Gender analysis on Climate-Smart Agriculture, National Environmental Policies, and Climate Change Adaptation in Rakai District, Uganda

MSc Thesis Law and Governance – LAW-80436

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IITA contact person: Edidah Ampaire and Piet van Asten

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Abstract

Climate-Smart Agriculture (CSA) is seen as key to increase agricultural productivity in a sustainable way, to build resilience to climate change, and to reduce GHG emissions from agriculture. These practices are also needed to empower local farmers in the Rakai District, Uganda to protect them from natural hazards, because of climate vulnerability. However, a knowledge gap exists concerning a theoretical understanding of the adoption of CSA practices by smallholder farmers, especially divided between male and female farmers. Adoption of CSA practices depend on decisions farmers make and factors as the access to capital: economic, social, political, cultural, and human capital, as well as on the context and farmers' understandings that influence these decisions. Based on a literature review, field notes, pre-test interviews and focus groups discussions, expert interviews, participant observations, and (semi)-structured interviews a theoretical framework is outlined, wherein the livelihood of female and male smallholder farmers is fundamental. Among the farmers studied it appeared that adoption of CSA is influenced by the gender differences in access to capitals. It is found that men control land, means of transportation, and the market for the produce. The money, earned by selling produce is also often controlled by men and can among others be used to buy tools and to hire labour. Women, on the other hand, have access via their husband to these capitals, are more often united in religious groups, and practice daily activities at home and on-farm. Male and female farmers are influenced to adopt CSA to access of services by the government such as training sessions and demonstrations, especially through promotion of extension officers the adoption of agroforestry is entirely used among the farmers in the district.

Keywords: Climate-Smart Agriculture, agroforestry, climate variability, gender, smallholder farmers, decision-making, environmental policies, Rakai District Uganda

Acknowledgement

It is April 2015, one year after I went to the Rakai District in Uganda. With great pleasure I look back at the time I have spent there. It was such a different country compared to the Netherlands and I had a wonderful time. In partnership with International Institution of Tropical Agriculture (IITA) I could join the CCAFS programme to work on my thesis "Gender analysis on Climate-Smart Agriculture, National Environmental Policies, and Climate Change Adaptation in Rakai District, Uganda." As a student in the master Development Studies, I focused on law, rights and policies and I did a minor in disaster studies and gender and rural history. Now I was finally able to put my knowledge into practise. My findings there form the foundation of the results of this thesis.

My gratitude goes to the research institute IITA and the NGO CIDI. Special thanks go to Edidah Ampaire, Piet van Asten, Laurence Jassogne, Happy Providence, Rebecca Nabatanzi, Mastewal Yami, Kiragwa Lawrence, and Nakaliisa Rose, and of course to all other staff of IITA who gave me tips and tricks during the research process. I also want to thank my roommates of the student house in Kampala for their input and help. I like to give special appreciation to my parents Jan van Sambeek and Thea Kuys and my sister Ellen van Sambeek for their unconditional support and their patience. Also I am really glad with my friends in my home town Schijndel and my study city Wageningen for their enthusiasm and to be all ears whenever I needed it. Last, I like to give special thanks to my supervisor from Wageningen University Han van Dijk, to give me the knowledge and feedback I needed.

Weebale
(Thank you)

Lisa van Sambeek, 2015

Abbreviation list

AIDS	Acquired immunodeficiency syndrome
BRAC	Bangladesh Rural Advancement Committee
BXW	Banana Xanthomonas Wilt
CAPCA	Central Archdiocesan Province Caritas Association
CCAFS	Climate Change, Agriculture and Food Security
CCU	Climate Change Unit
CDD	Community Driven Development project
CGIAR	Consultative Group on International Agricultural Research
CIAT	International Centre for Tropical Agriculture
CIDI	Community Integrated Development Initiatives
CSA	Climate-Smart Agriculture
DATIC	District Agriculture Training and Information Centre
FAO	Food and Agricultural Organization
GDP	Gross Domestic Product
GHG	Greenhouse gas
Ha	Hectare
HIV	Human immunodeficiency virus
IITA	International Institute of Tropical Agriculture
IKS	Indigenous Knowledge Systems
LACA	Local Action Committee on AIDS
LC	Local Council
LLGs	Lower Local Governments
LRD	Land Reform Decree
MADDO	Masaka Diocesan Development Organisation
N=	No answer
NAADS	National Agricultural Advisory Services
NAPA	National Adaption Programme of Action
NGO	Non-Governmental Organization
p	Primary school
RACA	Rakai Counsellors' Association
s	Senior school
TPC	Technical Planning Committee
UNFCCC	UN Framework Convention on Climate Change
VHT	Village Health Team

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1. Introduction

This thesis reports about research in Uganda on the gender dimension within the decision-making process of adopting Climate-Smart Agriculture (CSA) by local farmers in the Rakai District (see map of Uganda in Annex 1). The objectives of this research were: to identify the difference in gender to make decisions on the adoption of CSA practices on agroforestry farms in the Rakai District, Uganda and to understand the influence of environmental policies on the behaviour of male and female smallholder farmers in CSA adoption. Agriculture is of great importance for the population in Uganda. By focusing on the benefits and constraints that male and female farmers face in Rakai, a better understanding will be acquired about the farmers' behaviour and their risks and uncertainties. To understand the gender dimension, it is crucial to concentrate on the influence of the national environmental policies for male and female farmers. This research will look deeper into the identification of CSA practices in Rakai. It will also focus on the access to capitals by female and male farmers, identify the roles within the households, understand the gender dimension in the decision-making processes of CSA adoption, and look into the implementation of national environmental policies.

This research is part of a larger project from the International Institute of Tropical Agriculture (IITA) Uganda. IITA Uganda is part of CGIAR (Consultative Group for International Agricultural Research) and they try to find solutions for hunger, malnutrition, and poverty (IITA, 2014a). One of their main programmes is the Climate Change, Agriculture and Food Security (CCAFS) programme. According to the IITA website "CCAFS offers developing country farmers new options for adapting to emerging impacts of climate change in the coming decades and for mitigating climate change through a 'carbon-friendly' agriculture that also strengthens food security and reduces poverty" (IITA, 2014b). CCAFS aims to address climate changes and the declining food security by focusing on Climate-Smart Agricultural practices, policies, and measures. In this research I will focus on CCAFS Flagship 4: "Influencing and linking policies and institutions from national to local level for the development and adoption of climate-resilient food systems in Uganda." CCAFS Flagship 4 is funded by CGIAR and led by IITA. The project aims to use inter-disciplinary science-based recommendations to influence policy implementation that encourages adoption of CSA practices, across multiple scales and actors.

The objectives of this programme are:

1. To identify and test pro-poor adaptation and mitigation practices, technologies and policies for food systems, adaptive capacity and rural livelihoods;
2. To provide diagnosis and analysis that will ensure cost-effective investments, the inclusion of agriculture in climate change policies, and the inclusion of climate issues in agricultural policies, from the sub-national to the global level in a way that brings benefits to the rural poor (CIAT, 2011).

One of the activities within this CCAFS project is to focus on gender equity gaps and to create evidence-based gender awareness among policy actors, with the intention to promote gender responsive implementation of climate change adaptation policies. It is assumed that men and women face different climate vulnerabilities and have different adaptive capacities, whereby climate

change could worsen poverty and lead to gender inequalities. Policies that do not clearly consider gender issues tend to have unintended negative consequences for women and other marginalized groups (CCAFS Coordination Unit, 2014b). To summarize, this CCAFS project focuses on gender to ensure that rural women benefit from its contribution to poverty reduction, enhanced environmental resilience, improved food security, human health, and nutrition (CCAFS Coordination Unit, 2014a).

The agricultural sector is an important sector of Uganda's economy. Roughly 66 percent of Ugandan working population is directly involved in agriculture. Agriculture contributes to more than 23 percent to Uganda's total GDP (Gross Domestic Product) in the fiscal year 2012/13 and about 40 percent of the total exports earnings in 2012. Coffee, tea, cotton, and tobacco are the main export products. Coffee forms a major source of revenue for the country since it dominates the exports in terms of value. In 2012, Uganda produced a total of 186,126,000 kilos of coffee of which 72 percent was Robusta (Uganda Bureau of Statistics, 2013). The population of Uganda depends on agriculture products such as banana and cassava for food security.

Unfortunately, it seems that Ugandans population has to deal with climate variability and environmental degradation, which causes floods, waterlogging, droughts, and landslides. This could give problems such as food insecurity, famine, reduction of crop yield, land conflicts, water scarcity, livestock death, frequent outbreaks of pest and diseases, but also political instability, poverty, negative health effects, and other natural disasters which contribute to farmers' uncertainties (OCHA, 2011; Tolo et al., 2014).

As said above agriculture is very important in the daily lives of the overall Ugandan population and climate vulnerability and environmental risks could lead to food security problems and gender inequality. The CCAFS programme tries to manage these risks by focusing on the development and adoption of climate-resilient food systems via CSA. The CSA concept was developed in 2010 by the FAO (Food and Agricultural Organization) for the Food Security, Agriculture and Climate Change Conference in The Hague in 2010. The idea behind the CSA concept is to focus on food security, for now and the future, including adaptation to climate change and creating ownership among governments, regional and international agencies, civil society, and the private sector (CCAFS Coordination Unit, 2014b).

This research will focus on the gender dimensions in decision-making process of adopting CSA practices and the gender gaps within climate change adaptation policies in Uganda. In this research, CSA is defined as "agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes greenhouse gases (mitigation), and enhances the achievement of national food security and development goals" (FAO, 2013: 548). On the website of FAO the concept is further explained "CSA is an integrative approach to address these interlinked challenges of food security and climate change, that explicitly aims for three objectives: (1) sustainably increasing agricultural productivity, to support equitable increases in farm incomes, food security and development; (2) adapting and building resilience of agricultural and food security systems to climate change at multiple levels; and (3) reducing greenhouse gas (GHG) emissions from agriculture (including crops, livestock and fisheries)" (FAO, 2014). "CSA is an approach to developing the technical, policy and investment conditions to achieve sustainable agricultural development for food security under climate change" (FAO, 2013: X). CSA explicitly considers the impact of climate risks. This requires changes in agricultural technologies and focus on food security and poverty by managing climate

risks, understand and plan for needed adaptive transitions, and if possible, exploit opportunities for reducing or removing greenhouse gas emissions. Simplified, these CSA practices are preconditions of climate informed agricultural practices that enhance food security, increase farm incomes, and development (CCAFS Coordination Unit, 2014b; CGIAR, CCAFS and FAO, 2014).

