Julius Mwine, have both done a fantastic job in guiding my research and giving constructive critique on my work. Also my deepest thanks go to my guide and interpreter, Godfrey Bwogi, who has given much input and showed great patience during our three weeks in the field. Meresiane Nnassuuna Musoke and Neema, who made me feel so welcome at UMU. Last but not the least I want to direct big thanks to my two student colleagues, Ellinor Isgren and Emmelie Johansson, for great discussions and advice on the way.

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# Part I: Background and frameworks

## 1. Introduction

### 1.1 Problem background

The basic definition of a sustainable agroecosystem is a biophysical system where there is a balance between inputs and outputs, which is managed with methods that can be used perpetually without decline in yields whilst not having negative effects on the social life or on the environment outside the individual farm (Gliessman, 2005). However a presumably idealistic description, at least it offers a frame for analysis. Francis et al (2003) argue that the study of agroecology “can provide insight on how to deal with questions at the systems level and contribute to the development of sustainable societies” (p. 101). An agricultural system is an open system with continuous exchanges with nature and society (Francis, 2003) and whilst not isolated the upstream and downstream effects of activities inside the agricultural system have to be taken into account when assessing the sustainability of an entire agroecosystem (Dryzek, 1997).

About 85% of the population in Uganda base their livelihoods on agriculture (UBOS, 2010) and at the same time the population has for the past century been steadily growing at a yearly rate of over two per cent, currently around 2.4% (Kisamba-Mugerwa, 2001). The agricultural sector has been subject to various remedial programs, including structural adjustment programs and mass extension service methods. The aims have been to pull farmers into the monetary economy but still production is characterized by low yields and low value enterprises (Kisamba-Mugerwa, 2001). Some of the reasons may be weak linkage between formal research institutions, extension services and farmers<sup>1</sup>.

Dryzek (1997) argues that the quest for sustainability cannot be reached top-down and that institutions on a local level are crucial in that development. However, Cleaver (2002) has found that the poor in a community often have difficulties participating in meetings as their labour intensive livelihood simply does not allow for them to sit in on lengthy processes. Nilsson (2004) investigated gender roles in Masaka district and found that men and women are systematically seated differently at meetings and that men are the ones active in farmers’ discussions although farming traditionally is the women’s domain. Having made his research in northern Sweden

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<sup>1</sup> [www.fiuc.org/umu/index.php/capacitateprject](http://www.fiuc.org/umu/index.php/capacitateprject), visited on January 4 2012.



Sandström (2008) argues that social and historical influences are embedded in how management arrangements over a resource is negotiated. Obviously, conflicting interests in natural resource management are not rare. One way of managing scarce resources is through preservation.

Tumusiime and Vedeld (2012) conducted a case study in a village adjacent to a forests preserve and found that the promised incomes to the village from tourism were consumed by costs caused by wildlife encroaching on plantations. The researchers concluded that this failure was due to what they called “institutional confusion”.

Institutions range from kinship to the implications of government and private organizations. Other institutions are the formal and informal economy, which constitute to various extent both developed and developing economies, even though the informal economy makes up a major part of the latter (Harriss-White, 2010). Informal economic activities are characterized as low threshold to entry, low-tech and low levels of capital and skills. Agricultural workers and small scale farmers are highly represented in the informal economy. Different forms of institutions have been referred to in various terms in the literature. The various scientific disciplines dichotomize institutions differently, such as characterizing an economy as either formal an informal. Institutions may change with the composition of people who are in it but institutions may also reinforce patterns which hold change back. Institutions influence what is expected of people who fit into the various categories and thus reinforce social structures (Douglas, 1986).

## **1.2 Problem statement and research questions**

The overall aim of this thesis work is to explore the institutional framework that surrounds the management of natural resources in agriculture in peri-urban Masaka and assess the sustainability of those agroecosystems.

The following research questions are addressed in this thesis:

- 1) Which institutions affect natural resource management and farming strategies in peri-urban Masaka and how are they organized?
- 2) How do farmers in peri-urban Masaka perceive their natural resources and responsibility for the management of them and how do they perceive notions of sustainability?
- 3) How are agricultural systems in peri-urban Masaka constructed from an agroecological perspective?

## 2. Analytical framework

### 2.1 Resource governance and management

Adequate governance arrangements are results of their biophysical backdrop and the needs of the people involved. The longevity of robust natural resources institutions results from modifications through collective choice (Ostrom, 1990). Robustness, the capacity to maintain a sought after quality during change, in natural systems is synonymous with adaptability, but systems vary in the fundament for adaptability. This fundament, according to Ostrom, consists of the rules of collective choice. As a complement Ostrom (2005) has identified eight design principles which she has found to characterize the structure of sustainable common pool resource institutions. A common pool resource is a resource system, such as a forest or an ocean, which is interesting to users because of the units they are made up of, i.e. the fish, the shrimp and the water. By being a user you reduce the share available to other users. It is difficult to exclude users but there are rules to regulate the use of the resource (as compared to a case of open-access where there are no restrictions). A commons dilemma, where users start to extract larger shares and the resource becomes overused and consequently depleted, may arise when utilization by individual users are not somewhat coordinated (Ostrom, 2005).

In successful common pool resource arrangements she found that (1) if the resource is an entire system, as opposed to a single resource, the system boundaries are clearly defined. (2) Resource allocation is regulated, related to local conditions and proportional in benefits and costs. In addition (3) the people affected by the management of the resource are the ones who make management decisions through collective choice arrangements. To be sustainable these systems require (4) monitoring of both the biophysical state of the system as well as monitoring of user behaviour. Monitors may be officials and/or users. (5) Punishments proportionate to the seriousness of violation of the rules, set up to protect the resource from exploitation, are sanctioned by other users or by officials. For when conflicts arise (6) there is a local venue available at low cost to facilitate conflict solving. The principles for sustainable governance institutions also extend beyond the resource users in that (7) government and authorities recognize the right for individuals to organize and right to their longstanding tenure. All of the above activities need to be (8) nested on different scales, i.e. smaller organizations within larger organizations. Such nested enterprises have been shown to overcome the weakness of large scale or small scale governance institutions.

Lewins (2007) is sceptic toward the simplification and how local institutions seem to be given a prioritized role over state or district level institutions. He argues that natural resource systems are too complex for such principles to be literally interpreted.

In response to Ostrom's (2005) design principles Cleaver (2000) concludes that there is no need for graduated sanctions if there are no attempts at breaking rules and that such institutions seem superfluous when people follow social norms. Also the collective choice principle is challenged by observations of people who have to prioritize other things in life or simply choose not to participate. Consequently someone's interest will not be represented whilst another may be over-represented. Cleaver (2000) has also recognized that when problems arise on larger scale community members turned to the authority figure most appropriate for the conflict at hand and that traditional headmen and modern district chairmen exist in parallel with supernatural authorities. Such observations indicate that a division between institutions is inaccurate and that they in fact are intertwined.

## **2.2 Institutions theory**

According to the structural-functionalist school of thought society is made up of social institutions, which fill specific economic and social functions. Their existence depends on the function they have for the order in that society. Family is one such institution, with the function to socialize children. Hylland Eriksen (2010) states that "the person is a social product, but society is created by acting persons" (p.79). Similarly Douglas (1986) argues that humans, their thinking and actions are dependent on institutions, but this dependency is bilateral. Institutions would not exist without human negotiation and hence we shape and reshape them. She explains institutions as being made up of the people whose cultures constitute the norms for institutional actions and that institutions simultaneously make the categorizations of people and places which people also put themselves and others in. Cleaver (2002) has used the terms bureaucratic or socially embedded to describe institutions and she has argued for a fresh look at institutions, one which has overcome the dualistic view of institutions as either formal or informal, traditional or modern. In anthropology the dichotomy small scale and large scale persists. Such dichotomies are however not unproblematic as they represent ideals whilst the world is constituted of gray zones (Hylland Eriksen, 2010).

Ostrom's (2005) eight design principles describe what could work as a researcher's guide in identifying strengths and weaknesses in natural resource management institutions. She does however maintain that the multitude of institutions can never take the same shape. Cleaver (2000) on the other hand criticizes the rigidity of Ostrom's (2005) principles calling on examples from case studies where decisions are complexly embedded in cultural, historical and agroecological conditions. Bricolage is the process through which institutions are constructed through borrowing and diversification of the institutions which exist in a society (Cleaver, 2002). They often fulfill more than one purpose and rather than inventing new institutions old ones are adapted to new conditions. These changes and other decisions are often negotiated outside formal

meetings and thus she argues, just like Hylland Eriksen (2010), that institutions are neither wholly formal or informal.

### **2.3 Sustainable agroecosystems design principles**

*“Problems in sustaining agriculture’s natural resource foundation can only be masked for so long by modern practices and high input technologies. ...the negative impacts on farms and farming communities will continue to become more evident. The conversion to sustainable agroecosystems must become our goal”* Gliessman, 2005, p. 104

Altieri et al (1983) suggest four fundamental principles for agroecosystem sustainability:

1) primary production gives a clue about the soil’s carrying capacity. An area covered in a certain amount of biomass will not be able to support more biomass without additional inputs and thus a grassland area should not be turned into an orchard.

2) land use capability relates to the assessment of soil quality and other biophysical factors, such as water availability, soil texture, resilience to erosion

3) vegetational patterns of a preexisting natural ecosystem should be used as model, when an agricultural system is under establishment. Edible crop species will replace the original wild species, but the physical structure of the original vegetation profile will be the same.

4) knowledge of successful local farming practices. Diverse and intercropped agricultural systems adapted to local conditions where appropriate techniques are in use have been shown to replenish the soil and provide for both economic stability and social equality.

When these four basic principles have been followed there are several more which generally contribute to long term sustainability of the agricultural system. Some of these are: minimized tillage of the soil; the use of living mulch and cover cropping; biological nitrogen fixation; the use of windbreaks and biological pest management. These help to increase the overall sustainability of the entire agroecosystem because external effects of activities within the agricultural system will decrease. In addition to these, another four methods which have been recognized by Pretty (2002) to improve sustainability through development of small scale agriculture should be considered. They involve 1) intensified utilization of one part of the system without affecting the other parts, 2) adding another productive element, 3) better planning of the use of natural resources such as land and water and 4) the introduction of legumes, IPM or local varieties to increase the yields of staple crops.

Thus far the focus has been on agricultural production vis-à-vis the environment and Pretty (2002) defines sustainable agriculture as making “the best of nature's goods and services while not damaging the environment” (p. 56). Other aspects of sustainable agriculture, the health of farmers, just societies and the multifunctionality of agriculture as a producer of public goods, will be treated in the next section.

## **2.4 Systems perspective in agroecology**

The core in agroecology is the sustainability of agroecosystems within which continuous exchanges take place between agricultural and adjacent sub-systems (Gliessman, 2008; Dryzek, 1997).

One challenge in agroecological research is to unify several aspects to produce a valid analysis. In anthropology the concept of reproduction (Cleaver, 2005) is used to describe how social organizations are maintained over time, and not necessarily in a good way. At the same time agroecologists argue that agroecosystems should be based on the models of natural ecosystems, which “provide a model of survival and relative stability” (Frances, 2003, p. 101), i.e. the way natural ecosystems reproduce themselves. Hence the sustainability analysis of a system is not without contradictions. The acknowledgment of these complexities is at the essence of the systems approach to agriculture, which also involves taking into account the different and various views of a problem. Pretty (2002) argues that the current narrow measures of agricultural efficiency are what make modern agricultural practices look successful but he also highlights five assets which are equally important components for the success of agricultural production. These are groups of different types of capital which simultaneously affect and are affected by the level of production through feedback loops. Social capital is based on networks, norms, prestige, trust, reciprocity and attitudes, that are important to produce and reproduce a society, whilst human capital is the skills and health of the same people. The skills to interact and organize are crucial for the addition of value to other assets. Natural capital includes natural resources but also the management of waste and nutrient cycling. Both the physical and financial capital are what farmers have to work with to facilitate their production, such as buildings, markets and pensions and remittance and subsidies. When agriculture is practiced in sustainable ways one type of capital feeds back to add value to the other assets and thus sustainable agroecosystems are positive for both society and nature. The effects of a negative feedback loop are what is also known as externalities (Pretty, 2002). These are unintended but actual strains on the different assets and occur when longterm and spatial effects of agricultural practices are not taken into account. In the long run they encompass private costs incurred on, as well as by, farmers. In this thesis, what is treated as agroecosystem are the agricultural systems in the area and their exchanges.

## **3. Research methodology**

### **3.1 The case study design**

The over all aim of this thesis is to explore the institutional framework that surrounds the management of natural resources in agriculture in peri-urban Masaka. Because this geographical area was new to me I didn't know much about what I would find in the first place. I knew what I wanted to look for and I knew I knew that it would require a holistic approach. I wanted to find out the how and why of management strategies but it wasn't important to the study that the results be representative of the entire district, or even of any village for that matter. This holistic systems perspective would perhaps be best facilitated by a case study approach, as it allows for exploration of real life in its every day context through triangulation (Yin, 2003).

On the opposite end from case studies on the research spectrum are literature studies of secondary data, based solely on the literature chosen by the researcher, and experiments in which research is reduced to the single predetermined independent and dependent variables of a system. In the research designs on the exploratory end of the spectrum it is the subjective perceptions of the informants that constitute the data. This case study has used methods from the Participatory rural appraisal (PRA) tool box to explore farming strategies. How farmers define their world is what the researcher has to abide to in defining the system to be studied. Boundaries can not be fixed from the start but rather will become clear as the researcher explores the reality of the informants (Yin, 2003).

The case study method comes in several different design structures, each formulated according to the number of units of analysis identified. As this study has two units of analysis – the institutions involved in natural resource management and farmers' perceptions of natural resources and sustainability – it will have the structure of an embedded multiple case design (Yin, 2003).

### **3.2 Participatory rural appraisal (PRA)**

In order to get to the bottom of a case study involving people, appropriate methods need to be employed. Batterbury's (2001) team used semi-structured interviews complemented by group discussions and participatory research exercises to explore bricolage and income diversification in farming households in rural Nigeria.

PRA was developed from Rapid rural appraisal (RRA) (Chambers, 1995; FAO, 2000) and has shifted focus from mainly collecting data about rural livelihoods to getting the perspectives of farmers and rural people. The two methods do however share the same principles for approaching a study suggested by Chambers (1981). The researcher should avoid strict sampling and allow for

meetings to take time and that time could actually be lost by rushing by having to gather subsequent information to bridge gaps. There is also a point in not making assumptions about categories, which may be biases that have a meaning to the researcher but may be meaningless to the informant in their context. The researcher has to be gender sensitive at all times and should assume the position of a student, learning from the farmer and trying to see the world from their perspective.

Two methods that are suggested in the PRA tool box (FAO, 2000) were modified and used. One is the use of Venn diagrams to find out participants' view of relationships between organizations and groups. This tool was adapted to be used to find out which perceptions farmers have of the three pillars – society, economy and environment – of the sustainability analysis (GEO-4, 2007) and how these pillars relate to each other. The other method used is the resource cards. Several cards were used with the names of people and formal institutions. The cards were then to be placed in the order of responsibility to govern natural resources. Both methods were used in the focus group sessions.

### **3.3 Interviews**

The most obvious method I could think of to find out which strategies farmers use to manage natural resources in their agricultural systems was to make interviews. An interview situation does however have its drawbacks and informants may, for example, answer what they think the researcher wants to hear or try to give the 'right' answer (Kvale & Brinkmann, 2008). Transect walks (FAO, 1997) through the agricultural systems were used as complementary method to the sit down interviews. During these walks questions often appeared that I had never thought to ask about in advance because they were raised in that specific situation or garden.

An interview guide was constructed to be as open-ended as possible and was used during the semi-structured interviews (Bernard, 2006). Different interview guides were constructed for the different informants, as some expert informants were consulted to complement the farmer interviews. A voice recorder was used in all interviews, except for a few where the informant declined to be recorded, and the recordings were transcribed.

A male interpreter, a Masaka resident, was appointed by the Department of Agriculture at Uganda Martyrs University. He also had the function of guide and driver, as the area was new to me and transportation outside of the urban area does pose some challenges. For instance, there are no street addresses and public transportation stops are all located along the main roads and town centers. About half of the informants were interviewed in Luganda with the help of the interpreter whilst the other half were interviewed using English or a mix of English and Luganda.

### 3.4 Focus groups

Focus groups can be used to get detailed information by letting participants who have something in common, the reason why they are there, discuss the researcher's questions between themselves. In a focus group session there is the opportunity to get a lot of information in a relatively short time. One disadvantage however is that groups are less easy to control compared to individual interviews. The typical group has six to twelve participants and Bernard (2006) recommends they do not previously know each other. These requirements both posed some practical difficulties. First of all people from one village tend to know each other at least to some degree and due to budget and time restraints and a limited contact network it was not possible to bring in farmers from other villages. Secondly, if more time had been spent in the area or communications had been easier it might have been possible to perhaps find a more suitable venue. Since an interpreter was used for both focus groups and because time was a limiting factor to the farmers and to me, the smaller group size was chosen. One consequence of interpretation is that almost twice as much time is needed to say the same thing.

The discussions were done in two groups, one with female farmers and one with male. Bernard (2006) recommends that the moderator and participants not know each other, i.e. have private or professional relations, and this time it was transferred to the interpreter role as well. The subjects were not obviously sensitive issues and therefore the same male interpreter consulted for all other interviews was present during the men's focus group. However, as the interpreter was acquainted or friends with some of the husbands of the participants in the women's group an outside female interpreter was brought in for the occasion in order to avoid that some of the women might feel inhibited in the discussions by a man who is acquainted with her husband.

The focus groups were intended to find out farmers' perceptions of natural resources, responsibility for the management of them and their perceptions of sustainability. As the sustainability concept is an analytical tool, it is not quite suitable as subject of a discussion. Another obstacle is that there is no word for it in Luganda. Therefore I chose to break the concept down into the three pillars of sustainability (GEO-4, 2007) – the social, economic and environmental perspectives – and let farmers discuss around them.



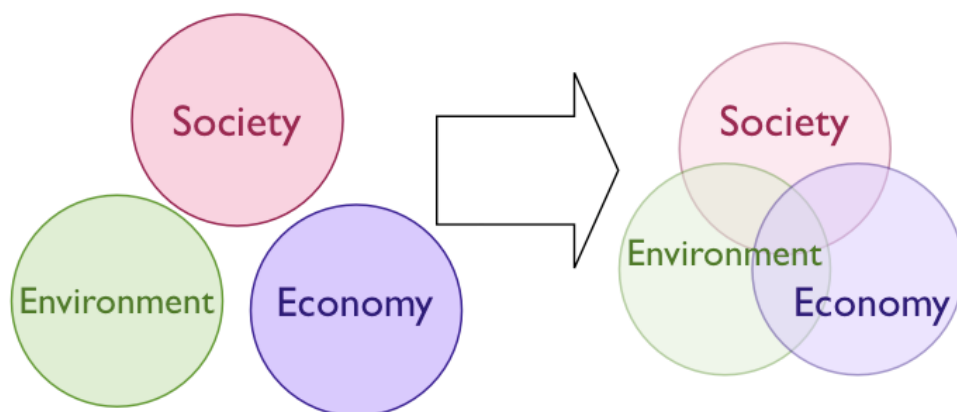


Figure 3.1. The three pillars that form the foundation for the sustainability analysis. (Adapted from, GEO-4, 2007)

### 3.5 Informant sampling

At first the Local Council hierarchy was employed to structure the identification of areas for interviews. A few councillors and civil servants from two of the three LC3 offices in Masaka were interviewed as well as farmers in villages vertically sub-ordered to these LC3s. The reason for choosing to stay within the same lines of LCs was simply to stay within the same bylaw frames, as bylaws which apply in the villages are drafted by councilors on the LC3 level. The LC hierarchy will be described in further detail in section 4.1.

Both convenience and purposive non-probability sampling methods were used to contact informants (Bernard, 2006). Since I didn't know the area or the people we started out with convenience sampling by talking to farmers who were home at the time we drove by. After some time certain questions had emerged and in order to get them answered I decided to contact people who might be able to do that. Some of these questions pertained to cattle in general, and then turned into being about cattle of local breed, and others were about trees and thus I went to talk to people who work with these.

I also facilitated focus group to gather information generated in the relatively more dynamic group interaction. This was also done on village level, mainly so that it would be easy for participants to attend as villages are rather small. The two groups were divided into one consisting of only women and one consisting of only men. The decision to make this division was based on my experience from previous interviews with wives and husbands together, where the wife sits back and the husband answers the questions, even though the question is directed at both.

## 4. Background on Masaka district

### 4.1 Legal framework

Masaka is situated in what was formerly the Baganda kingdom (REF). The language spoken is Luganda, which is the language spoken by the largest number of people in Uganda, next to English. After the civil war, which ended in 1986, reforms have been executed all over Uganda to decentralize different forms of governance (Sanginga, 2010). Now the country is divided into 111 rather decentralized districts, each governed by a Local Council 5 (LC5 for short or simply district offices). The district is divided into a number of LC3s, which are local governments on sub-county level, that in turn comprise a number of LC2s. The LC2s, or parishes, don't have any legal power. Within the sub-county there are several LC1s, the legal entities of the villages, with committees consisting of nine distinctive grassroots farmers who have been elected councilors (Sanginga, 2010). LC4s used to be county level but were removed and now only remain in the larger towns, e.g. Masaka and Kampala, and are municipalities comprising a number of local government divisions, i.e. LC3s. Masaka is thus both a district center and a municipality. Masaka municipality encompasses three LC3 divisions, Nyendo/Ssenyange, Katwe/Butego and Kimaanya.

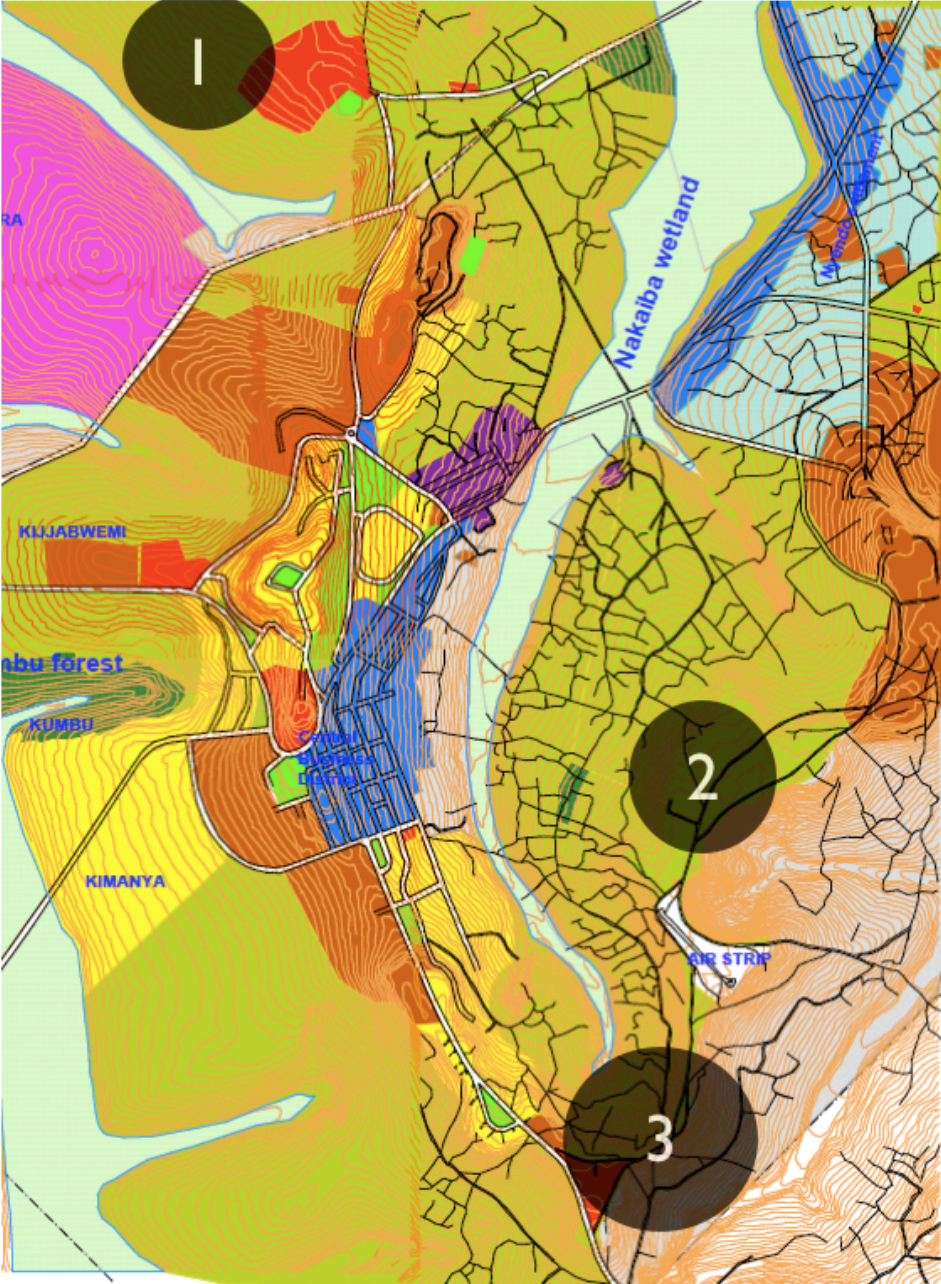
According to Sanginga et al (2010) the laws are divided into different levels of jurisdiction. Laws that apply in all parts of the country are called statutes. All other laws have to congue with these statutes. Ordinances are only applicable within the district where they have been drafted and is in accordance with conditions in that specific district. In the different sub-counties there are bylaws which apply to all villages with the jurisdiction of that LC3. Local Councils on both levels 1 and 3 can formulate bylaws but they are drafted by the LC3. The enactment of the bylaw is however a multilevel sequential process.

From Sanginga et al (2010):

1. A bylaw bill may be drafted by a LC3 councilor to initiate the process.
2. After the bill has been introduced to the council it is published and distributed to all councilors to be debated.
3. A verdict is due within 14 days after publication.
4. If passed, the bill will be forwarded to a higher instance to have it approved for congruence with current statutes and the constitution.
5. If returned with certification from the Attorney General the bill becomes an ordinance (district level) or bylaw (sub-county level) after being signed by the district chairperson.
6. The ordinance or bylaw is then Gazetted and published in various media.

**4.2 The geographical area**

The research area is concentrated to the peri-urban area of Masaka municipality. Masaka is situated in the hilly landscape about 40 kilometers west of Lake Victoria. Figure 1 illustrates the topography of the area with its variably steep hillsides and wetland areas and have the three villages, Namasenene, Bwala and Kidida, marked.



Map 4.1 A topographic map of Masaka municipality with the villages Namasenene (1), Kidida (2) and Bwala (3). (Adapted from UN-HABITAT,2010)

## Part II: Cases and results: Namasenene, Bwala and Kidda villages

In this part six cases will be presented in the form of excerpts from interviews and transect walks. The choice to present them case by case was made so that the dependency on and of the different parts of the agricultural systems would be easily visible. These cases are presented on the basis of comprising element content present in other cases as well as additional elements. The results of the study are based on analysis of findings in twenty four farmer interviews, in two focus groups and six expert informant interviews. The results from the focus groups are presented in the form of citations and figures.