The idea behind the CSA concept is to keep in mind to manage climate risks which require changes in agricultural technologies and approaches. This is also the main difference with normal agricultural systems (CCAFS Coordination Unit, 2014b). "What new is about CSA is an explicit consideration of climatic risks that are happening more rapidly and with greater intensity than in the past. New climate risks, require changes in agricultural technologies and approaches to improve the lives of those still locked in food insecurity and poverty and to prevent the loss of gains already achieved" (FAO, 2014). Actions to be taken should focus on-farm as well as off-farm and should be supported by technologies, policies, institutions, and investments. This means that not only farm management is needed, but also ecosystem and landscape management, with a focus on resource efficiency, resilience and the provision of services for farmers and land owners. CSA considers three different scales; from farm to landscape, from local to global, and from short to long time horizons within national and local specifications and priorities. This means that CSA is not a set of practices that can be universally applied, but is an approach that involves different elements embedded in local contexts (CCAFS Coordination Unit, 2014b).

CSA practices are seen as modest interventions which should be provided by the government and NGOs; for example, by providing education on-farming methods (via farmer field schools), providing tree seedlings, water and soil conversation, planting trees on farm, and providing knowledge on manure management and cheap loans. These initiatives, projects and programmes should help farmers to benefit from and support improvements of farm practices efficiently and equitable (See Annex 2: a scheme on the CSA adaptation process) (Tolo et al., 2014; Kyazze et al., 2012). However, according to Tolo et al. (2014) it should not be forgotten that farmers already have traditional knowledge and have a cultural understanding of agricultural development. Persons working with CSA should also take this into account. For example, farmers have their own traditional methods and indigenous knowledge on risk management for crop production, since their livelihoods are often directly affected by extreme weather events and climate variability. Scientists call this indigenous knowledge system (IKS). These are used by local communities to cope with and adapt to climate hazards. They are local alternatives for sustainable agricultural development. IKS could be used in soil conservation, weather forecasting, selection of planting seeds, and protection of crops (Tolo et al., 2014).

CSA has an important gender dimension; the differences of decision-making processes within smallholder farmers' households. Gender is the basis to understand different social, economic, and cultural roles of men, women, boys, and girls in societies. Men and women have different roles in distribution of resources, wealth, work, decision-making, political power, rights, and entitlements (Chaudhury et al., 2012). To identify these gender relations, a better understanding can be gained on the gender differences in access to CSA interventions and opportunities. Both men and women are likely wanting to adopt CSA, since these practises can bring income, increase food availability for the household, support to deal with climate shocks and expertise on climate variability, training opportunities (for example, introducing new crop practices and improved seeds), and differential access to production resources (Kyazze et al., 2012). Most of the time both men and women

contribute to improve farm productivity; however, factors as labour, knowledge, and property of land differ among men and women. Gender roles depend on ideology, religion, ethnicity, economy, and cultural factors in a community and these are very context-specific and dynamic (Chaudhury et al., 2012). In Uganda, men and women have different structural roles in agricultural production at household level, on-farm, and off-farm. For example, women are responsible for providing food for the family, which could mean that women's priority is mostly food crops. While in this case men's priority is to earn money from cash crops and livestock. Lack of food and money could cause tensions within the household. Also men often are the owners of land and decide on which land women can use to cultivate their food crops (MRFCJ, 2012; Wanyeki, 2003). This insecure land tenure could prevent women to make land decisions regarding technologies and to adopt CSA practices (Chaudhury et al., 2012) and even could lead to lack of development. Tripp (2004) argues that when women have no security of tenure they will not invest or improve the land (Tripp, 2004). This could mean that climate variability affects male and female farmers differently. CSA practices should therefore be gender sensitive (Chaudhury et al., 2012).

One of these CSA practices is agroforestry. Agroforestry is defined as "Planting trees together with crops on the farm. These are trees that produce or are primarily used for fruit, fodder, or fuel wood production or that provide other benefits, such as reducing runoff or erosion, enhancing soil fertility, providing shade, and medicines" (Meinzen-Dick et al., n.d.). This research will focus on agroforestry, which is a common practice in the Rakai District. In Rakai, both men and women are aware of using agroforestry as CSA practice and there is no significant difference in adoption of this practice between men and women according the results of Ampaire and Mango (2014). For example, van Asten et al. (2011) discuss agroforestry in their article on intercropping of banana and coffee in Uganda. They argue that coffee is the main cash crop while banana is a primary food and cash crop. It is suggested that growing coffee and banana together is more profitable then growing coffee alone, because mixed cropping systems are seen as less risky for farmers in case of crop failure or price fluctuations; especially, in the case for banana and coffee. This is important because of the pressure of increased pest and diseases in the area, such as: coffee fusarium wilt disease (tracheomycosis) and banana Xanthomonas wilt (BXW). Another benefit of using agroforestry could be the shade that trees produce for crops, which can improve the crop yield. Agroforestry could probably be optimized by making use of other CSA practices as improved soil management (for example, the use of mulching, livestock manure, or fertilizer), planting pits, and other high yielding practices such as pruning. Especially, smallholder farmers could benefit by making use of intercropping systems, because of their lack in resources as land, labour, and nutrient inputs. This system allows to spread the risks and to find a balance between food and cash generation. It could be stated that agroforestry improves the quality and quantity of farms; and it is a very important practice in the food supply of smallholder farmers (van Asten et al., 2011).

This research also focuses on the influence of environmental policies on the decision-making process of smallholder farmers. As said before, the main problem is that farmers, men and women, are highly vulnerable to the effects of climate change and they face different potential risks through climate variability. Also, farmers are the end-users of any agricultural technology and they make the decisions to adopt CSA practices on their farm. This means that supportive policies on CSA practices need to be made gender sensitive (Chaudhury et al., 2012). According to the course manual "Gender and Climate Change in Uganda" of the government of Uganda, policy makers should be aware of the impact of climate change on the lives of women, men, boys, and girls, because they all face different

risks in the impact of climate change and have different needs to adapt to climate change regulations. This gender division within the systems of smallholder farms in Uganda should be considered in policy implementation. Both local and national government should also consider the different impacts on gender through environment policies and land-use policies (Climate Change Unit, 2013). This leads to questions as how exactly are these policies implemented on local level? How is gender included in those policies? What kind of gender gap is there in policies or in policy implementation? How do these existing policies influence farmers' behaviour? How does including gender in policies affect the adoption of CSA practices by male and female farmers? To be able to do meaningful adoption, farmers need supportive policies in place. In Uganda there are environmental policies such as the Climate Change Policy, National Adaption Programme of Action (NAPA), and National Wetlands Policy. These are developed and updated to acclimatize adverse effects of climate change and to achieve poverty reduction by environmental sustainable development. The policies are formulated by the national government; this process is unidirectional and top-down. Locally could be said that there is a lack of policy implication, because local implementers are not involved in the formulation process. Besides that, there is inadequate knowledge on policies at different levels, a lack of coordination among different actors, corruption, and there are limited resources available. Lack of policy implementation could (in)directly increase farmers' vulnerability to climate change effect (Ampaire and Happy, 2014).

Climate-Smart Agriculture, gender, and climate change policies intertwine with each other. Farmers make decisions on their technologies and the adoption of CSA. Important to understand is how these farmers make those decisions? They have to deal with the context; for instance, climate variability, policies on different levels, and the local market. They need to take into account natural resources and access to assets as land, credit, information sources etc. These are all part of the capitals mentioned by de Bruijn and van Dijk (2005a); this will be further explained in the theoretical framework in chapter 2. The capitals contribute to the decision-making process of farmers. For example, the access to some capitals could be influenced by policy programmes. Probably this access will be different for male and female farmers. All these factors influence livelihood decisions of the farmer, which is very dynamic and results in decision-making on CSA adoption. This leads to the main question:

How do male and female smallholder farmers make decisions on adoption of CSA practises on agroforestry farms in the Rakai District, Uganda and how do environmental policies influence male and female farmers' behaviour in CSA adoption?

To answer this research question some steps need to be taken into account. First I will identify the CSA practices currently used by male and female farmers in the Rakai District. Secondly, the households' characteristics to access of capitals by the smallholder farmers must be understood. Then the gender dimension within the decision-making process of CSA adoption must be considered, as well as farmers' behaviour in response to Ugandan environmental policies. And finally, this research should give an answer on how national environmental policies are implemented by local councils and/or extension officers. Those steps make the following sub research questions:

1. What are the most relevant Climate-Smart Agricultural practices of smallholder farmers, of men and women, in the Rakai District?

2. Who controls, gains, or maintains the capitals within the smallholder farmers' households and how does that influence female and male agriculture decision-making?

3. How do gender dimensions relate to the adoption and the use of CSA practices in the farmers' households?

4. How do environmental policies influence decision-making processes of smallholder farmers on CSA adoption?

To answer the main question and the sub-questions, first the theoretical framework will be introduced in the next chapter. In chapter three the methodology will be explained. After that, a further introduction of the research area, the Rakai District, will be given. In chapter 5 and 6 the results will be discussed. The answers to the main and sub-questions will be discussed in chapter 7.

2. Theoretical framework

In this chapter I will discuss the theoretical framework for this research. To understand farmers' behaviour in adopting CSA practices, this chapter will focus on farmers' livelihoods. The idea behind CSA practices is to reduce uncertainties and risks of food insecurity and climate variability for farmers. By looking into farmers' livelihoods it helps to understand the decision-making process of adopting CSA practices to these uncertainties better.

To understand the factors that influence decision-making de Bruijn and van Dijk (2005a and 2005b) offer a model of decision-making, which is consists of the following elements: capitals, context, and understanding by farmers. Capitals can be divided into five categories: economic, social, cultural, political, and human capitals. The context refers to farmers' access to capitals; this is very dynamic and differs per farmer. Understanding refers to how farmers understand their context and climate variability. All these elements influence the pathways of farmers to decision-making under climate uncertainty to adopt CSA practices (de Bruijn and van Dijk, 2005a).

To understand the context, the theory of access helps to indicate the access that farmers have to their capitals such as resources, credit, and land. It shows the benefits smallholder farmers could get out of having better access. By lack of access to capitals it is less likely that farmers have the possibilities to adopt CSA practices. Whereby, they are still exposed to food insecurity, lack of cash generation, and exposure to uncertainties caused by climate variability (Ribot and Peluso, 2003).

Additionally, if farmers lack understanding of climate variability, they are less likely to adopt CSA practices. Unfortunately, even for scholars it is hard to state with precision what the direct effects are of climate change. To this day they are still in an ongoing discussion regarding the existence of climate change, mainly because climate change is very hard to measure. The effect of the climate on farmers is uncertain. That is why in this thesis we will focus on the effects of climate variability and not on climate change (de Bruijn and van Dijk, 2005a).

All these factors have one thing in common; the gender analysis. By making a distinction between male and female farmers, different forms off access can be analysed; what differentiates male and female farmers in gaining, maintaining or controlling access? By looking to the gender dimensions, decision-making processes on CSA adoption could be assessed within the households in Rakai. The gender analysis shows the bundle of rights and web of power of male and female farmers; it should identify how farmers' behaviour is influenced. The gender analysis also clarifies the gendered benefits and constraints farmers encounter in the Rakai District. Also to understand how local policies work, the gender analysis is of great importance.