### 5. Cases

#### 5.1 Laurentia

Laurentia, 41, says she has been a farmer since she was born. This farm has been her home for almost twenty years. She is a widow and two out of her three children still live at home. The daughters are the oldest ones and have both finished senior seven (S7)<sup>2</sup>. The oldest is studying to become a nurse and the second is studying computer science instead of secondary school whilst the youngest, a son, has ended school and helps out on the farm. She used to own almost one hectare of land but two years ago she had to sell one quarter of it to be able to pay for her daughter's school fees at Masaka Comprehensive. The decrease in land has affected her income.

*“I used to grow some potatoes there and now I don't have the space to grow it. The space which I have now is only for some small coffee and banana, cassava and beans. Though I have some cocoyams which are intercropped with the banana.”*

During the transect walk she shows the place where her son tried to grow Gloria cabbage. He wanted to make an income by selling it but the cabbage became infested with an unknown disease and would not grow. On the farm she has five zero-grazing pigs and a few local breed chicken. The pigs contribute to part of her income and about twice a year she can sell a few piglets and one or two mature pigs. They generate an income of about 220 USD.

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<sup>2</sup> The school system is divided into Primary school (1-7) and Secondary school (1-7). S7 is the last year in Primary school.

Firewood is used for fuel and she gets it all from within her own plot as a way to cut down on expenses. After the rain there is always new wood lying around and she can use branches from fruit trees and cassava after she has harvested it.

*“But it is not a lot. At first we had some eucalyptus. When we cut it down we remained with these stumps. We broke the stumps and we used them. Sometimes we break some small trees to get firewood.”*

She admits that they don't plant new trees, despite the statute demanding that two new trees be planted for every tree that is cut.

*“The land is becoming smaller and smaller and smaller. And now it is too small. But I've been planning to plant shrubs, but not big trees.”*

She does see the problem with that strategy as shrubs will not produce enough wood and eventually she says she will have to buy firewood at the market. She explains that the shortage of land has led to cooperation between farmers and on her part she lets a friend keep their pigs in a small pen on her land. They have an even smaller plot than she does and don't have room for the pigs at home, but the shortage also causes conflicts.

*“My neighbours are very stubborn. They have those goats, they destroy my crops. The cows destroy my crops. And the pigs destroy my crops. That's the problem./.../ Some get loose but some are left to walk around.”*

Laurentia has tried to get help from law enforcement but they didn't assist her. She has also talked to her neighbours, but not all of them respond the way she would hope. Some turn the problem around and make her feel like the person who puts them under pressure. She says that some of them have less than a third of a hectare or even as little as one fifth.

*“Most of them have land for their buildings only.”*

She manages the soil with fertilizers in the form of pig manure and she also buys poultry husk and some cow manure from her neighbours. She sometimes buys artificial fertilizers but she can hardly afford it anymore. The manure she buys from her neighbour is much cheaper than the artificial fertilizers but she does prefer those over manure. Besides being too expensive she can't apply it every season anyway because it makes the soil acidic.

She uses dead mulch such as grass and banana leaves to cover the soil in the banana plantation. That is something which was always done on her family's farm, but she learnt a bit about soil

nutrient management when she was a participant in a Vi-project<sup>3</sup> ten years ago. She learnt about soil covers and she even used to teach other farmers before the project ended. She says she has learnt about modern ways to manage soil covers, but says that the main difference is that she now knows more about what types mulch to choose to avoid pests and insects. Many of her banana trees are however infested with banana bacterial wilt (BBW) and the banana harvests have lessened in recent years because of it. Weeds are still a problem in the rest of her garden and she says she spends a lot of time trying to control them and therefore she tried herbicides but they also killed the cocoyams.

*“I look after the animals, I have to come back to cook for my self and the children, to wash clothes, to go to the church./.../For example today I have to go to the church, on Saturday I have to go to the church, and then on Sunday. We have a new group and we have to get together to pray. Even on Saturday I have to go to mass and on Sunday in the morning I have to go and even on other days I have to go and prepare.”*

Outside the house they have a water tap provided by the municipality. She pays just over 8 USD per month for this water which she can use unrestrictedly.

*“I’ve never tried to harvest rainwater. Maybe because I have a tap. But I try to think about it because I see that I use alot of money to pay that water. But I have not yet bought where I can collect it. I have to buy a tank.”*

Her neighbour collects rainwater and she know how it is done but admits she thinks it is convenient to get it like this and it takes time to save up the money to buy a tank.

## **5.2 Mary**

Mary is 53 and lives with her husband on their one to one and a half hectares of land. Mary and her siblings inherited the land form their parents she and her husband were appointed to manage it. Hence they don’t have a title and their children will have to decide between themselves who shall take over the land after them.

They breed pigs and she currently has four of them. They needed to diversify their income and asked for pigs form NAADS<sup>4</sup>. Because of the shortage of land in the area they had to provide a pigpen where the animals could be confined at all times, before being eligible to receive them. Half of their income comes form selling surplus fruits and vegetables and the other half comes from the pig husbandry business. This does however involve a lot of expenses as well. They buy

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<sup>3</sup> Vi Agroforestry Programme, Part of the Swedish Cooperative Centre (SCC)

<sup>4</sup> National Agricultural Advisory Services. Provide extension services to farmers.

600 kilos of fodder every seven months at around 96 USD but the pigs are not sold at the same rate and so they often don't have the cash to pay for the fodder. Together with neighbours she has a loan group that takes microfinance loans from the christian credit institution Opportunity Uganda. She uses the money to buy fodder for the pigs but for many other expenses as well.

*"There is nothing you can do without getting these small loans."*

Mary also buys firewood at the market mainly because there are not enough trees in their garden to get wood from. They only have one ficus, two avocado trees and a few coffee trees but no calliandra or other shrubs. They need to have trees that produce fruits and so there is no room for other trees. At the same time most residues from the fruit trees are used as soil cover in the banana plantation. They haven't estimated the cost of buying firewood instead of collecting it.

*"Sometimes firewood can be expensive. Another day you can go to the coffee tree."*

Ashes from the fire are placed under the banana trees and the soil in that plantation is mulched with crop residues. This is how her parents did it back when they farmed this land. Now that they have their own pigs they get manure to fertilize the soil. It is applied in the bananas and where they grow tomatoes and cabbage. Before Mary had the pigs they bought manure from different neighbours who had more than they needed. Soil covers are only used in the banana plantation but they do have problems with weeds all over the garden, except for where the soil is covered. If they have the money they buy herbicides about once a year but that rarely happens.

They get their water from a protected spring where Mary's husband fetches about one hundred forty liters every day. The spring is managed by the LC1 and villagers are allowed to get as much water as they need. Besides the spring as a source of water they also harvest rainwater. She explains that the water is her husbands domain and so she isn't sure how much they can harvest or how much of the water that they use that has been harvested. If she needs a lot of water he will bring it and may be a mix of spring and rainwater. But she does economize and tries to keep their consumption down. Most of the water they consume is given to the pigs.

She has no experience from NGOs or extension services. She has been to a few seminars but they have largely been on biogas. I ask if she has been to any seminar that has changed the way they manage their garden. Besides the one where she learnt about pig husbandry six years ago she answers no.

*"I have the knowledge but I have not yet had the opportunity to use it."*

At the local council they rarely talk about natural resources, except for stray animals and land conflicts. There are about ten conflicts concerning boundaries each year but most of them are solved in court and only about one or two can be settled in the village.

### 5.3 Solomon

Despite owning almost four and a half hectares of land Solomon only gets little farm income. He has been a farmer all his life and has lived on his current farm for over sixty years. This is where he and his wife have raised nine children. Now only the youngest, a fourteen year old daughter, still lives at home. She is in senior 4 and sometimes helps out on the farm during school breaks but Solomon and his wife are the ones who do the work. He explains that his daughter is not the one who will be taking over, but that she will be ending school after this year and is soon going to be married. He thinks that his 21 year old son, who is a business student at Kabale University, is better equipped to take over the farm.

The coffee and sweet bananas that they grow are sold but the matooke and fruits are grown for home consumption. The avocado trees only produce enough for himself and his family. Solomon also has a few goats and since nine years he has two local breed cows. A pasture located about seven miles from his home makes up almost 90% of his land. There is where his cows are brought by a herdsman to graze, together with several other animals.

*“The animals are mixed up with animals of friends of mine. I’m not sure exactly how many animals these people have because mine are taken for grazing every morning combined with those [other animals] and they only bring mine back in the afternoon.”*

I ask if the the pasture could be overgrazed but he has never experienced it during the decades that the land has belonged to his family and it doesn’t seem to be a concern. He reasons that if they did run out of grass they would just have to cut it from somewhere else. None of his friends have to pay for the share that their animals get and he lets them graze as a favour.

*“Around here it is very difficult to get big land for pasture because all the land is being cultivated.”*

Solomon says that the costs related to his current local cows are only what he has to pay the herdsman, who charges less than .5 USD per cow per month from the owners. According to him it is difficult to find a good herdsman these days and few people want to do it. It is very difficult to find a good herdsman. It isn’t that they are lazy but they don’t want to work.



When he grew up his family always had local cows. When he decided to buy his current ones it was to get fertilizers for his matoke and coffee plantations. Since his cows are kept off the farm during the days he can't get as much manure from them as his plantations require. He buys additional manure from anyone who is selling. To manage his coffee he applies artificial fertilizers, which cost him around 260 USD twice a year. He also needs to buy new seedlings sometimes and he almost always uses microfinance loans to buy these components each season.

*“[Children help] sometimes, but when they're not around, you have to struggle by yourself.”*

He doesn't keep the cows for milk because they are mostly too far away from the house. They would only produce about one liter each anyway and so he buys his milk instead. He would have wanted to get exotic zero-grazing cows but there is no money for it he says.

*“If there were anyone financing it I would because we don't want to go without our local ones because our local ones are not that expensive to look after. There is not much care needed like for the exotic ones.”*

#### **5.4 Hamid**

Hamid has had his farm for over thirty years and he now owns a total of one and a half hectares. He is one of the farmers I met who has been officially employed and he has used his wages to save up to build their house and to make new investments. He hasn't been able to acquire any land in many years since almost all of the family's income has gone into schooling for his children.

*“I started very very small with a few chicken. Then I bought some goats and then the cows there. But I've been using the outcome of those to educate my children. That's why [the farm] hasn't expanded.”*

Hamid has had one or two cows for as long as he has had the farm and his first one was brought with him from his parents' farm. He has chosen cross bred cows because they produce as much milk as pure Friesians or Guernseys whilst being more resistant to diseases. He has two zero-grazers and one calf. The two grown animals are however not kept in a confined space like zero-grazers normally are but rather in a small pasture of about twenty by twenty meters. He also owns some goats but he has sent them to his son's farm in Bukakata<sup>5</sup> because there is no room for them here.

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<sup>5</sup> Bukakata is a sub-county in Masaka district. It is situated to the east of Masaka municipality, on the shore of Lake Victoria.

He sells around 600 liters of milk and about two hundred eggs per months as well as a few goats per year. They also grow cassava and other common crops for home consumption. Even though the children have moved out of the house they still influence the management of the land. The matoke plantation is quite large and Hamid explains:

*“I have an extended family and I have an old parent somewhere there that I send some help.”*

His son tells us that his older siblings have all graduated from the university and have houses and incomes of their own. They don't have much land and so Hamid feels responsible to provide them with food. When asked he says he hasn't "taken the trouble to record" how much of the total matoke harvest is given away to family members. His youngest son is nineteen and helps out on the farm full time.

*“I've been helping out ever since I was a little boy. They used to send us 'go get this go get that' and it started like that. Now I'm here to manage when my parents are not here.”*

He is the one responsible for collecting forage for the cows and he cuts and brings home about 65 kilos of grass and callinandra each day. He does however not restrict collection to their own forage plot. Every two days he walks a mile to collect grass from 'communal areas' as to let their own plot re-grow somewhat. However, all land in Masaka municipality has been privatized and no communal areas actually exist. According to him he sometimes meets herders who take their cattle there to graze, but he is the only one who goes there just to pick grass. He says he is not the one who is going to take over the farm, but that they are all going to look after it. Hamid agrees.

*“You know here everything which is carried out in our house everyone needs to know so that they can give their advice about what they think should be done.”*

He has learnt to plant a lot of grass and elephant grass on the contours and to mulch the soil so that it will not erode. He has planted jacaranda, calliandra, ficus, mango and avocado in their garden and this is where they get most of their firewood.

*“I collect it from the trees. I have a number of trees. I cut of branches, clean them and then use them for firewood.”*

They do however have electricity in their house and use it to cook small things but firewood is used for traditional cooking, like matoke.

Hamid has invested in a one thousand liter tank. In the rainy season his family can go for a month or longer without having to use tap water. The biannual rainy seasons take place in March

through May and September through November. This March there hasn't been much rain and thus farmers have not been able to rely on it for irrigation in the next dry season.

## 5.5 Theopiste

At age 67, Theopiste can't keep all of her land cultivated. She has five grandchildren living with her, but they are only in primary school and too young to be of any real help on the land. In time they are going to start helping out during breaks but in the meanwhile her children pay a helper who comes there a few times a week to dig. She says she has three gardens and one pasture, distributed on a total of one and a half hectares. With help from his parents her husband bought a small piece land when they got married. She later inherited a larger piece together with her siblings but during the wars they sold it off and bought a plot closer to their home.

Theopiste has 'around' six cows that belong to her and her grownup children. She wouldn't be more specific than that. She hires a herdsman who takes them to the pasture. Her herdsman is responsible for other people's animals as well and often a few herdsman bring several herds together during the days. She says that many owners have very little land and so their herdsman take the cows to different pastures every day. She doesn't know how many animals there are in total and she lets the other owners' cattle graze on her land for free. She says that not all land necessarily needs to be utilized and that it is an asset that can be sold off in times of need.

She gets firewood from her woodlot, a small area of a few trees next to the pasture, where she and her granddaughter collect it. There she has acacia, eucalyptus and calliandra. She collects the ashes from the firewood and at the time the banana trees are pruned she mixes the ash with the soil in the banana plantation. She only planted a tree once, a eucalyptus, which has now spread so that there are several eucalyptus trees. She can't remember when they last cut a tree but if they did it would be a eucalyptus because they regrow by themselves and grow fast. She grows bananas in two places on her land. Right now she is working on spreading manure in one of the gardens.

*"Here I applied manure seven years back. Now I'm going to reapply."*

She explains that she fertilizes the soil in each of the gardens only once every seven years. She applies it before planting seeds and seedlings and the years she doesn't have a garden to put the manure she sells it.

*"It is traditional knowledge that you can't apply manure every year. If you do the soil will be overfertilized. Now we apply it every seven years and stop for some time."*

They get water from a protected spring where her granddaughter fetches it. Several villages get their water from the same spring and they use it for free. She also harvest rainwater during the rainy season and can collect up to six hundred liters.

She has no experience from NGOs or from extensionists. She sometimes attends seminars but she only goes there to get seeds. Some seminars are called by the local council and are compulsory. They are often about cooperation and food security. She thinks that her land is too small and that she herself is too old to convert that knowledge into practice.

## **5.6 Fausta**

Fausta is 60 years old and has lived on this land all her life. Her husband died several years ago but her 31 year old son Moses, his wife Jenny and their child live in a small house on the same land. Fausta has no title for the property which she and her siblings inherited from their father. At first they divided the land so that everyone had a plot but now only two siblings remain. They decided to sell off a few pieces of land and Fausta now has just over a hectare. Moses is preparing to have it surveyed to get a title because it makes the process easier if he needs to sell it. He explains that his three older sisters are all married and live somewhere else.

About five years ago Fausta used to have a local breed cow that she kept tethered and that Moses sometimes took out to graze on a pasture that belongs to a neighbour. This neighbour doesn't have any cattle of her own but lets others take their cattle there to graze. The cow couldn't however conceive and hence not produce any milk and so she sold it after some time. Besides to get milk the other purpose with keeping a cow was to get manure for the garden. Now they remain with one goat that is tethered to a tree in front of her house and that she takes for walks to let it graze.

*“It is an insurance. In case there is a problem the goat can be sold off.”*

The value of a goat depends on its size. Her goat is medium sized and worth about 50 USD.

They grow cassava, sweet potatoes, beans and “some matoke”. This was surprising as in most gardens I have visited the banana trees have taken up more than half of the area.

*“We've had a lot of sun and very little rain. The matoke has dried up but as soon as we get some good rain we will replant the young trees.”*

They don't any of the produce and if they have any surplus Fausta gives it to her siblings and their families, since it is their land as well. In return she gets remittance from them and from her own children.

They have no experience from any NGOs but about a year ago they attended a NAADS seminar on good farming practices.

*“We learnt good farming practices and how to fertilize the soil before planting matoke and coffee. They taught spacing and size of holes and how to prepare composite manure and to use green manure to fertilize the soil.”*

They get cow manure from the pasture that belongs to their neighbour and it is usually Fausta and Jenny who collect it. The manure is then placed in a hole in the ground where it is mixed with water, grass or weeds and ash before it is covered with soil. At the beginning of the next season they take it out and place it in the soil before planting seedlings. They can't however tell if the methods they learnt have improved their yields.

*“There has been a dry spell for almost a whole year. The yields are different. They used to be good but now it's been so dry that matoke yields are becoming very poor.”*

To balance the loss in matoke Moses has expanded their garden into the wetlands. They live at the foot of a hill just above it and he thinks that it is allowed to grow crops there as long as you don't go too far out. A doctor sold him a plot there where he grows sweet potatoes and sugarcane that he is hoping they will be able to make an income from. He doesn't know the person who sold him the land personally, he only knows that he is a big landowner around the area. The family had made savings over the years from the remittance his mother has received from her family and that money was used to purchase the plot.

## 6. Results

### 6.1 Farmers perceptions

#### *Of natural resources*

The session started with a discussion of what the participants consider as natural resources. Both groups rather quickly decided that natural resources are what can be found in nature and used by people. In table 6.1 the natural resources are presented which the respective groups discussed.

Table 6.1.

<b>Female farmers</b>	<b>Male farmers</b>
Land – where you have your house. Boundaries are important.	Trees – timber
Hills – radio and mobile masts	Sand – fertile
Eucalyptus trees	Lakes
Rivers	Forests
Wetlands – for vegetables and water for bricks	Animals and farm animals
Papyrus – baskets and mats	Mountains
Forests – timber and poles	Wetlands
	Land
	Air
	Manure – gets from animals

The men came to the conclusion that even domestic animals, and hence also the manure from them used in farming, are natural resources because the first animals were god-given as part of nature. The women's group on the other hand contrasted nature made and man made. They stated that eucalyptus trees are a natural resource but did emphasize that they plant the trees themselves.

Both men and women mentioned hills and mountains as important for communication as masts are often placed on the tops. Wetlands were mentioned as a good place to establish gardens and mine sand for brick making. They are also a source of papyrus to make baskets and mats.

### ***Of institutions and responsibility***

The second discussion was on people and organizations and their responsibility in governing the natural resources. Eight cards were introduced, with the words 'Me', 'My husband' or 'My wife', 'NAADS', 'Uganda government', 'Local Council', 'Parish', 'Religious leaders' and 'NGOs' written on them. The women's group wanted to add another ten cards with names and the men's group added another two to the ones that the women had already added.

At first the men's group wanted to ascribe the most responsibility to the government. After a while the group did however decide that the government only delegate their responsibilities and could thus be regarded as the least responsible.

Man 1: *"Officials only want resources but they are not that concerned with where they came from."*

Man 2: *"Traders are worse. Where should we place them? They don't act responsibly at all. They only want to make profits but they should be very responsible."*

In the women's group the debate was especially lively when 'Me' was discussed. At first it was placed second, after 'My husband' but then they hesitated. Did it mean 'Me' as a wife or 'Me' as a person? I clarified that the individual was intended. The group then started to discuss the difference in responsibility between the wife's role and them as individuals and came to the conclusion that 'Me' as an individual has more responsibility over the environment than 'Me' as a wife.

*"As an individual you don't have to wait for anyone to command you."* /Participant in women's focus group

The men agreed rather fast that regardless of the meaning of 'Me', they would always have more responsibility than their wives. As husbands they have to pay attention to what takes place the farm and if something needs to be done they will tell the wife who will carry it out. Then someone mentioned the Book of Genesis<sup>6</sup> and that the man has to be responsible for the resources.

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<sup>6</sup> The first book in the Christian Old Testament which describes how the world was created.

Table 6.2

Female farmers		Male farmers		
Most responsibility				
Me		Me		Traders
My husband	Children	My wife		Timber dealers
Uganda government		Children	Law enforcement	Charcoal burners
NEMA		NAADS	Farmers	Brick makers
Local Council		Teachers		Fishers
District officers		Community		
Community		Local Council		
Parish		Parish		
Teachers		Religious leaders		
Religious leaders		NGOs		
Farmers		NEMA		
NAADS		District officers		
Brick makers	Charcoal burners	Uganda government		
NGOs				
Timber dealers				
Traders all types				
Least responsibility				



*“Husbands have to be responsible for the soils to get good harvests and if they don’t take care so that there are enough trees the homes will be ruined”* /Participant in men’s focus group

The wife is the assistant in their cooperation, but she is also the trainer because children will do as the mother does. Eventually the men decided that as individuals they may have more responsibility for the natural resources than as husbands.

*“Everybody should be responsible. If not the world will come to an end.”* /Participant in men’s focus group

Both groups placed the Local Council fairly high. The men’s group placed it the highest of the government levels and the women placed it number five, although after the Uganda government and NEMA.

*“The Local Council has much responsibility. They are effective. They have to settle land disputes and they have control measures.”* /Participant in men’s focus group

The women then went on to discuss the responsibility of teachers. After some discussion they agreed that teachers teach people in the community and so the community should be more responsible for the environment. They continued to ascribe responsibility to the grass roots.

*“When an offence is committed individual people will be around, not the whole community, Local Council or District officers.”* /Participant in women’s focus group

After half of the cards had been placed it became difficult to arrange them according to the responsibility they have. NGOs were placed third least responsible with the motivation that they only help implement what NAADS and NEMA have already decided.

Toward the end the men decided to make three rows. On the vertical left line they placed the cards according to the level of responsibility they thought should be ascribed to that person or organization. In the right line those who have a tendency to ruin the environment and who don’t take any responsibility were placed and in the middle line they placed law enforcement and farmers. When the men discussed the responsibility of farmers they said that they can both ruin the natural resources and look after them, because they directly depend on the natural resources for their livelihood.

*“Law enforcement stand on two sides. One time they accept bribes the next they have to follow the law and help manage resources.”* /Participant in men’s focus group

## *Of sustainability*

In the women's group the three circles were stacked so that the society was on top and centered, with the economy and environment paced left and right, unconnected to each other. After I asked if they thought the economy needs the environment to function they started to discuss that they do get income from the natural resources and agreed between themselves to move those two circles closer to each other. Then I asked if they thought there might be the opposite dependency, but nothing came out of that discussion. I gave them some extra time in case they wanted to make additional changes but they insisted on leaving the pillars with the society pillar on top.

*"We need good social relationships to make a good economy and manage the environment."*  
Participant in women's focus group.

The male farmers group didn't discuss so much during this last exercise. Especially when the environmental aspect was brought up they had difficulties both coming up with ideas of what is important for the environment to work and what farmers need from nature. The women's group mentioned soil conservation, not soil in itself but rather from the aspect that people have to manage it.

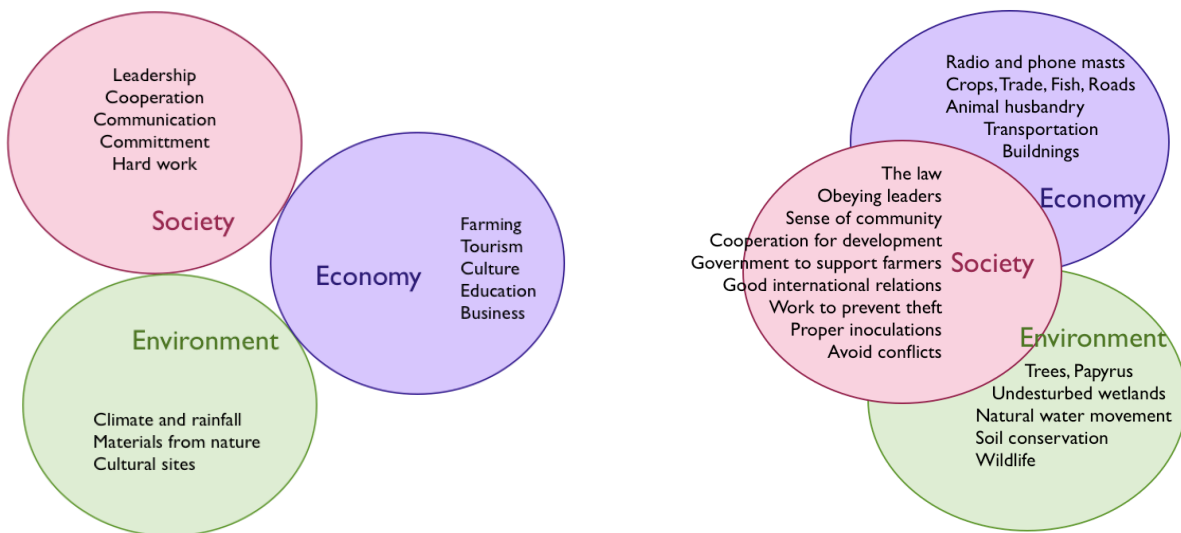


Figure 6.1 The content and the resulting placement of the pillars of sustainability in the male farmers' discussion (left) and female farmers' discussion (right).

## 6.2 The role of institutions in natural resource management

In the focus group discussions it was revealed that both the male and female farmers' groups ascribe the most responsibility to manage the natural resources to themselves, their spouse and children. The women then placed the Uganda government in the second most important positions, whilst the men placed the National Agricultural Advisory Services (NAADS) in this position. The men placed the government last arguing that the motivation that they delegate their power and responsibilities. Results from the focus groups and examples from interviews indicate that the family as an institution is important for the management of the natural resources. In both focus groups the role of husband and wife were discussed. Husbands are responsible for management decisions and wives carry out the work. One of the women explained that as a wife they can't act independently in managing natural resources.

Ostrom's (2005) eight design principles are mainly intended for common pool resources. As it turned out it seems there are no such resources left in peri-urban Masaka. Despite the overall decentralized government structure, the chances to make management decisions concerning the resources most needed and closest to the users (Ostrom, 2005) have been taken away. The forests are one example. All farmer informants rely on wood for cooking and burning bricks when building houses but some are constrained in this by the small number of trees on their land. Some have to buy expensive firewood whilst others have to plan new strategies such as planting shrubs instead of big trees.