Therefore the theoretical framework will discuss the livelihood and the decision-making approach by de Bruijn and van Dijk (2005a and 2005b), the theory of access by Ribot and Peluso (2003), the gender analysis by Doss (2013a), and explains the importance of a policy process.

2.1 Livelihood approach

The first theory that contributes to this research is a model for decision-making from a livelihood perspective. It analyses how farmers come to their decision to adopt CSA practices. Livelihood is defined by Chambers and Conway (1991) as "a livelihood comprises the capabilities, assets (stores,

resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the long and short term" (Chambers and Conway, 1991: 6). Therefore livelihood is influenced by social, economic, political, historical, and demographic trends and possible risks to which farmers are exposed (Frankenberger, 2001). Besides, livelihood depends on various strategies of both on-farm and off-farm activities, which helps farmers with food and cash generation. Each household has multiple possible sources to resources and assets which frame their livelihood. These sources are based on the farmers' endowments and there position in the (legal) political and social structure of society (Drinkwater and McEwan, 1994). Unfortunately, not all farmers and households have equal capabilities to manage stress and shocks. Poor people balance between "competing needs for asset preservation, income generation and present and future food supplies in complex ways" (Maxwell and Smith, 1992: 49).

2.2 Five kinds of capitals

With the livelihood approach in mind, I will try to explain how farmers come to their decisions to adopt CSA practices; divided into decisions made by male and female farmers. To understand the livelihood of the households, identifying farmers' access to capitals is important. Farmers' access to capitals lead to differences in (male and female) farmers' decisions and have influence on the likeliness of CSA adoption. Krantz (2001) describes capitals as "livelihood resources: the basic material and social, tangible, and intangible assets that people use for constructing their livelihoods" (Krantz, 2001: 8). However, Krantz only outlines four types of capitals (natural, economic, social, and human). In this research I focus on five different kinds of capitals, distinguished by de Bruijn and van Dijk (2005a). Different kinds of capitals may be distinguished:

1. Economic capital: access to technology as tools, labour, crops, knowledge, land, livestock, cash, water etc. In this research one of the main capitals is economic capital, this because of the aspect of access to land and labour. Land tenure is in Uganda a problematic concept, which will be explained further in section 4.4. Labour will be further explained under section 2.5 in the gender analysis;
2. Social capital: social security networks, family, neighbours, households, village etc.;
3. Cultural capital: religion, knowledge, skills, education level etc.;
4. Political capital: status, ethnic identity, local hierarchy role, relation government and NGOs, access to local programmes etc.;
5. Human capital: psychological and health constitution.

Capitals are dynamic and context-specific. They give a view on farmers' vulnerability and the way they need to make decisions to climate variability (de Bruijn and van Dijk, 2005a).

2.3 The theory of access

To understand better the access to capitals, such as resources, labour, and land by male and female farmers, the theory of access is relevant for this research. This theory focuses on the access farmers have to the above mentioned capitals. Ribot and Peluso define access as "the *ability* to derive benefits from things." This differs from classifying property as "the *right* to benefit from things" (Ribot and Peluso, 2003: 153). Sometimes farmers have access to resources, but do not own them by

rights. This is seen as the main difference between access and property. Access is about all possible means by which a farmer is able to benefit from things, while property needs some kind of socially acknowledgment or rights on national level, customary law, or by conventions. The definition of access contains a wider range of social relationships that can limit or enable farmers to benefit from resources and does not focus on property relations only. Farmers depend on access to resources, which Ribot and Peluso (2003) distinguish in mechanisms, processes, and social relations. What benefits do farmers experience from material, cultural, and political-economic factors? What bundles and webs of powers do farmers have access to, to shape and help them with gaining resources? The position of every farmer is context-specific; it differs because of historical and geographical access to resources. It is a dynamic process, which can change the range of powers and the forms of access to resources (Ribot and Peluso, 2003). Farmers' access to resources, like property of land, could fall under formal and informal systems, which could lead to legal pluralism; "where a plurality of legal, customary, or conventional notions of rights are used to make claims" (Ribot and Peluso, 2003: 163). As said, every farmer has different "webs of access and bundles of power." These strands in the webs and bundles of power are the means, process, and relations by which farmers are able to gain, control and maintain access to resources. Which Ribot and Peluso define as mechanisms. Mechanisms can be distinguished into rights-based and illicit mechanisms and into structural and relational mechanisms of access (Ribot and Peluso, 2003). First the webs of access will be further explained and then the difference between gain, main, and control of access. This section will end with the explanation of the mechanisms of access.

The webs of access and bundles of power are dynamic processes whereby farmers have access to groups and interrelationships. An individual's or group's position may change over time, as well as power within relationships. The various types of power relations in access could lead to differences in benefits and beneficiaries. For example, privileged access to authority could influence individuals' access strongly. Another example is the gender sensitivity within power relations. In 1917 Maine already mentioned the bundle of rights as "which disaggregated property into component rights – such as the rights to own, inherit, use, or dispose of – provided a nuanced understanding of the many social relations around things" (Maine, 1917 in Ribot and Peluso, 2003: 158). Though Ghani (1995) refers to bundles of powers as the idea that in a political-economic framework some people could benefit from particular resources while others cannot, because "the bundles of powers become nodes in larger webs and, at the same time, can be disaggregated into their constituent strands" (Ghani, 1995 in Ribot and Peluso, 2003: 158). To analyse the web of power within the theory of access, Ribot and Peluso identify three steps. First, they argue that the analysis of resource access requires identifying the object of inquiry. How do farmers benefit from the resource? How do farmers benefit from the flow, how do they distribute it, and how are power relations analysed to understand the benefit from mechanisms of access. Secondly, they discuss that the mechanisms of access need to be identified and mapped; who gains, maintains, and controls the access within the particular political and cultural circumstances (Ribot and Peluso, 2003: 160-161)? Last, they discuss that the analysis of power relations underlie the mechanisms of access involved in instances where benefits are derived. In this research the focus of the web of power will be on the access of farmers to land, social relations, and services offered and made available by government and civil society. How do access and social and political status influence smallholder farmers' decision-making on CSA adoption? Furthermore, insight will be given into the sources of knowledge that farmers have access to.

Analysing access refers to the process of identifying and mapping the mechanisms by which access is gained, maintained and controlled. For controlling access Ribot and Peluso (2003) use the definition of Rangan (1997) “control refers to the checking and direction of action, the function or power of directing and regulating free action” (Rangan, 1997 in Ribot and Peluso, 2003: 158-159). Access maintenance is seen by the definition of Berry (1993) “Maintenance of access requires expending resources or powers to keep a particular sort of resource access open” (Berry, 1993 in Ribot and Peluso, 2003: 159). The third, according Ribot and Peluso (2003: 159) gaining access is “the general process by which access is established.” These differences are especially of great value in measuring the difference of control and gaining access to the different kinds of capitals (de Bruijn and van Dijk, 2005a) by male and female farmers – the gender difference (Doss, 2013a).

Ribot and Peluso (2003) make a distinction between mechanisms of access: the rights-based and illicit mechanisms and the structural and relational mechanisms. There are several ways farmers can have access, in which political and cultural circumstances play a big role. Also men and women benefit differently from access mechanisms (Ribot and Peluso, 2003). Some categories within access mechanisms resemble the capitals, mentioned above, by de Bruijn and van Dijk (2005a), but they are not the same. As said, the categories within access of mechanisms are right-based access and illegal access and structural and relational access mechanisms. These mechanisms are context-specific and unique, wherein power operates differently. By analysing smallholder farmers’ access, some aspects are important: Do they have right-based access (according law, custom, or convention) or illegal access? Which does not mean that every right is acknowledged at every level; property and also access is not legal in every level; you then speak of illegal access. However, this could be socially approved or tolerated. On the other hand farmers benefit from the structural and relational access mechanisms: technology, capitals, markets, labour, knowledge, authority, identities, and social relations (Ribot and Peluso, 2003). For example, access to labour could help famers benefit from resources, like those who control access within the household (often these are the men) are able to acquire the benefits of cash payment or a percentage of the harvested resource. They may gain access to markets or social relations. The social identity (this will be further explained by Doss (2013a) later in section 2.3) is part of benefiting of access; these could be the membership within a group, age, gender, ethnicity, religion, status, profession, place of birth, education level etc. Who is included and who is excluded? In addition, social relations are important: friendship, trust, reciprocity, patronage, dependence, and obligation to others. These could be seen as individual characteristics which are very dynamic and context-specific. To combine this theory of access with the decision-making approach leads to the questions; how could access of farmers (distinction between men and women) lead to decisions on CSA? To what extent does gender influence access and how do power relations predict the way decisions are made?

2.4 Pathways

To analyse the decisions farmers make by considering the access to capitals, the context for smallholder farmers is essential. To get a better idea about their adaption of CSA, the effects of climate variability in Uganda for smallholder farmers are important. Why do smallholder farmers decide to take some measures? Do uncertainties, scarcity, risks, or other factors have effect on the decisions farmers have to make regarding their production process, resource management, and economic and social care in their livelihoods? Could the impact of climate variability, policy implementation, and agricultural technologies change the decisions of farmers (de Bruijn and van Dijk, 2005a)?

Through climate variability, households face risks in agricultural production. Within the decision-making theory the high-risk conditions of farmers could affect the decision-making process on adopting CSA practices. Those risks contribute to the perception and behaviour by farmers; individually or in groups. These risks are very context-specific per household and could differ on multiple levels within the village, parish, sub-county etc. For this theory of decision-making some dimensions have to be considered which influence decisions of a farmer, also these are context-specific (de Bruijn and van Dijk, 2005a):

1. Size and scale: is the farmer a member of a kin group or a village? The scale where farmers are distributing their crops could be an important criterion on farmers' organization, resource management or objectives. For instance, when having a small plot, it is less likely that farmers make use of agricultural technology systems, because this could even reduce the land size further;
2. Time horizon: this could influence decisions of farmers, the higher the uncertainty the shorter the time horizon is for farmers. Do individual farmers think of long term effects or do they make decisions based on reality and actual risks, constraints and uncertainties?;
3. Kind of assets: decisions change among farmers on the basis of their assets (de Bruijn and van Dijk, 2005a). What do they actually have and what do they use? How do they gain, maintain or control access to assets (Ribot and Peluso, 2003)?
4. Environmental factors: these factors have effect on the decisions of farmers and influence their internal organization. Farmers must adapt to the environmental risks they face on their farm;
5. Vulnerability: farmers face different vulnerabilities to the effects and the impacts of climate variability (de Bruijn and van Dijk, 2005a). For example, high climate variability could lead to uncertainties about food production especially because it is for smallholder farmers more difficult to make strategic decisions in advance (de Bruijn and van Dijk, 2005b).