*"In the past there used to be a lot of forest, like free government land and community land and people had access to such places to get fuel wood. Now all land is private and the government is very strict on their forest reserves. People still need wood but can't get it from the forest or the private lands. Therefore they have to grow trees on their own farms."* /Forestry expert with the Vi Agroforestry Programme

*"We have two categories of forests. The national forests are looked after by the central government and the district reserves are looked after by us. Some are still being degraded, people don't know the boundaries and encroach on them."* /District environmental officer<sup>7</sup>

The Uganda Wildlife Authority (UWA) is in charge of the management of most forests. UWA is a parastatal organization, which means that the local governments (LC3) have no power over the resource (Tumusiime & Vedeld, 2012). Another example of a resource which has been cut off from the people in the peri-urban area is the wetlands. The narrow lands and, according to one expert informant, the generally degraded soils in the peri-urban area have forced some farmers to encroach on them. The focus groups both mentioned the wetlands as a natural resource system to

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<sup>7</sup> At the Masaka District Headquarters

grow vegetables and mine sand in and to harvest papyrus. The women also recognized the importance of undisturbed wetlands. These were contradicting discussions which can be interpreted as a desire to utilize a resource which is not theirs to utilize. The farmer who showed us the plantation established by him in the wetland said that as long as you don't go too far into it plantations are allowed there. This argument is somewhat arbitrary and is contradicted by the environmental officer who stated that the wetlands belong to the municipality, which is responsible for the protection of it, and thus it is not a common pool resource.

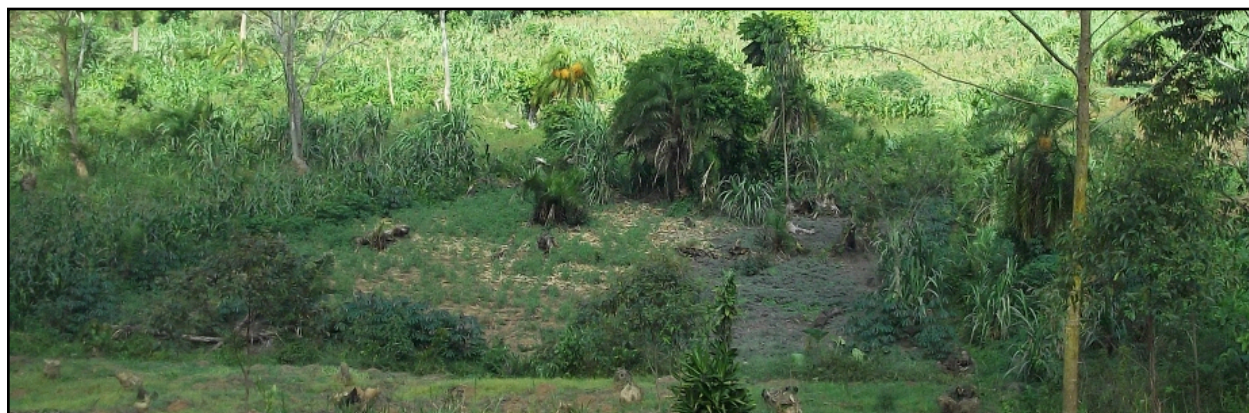


Figure 6.2 Wetland plantation. Photo: Pernilla Denker

In her work concerning successful natural resources management Ostrom (1986) has found that if the resource is a system it must be clearly defined. In this case the wetland is obviously a resource, however off limits, but, just like with the forest reserves, there are no signs or marks telling people where it actually begins. The environmental officer explained that they try to inform people of indicators found in the wetlands, such as plants of certain species. They are however restricted in ways to reach out to people.

In Masaka municipality there are no communal grazing lands. The son of one of the farmers goes every other day to an area in Bwala to collect forage for their zero-grazing cows. He thinks it is a communal grazing land because sometimes he encounters herdsmen and cattle there. The NAADS extension officer<sup>8</sup> explains:

*“Grazing in this municipality is illegal. It exists but it is illegal. There is no land for it.”*

One farmer has sent his goats to his son in Bukakata, where there is space for them to graze. Some farmers own a bit of land where they let other cattle owners graze their animals. The

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<sup>8</sup> Agronomist with long experience with advising farmers through NAADS

number of animals on the land seems to be unknown to the landowners and therefore the resource allocation (Ostrom, 2005) is not regulated.

The only common resource found was the protected spring<sup>9</sup> which is governed by LC1. There are however no restrictions to how much water people can use and they only pay a small fee for the maintenance of the site. The spring is not a common pool resource per definition though since one person's use will not affect the share left for others (Ostrom, 2005). The water keeps flowing from the spring and into the wetland if it is not used. In the sustainability discussion the women's focus group recognized 'natural water movement' as an important environmental aspect, but only a few farmers stated that they rely on the protected spring for water, as in most cases it is provided by the municipality through pipes. It is also quite common that farmers harvest rainwater and some farmers take it for granted that people do. Their parents did, and now they do. There are thus at least three ways to get water but no one could show any form of irrigation scheme. Farmers seem to simply rely on the rain for that. Now that the rain was late this has caused problems for some of them. One farmer said that he hoped God would forgive them soon so that there would be rain. The longevity of robust natural resources institutions results from modifications through collective choice (Ostrom, 1990).



Figure 6.3 The protected spring in Namasenene. Photo: Pernilla Denker

The LC1 is supposed to be a forum for decision making in the villages, but many informants never go to these meetings. One farmer thinks the council is corrupt, others have said that "all they do is talk". The ones who do go to meetings say they mostly discuss and solve social issues,

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<sup>9</sup> A natural spring at the foot of the hill, roofed and walled in with concrete. The water flows from a tap, which cannot be switched off, on one of the walls.

such as informing boda boda drivers<sup>10</sup> they mustn't drive after ten at night etc. The LC1 is the most local institution in the decentralized government hierarchy, but whether there is room for collective choice (Ostrom, 1990) regarding natural resources remains unknown after this study.

The law as an institution is rather weak regarding the management of the natural resources. This weakness is caused by challenges in the enforcement as well as knowledge gaps among the farmers. The bylaws which apply in the Katwe/Butego division of Masaka municipality there is a bylaw prohibiting the wandering and grazing of livestock on streets (Statutory instruments, 2009). There are disputes between neighbours who don't take care to keep their animals tethered and they consequently end up grazing in gardens and on woodlots. When farmers were asked about bylaws concerning the natural resources they often replied that either they don't know of any or that bylaws are not very effectual. By this they meant that people unknowingly follow them out of common sense or that bylaws are not enforced.

*“Why it isn't implemented? I think we have a weak institutional structure. Both technically and politically. There is a weak linkage there. And again, when it comes to enforcement there is the issue of supporting the process.” /District environmental officer*



Figure 6.4 A stray cattle family of local breed and a zero-grazing exotic cow. Photos: Pernilla Denker.

Several farmers revealed that their animals are herded by herdsmen, who walk the animals a few or up to several miles per day, to and from their respective pastures. Other farmers witness of herdsmen who let animals graze anywhere because they are lazy or can't control them. There is a gap here in the bylaws which do not clearly define whether the wandering and grazing is an

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<sup>10</sup> Boda-bodas are inexpensive motorcycle taxis that operate in the municipality.

offense equal with that of allowing animals to stray. According to bylaw stray animals will be impounded, but it does not specify what applies to animals that graze on their way to a pasture under the watch of a herder. Two young herdsmen who were walking their herds on top of Bwala Hill revealed that they often walk the herds which they are responsible for on that hill. They had however not asked permission and said that if someone told them to leave they would bring the animals somewhere else. The bylaw which prohibits the “uprooting or breaking” of trees or plants (Statutory instruments, 2009) applies to trees in all of the municipality. The environmental officer informs that in addition there is a statute which makes it a criminal offense to cut a tree without planting two new ones. The person who plants them is also responsible for protecting them from damage. Farmer informants often revealed that if they ever cut a tree it is a eucalyptus because they re-grow by themselves and they see no point in planting other trees, as young trees are often damaged by grazing animals.

An important factor in land acquisition to most of the farmer informants is kinship. It is difficult to acquire land and family is important in that matter as farmers have often inherited the land they farm on, but the arrangements differ from case to case. Most have inherited the land from the father. One man has lived on the same land all his life. One woman and her husband were appointed by her siblings to manage the land which they had inherited from their father. A third inherited it from her father and she is managing it together with her son, who is going to take it over from her. Some have a title for their land and others don't. Not having a title still gives you the same rights to the land but in case it were claimed by someone else it would be difficult to disprove them. Land for which nobody has a title is inherited according to customary laws, which give all inheritors equal right to the land. The holder of a title needs to include all the names of the people intended to inherit the land, or they will have no legal right to it. To get a title for your land it has to be surveyed, often by a private company, and when you have the papers it is possible use the land as, for example, collateral in a bank loan (LEMU, 2008).

Kinship networks also play a crucial role for land shortage management strategies. Hamid earns a living partly from selling goats. His land is small but has overcome the shortage by installing the goats at his son's farm in Bukakata, where land is less scarce. One farmer in Laurentia's village gets to keep their pigs in a pen in Laurentia's garden as a favour, because they don't have the space themselves. Both Solomon and Theopiste own quite large pastures where they let cattle of friends of theirs graze and when Fausta had a cow her neighbour let it graze on their land. None of them charge or have to pay for the use of others' land. These arrangements seem to be common and the role of the social network is important to those farmers who don't have enough land of their own. Both focus groups emphasized the importance of the social aspect in the sustainability discussion and argued that cooperation and leadership are important to make society work. They also mentioned, among other things, conflict avoidance, sense of community and communication. Management institutions vary according to their agroecological conditions

(Cleaver, 2000), which in this case are restricted grazing land availability and local social norms. People help each other out by granting favours, even though that activity could have been income generating. A further example of this are the gifts from their gardens that farmers hand to friends and family. The ones who were asked could not estimate how much was given away, and thus not the monetary value of these gifts.

The land shortage is also managed through other methods. One supported by, among others, NAADS and the NGOs MADD<sup>11</sup>, Vi Agroforestry Programme<sup>12</sup> and Heifer International<sup>13</sup> is the zero-grazing concept.



Figure 6.5 A tethered goat and zero-grazing pigs. Photos: Pernilla Denker

It was introduced by the English during the colonial days and was at first used by the government in the dairy monopoly. Since that monopoly was lifted this animal husbandry method has become popular for milk production purposes in densely populated areas (Baker, 1970). Organizations were frequently mentioned by informants as having made an impact in their decision to switch to zero-grazers. Mary received her pigs from NAADS after she had provided a pigpen where they are confined. It was from a NAADS seminar that she learnt about zero-grazers. Interestingly it was mostly male farmers who own zero-grazing cows and women who own zero-grazing pigs. These men all had a background as participants in projects or from government work (one).

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<sup>11</sup> Caritas MADD<sup>11</sup>, main focus on milk production.

<sup>12</sup> Swedish Cooperative Centre (SCC)

<sup>13</sup> Active in Uganda since 1980. Base their activities on giving and receiving animals to and from farmers.



When it comes to soil fertility there are several different influencers. Formal organizations, tradition and the informal economy all play part in the choice of practices. Those who don't have animals to get manure from either buy manure from neighbours or collect it from landowners' pastures. The methods and intervals of application seem to be more or less elaborated. Some have learnt fertilizing techniques from organizations, especially from NAADS seminars but also from NGO projects where they have taken part. Other farmers have experience of neither NGOs nor extension officers. Theopiste relies on a fertilizing technique which 'everyone' knows of, where she applies manure on each plot only every seven years and Mary manages the fertility of her soil with manure and ashes the same way her parents did when they lived on that same land. Many agricultural systems that were visited suffer from weeds, which are widely spread especially in the cassava and sweet potatoes, but almost all matoke plantations on the other hand were carefully mulched and crop residues were even taken from other crops and placed as mulch in the banana plantation. The aforementioned argument is in line with Cleaver's (2000) findings that management decisions are embedded in culture and history. To a certain degree soil management decisions in Masaka's peri-urban area rely on tradition. Many farmers do however have problems to varying degrees with BBW in their bananas. According to an expert informant the disease has been present in the banana producing parts of Uganda for many decades and yet farmers in peri-urban Masaka seem to have very little knowledge about the disease. This indicates a gap in the transfer of knowledge between research institutions and farmers.

*“Banana is a cultural crop of the people here that their great grandparents grew up eating. That's why if a Muganda goes to a place and he is given rice, he will come back and say he has not eaten. That's why they put in a lot of attention and effort to make sure there is good production from their bananas. Many other crops are just by the way. Except if they are valuable to sell.”* /NAADS extension officer



Figure 6.6 Mulched banana plantation and matoke och its way. Photos: Pernilla Denker

### 6.3 Agroecosystems sustainability

Primary vegetational production in the area has historically been forests, according to expert informants. Expanding land for agricultural production and demand for timber and wood for fuel have led to deforestation in and around the municipality, although there are fragmented patches of trees in most places. One statute and one bylaw prohibit the cutting of trees and that two new trees must be planted and cared for by the person who cuts down one tree. The effect of these laws is somewhat unclear since farmers' primary concern when it comes to trees are their personal needs. Some have a small woodlot others only have a few fruit trees but based on the historical primary production in the area the soil should have the carrying capacity to support those trees which have been planted by farmers in their gardens (Altieri et al, 1983).

When it comes to land use most farming systems contain many annual crops, such as cassava, sweet potato, cocoyam, beans, and groundnuts. These do not bind the soil on the hillsides very well and in several gardens signs of water erosion were clearly visible. The year has two rainy seasons, sometimes with large amounts of precipitation. During those rains the water will transport the fertile top soils from the agricultural lands on the hillsides down into the wetlands. The rains also bring large amounts of garbage into the agricultural systems since waste management in the municipality is poor. The traditional way of mulching the matoke plantation, used in all gardens visited, should mitigate the runoff somewhat. The clay soil can hold moisture for some time and crops will sustain even during dry periods, although the banana trees are sensitive to drought, hence the mulch.