These dimensions show that farmers have different risk positions; some are more vulnerable to specific forms of risks than others because of the stock of capitals. Whereby, the hierarchical position of a farmer could also contribute to the risk position of farmers. The risk position could influence the decisions farmers have to make (Beck, 1992 in de Bruijn and van Dijk, 2005a). In these dimensions gender also has to be considered. Male and female farmers could have different kind of risk positions because they are positioned differently to these dimensions. For instance, in size and scale, the access to land is more uncertain for different farmers, this would lead to different kind of decisions (Doss, 2013a). The decisions farmers make are partly depending on their local position and environmental risks; for instance, through climate variability (de Bruijn and van Dijk, 2005b). This means that this research needs to look deeper into climate variability in the Rakai District. Important to know is the way farmers experience the different kind of dimensions and the kind of climate variability farmers notice in the Rakai District in the last 10 years. This should lead to outcomes on farmers capability to adapt to those changes and how they behave to adopt CSA practices (in section 4.4 an overview of CSA practices will be given) (de Bruijn and van Dijk, 2005a).

To analyse farmers' context (by means of the dimensions), the approach of pathways and habitus are important. Pathways and habitus help to get understanding on how farmers understand climate variability and the context. The concept of pathways helps to focus on the evolution of decisions-making units over time. It refers to strategies, whereby farmers and households make decision to

deal with risk in an unstable environment; in this case climate variability. It is a historical perspective, whereby farmers decide on past experiences rather than on future visions. Farmers make repeating decisions on their goals, preferences, resources and means on their changing conditions, it is a learning process. It does not need to follow a planned or logical order. In this research farmers are questioned about these changing conditions and the decisions they made over the past (their last five years) at their farm. It has to be said that the conditions farmers experiences differ among the actors and their knowledge, experience, and understanding of the environment may be differ. This means that it is likely that even if they face the same conditions, their pathways may be distinctive. For instance, farmers are asked about their access to capital, available resources, and their goals and preferences regarding their technologies, this will differ from farmer-to-farmer and is also be part of their habitus (de Bruijn and van Dijk, 2005a).

Habitus is the approach to analyse cultural understanding of the environment in decision-making; it examines if farmers understand their environment (their capitals and their context) from their own use and how they make their decisions from thereon (de Bruijn and van Dijk, 2005a). Farmers come into contact with influences from outside, like markets, trade, tourism, labour migration, refugees, but also religion (de Bruijn and van Dijk, 2005b). This could mean that farmers are coping farm strategies of other farmers and do make changes according their interpretation of the environment (de Bruijn and van Dijk, 2005a). The changing environment could contribute to decision-making; for example, when farmers' experience a few years of droughts, it will influence how they understand changes and how they see their present lives (de Bruijn and van Dijk, 2005b).

The capitals farmers have are of great importance to understand pathways and habitus, especially land and labour. For example, when a farmer has a small piece of land the farmers' behaviour will be very different from bigger land holders. In addition, the analysis of pathways and habitus will uncover the different evolutions of farmers living in an environment with the same conditions and the contextual changes. Other important aspects of pathways and habitus are group membership, personal circumstances, material wealth, psychology, customs, experiments, climate-related events, poverty, and innovation. But also social identity as migration, social networks, innovation, source of income, religion. Furthermore, male and female pathways as well as systematic differences across generations could differentiate decision-making processes; differences in gender. These aspects encounter different decision-making processes by male and female farmers and are included into the capitals. Whereby, the access and availability of capitals contribute to the adopting process of CSA practices by these farmers (de Bruijn and van Dijk, 2005a).

2.5 Gender analysis

To understand the role of gender within CSA, climate change adaptation and other environmental policies in Uganda, I want to introduce the idea of gender analysis. This gender component can be considered in both theoretical approaches mentioned above. I already pointed out some gender differences. "Gender analysis," according to Doss, "examines how the roles, rights, and responsibilities of men and women interact and how that affects outcomes. In agriculture, gender analysis provides insights into how socially constructed roles and responsibilities shape the myriad decisions around agricultural production and processing" (Doss, 2013a: 1). Here this means that the characteristics of the household members, being owner, controller, or having access to capitals contribute to which decisions are made in households to adopt CSA practices.

Doss (2013a) argues that gender has to play a crucial role in the design of agricultural policies, which can help to increase productivity and reduce poverty. She pleads for focusing on the social roles of men and women, which means that to study women's behaviour you need to consider the broader context; and therefore not only focus on women, but also on men. For instance, a woman and a man could have different ways to get access to capitals. To understand this it is important to focus on how men and women are differently influenced by ways to get access to and/or control capitals (Doss, 2013a), or, as Ribot and Peluso (2003) call it gain, maintain and control access. Access will also be analysed along the gender dimension. By understanding the constraints and opportunities, farmers risk or benefit from capitals, policy makers could develop suitable environmental policies to mainstream gender and promote gender equity (Doss, 2013a). Gender mainstreaming is defined by Eklund and Tellier (2012) as "the process of assessing the implications for women and men of any planned action, including legislation, policies or programmes, in all areas at all levels. It is a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of policies and programs in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated. The ultimate goal is to achieve gender equality" (Eklund and Tellier, 2012: 593-594).

Gender is often left out in the analysis of the adoption of new techniques or market opportunities. As well as analysis whether women are being left behind or whether their situation is made worse with the introduction of new techniques or market opportunities. By focusing on the gender analysis, I can localize the gender gaps and risks that women face as farmers and how they experience differences in CSA adoption. These gaps could also be important for policymakers to be alert on monitoring, implementing, and evaluating policies and to create awareness about the different impact on men and women on development and economic growth. In particular, policy makers require more information on the control of resources, decision-making, contributions of labour etc. (Doss, 2013a). According to Doss and Morris from their research in Ghana there is evidence that gender differences in mechanisms have effect on the adoption of agricultural technologies. Important for these findings are how the policy implements measures to ensure better access for women to land, labour, and extension services (Doss and Morris, 2001). Another important factor in gender is risk. Doss and Morris (2001) give a hypothesis on risk: "wealth is often positively associated with the adoption of new technologies, because wealthier farmers are better able to bear risk and therefore are more likely to try new technologies" (Doss and Morris, 2001: 35). Doss and Morris (2001) assume in this research in Ghana that a greater proportion of women are landless or have significantly less access to land. This could be seen as one of the dimensions mentioned by de Bruin and van Dijk (2005a), namely size and scales. No or less access to land would mean that women are not able to bear risks and are less likely to adopt new technologies. Another factor in the adoption of technologies is the level of education. This is of importance, because of the ability to get insight into and manage unfamiliar innovations. Female farmers often lack years of schooling compared to male farmers. Also the frequency of contact with extension services influences the uptake of new technologies. It is even plausible that extension officers might prefer visit farmers with more land, farmers who focus on one main crop, or those who have already adopted some innovations. All of these factors are correlated with gender (Doss and Morris, 2001). Other aspects to take into account in agricultural research when interviewing farmers are to:

- Ensure that women farmers are represented and counted. Farmers are not necessarily males; examine who makes the decisions and who has the agricultural knowledge within the

households. Possibility is that parcels within the households could be joint owned or even separate between men and women;
- Even when a man makes the major decisions on agricultural practices, the woman may make decisions for specific (traditional female) crops, animals or other activities;
- Assess the contribution of everyone, men and women, to identify the opportunities and constraints they face. Even if women are not making major decisions (Doss, 2013a).

By focusing on these aspects, Doss (2013a) says not to forget the importance of data collection on individual characteristics or social identity as sex, age, education level, marital status, status within the household, and relationship to the household head. For example, it is important to know the marital status of the woman (is she married, single or widowed?) because this could lead to different access of resources as land, but also to a persons' status within the community. Doss (2013a) argues that marital status could frame how decisions are made within the households (Doss, 2013a). In another article of Doss (2013b), she explains that bargaining power of women within households is linked to variables as health and education of children. In addition, Doss says women's bargaining power may affect many other households' aspects as daily activities in the house, farm work, and off-farm work. To get paid or not can strengthen women's positions or achieve other desired outcomes, such as more involvement in decision-making process (Doss, 2013b). All these aspects could lead to benefits or constraints concerning women. These benefits and constraints have effect on the decisions women make on CSA adoption.

A last aspect to focus on is the identification of the controller and who gains access to capitals and assets within a household. Especially, because the entire bundle of rights is probably not owned by one individual within the household. For example, land can be owned by someone, but this does not mean he or she also has the right to sell the land or plant particular crops or trees on that piece of land. To understand farmers' behaviour in the long term process and their decision-making, some extra information on agricultural production is important such as productive resources, being an owner of livestock and/ or tools, outputs of agricultural productivities, and roles and access within the households (for example, it may be assumed that the role of women in agricultural processes will be more focused on food preparation). Also important are land tenure or land characteristics such as access to land, title to land, owner(s) of the land, and right of decision-making. Not least could be the services provided by institutions to men and women, like access to credit or farmer groups. Last of all, main capital for men and women is labour within agricultural production decision-making. This provides a means to analyse how income can affect women's and men's role in agricultural processing and within the household as food preparation (Doss, 2013a). Doss (2013a) explains "that giving income to women or giving women increased bargaining power within the household will have an impact on the outcome of household decisions" (Doss, 2013a: 10). This means that it is likely that women will spend more income on their children. Doss (2013a) argues that the key differences within a household are based on gender. These factors that influence men's and women's decision-making are included in the five kinds of capitals (section 2.2) mentioned by de Bruijn and van Dijk (2005a).

Doss concludes that gender analysis is broader than intra-household analysis. It examines how gender shapes behaviour, not only within the household but also at the community, institutional, and national levels (Doss, 2013a). The gender analysis needs to identify if a gender gap exists on the theoretical and practical understanding on implementing, monitoring and evaluating gender in

national environmental policies. Implementing gender is a process with many aspects in local, district, and national level. So we must consider the household characteristics (such as education level, status, and/or household composition) and understand the context to get a broad idea about how decision on CSA adoption is made (Doss, 2013a).

2.6 Policy process

When livelihood becomes more sustainable this could help policy makers in development, sustainable resource management and poverty eradication. The sustainability of livelihood does not only depend on the access of capitals, but should also be analysed within organizational structures and institutional processes (see Annex 3 for Krantz' livelihood approach framework) (Krantz, 2001), or also called policy processes (IDS, 2006). "The policy process is the means by which policy is conceived, negotiated, expressed, and possibly brought into law, and the procedures of implementation and practice" (Blaikie, 2010:2).

In this research I will focus on environmental policy; an understanding of the policy process and environmental programs will be provided, with a major focus on the affected population and their interaction within these policies (Lund et al., 2011). "Environmental policy has much in common with policies in other area – and aspects of this analysis could be applied to other fields – the environment has proved a particularly good subject for investigations into policy processes. The reasons for this, as explored below, include: the major role of science and technical issues in environmental policy debates; the fact that environmental problems are typically complex, inherently unpredictable and characterized by varying degrees of uncertainty; the fact that environmental problems operate across a range of scales, drawing in wide levels of interest; and because perceptions of both problems and solutions are value-laden and differ greatly among actors" (IDS, 2006: 5). Within environmental policy making "the most important current area is undoubtedly climate policy, covering both the mitigation and reduction of emissions of greenhouse gases and adaptation to climate change" (Gsottbauer and van den Bergh, 2010: 27).

Environmental policies should be based on the needs of the farmers. However, often there is a gap between the needs of the farmers and the implementation of the wanted outcomes. Issues involved are climate change adaptation, food security, and poverty reduction (Lund et al., 2011). Especially, in this research the issue of adoption of Climate-Smart Agriculture is important and how environmental policies influence smallholder farmers' behaviour to adopt CSA practices. In my results I will focus on how policies provided farmers services to learn on CSA practices. For farmers, many real life decisions follow out of information on risk, "such as protection against environmental hazards (how likely is a natural disaster?) and adoption of innovations (which benefits?)" (Gsottbauer and van den Bergh, 2010: 9). By looking into the policies process and services provided by the government and/ or NGOs, this research hopes to answer the question; how do environmental policies influence decision-making processes of smallholder farmers with respect to CSA adoption? As said individual decisions about adaptation to climate variability are influenced by risk perceptions. It is important to understand the determinants of decisions under uncertainty in order to improve individual risk judgment. "A good understanding of individual behaviour and decision-making is essential to explain and predict how people will act concerning environmental issues and subject to specific environmental policies" (Gsottbauer and van den Bergh, 2010: 2). Also to understand farmers' behaviour better it is important to view how national environmental policies are locally implemented. Policies are developed by policy makers, which have to be implemented and adopted

at different levels; national, district, sub-county, parish, and the village. Policy makers have a different perspective to climate variability than farmers living in the affected area. The design of adequate policies requires a good understanding of how people behave and make decisions within the context. For example, failures of adoption can come because farmers decide to stay with traditional knowledge or out of self-interest (not willing or free ride on its provision) (Gsottbauer and van den Bergh, 2010). To sum, there are policies in the meaning of regulations (policies on paper) which are designed for the environment farmers are living in and there are also policy programs offered to farmers, which I call: services. These adopted laws and services affect the way farmers make decisions on CSA adoption.

2.7 Conclusion

The purpose of the research is to gain insight into the decision-making processes of both male and female smallholder farmers in the research area of Rakai, Uganda on adaptation of CSA on agroforestry farms and to gain insight into the influence of national environmental policies on farmers' behaviour. To better understand the process of smallholder farmers' decision-making, a theoretical understanding on decision-making approach, the theory of access, the policy processes and gender analysis is needed. The underlying idea is that men and women make different decisions on their farm because of their diverse livelihood, which depend on their access to economic, social, political, cultural and human capital, the context, and their understanding. In the meantime, farmers need to deal with risks positions and have to gain opportunities within this dynamic context. Every farmer follows its own pathway to decision-making on CSA adoption. So by understanding the difference in access to capitals and dimensions (such as size and scale, time horizon, kind of assets, environmental factors, and vulnerability) of farmers, a better understanding on gender behaviour could be made by the adoption of CSA practices as well as how farmers' behaviour is influenced by the way national environmental policies are implemented and adopted in local society by means of policy processes. The gender dimension analysis how the roles, rights, and responsibilities of men and women interact and how that affects their access to capitals. In addition, gender analysis provides insight into how socially constructed roles and responsibilities shape the myriad decisions around agricultural production and processing (Doss, 2013). In this research it is important to localize the gender gaps within access to capitals to get a better understanding about gender inequality and decision-making on CSA practices, which could contribute to policy making.

3. Methodology

This research was composed of several phases. Firstly the draft proposal was created in the Netherlands, thereafter I spent three months in Uganda for field work. After coming back from Uganda the writing and analysing part began. Before describing the target group issues, I want to devote a section on the data collection and one on the research methods. Therefore, in this chapter, first the methodology used will be discussed to answer the research questions, then the different research methods are discussed, and finally the selection of the target group will be persecuted.

The output of the research is a final report for my Master Thesis for the department of Law and Governance of Wageningen University. The data could be used by research institutes as IITA, CIAT (International Centre for Tropical Agriculture), and Regional NGOs.

3.1 Data collection

Within my research I want to give answer on the main question: *How do male and female smallholder farmers make decisions on adoption of CSA practises on agroforestry farms in the Rakai District, Uganda and how do environmental policies influence male and female farmers' behaviour in CSA adoption*? To answer this question and analyse the theoretical concepts, I had to collect required data into the field, the Rakai District, Uganda. To organize these required data, I divided them in categories:

1. To identify the Climate-Smart Agricultural practices used in Rakai;
2. To understand the access to capitals by smallholder farmers and the household characteristics in Rakai;
3. To determine the gender dimensions in decision-making processes on CSA adoption within the households in Rakai;
4. To identify how farmers' behaviours are influenced by environmental policies;
5. To find out how national environmental policies are implemented by local councils or extension officers.

To obtain the data for my research I made use of several data collection methods. In section 3.3 I will show the criteria for my target group, among others I wanted to talk with farmers who have an idea about CSA practices and, if possible, also make use of them. In this research I focus on five capitals: economic, social, political, cultural, and human capital (as described in section 2.2).

First, I want to identify the Climate-Smart Agricultural in Rakai. In particular, I want to identify the CSA practices used; which ones are used by females, which ones by males. A distinction must be made between CSA practices and tradition knowledge systems (IKS). I like to get more knowledge on why they use practices, why do they need them in their opinion. How do smallholder farmers, men and women, define CSA practices on their farm in the Rakai District? How do smallholder farmers, men and women, make decisions on adopting CSA practices, what are their constraints and opportunities? What climate variability do farmers experience? If farmers do not use CSA, how do farmers adapt to climate vulnerability? To what extent do CCAFS assumptions on CSA practices match with the experienced reality by farmers? To get this information I need to make use of several methods. A literature review: on existing research from CCAFS, to find out their definition of CSA practices. To compare these with relevancy for the Rakai District, I held expert interviews with

extension officers and focus groups discussions with farmers. By interviewing the experts I hoped to gain data on the available CSA practices in the Rakai District and via the focus groups discussions I hoped to get knowledge on the CSA practices which farmers actually use.

Second, I want to understand the access to capitals by smallholder farmers and the household characteristics in Rakai. The information I want to gain out of this is to get an overview to the access of capitals (see section 2.2: economic, social, political, cultural, and human capital) by smallholder farmers and to divide this in the differences between male and female farmers (see 2.5 gender analysis). What capitals and accesses do farmers, men and women, have and what is the impact on decision-making? How do farmers see themselves, their access to the different kind of capitals? To compare these, the dynamics within the households are interesting; what are the household characteristics? What is the farmer's role within the household? How do gender dimensions contribute to decision-making? I like to find out if male and female farmers within the households have different access to capitals. To conduct this information also the focus groups discussions will be of importance; this to understand the dynamics within different kind of households. Another research method is the semi-structured interviews; to ask farmers one-to-one on their views. Prior to the use of the semi-structured interviews, pre-test interviews were held; to check the interview questions. Using interviews, it was a good method to understand the pathways farmers experienced on the risks they face as farmers, which access to capital they gain, and how they come to their decisions.

Third, I want to determine the gender dimensions in decision-making processes on CSA adoption within the households in Rakai. This to obtain data on farmers' decision-making process and data on access to capital which farmers' gain, maintain, and control (this information is in line with the acquired knowledge from category 2), but also to obtain data on household dynamics and pathways farmers take; what is going on in the livelihoods of farmers which influence female and male farmers' behaviour. Important here is to focus on gender. Gender is an analytical concept and all the data I gather, should be analysed from a gender perspective. For this information, I need to compare theory and practice. In other words, I want to compare existing research with the response of farmers. I used the methods of literature interview and different kind of interview techniques. Another method to get the best valuable information is comparing the responses farmers gave with what you see yourself in practice; by using the technique of participant observations and making field notes.

Fourth, I want to identify how farmers' behaviours are influenced by environmental policies. From the other three categories previously described, the decision-making process of farmers in the Rakai District is identified. In this category I want to see the influence of environmental policies on the decision-making processes. How do environmental policies influence farmers' behaviour? How do existing policies address gender issues in climate change adaptation and CSA? To understand this, the implementation process of environmental policies is of importance, as well as the services provided by the government and NGOs in the Rakai District. In brief, I want to get an overview on local policies and services available in Rakai; the policy processes (see section 2.6). To answer this, I used the information of extensions officers by making use of expert interviews. Other methods I used were the different kind of interviews with local farmers. I wanted to know what awareness do they have on local policies and provided services? To see if this knowledge enrich their access to capitals and influence their decision-making on CSA adaptation and this is also analysed with a gender dimension.

Finally, I want to find out how national environmental policies are implemented by local councils or extension officers. The information I like to gain out of this categories, is knowledge on the implementation, monitoring, and evaluation process of national environmental policies in the Rakai District. How are the national environmental policies incorporated in local acts and the local councils? How do the extension officers implement these policies locally, what programs and services do they provide? To get this data a literature review was needed on existing national environmental policies. Other methods were interviews with the extension officers and farmers. To collect all the required data, I made also use of the following methods: field notes and participant observations.

To summarize, during this research I want to make use of the following research methods: literature review, field notes, focus groups, expert interviews, participant observations, and (semi-)structured interviews.

3.2 Research methods

In this section I will further explain the research methods I used for this research. I made use of the methods literature review, field notes, focus groups, expert interviews, participant observations, and (semi-)structured interviews. For this my budget was limited; I had to buy my own ticket to Uganda, some gifts, visa, and living expenses. The organization IITA helped me with the accommodation, transport, network to the field-the Rakai District, interpreter, and voice recorder. To get an overall idea of my planning and how I spend my time in Uganda, I hold a time chart of my research activities (see Annex 4: Data collection time scheme). My research consisted of multiple phases; observation, preliminary interviews, the final interviews. First, I wanted to know what is exactly going on in the Rakai District; methods to be used are focus groups and participant observations. After this I want to test the topics I want to discuss, I made use of analyses of the focus groups, participant observations, and expert interviews. Finally, I tried to get valid answers with the (semi-) structured interviews.

3.2.1 Literature review

The literature review is the underpinning of the theoretical framework. The literature research was done at the beginning of the research until the end. The literature contains sufficient articles about smallholder farmers adopting CSA and the theories: the decision-making approach, theory of access, and gender analysis. Literature was searched in the databases of Wageningen University, Google Scholar, Scopus, and data received from IITA. Different topics to search on were: CSA, IKS, climate change adaptation, climate change policy, climate variability, cash crops, subsistence crops, agroforestry , gender, gender equality, gender gaps, Land act Uganda, gender in policies, decentralization, customary law, decision-making, risks and uncertainties by smallholder farmers, constraints and opportunities of smallholder farmers, theory of access, gender analysis, multi-level governance, land tenure, environmental policies of Uganda, Rakai District etc. The literature review was applied in the theoretical framework of the research and analysed within the data outcomes of the interviews.