Figure 6.7 Gully caused by water erosion and garbage transported by water. Photos: Pernilla Denker

As noted, most agricultural systems contain a few trees as well as shrubs, most commonly cassava and calliandra, and ground vegetation in the form of sweet potatoes, groundnuts and beans. In the systems I have visited they do however rarely grow together, except for banana and cocoyam or coffee and ficus, and in some places the soil is quite bare. Hence most agricultural systems do not entirely imitate the surrounding natural ecosystems, which have vegetational components on all levels. Another phenomenon which might affect soil fertility on the farms is the fact that farmers use soil from their own land to make bricks for home construction

Biological nitrogen fixation, minimal tillage and the use of windbreaks are considered to further increase the sustainability of the agricultural system (Altier et al, 1983). Farmers often grow calliandra in their gardens, but some have not been aware that this is a nitrogen fixing species. Calliandra is often grown by owners of zero-grazing animals as a source of protein. On the larger farming plots also acacia has been spotted on occasion. Some farms are surrounded by a hedge. These were often the farms managed by men who own zero-grazing cattle. Other farmers had no such boundary markers or windbreaks, although the generally rich vegetation of various heights (relative to open fields) did seem to break the wind well enough, and wind was not brought up as a problem by any informant.

Keeping zero-grazing animals is a method to intensify one, or add a new, part of farm production without affecting the other parts (Pretty, 2002). Especially NGOs seem to play a role in farmers' choice to convert to zero-grazing exotic cows. One expert informant explained that farmers often don't have much knowledge about zero-grazing exotic cows and perceive them as too difficult to look after. The local cattle look after themselves, as one farmer expressed his view, but they do on the other hand only produce small amounts of milk. NAADS have provided some of the informants with zero-grazing pigs which the owners now make an income from, without the pigs putting a strain on the garden.

The meat and milk of the local Ankole cattle has a special rich taste, which is one argument for farmers to keep them. They are also worth more than a goat, although less than exotic cows, and in the absence of formal insurance and banks they can be sold off in times of need. A farmer who owns just one local cow often tethers it to poles and trees close to their home, but owners of several have difficulties finding pasture in the peri-urban area. The two informants who own pasture do let other farmers graze their cattle there, but they don't keep count on the number of animals that are on the land and they don't charge money. It seems somewhat like a solution created in the moment but it also indicates the quality of social capital (Pretty, 2002) based on trust and reciprocity.

Also the natural capital is quite good. Most informants have farm animals to provide them with fertilizers and there is a foundation for functioning nutrient cycling, but according to expert

informants the general soil fertility in the area is poor. Crop waste is either used as dead mulch or as fuel and the ashes are spread in the gardens. The resource base is large but seems to be under high demand in the case of wood and fragmented in the case of land and this is where weak human and financial capitals seem to cause negative feedback. Most farmers only have primary school education and are not very skilled at anything in particular. They don't organize themselves, which not only shows in the management of land resources, but generally what informants have to offer in the way of produce. Only one farmer was specialized in nursing coffee seedlings and a few sell milk, but the others all grow the same things and most don't have an occupation outside of the farm. Human capital needs access to services but government institutions such as NAADS and local governments are on a small budget and have difficulties reaching out to farmers. Some of the farmers have paid for university studies for their children, sometimes only for the oldest ones. One financed this by selling off a portion of her land and consequently her natural capital is now smaller. Unless the child buys back the land eventually the lost income must be considered an externality (Pretty, 2002). The financial capital identified in this peri-urban area often exist in the form of natural resources and farm animals, normally grouped under natural capital. Farmers have explained that goats, cows and land work as an insurance in bad times. This means that when they sell natural capital they also lose a potential source of income. Another common feedback is from the natural capital to the physical capital when fertile top soil is mined to make clay for bricks. Almost every house in the peri-urban area is built of bricks made from the soil on the land where the house is situated. Large amounts of wood are also needed in this manufacture to burn the bricks. The women's focus group pointed out that roads and transportation are important for the economy. These both belong to the physical capital, but are inferior in this agroecosystem.

## **7. Discussion**

In this thesis I have attempted to explore the roles which different institutions play in the management of natural resources and to put it in an agroecological context. Local natural resource management is important because sustainability cannot be reached through central governance of local resources, but rather begins with adaptation to local conditions (Dryzek, 1997). In the cases presented in this study there is an obvious absence of sustainable common pool resource management institutions as defined by Ostrom's (2005) eight design principles. Of course, it could be that such local management institutions do exist but that informants who were interviewed for this study do not regard them as influential. However it seems more likely that the local settings in Namasenene, Kidda and Bwala in the peri-urban Masaka area simply do not provide for such management institutions. One major reason for this is that all land is privately owned and that no communal areas exist. The three resources – land, trees and wetlands – which

were often mentioned in interviews are not governed by potential users but rather by the municipality and protected under bylaw. Trees on public land are not to be used by locals, the wetlands which surround the hills on which Masaka is located are governed by the municipality and there are no communal pastures.

As it turned out in the results much of the attention has been directed toward cattle, and for good reason too. These and other farm animals are important to both farmers and farming systems. They are a source of fertilizers, they are used as insurance in case of bad times and are more or less providers of milk. Cleaver (2000) has argued that local management institutions do not necessarily need the rigidity that Ostrom (2005) suggests in order to be long lasting but that other types of management arrangements can be sustainable as well. Some owners of local cattle have adapted to the agroecological settings in the area, where land scarcity, bylaws and social norms all play a part. In this particular institutional bricolage kinship plays an important role in managing the scarcity of land resources for pasture, where cattle owners lend their land to friends free of charge but where on the other hand no one keeps track of the number of animals which graze there. Such arrangement build on trust and reciprocity and decisions pertaining to the pasture are made by the users themselves. These arrangements are however situated in the center of a complex setting and whether the keeping of grazing local breed cattle is a wise choice in this area is a matter for discussion.

The way cattle are herded back and forth from their stables to the pasture may be a cause for conflict with farmers as the animals graze on whatever comes in their way. Large herds of grazing animals seem also to have consequences for tree planting, which has been promoted in the area through government projects, NGO projects and statutes. Informants have complained that there is no point in planting new trees outside their own gardens, as animals often destroy young trees by grazing on them. Trees are a very important source of fuel but also for regulating the local climate and garden micro climates and bind the soil on slopes. Obviously there are conflicting interests because of these different uses. Despite wood being a necessity for the people here trees on public land are protected and may not be harvested for firewood and in addition there are no forests in the densely populated peri-urban area. The law has however been identified as a weak institution in the governance of the national resources and farmers and herdsman are not quite familiar with bylaws which apply to them. Could this be because they lack legitimacy in this agroecological setting? According to law, if a tree is cut, two new trees must be planted and looked after by the person who planted them. Instead farmers almost always claim to cut eucalyptus because they re-grow. These are on the other hand an invasive species, a heavy feeder and a fast grower which requires large amounts of water. From a systems perspective these herding arrangements thus seem not to be a long term solution and not sustainable in the sense that Cleaver (2000) argued for. Since land is supposedly not going to get

any less fragmented, unless changes on municipality or sub-county level were to take place, the issue of grazing cattle and fragmented and scarce land resources will persist.

The milk and meat of these animals have a distinct flavour, according to cattle owners, which is very different from that of exotic breeds. Local cows do however produce as little milk as one tenth of that of exotic breeds, but because of the flavour they are considered special. There could probably be more sustainable ways for farmers to keep these animals and still manage their scarce pasture and wood resources if they were better organized. Some of the reasons why they aren't seem to be found in weak support from the central and local governments and bylaws which cut off farmers from much needed and desirable resources. Assets in the form of human capital are small, most farmers have only a few years of education and have never developed any particular skills. One thing which struck me was the numbers of farmers and officers who wanted to be informed of the results of my study or get my opinion on how they as farmers and community can develop. Interviewing farmers and local government officers gave me the impression that a bunch of international NGOs seem to substitute for financially weak local government institutions. These NGOs in turn have different goals and the widths of their focus on the farming systems vary.

Just like the private pasture arrangements previously discussed, changing to zero-grazers is another, perhaps even further, adaptation to the local agroecological conditions. In instances where farmers have decided to invest in zero-grazing exotic cattle, such as Friesians or Guernseys, NGOs have often been involved, directly or indirectly. Zero-grazing pigs have often been provided by NAADS to improve income diversity, but only after the applicant has constructed a pigpen in which to confine the pigs. These animals become a central element for income generation and nutrient cycling in the farming system. However, only few farmer informants actually have zero-grazers, both pigs and cows, and instead goats are more common. Although being of smaller value than cows and pigs, goats seem to be regarded more as wealth and an insurance rather than a source of income. This could have to do with farmers' different socio-economic statuses, but has also been explained as a consequence of lack of knowledge, especially concerning exotic cattle which are sometimes perceived as being too difficult to look after. The ignorance about the husbandry of exotic cattle and the small number of owners of zero-grazers does however suggest that the formal institutions which promote them only have limited influence on farmers in their choice of cattle to manage land use and that knowledge does not transfer between farmers, perhaps because of social barriers.

Interestingly, when focus group participants described what they perceive as natural resources they mentioned sand, soil and water for brick making, as well as trees and forests for timber and poles and papyrus for basket and mat making. They all agreed that natural resources are for people to make products. Wood for fuel and soil and water to grow crops were not discussed.

This could be an indicator that farmers don't perceive farming as production, but rather as a way to get by, i.e. subsistence. There is a mix of institutional influence on the management of water and soil, which comes from NAADS, various NGOs, family and the informal economy. These are both on the individual agricultural system level and many farmers use the same methods their parents used to use, especially when it comes to water collection. However, many female farmers explained that also the way they manage their soil is how their parents had managed it before them. The family has been recognized as a strong institution in the management of the natural resources. If husband and wife had equal mandate in the household perhaps management of the resources would be different. Only about half of the informants have learnt new techniques from NAADS seminars or been part of NGO programs over the course of a couple of decades. Often it seems to be only part of the garden, such as the maize garden or the maize-bean intercropping system, that is managed with these new techniques and a lot of effort is put into doing it right. Manure from farm animals is used to fertilize the soil, but many farmers own only one or few animals. Some have been taught how to make composite manure but others turn to the informal market for fertilizers from farm animals but whether the applied amounts are appropriate is not known. Soil nutrient depletion is a slow process and farmers don't have the means to measure soil fertility, although some did admit that their yields are on the decrease. What actually causes this is not known after this study. Many plantations are infested with banana bacterial wilt (BBW), which ruins harvests, but there seems to be no coherent view of the BBW issue. There is very little knowledge among farmers about how infected trees should be treated and the cause of BBW seems to be unknown in general. All farmers grow at least, and usually more than, ten different vegetables and fruits in their gardens, but being the staple crop and a traditionally important dish banana plantations predominate. The large acreages of banana in peri-urban Masaka might be one explanation for the persistence of BBW and perhaps even more diversified landuse and less dependence on matoke would be beneficial in the long run. This might however self regulate within a few generations as many farmer informants send at least one of their children to higher education and consequently future generations will perhaps move away from subsistence and farming might instead eventually become a profession for a few rather than a way of living for most. But what is really sustainable? In agricultural production it is constant or increased output through constantly held inputs. In societies it is stability and maintenance of roles. When social conditions change, changes in the use of natural resources may result and the current small scale diverse agricultural systems, which are considered sustainable by agroecologists such as Gliessman and Altieri, among others, may transform, depending on the interests of the people who manage them.

A sustainable agroecosystem has positive feedback between the different types of capital (Pretty, 2002). Social capital in the form of trust and reciprocity exists among farmers in peri-urban Masaka, but not in the form of collective choice or knowledge transfer, perhaps especially not between farmers belonging to different socio-economic groups. On the human capital side there

is a lack of skill and education. Just as with knowledge transfer, this might have to do with different social belongings. For natural resource management to be sustainable, improvement of livelihoods is as important as the environmental benefits (Dryzek, 1997). Perhaps there is a point in keeping local cattle because it is a strategy to both maintain the biodiversity of the agricultural landscape but also to diversify income, if farmers were only better organized. Local institutions for the management of privately owned grazing land could be a product of a process to create a market for Ankole meat and milk. The outcome of such a process should however not be a predetermined idea from the outside, but should rather be created out of local needs and collaborations. Though, in order for social and human capital to increase and to lessen the burden on the natural capital the local governments and village councils in Masaka municipality would have to play a more prominent role by facilitating farmers. These would at least have to support the process of creating legitimate natural resource management arrangements from which both farmers and cattle owners will gain. Robust such institutions would potentially cause positive feedback loops to the natural and financial capital. Dryzek (1997) has argued that sustainability cannot be reached top-down and the fact that the government system in Uganda is decentralized could be a great breeding ground for locally adapted and governed institutions. Local government and extension officers do however all testify of constrained budgets which limit their capability to reach out to farmers. As it is now, bylaws drafted by the LC3s and statutes seem not to be effectual because farmers do what they are necessitated to do to get by and therefore both the law and governments seem to lack legitimacy in managing the resources. I would argue that only the prioritization by the central government to facilitate local farmers through the local governments and village councils can strengthen these local formal institutions in their role in the management of local natural resources.

After this study I would suggest that the three municipality divisions, i.e. local governments, and the village councils work together to initiate and structure collaboration between inhabitants in the peri-urban areas of Masaka to get a dialogue going about what could be done to solve existing natural resource issues. These institutions could possibly strengthen their role in managing and supporting local management of natural resources if they were involved in participatory research on natural resource issues together with peri-urban farmers and were the ones which initiate that research and facilitate the implementation of methods and strategies based on these site specific results.