3.2.2 Field notes

During my fieldwork, I wrote down my daily experiences in details on my laptop. By reading over these field notes, links and connections could be made between different kinds of events. The time period of this method was every day. I used this method before as well as during my time in the field, by making field notes and analyse what I had learned that day. To write the field notes, I had to make use of other methods such as participant observations and different kind of interview techniques. I

wrote in detail about meeting persons and listing to conversations; how people were dressed, but also who said what, the location, what happened, how often things happened, my personal feelings etc. Other important details were clothing, language spoken, interpretations on sphere, and reactions ('t Hart et al., 2005). To analyse these field notes I made use of a coding system, these helped me organizing the overwhelming amount of information.

3.2.3 Pre-test interviews and focus groups

The first time in the field I started to pre-test my interview. I selected four smallholder farmers. Interviews were separated in male and female farmers; two males and two females. After analysing the information of the pre-test interviews, I made use of four focus groups discussions: two male groups and two female groups. In the groups there were around seven to nine persons participating and persons were selected with the help of CIDI. The purpose of the pre-test interviews and focus groups interviews is to get data, knowledge, and local experience on the following topics ('t Hart et al., 2005):

- Perception farmers (male, female) on climate variability and climate change;
- Effects of climate variability and climate change on the crops;
- Risks and uncertainties farmers face with regard to agroforestry;
- All kind of access farmers have;
- Gender roles in the household and in farm activities;
- Local and national policies on climate change;
- CSA/ IKS, adaptation of strategies, own strategies (Nakiganda et al., 2012).

During these interviews I had many help from my colleague from IITA (a consultant hired by IITA). Besides her expertise in the field, she also helped me to interpret the interviews.

During the focus groups discussions, I used different kind of interview techniques. Not only did I ask open questions during the interviews, I also gave situation sketches, so farmers could answer what they will do in those cases. The focus groups had as main goal to get more local information, but also served as basis for the topics within the (semi-)structured interviews. To analyse these first interviews I made use of a coding system with the help of the computer program R, which helped me organizing the overwhelming amount of information I got out of these focus groups discussions.

3.2.4 Expert interviews

The expert interviews had the same main goal as the focus groups. They were the basis to collect basic knowledge on local information, as policies and climate vulnerability and they were analysed to get topics for the (semi-)structured interviews. For this I interviewed two extension officers: the forestry officer of the Rakai District and an agricultural officer; a consultant for NGOs and the local government. I asked them questions on their profession, the government functioning, and the provided services by NGOs and government. Also I got more insight in the gender dimensions with the questions asked. They gave me further insights in their perceptions of risk and factors that influence decision-making of smallholder farmers. Sampling of this was done by the help of CIDI. To analyse these kinds of interviews I made use of a coding system.

3.2.5 Participant observations

This method helped me to observe (female/ male) farmers in their own environment (the farm); I hoped to get some basic knowledge on decision-making processes of farmers. By participating in the

social lives of the stakeholders, I hoped to see everyday circumstances within the households and community. Instead, the only real activity I joined was a youth development programme of CIDI. During my stay at the hotel I also got the chance to talk with a few other persons working at a bank, for the government etc. The goal is threefold: First, to see the behaviour of farmers (cultural behaviour, interactions, and events); second, to get basic knowledge on farmers' understandings and skills (as local knowledge); finally, to see cultural habits (off-farm work, tools, symbols, clothes). I made use of my field notes and coding system to analyse the information ('t Hart et al., 2005).

3.2.6 (Semi-)structured interviews

For this method, smallholder farmers (nine females, nine males) were interviewed. They were mainly farmers which were with or without agroforestry farms. Agroforestry is one of the CSA practises, and is well adopted in the Rakai District. Some of these farmers I already interviewed during the focus groups discussions. The sampling was again done by CIDI. I started with a pre-research by holding focus groups discussions and by holding expert interviews. Also I tested the interview questions earlier, by making use of pre-test interviews. Hereafter, I adjusted my research plan and my questions for my (semi-)structured interviews.

The design of the (semi-)structured interviews starts with a blueprint of the interview. A blueprint was made with formulated questions in certain categories and in a fixed order. The questions are based on an indicator list, and were subdivided in topics and aspects. The interview consisted of open and closed questions and sometimes questions are repeated to get a valid answer (see annex 5 for examples the interview questions). The semi-structured interviews started with some general question to understand the social identity of the interviewee as age, marital status, education level, religion, village, parish, sub-county, household head, composition of the household, status, and profession. Then the interview talks about the farm situation, what kind of crops, trees and/ or livestock the farmer has, who is responsible for particular crops, trees and/ or livestock, and activities at home, on-farm, or off-farm. Inherent questions about land tenure are asked, who owns which land, who has the title, who can make decisions, and what community land is there in the area. Questions, to get a better understanding about what farmers see as climate change and/ or climate variability, what kind of shocks they experienced and how they protect them from these, what are their future plans (short and long term), and what kind of services do the government provide to farmers. Then questions were asked about the CSA practices used in Rakai, do they make use of agroforestry including decision-making on management, production and selling produce from crops and trees. But also what constraints and opportunities do their crops and trees give them, how do they protect those crops and trees, what kind of CSA are they using, what are they lacking as CSA, but also in knowledge or credit etc. Questions on the different kinds of climate variability farmers experience and how do they protect their farm from these. What kind of traditional knowledge is present? In addition, some questions about the household characteristics of farmers were asked, including what kind of capitals farmers own or have access to. Meanwhile, I focused especially on the cultural and social capital of farmers. To end the interview with questions on existing local policies and services and policy gaps.

Within these interview questions, most questions were open questions, to get an idea on how farmers think of their agricultural technologies. Nonetheless, farmers sometimes lack giving valid answers; for instance, on their entire capitals, to overcome this some closed questions were asked to them as well. As mentioned, Annex 5 gives some examples of questions. During the first few

interviews, the questions were more open then later when I interviewed more persons and got more often the same kind of answers. To analyse these interviews I made use of a coding scheme.

3.3 Target group

For my research I used different kinds of interview techniques: the focus groups discussions, semi-structured interviews, and expert interviews with extension officers. This means I need to focus on different kind of group samples. The different kind of interviews (see also section Interview list):

- 4 pre-test interviews: 2 males and 2 females;
- 4 focus groups: 2 male groups and 2 female groups;
- 18 semi-structured interviews: 9 males and 9 females (whereof 3 female headed households);
- 2 extension workers: an agricultural extension officer and the district forestry officer of Rakai.

For the data collection I had a criteria list for my sample group; however, I have some practical notes, which have consequences for my results. My main sample group, for the semi-structured interviews and for the focus groups, were male and female farmers in the Rakai District, sub-county Lwanda. The potential participants were approached with the help of a local NGO, called CIDI (Community Integrated Development Initiatives), in the Rakai District. Given time and space, I had to take into account, that I could not interview random persons, because I wanted them to meet some criteria ('t Hart et al., 2005). So I made use of a purposive selection, by targeting my group sample (Boeije, 2005). Working with a partner as CIDI and the consequence of not having a big group sample, contribute to not enough generalization. This sample cannot be seen as significant for the society, which is why in this research the main focus will be on case studies.

The sample group, for this research, were supposed to be male and female smallholder farmers who work or do not work with the CSA practices of agroforestry in the Rakai District. The idea is to get knowledge on the conditions about the roles, right, and responsibilities of both male and female farmers on their farm and within their households (Doss, 2013a). By observing and interviewing those farmers, I like to get more inside in their daily practices and on decision-making. That is why I included another group in my interviewee sample: the female headed households next to the male headed households.

Characteristics, as being a smallholder farmer, living in the Rakai District, sub-county Lwanda, and working with or without agroforestry, were meant to be the basis for my selection. Also essential was to interview an equal number of men and women. My selection criteria were:

1. Contribute to diversified livelihoods;
2. Smallholder farmers;
3. Mixed female/male farmers;
4. Living in the Rakai District/sub-county Lwanda.

However, the interviewed participants in the (semi-)structured interviews do not satisfy the criteria. While those in the focus groups discussions and the pre-test interviews match the criteria. In practice not always smallholder farmers were selected for the (semi-)structured interviews. Some could be seen as middle-size farmers and even some were large-size farmers. All in all the selection criteria

were not achieved, because not all the interviews were held with smallholder farmers, but often with farmers with more prosperity. I did not meet the criteria, because I was depending from a local NGO. Unfortunately, this had some consequences for my research. For instance, to analyse the quantitative data is not always viable or significant. Also it means that I cannot give data on how some aspects work for smallholders in the Rakai District. Nevertheless, I can still look into some cases; what did I learn from those cases and which ones are interesting for this research. These outcomes will be put in separate boxes. Another invalid criterion, not every interview is hold with general female farmers. After my analysis I noticed that many women have a special position in their community. This could have consequences for the outcomes; for instance, on access to capitals and women's social identity or web of power. Other constraints during the interviews and within the group sample:

- There is the possibility that the interviewee gave social desirable answers;
- I was depending on a local NGO, CIDI as selector and access to smallholder farmers;
- There were sometimes issues of trust because of culture aspects between the researcher (me, a white lady) and the interviewee. For example, some interviewee did not see the point of the interview or showed suspiciousness;
- Language problem: the interviewee often spoke Luganda, while I only speak English. Including some interpreter problems. I noticed not everything was directly translated to me. So I had to ask my interpreter a few times to give an explanation about the translation;
- Some topics were too private to talk about, when it comes to money or gender division. I noticed restraints and sometimes I got curt answers;
- The time of the interview (two hours), was especially a problem for men. While women often found it an honour that I wanted to interview them, it seemed men found it a wasted of their time. Often they told me to hurry up or they said beforehand they had to be somewhere else;
- Some non-respondents or some interviewee had no topic awareness; for example, on policies or climate variability.

Besides my main sample group, I also interviewed two experts. Those experts should have been male and/or female extension officers who work on implementing policies on climate change or with CSA practices on agroforestry in the Rakai District for an NGO or for the government. The purpose for the expert interviews was to collect basic knowledge on local CSA practices and to get an idea of local services by NGOs and the government. The idea was to give me further insights in the experts' perceptions of risks and factors which influence decision-making practices by smallholder farmers. The participants were selected with the help of the local NGO, CIDI. The criteria for selection:

1. Awareness of climate variability;
2. Awareness of CSA practices;
3. Work for the government or NGOs;
4. Work on projects with smallholder farmers;
5. Work in the Rakai District; especially, sub-county Lwanda;
6. Work on agriculture, agroforestry, CSA, climate change adaptation.

Also with the experts there were some constraints:

- There is the possibility that the interviewee gave social desirable answers;

- The accessibility of the interviewee went via CIDI;
- The topics could be policy sensitive, also with the chance of social desirable answers;
- Culture of corruption or paying bribes;
- On some topics there was no awareness by the interviewee.

On the contrary, of these constraints cannot be said in advance that they have had an effect on the final results.

4. Research area: Rakai District

To introduce and understand the local context better before the results are discussed, this chapter provides insights in the Rakai District and some basic data. First, some data on the Rakai District in general will be discussed, as well as environmental statistics and general climate risks in the Rakai District. Then more information will be provided on traditional knowledge; local practices used by farmers. Next CSA will be explained, which CSA practices have farmers adopted to prevent them from climate variability. In the last section the influence of the land tenure system and the national environmental policies will be presented.

4.1 Statistics of the Rakai District

In 2010 the population of the Rakai District consisted of approximately 546,000 people. Like elsewhere in Uganda, subsistence agriculture is the main economic activity in this district (Kyazze et al., 2012). This research interviews are all conducted in the Kooki county, Lwanda sub-county. In 2009 the population of Lwanda counted 5499 households and consisted of 28,200 people, amongst which 13,900 where males and 14,300 where females. In 2009 the poverty line (living below $1.25 a day) of the Rakai District was set at 31 percent of a total number of 450,127 individual headcount. For Lwanda sub-county this was less, namely 23 percent of the population representing a total of 25,050 people (Rakai Local Government, 2009).

In Rakai, 76 percent of the landholdings are used for crop production. Just more than half of the households have access to less than 1 Ha (hectare) of lands, under half of the households between 1 and 5 Ha, and 1 percent of the households have more than 5 Ha land (AMKN platform, 2014).

The society in the Rakai District has a patriarchal system. Men dominate socioeconomic and environmental decision-making (Tolo et al., 2014). The average household size is 4.4 people per household (Rakai Local government, 2009). 80 percent of the households in Rakai are male-headed households, against 20 percent female-headed households. These women, who are female heads of the household, are often divorced, single or widowed. Within the household the division of tasks, like household activities and on-farm labour, are mostly done by women alone (45%), compared to 33 percent of tasks by men alone. Off-farm activities are important for farmers as extra income source. For instance, 41 percent of households depend on off-farm jobs; for example, employment on someone else's farm (AMKN platform, 2014).

4.2 Rakai environment

4.2.1 The Rakai District

The Rakai District is located in the South-Western part of Uganda, near Lake Victoria. The southern boundary is part of the boundary between Tanzania and Uganda. Neighbouring districts are the Lyantonde District in the North, the Masaka District in the East, Kalangala District in the South-East, and the Mbarara District in the West. The total area of Rakai District is 4,124 km² (Kyazze et al., 2012). Because of the location of the district, close to Lake Victoria, the North-Eastern and Western hills (some as high as 1,520 m), and the North-Western plains the topography is very diverse (IISD, 2013).The Rakai District consists of different agro-ecosystems as forest, wetlands, savannahs, lakes, and rivers. Some forests have become forest reserve (Rakai Local government, 2009; IISD, 2013). 25.2 percent of the total land in Rakai consists of wetland areas (i.e. approximately 1,234 km2) (IISD,

2013). Some farms are located along lakes and mid hills and experience flooding and soil erosion. On the other hand, in the large flat area smallholders are highly vulnerable too droughts and often practice agro-pastoralism (AMKN platform, 2014). This should be considered when focusing on farm techniques used by smallholder farmers.

The Rakai District is throughout Uganda well known as the district with the first case of HIV diagnosed in Uganda (AMKN Platform, 2014). HIV/AIDS impacts the health of farmers and decreases the available labour for agriculture. Early 1990 government and development partners rushed into this District to fight against the socio-economic effects of HIV and AIDS. VHT (Village Health Team) were developed. In 1993 the District was one of the first districts to be decentralized. So there are many long-term health programmes that from origin focus on HIV but broaden to health and nutrition services (AMKN platform, 2014; Rakai Local government, 2009). The VHTs were formed to assist the limited numbers of health workers in the districts and offer health services in areas which are difficult to reach. They are trained by the ministry of health to assists patients and they offer immunization, health talks, first aid, and even sometimes help mothers to deliver babies (URN, 2012). Still a focus on health care systems is needed because of the high prevalence of HIV and AIDS. In 2010, 12 percent of the population in Rakai was HIV infected, which is almost twice the national average of 6.4 percent. In the Rakai District a development plan to deal with the negative impact of HIV/AIDS on agriculture was established. Often people with HIV and their families lack the capacity to invest in agricultural inputs and farming technologies; they need less labour-intensive techniques. Because of their need for health care and treatment, they are even more vulnerable to the pressure to sell their land for money. HIV/AIDS-affected households are very vulnerable to the impacts of climate hazards (IISD, 2013).

4.2.2 Rainfall data and climate variability

In Uganda and in the Rakai District there are two rainy seasons. The rainy seasons are from March/April to May and from October to December (Kyazze et al., 2012). In 2013, the average annual minimum and maximum temperature were 14.1° C and 26.7°C and there was an average annual rainfall of 952 mm (IISD, 2013). Temperature differences and rainfall patterns show some climate variability. Figures 4.1 and 4.2 illustrate the average rainfall and temperature in Rakai per month, from 1960 to 1990 and from 1990 to 2009. The figures show that in the first rainy season there falls more rain than in the last season, also the temperatures are higher in the first rainy season (The World Bank Group, 2014). Besides, by comparing the tables, they show an increase of the average monthly temperature and also a decrease in millimetres rainfall. In addition, the tables illustrate a shift in rainy seasons and temperature levels (The World Bank Group, 2014). Since 1960 the annual temperatures have increased by 1.3°C, with an average rate of 0.28°C per decade in Uganda. The annual rainfall has decreased with an average of 3.4 mm per month and 3.5 percent per decade. This clarifies that there are more frequent droughts than before. Showers are less predictable, there is less rainfall, but when the rain falls, it is heavier. This climate variability has an effect on the crop production, through droughts, floods, landslides, wind storms, and hail storms (this will be further explained in section 4.3 on climate risks) (Nakiganda et al., 2012).In the future, there are changes predicted in the seasonal distribution of rainfall, whereby rainfall will increase from December to February and decrease from June to August (IISD, 2013).

Unfortunately, the collection of climate data in Uganda is inadequate, and there are problems with the accuracy and availability of historical data (IISD, 2013). Therefore, it was challenging to find climate forecast data for the Rakai District.

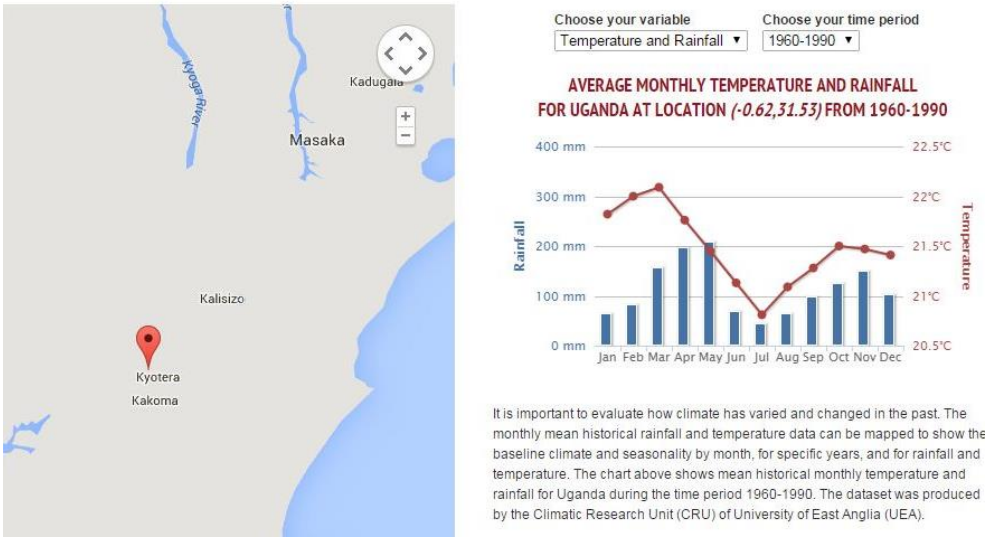

Figure 4.1: The average rainfall and temperature in Rakai per month, from 1960-1990 (The World Bank Group, 2014).

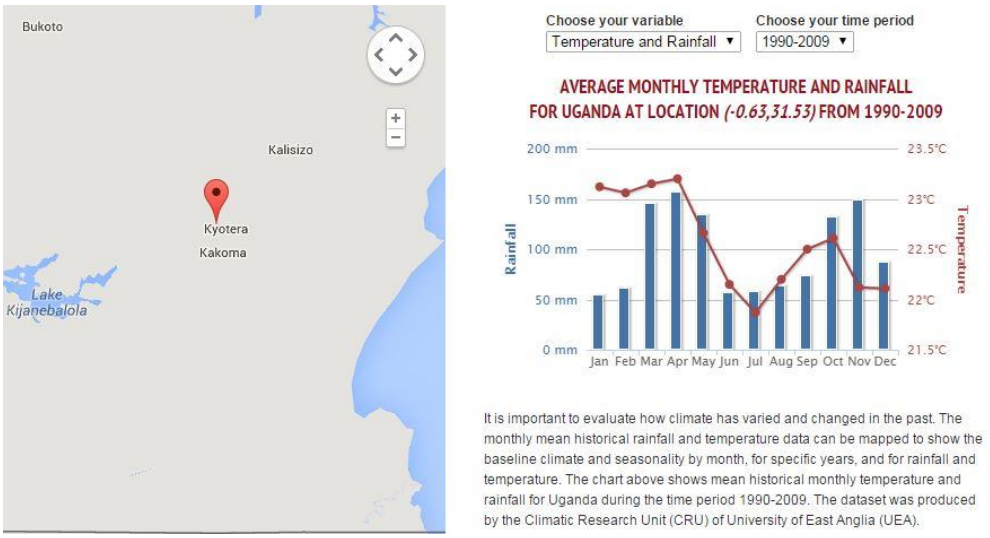

Figure 4.2: The average rainfall and temperature in Rakai per month, from 1990-2009 (The World Bank Group, 2014).

4.2.3 Enterprises in Rakai

In the Rakai District, coffee is the main cash crop for farmers. Almost 75 percent of the farmers produce coffee (Kyazze et al., 2012; AMKN platform, 2014). Due to the changeable climates and topographies, farmers in Rakai primarily grow Robusta coffee together with some Arabica (IISD, 2013). Middle-men sell this coffee on local markets and in Kampala.