## **8. Reflections**

Some limitations to this study have been language barriers and time constraints. Interpretation is a challenge to both the interpreter and the researcher. The researcher can never know how they would have interpreted the answer had they understood the local language. Giving instructions in



a focus group and taping into the discussion are included in this challenge. Also the fact that the interpreter is a local might have both its advantages and drawbacks. Without his knowledge of local customs and way finding, unforeseen obstacles could have turned this study into a very different experience. Being a local his acquaintance with some of the informants was almost inevitable but may also have affected the findings. The actual field study started with only three weeks to complete it and if more time had been spent in the area further and deeper understanding of the institutional setting may have been acquired. But the broad focus of the study, on natural resources, their management and the implications for the general agroecosystem of peri-urban Masaka, is what has been especially challenging. In the analysis many small parts have had to be fitted into the large puzzle which symbolizes the context. The context in this study has been three peri-urban villages in Masaka municipality and because the number of informants is far from a normally distributed respondent sample, findings could actually be different if other people in the same villages were interviewed. What has been presented here are the practices and the views from the point of these specific informants. This can be criticized for lack of representation and its relevancy questioned but interviewing just these few informants has shown great variation in strategies and dynamics which might otherwise have passed unregistered. In order to understand what lies behind or hinders natural resource management and what affects the sustainability of the agroecosystem in which they are a part such dynamics are an important piece of the puzzle.

Initially I came to Masaka assuming that there would be interesting natural resource management institutions to analyze from the point of the theoretical framework of this thesis, especially common pool resource management (Ostrom, 2005) and theory on institutional bricolage (2000). As it turned there were no such institutions, at least none which had emerged out of the necessity to manage any natural resource system. Instead the government and local governments try to protect some resources which in turn prohibits potential users from managing them. In other words, there hasn't been all that much to analyze the way I had hoped. The cause for this disappointment is on the other hand a finding in itself. The management of a natural resource cannot be sustainable if it entails shutting out users which rely on the resource for sustenance (Dryzek, 1997). Very little research on natural resource management from the point of agriculture has previously been carried out in Masaka. In fact it has mostly either been narrowed down to involve projects, or been carried out in forest conservation areas, i.e. in rural areas. The impression I have is that peri-urban research in general seems to have a focus on urban issues rather than on issues such as agricultural management. Similarly, many of the officers who were interviewed didn't seem to distinguish between urban dwellers and peri-urban farmers. Also the fact that farmers speak of their cultivated land as gardens has crossed my mind as being yet another indicator that farmers view farming as housework rather than a profession. If that is the case they may perceive their own success or failure as no one else's business, but obviously even small scale farming will turn into a public and environmental issue when everyone practices it.

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# Appendices

## Appendix 1

### Interview guides

#### Farmers' interview guide

##### **Name**

##### **Age**

##### **Education**

##### **Size of family**

##### **Family**

How many people live on this farm? How many work here? What does your husband/wife do?  
What do your children do?

##### **Land**

Tell me about the land.

How long have you lived here? Owner? Have title? Inheritance? Size of farm? All under cultivation? Has the size changed? What are your sources of income? Has it always been the same source? Are there any bylaws concerning land?

##### **Work distribution**

Do you have cattle, goats? Tell me about them.

How many? Grazer/zero-grazer? Who looks after it? Find out arrangements.

What do you use for fuel? Where do you get it from? Find out arrangements. Any cooperation w/ other farmers?

##### **Trees**

What trees do you have on your farm? Tell about your uses of trees.

Do you ever have to cut trees? For what? Planted any new trees? What are they? Why did you plant them/choose that species?

Do you know of any bylaws that have to do with trees?

**Water**

Where do you get water from? What do you use it for? How much can you use? How much do you need? Who checks? Find out arrangements. Do harvest rainwater? Where did you learn about it? Do you know of any bylaws that have to do with water?

**Soil**

Do you mulch your crops? How? Where did you learn that? Do you have any nitrogen fixing trees in your garden? Species? Who decided to get them? If no mulch where do crop residues go? Why?

Do you use fertilizers? How? How long have you done that? More or less than five years ago?

Do you till the soil? Why?

Have you had problems with erosion? How did you notice? Have you been able to stop it? How can it be mitigated? Where did you learn that from?

**Ecosystem**

Do you use pesticides? Type? Why? Have you always done that? More or less than five years ago? Do you know of alternatives to pesticides?

Do your crops grow together or separated? Why?

Experience of extension workers? How many times? Do you attend seminars? Are you in contact with the LC? Do you go to meetings? Any experience of NGOs? When? Which one?

## **Expert informants' interview guide**

What are your responsibilities?

### **Bylaws**

**LC3:** Can you tell me about some of the bylaws concerning natural resources that have been passed here?

**LC5:** What ordinances are there in Masaka which deal with natural resources?

Are farmers generally informed about bylaws which apply to them?

In your experience have there been any changes which have been especially difficult to implement? Do you know why?

### **Land**

There seems to be a problem with land, what is your take on that? What do people do to solve it?

Tell me about the grazing opportunities in the peri-urban area.

In your experience what is more common, grazing or zero-grazing cows? Why do you think some farmers still keep grazing cattle?

Is it allowed to use some parts of the wetlands? Who owns them?

### **Trees**

There is a bylaw about planting two trees for every one cut, why are trees so important?

What influences farmers' management of trees? Why is eucalyptus so popular?

### **Soil**

In your experience, how do farmers mitigate soil erosion?

Why do farmers only use mulch in their banana plantations?

## **Appendix 2**

### **Manuscript for international journal**

#### **Abstract**

In this thesis the roles which institutions play in the management of natural resources are explored. These management strategies and the natural resources were put in the context of sustainable agroecosystems and the components were looked at from a systems perspective. The study has the structure of an embedded multiple case design and conducted through participatory methods: semi-structured interviews, transect walks and focus groups. The results were analyzed using theories on resource governance and management, institutions, agroecosystems sustainability and agroecological systems. Several institutions were identified as playing a more or less important role: family; the law; national, parastatal and government organizations and the informal economy. The most frequently mentioned and discussed natural resources and resource systems were trees, the wetlands, agricultural land, pasture and soil. The study concludes that there is a lack of local natural resource management institutions which connects to the human capital and the absence of facilitation to support such capital in the management of natural resources.

Keywords: peri-urban, Uganda, institutions, strategies, agroecosystems, natural resource management

#### **Introduction**

The basic definition of a sustainable agroecosystem is a biophysical system where there is a balance between inputs and outputs, which is managed with methods that can be used perpetually without decline in yields whilst not having negative effects on the social life or on the environment outside the individual farm (Gliessman, 2005). Francis et al (2003) argue that the study of agroecology “can provide insight on how to deal with questions at the systems level and contribute to the development of sustainable societies” (p. 101). An agricultural system is an open system with continuous exchanges with nature and society (Francis, 2003). Dryzek (1997) argues that upstream and downstream effects of activities inside the agricultural system have to be taken into account when assessing the sustainability of an entire agroecosystem, but also that sustainability cannot be reached top-down.

A locally organized management of natural resources is embedded in social and historical influences (Sandström, 2008; Cleaver, 2000).



Agricultural development in Uganda is slow and the project Capacitate East Africa<sup>14</sup> has identified weak linkages between research and farmers as one reason, whilst Tumusiime and Vedeld (2012) found institutional confusion to be part of a failed natural resource management and rural development project.

This study draws on theory on resource governance and management, institutions, sustainable agroecosystems design principles and agroecological systems perspective to attempt to answer the research questions:

- 1) Which institutions affect natural resource management and farming strategies in peri-urban Masaka and how are they organized?
- 2) How do farmers in peri-urban Masaka perceive their natural resources and responsibility for the management of them and how do they perceive notions of sustainability?
- 3) How are agricultural systems in peri-urban Masaka constructed from an agroecological perspective?

### **Analytical framework**

Ostrom (1990) argues that the longevity of robust natural resources institutions results from modifications through collective choice. She has developed eight design principles for successful common pool resource arrangements (Ostrom, 2005).

- 1) if the resource is an entire system, as opposed to a single resource, the system boundaries are clearly defined.
- 2) Resource allocation is regulated, related to local conditions and proportional in benefits and costs.
- 3) the people affected by the management of the resource are the ones who make management decisions through collective choice arrangements.
- 4) monitoring of both the biophysical state of the system as well as monitoring of user behaviour. Monitors may be officials and/or users.
- 5) Punishments proportionate to the seriousness of violation of the rules, set up to protect the resource from exploitation, are sanctioned by other users or by officials.
- 6) there is a local venue available at low cost to facilitate conflict solving.
- 7) government and authorities recognize the right for individuals to organize and right to their longstanding tenure.
- 8) All of the above activities need to be nested on different scales, i.e. smaller organizations within larger organizations. Such nested enterprises have been shown to overcome the weakness of large scale or small scale governance institutions.

Cleaver (2000) has questioned the rigidity of these principles, arguing that there is no need for, for example, graduated sanctions in the presence of social norms which prohibit such actions. Natural management institutions are created in their social historical and agroecological context and long lasting management institutions rely on bricolage, the borrowing and diversification of institutions which exist in a society (Cleaver, 2002).

Just like Ostrom (2005), Altieri et al (1983) has developed design principles, but for sustainable agroecosystems.

- 1) primary production gives a clue about the soil's carrying capacity. An area covered in a certain amount of biomass will not be able to support more biomass without additional inputs and thus a grassland area should not be turned into an orchard.

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<sup>14</sup> [www.fiuc.org/umu/index.php/capacitateprject](http://www.fiuc.org/umu/index.php/capacitateprject), visited on January 4 2012.

- 2) land use capability relates to the assessment of soil quality and other biophysical factors, such as water availability, soil texture, resilience to erosion
- 3) vegetational patterns of a preexisting natural ecosystem should be used as model, when an agricultural system is under establishment. Edible crop species will replace the original wild species, but the physical structure of the original vegetation profile will be the same.
- 4) knowledge of successful local farming practices. Diverse and intercropped agricultural systems adapted to local conditions where appropriate techniques are in use have been shown to replenish the soil and provide for both economic stability and social equality.

Pretty (2002) adds another four:

- 1) intensified utilization of one part of the system without affecting the other parts
- 2) adding another productive element
- 3) better planning of the use of natural resources such as land and water and
- 4) the introduction of legumes to increase the yields of staple crops

The core in agroecology is the sustainability of agroecosystems within which continuous exchanges take place between agricultural and adjacent sub-systems (Gliessman, 2008; Dryzek, 1997). Pretty (2002) argues that the current narrow measures of agricultural efficiency are what make modern agricultural practices look successful but he also highlights five assets which are equally important components for the success of agricultural production; the natural, social, human, physical and financial capitals. When agriculture is practiced in sustainable ways one type of capital feeds back to add value to the other assets and thus sustainable agroecosystems are positive for both society and nature. Unsustainable practices on the other hand create externalities, i.e. costs to farmers and society. One challenge in agroecological research is to unify several aspects to produce a valid analysis.

## **Research methodology**

The holistic systems perspective which this study requires, is best facilitated by a case study approach, as it allows for exploration of real life in its every day context through triangulation (Yin, 2003). This case study has used methods from the Participatory rural appraisal (PRA) tool box to explore farming strategies. How farmers define their world is what the researcher has to abide to in defining the system to be studied. Boundaries can not be fixed from the start but rather will become clear as the researcher explores the reality of the informants.

Two methods that are suggested in the PRA tool box (FAO, 2000) were modified and used. One is the use of Venn diagrams to find out participants' view of relationships between organizations and groups. This tool was adapted to be used to find out which perceptions farmers have of the three pillars – society, economy and environment – of the sustainability analysis (GEO-4, 2007) and how these pillars relate to each other. The other method used is the resource cards. Several cards were used with the names of people and formal institutions. The cards were then to be placed in the order of responsibility to govern natural resources. Both methods were used in the focus group sessions. Transect walks (FAO, 1997) through the agricultural systems were used as complementary method to the semi-structured interviews. During these walks questions often appeared that I had never thought to ask about in advance because they were raised in that specific situation or garden. The two focus groups were divided into one consisting of only male farmers and one with only women. Both convenience and purposive non-probability sampling methods were used to contact informants (Bernard, 2006). Since the area and the people were unknown to the researcher convenience sampling was most appropriate as a starting point. After some time certain questions had emerged and in order to get them answered expert informants were contacted.

## Results

### *Farmers' perceptions of natural resources*

Both groups rather quickly decided that natural resources are what can be found in nature and used by people. In table 1 the natural resources are presented which the respective groups discussed.

**Table 1**

Female farmers	Male farmers
Land – where you have your house. Boundaries are important.	Trees – timber
Hills – radio and mobile masts	Sand – fertile
Eucalyptus trees	Lakes
Rivers	Forests
Wetlands – for vegetables and water for bricks	Animals and farm animals
Papyrus – baskets and mats	Mountains
Forests – timber and poles	Wetlands
	Land
	Air
	Manure – gets from animals

The men came to the conclusion that even domestic animals, and hence also the manure from them used in farming, are natural resources because the first animals were god-given as part of nature. The women's group on the other hand contrasted nature made and man made. They stated that eucalyptus trees are a natural resource but did emphasize that they plant the trees themselves.

### *Farmers' perceptions of institutions and responsibility*

The second discussion was on people and organizations and their responsibility in governing the natural resources. Eight cards were introduced, with the words 'Me', 'My husband' or 'My wife', 'NAADS', 'Uganda government', 'Local Council', 'Parish', 'Religious leaders' and 'NGOs' written on them. The women's group wanted to add another ten cards with names and the men's group added another two to the ones that the women had already added.

In the women's group the debate was especially lively when 'Me' was discussed. At first it was placed second, after 'My husband' but then they hesitated. Did it mean 'Me' as a wife or 'Me' as a person? I clarified that the individual was intended. The group then started to discuss the difference in responsibility between the wife's role and them as individuals and came to the conclusion that 'Me' as an individual has more responsibility over the environment than 'Me' as a wife. The men agreed rather fast that regardless of the meaning of 'Me', they would always have more responsibility than their wives. As husbands they have to pay attention to what takes place the farm and if something needs to be done they will tell the wife who will carry it out. Then someone mentioned the Book of Genesis<sup>15</sup> and that the man has to be responsible for the resources.

**Farmers' perception of responsibility**

Both focus groups found the social pillar of sustainability (GEO-4, 2007) to be the prominent one. The results are illustrated in figure 1.

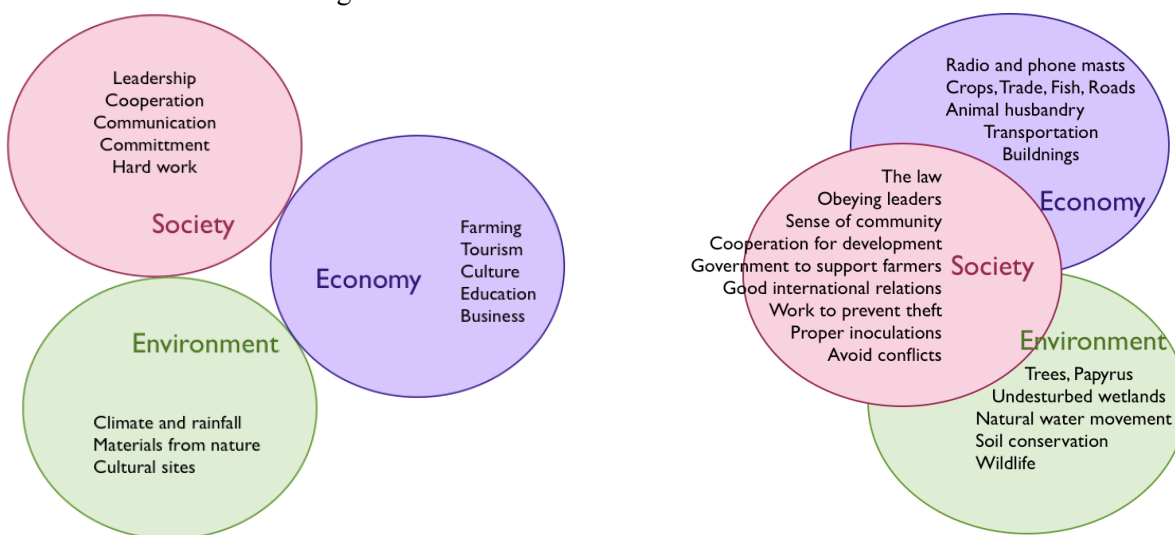


Figure 1. The content and the resulting placement of the pillars of sustainability in the female farmers' discussion (top) and male farmers' discussion (bottom).

**The role of institutions and natural resource management**

Results from the focus groups and examples from interviews indicate that the family as an institution is important for the management of the natural resources. In both focus groups the role of husband and wife were discussed. Husbands are responsible for management decisions and wives carry out the work. One of the women explained that as a wife they can't act independently in managing natural resources.

Ostrom's (2005) eight design principles are mainly intended for common pool resources. As it turned out it seems there are no such resources left in peri-urban Masaka. Despite the overall decentralized government structure, the chances to make management decisions concerning the resources most needed and closest to the users (Ostrom, 2005) have been taken away. The forests are one example. The Uganda Wildlife Authority (UWA) is in charge of the management of most forests. UWA is a parastatal organization, which means that the local governments (LC3) have no power over the resource (Tumusiime

<sup>15</sup> The first book in the Christian Old Testament which describes how the world was created.

& Vedeld, 2012). Another example of a resource which has been cut off from the people in the peri-urban area is the wetlands.

In Masaka municipality there are no communal grazing lands. One farmer has sent his goats to his son in Bukakata, where there is space for them to graze. Some farmers own a bit of land where they let other cattle owners graze their animals. The number of animals on the land seems to be unknown to the landowners and therefore the resource allocation (Ostrom, 2005) is not regulated.

The only common resource found was the protected spring<sup>16</sup> which is governed by LC1. There are however no restrictions to how much water people can use and they only pay a small fee for the maintenance of the site. The spring is not a common pool resource per definition though since one person's use will not affect the share left for others (Ostrom, 2005). The water keeps flowing from the spring and into the wetland if it is not used. The LC1 is supposed to be a forum for decision making in the villages, but many informants never go to these meetings. One farmer thinks the council is corrupt, others have said that "all they do is talk". The ones who do go to meetings say they mostly discuss and solve social issues.

The law as an institution is rather weak regarding the management of the natural resources. This weakness is caused by challenges in the enforcement as well as knowledge gaps among the farmers. When farmers were asked about bylaws concerning the natural resources they often replied that either they don't know of any or that bylaws are not very effectual. By this they meant that people unknowingly follow them out of common sense or that bylaws are not enforced.

An important factor in land acquisition to most of the farmer informants is kinship. It is difficult to acquire land and family is important in that matter as farmers have often inherited the land they farm on, but the arrangements differ from case to case. Most have inherited the land from the father.

Kinship networks also play a crucial role for land shortage management strategies. These arrangements seem to be common and the role of the social network is important to those farmers who don't have enough land of their own. Both focus groups emphasized the importance of the social aspect in the sustainability discussion and argued that cooperation and leadership are important to make society work. They also mentioned, among other things, conflict avoidance, sense of community and communication. Management institutions vary according to their agroecological conditions (Cleaver, 2000), which in this case are restricted grazing land availability and local social norms. People help each other out by granting favours, even though that activity could have been income generating. A further example of this are the gifts from their gardens that farmers hand to friends and family. The ones who were asked could not estimate how much was given away, and thus not the monetary value of these gifts.

The land shortage is also managed through other methods. One supported by, among others, NAADS and the NGOs MADD<sup>17</sup>, Vi Agroforestry Programme<sup>18</sup> and Heifer International<sup>19</sup> is the zero-grazing concept. Organizations were frequently mentioned by informants as having made an impact in their decision to switch to zero-grazers. When it comes to soil fertility there are several different influencers. Formal organizations, tradition and the informal economy all play part in the choice of practices. Those who don't have animals to get manure from either buy manure from neighbours or collect it from landowners' pastures. The methods and intervals of application seem to be more or less elaborated. Some have learnt fertilizing techniques from organizations, especially from NAADS seminars but also

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<sup>16</sup> A natural spring at the foot of the hill, roofed and walled in with concrete. The water flows from a tap, which cannot be switched off, on one of the walls.

<sup>17</sup> Caritas MADD<sup>17</sup>, main focus on milk production.

<sup>18</sup> Swedish Cooperative Centre (SCC)

<sup>19</sup> Active in Uganda since 1980. Base their activities on giving and receiving animals to and from farmers.

from NGO projects where they have taken part. Other farmers have experience of neither NGOs nor extension officers.

Many farmers do however have problems to varying degrees with BBW in their bananas. According to an expert informant the disease has been present in the banana producing parts of Uganda for many decades and yet farmers in peri-urban Masaka seem to have very little knowledge about the disease. This indicates a gap in the transfer of knowledge between research institutions and farmers.

### *Agroecosystems sustainability*

Primary vegetational production in the area has historically been forests, according to expert informants. Some have a small woodlot others only have a few fruit trees but based on the historical primary production in the area the soil should have the carrying capacity to support those trees which have been planted by farmers in their gardens (Altieri et al, 1983).

When it comes to land use most farming systems contain many annual crops, such as cassava, sweet potato, cocoyam, beans, and groundnuts. These do not bind the soil on the hillsides very well and in several gardens signs of water erosion were clearly visible. The year has two rainy seasons, sometimes with large amounts of precipitation. During those rains the water will transport the fertile top soils from the agricultural lands on the hillsides down into the wetlands. The rains also bring large amounts of garbage into the agricultural systems since waste management in the municipality is poor. The traditional way of mulching the matoke plantation, used in all gardens visited, should mitigate the runoff somewhat. The clay soil can hold moisture for some time and crops will sustain even during dry periods, although the banana trees are sensitive to drought, hence the mulch.

Biological nitrogen fixation, minimal tillage and the use of windbreaks are considered to further increase the sustainability of the agricultural system (Altier et al, 1983). Farmers often grow calliandra in their gardens, but some have not been aware that this is a nitrogen fixing species. Calliandra is often grown by owners of zero-grazing animals as a source of protein. On the larger farming plots also acacia has been spotted on occasion. Some farms are surrounded by a hedge. Keeping zero-grazing animals is a method to intensify one, or add a new, part of farm production without affecting the other parts (Pretty, 2002). Especially NGOs seem to play a role in farmers' choice to convert to zero-grazing exotic cows. One expert informant explained that farmers often don't have much knowledge about zero-grazing exotic cows and perceive them as too difficult to look after. The local cattle look after themselves, as one farmer expressed his view, but they do on the other hand only produce small amounts of milk. The meat and milk of the local Ankole cattle has a special rich taste, which is one argument for farmers to keep them. They are also worth more than a goat, although less than exotic cows, and in the absence of formal insurance and banks they can be sold off in times of need. A farmer who owns just one local cow often tethers it to poles and trees close to their home, but owners of several have difficulties finding pasture in the peri-urban area.

Also the natural capital is quite good. Most informants have farm animals to provide them with fertilizers and there is a foundation for functioning nutrient cycling, but according to expert informants the general soil fertility in the area is poor. Crop waste is either used as dead mulch or as fuel and the ashes are spread in the gardens. The resource base is large but seems to be under high demand in the case of wood and fragmented in the case of land and this is where weak human and financial capitals seem to cause negative feedback. Most farmers only have primary school education and are not very skilled at anything in particular. They don't organize themselves, which not only shows in the management of land resources, but generally what informants have to offer in the way of produce. Only one farmer was specialized in nursing coffee seedlings and a few sell milk, but the others all grow the same things and most don't have an occupation outside of the farm. Human capital needs access to services but government institutions and local governments are on a small budget and have difficulties reaching out to farmers.

Farmers have explained that goats, cows and land work as an insurance in bad times. This means that when they sell natural capital they also lose a potential source of income. Another common feedback is from the natural capital to the physical capital when fertile top soil is mined to make clay for bricks. Almost every house in the peri-urban area is built of bricks made from the soil on the land where the house is situated. Large amounts of wood are also needed in this manufacture to burn the bricks. The women's focus group pointed out that roads and transportation are important for the economy. These both belong to the physical capital, but are inferior in this agroecosystem.

### **The implication of the results**

Land and trees are both scarce resources and everyone needs them, yet there is no local organization around them. Land is scarce because it is all private and is often handed down from generation to generation. On the land which belongs to the municipality both the breaking trees and grazing are prohibited according to local government bylaw. The protection of trees within the municipality and the fragmented and small agricultural plots make it difficult for many farmers to find wood for fuel. Trees are important not only for people's daily needs but also to mitigate soil erosion by water and regulate the microclimate in the gardens, and other ecosystem services. If the government is trying to restore the forest resource base, I think it would be a good idea to promote alternative energy sources for farmers. One obvious alternative energy source would be solar panels. With the country's placement on the equator a solar panel should, depending on its size of course, be able to produce quite the amount of household energy. Another alternative energy source is biogas. The drawback of this is that the digesters have to be constantly fed with manure, which in turn requires easy access to sufficient amounts of it, but only a small number of the informants have more than one cow or a few pigs, if any.

Farmers who own grazing cattle will however have to adapt to the peri-urban environment, i.e. the agroecological conditions. Zero-grazers don't cause compaction of soil through trampling the way grazers do which may therefore require larger pastures than the former. Grazers owned by farmer informants have been of local breed, which only produce about one or two liters of milk per day, a fraction of that of an exotic cross breed, Ankole and Friesian for example. They do on the other hand produce meat and milk which are more fragrant than that of exotic cows and perhaps a specialized market for these products could be created, if it does not already exist. This would be an income opportunity for owners of local breed cows.

In a sustainable agroecosystem there is positive feedback between the different types of capital. The local government and extension officers all testify of constrained budgets which limit their capability to reach out to farmers. Facilitation from professionals is one condition which would probably help build human capital, e.g. skills, with the purpose to create local natural management institutions. Robust such institutions would potentially cause positive feedback loops to the natural capital. Creating organized common grazing lands, for example, could remove some problems which exist today, such as cattle grazing on young trees and on cultivated land. But also the human capital could develop through the management of natural resources through collective choice and skill creation. The farmers who have been interviewed seem to trust others and find cooperation important. I would argue that these properties are crucial for management by collective choice and to build local robust natural management institutions.

The family was recognized as a rather strong institution. The family socializes the children to social norms. In farmer informants' households the husband is the one who makes management decisions and the wife carries out the work. In a democratic household these roles would be equal and as a consequence different strategies and management decisions regarding the natural resources might result. Sensitization of household democracy could change the way future generations regard farming, livelihoods and natural resources and would perhaps open up for development. When social conditions change, changes in the use of natural resources may result and the current small scale diverse agricultural systems, which are considered sustainable by agroecologists such as Gliessman and Altieri, among others, may transform, depending on the interests of the people who manage them.

### Suggestions for future research

Based on the findings here the researcher would suggest that 1) the potential for solar energy in households in the peri-urban area be explored, as a strategy to lessen the dependency on wood for fuel and 2) the local and regional markets are surveyed for various specialized agricultural produce with the purpose to use the results in facilitated farmer driven management institutions and enterprise development.

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