According to the literature the main subsistence crops and some cash crops are bananas (locally called matooke), beans, maize, Irish potatoes, sweet potatoes, cassava, sorghum, millet, tomatoes, pineapples, onions, and cabbage (Kyazze et al., 2012; AMKN platform, 2014). In 2012 the total area

planted for these crops was 5,729,000 Ha (hectare) in Uganda (Uganda Bureau of Statistics, 2013). Banana (matooke) is for smallholder farmers the crop with the most value; it has both a high cash value and it is part of the basic meals for farmers (Nakiganda et al., 2012), but also beans and maize are important for food supply. Because of the two rainy seasons from March/April to May and from October to December, the food is mainly harvested in January, February, June, July, and August. During the dry season September through December, farmers rely mostly on the local markets (AMKN platform, 2014).

Scholars argue that unpredictable rainfall patterns make farmers change their crops. Now 25 percent of farmers produce more than nine different types of crops, 60 percent produce between five and eight types, and 14 percent of the farmers rely on a very few types of agricultural products. Farmers do not know when to plant and are planting fewer acres of annuals. Many have resorted to plant crops for each rainy season. Communities tend to survive more on perennials and cassava (AMKN platform, 2014). Another rising problem is the common crop diseases. Affected crops lead to reduction of yield and quality of the product (Rakai Local government, 2009).

Besides crops, most farmers hold livestock. Almost 80 percent of the households keep small livestock, while one in five households has cattle of their own. Livestock that farmers keep are cattle, goats, pigs, chicken, sheep, and turkey (Kyazze et al., 2012; Nakiganda et al., 2012; AMKN platform, 2014). In addition to livestock products and cash and subsistence crops, farmers produce manure, compost, honey, fuelwood, timber, and fodder (AMKN platform, 2014). Besides, NGOs and the government in the Rakai District provide farmers with seeds; for example, on fruit trees such as mangoes, oranges, avocado, but also for the *bracharia mulato*, *gliricidia* spp., *calliandra* spp., and *mucuna* spp. which are fodder species for livestock and could also be used to intercrop with maize (AMKN platform, 2014; Nakiganda et al., 2012).

Photo 4.1: Courtyard of a smallholder farmer (Pre-test interview 4, 2014)

Photo 4.2: Agroforestry and mulching practices

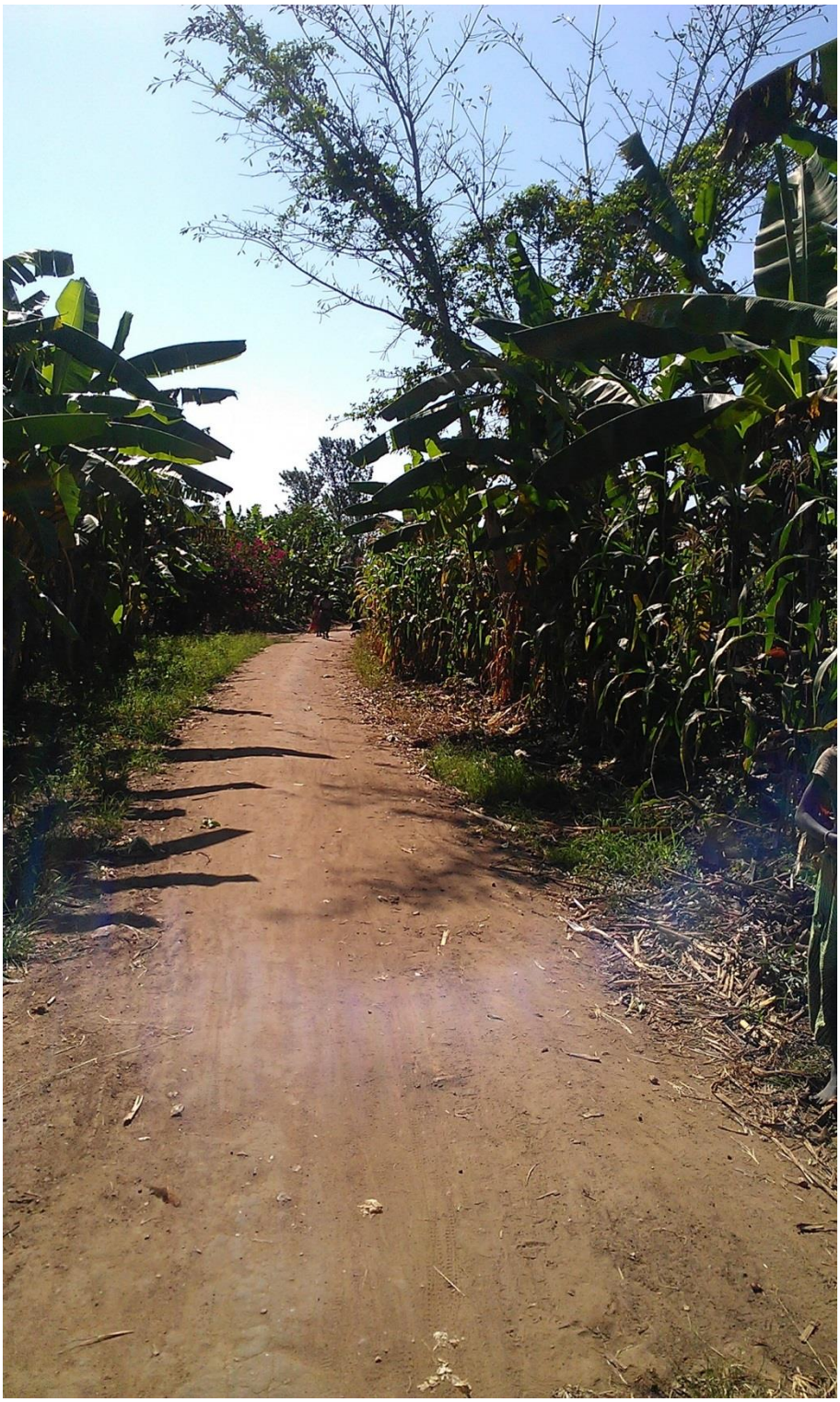

Photo 4.3: The edge of the plot

Photo 4.4: Passion fruit construction under an avocado tree

Photo 4.5: Well and borehole

Photo 4.6: Farm plot: banana and coffee

Photo 4.7: Agroforestry farm: coffee and fig trees – large-size farm

Photo 4.8: Agroforestry farm: coffee and fig trees – large-size farm

4.3 Climate risks

The population of Rakai depends on natural resources to meet basic needs; this means that the local communities are vulnerable to the negative impacts of climate variability. The local environment and natural resources remain the primary source of livelihoods for smallholder farmers (Tolo et al., 2014). Tolo et al. (2014) report that farmers notice effects of climate variability on subsistence agriculture. Climate variability is also noticed by scholars and the government. Rakai District officials and local development actors identify in their report 'the district developments plan from 2010-2013' of 2010 weather changes as a major threat to the district's development. In the same report, they notice some climate variability in season patterns. Other changes they noticed in Rakai are:

- Irregular, erratic seasons;
- Changes in the timing, frequency, coverage and amount of climate hazards;
- Unpredictable rainfall patterns within rainy season;
- Shorter and more intense rains (insufficient rainfall);
- Droughts have more frequency and take longer;
- Higher temperatures (IISD, 2013; Tolo et al., 2014).

A main problem for farmers is that they, because of the changes in rainfall patterns, can no longer follow the normal farming calendar. These early onsets of dry seasons and droughts have an effect on crop failure. Climate variability causes also other problems, like:

- Irregularity in time for planting, weeding, and harvesting;
- Decrease in crop productivity;
- Decrease in yield quality: crops and trees produce less flowers and less fruits;
- Farmers experience difficulties with predicting when to cultivate their crops;
- Frequent outbreak of pests and diseases;
- Reduced water and pasture for livestock (IISD, 2013; Tolo et al., 2014).

Many of smallholder farmers intercrop beans, maize, coffee, and bananas. Maize, beans, and coffee are sensitive to climate variability when changes occur in temperature, moisture, carbon dioxide concentrations, pH, and salinity. Rainfall variability, too much or too little water, has an effect on these crops yield and quality reduction. Also rainfall variability could increase sensitivity to pests and diseases, especially, when the soil has low fertility (IISD, 2013). The World Bank mentioned a reduction in overall coffee quality in Uganda in 2011 (Parizat et al., 2011). The impression is that this is related to the mentioned temperature changes and climate hazards, but also to other factors like low nutrients content of the soil and the age of the coffee trees. A lower quality of coffee affects farmers' income (decreasing), food prices (increasing), and production costs (increasing) (IISD, 2013).

In Rakai, 87 percent of the households state they have experienced a climate crisis in the past five years. More than half of the households in Rakai experience food shortages in the period from September to December. 74 percent indicates that they struggle to feed their family for at least two months a year. Only 10 percent of the households in Rakai are food secure all year long and 15 percent have enough food to feed their family for at least 10 to 11 months (AMKN platform, 2014). High population growth in Rakai also means that more people are likely to be exposed to climate hazards. Combined with the current environmental degradation and the socioeconomic and political context, these impacts further worsen the existing high poverty and could lead to conflicts on natural resources and further degradation of the environment because of increased erosion and the

reduction of soil fertility. As an example of this, conflicts rise between farmers and cattle keepers, who use water in wetlands and rivers as water source. Another example, the loss of livestock due to climate hazards can contribute to poverty and a reduction in manure availability, which again could lead to further decline in soil fertility (IISD, 2013).

Climate risks also affect gender dimensions within the households. Farmers, especially women depend on the mentioned subsistence crops (maize, beans, banana). The extra burden caused by climate hazards often falls on the women and children. For example, because of season changes, the weeding period does no longer occur during school holidays, which can cause two kinds of effects: 1. the women have to weed alone, without the help from their children. 2. Or, it affects the children, because they cannot go to school. Causes that women can no longer fulfill their role in food production, and water shortages disrupt household activities, this can even challenge cultural norms (e.g., women come home late from walking longer distances for water) and this could even increase domestic violence (IISD, 2013).

Only 17 percent of the farmers state that they have ever received any assistance to overcome hazards. Though they state that their source of assistance was mainly by services of government organizations (AMKN platform, 2014). Farmers indicate that information on extreme weather events (as storms, heavy rainfalls, prolonged sunshine) are mostly received via radio (87%). In addition, access to radios is important to get more knowledge and information (AMKN platform, 2014).

In short, because of climate hazards in Rakai, farmers face risks as lower yield productivity. Farmers are exposed to uncertainties climate variability. As climate variability will increase so will uncertainties and negative impacts through climate hazards. For this reason, farmers need practices, as CSA, to adapt to these hazards (IISD, 2013).

4.4 CSA practices in Rakai

There are modest interventions provided by the government and NGOs; for instance, they offer education on farming methods (for example, via training sessions and demonstrations), provide tree seedlings, give trainings on water and soil conversation, plant trees on the farm, and provide manure and cheap loans. These techniques are called CSA (Climate-Smart Agriculture) (see definition in chapter 1: introduction) (Tolo et al., 2014; Kyazze et al., 2012). The idea behind CSA practices is, as said in the introducing chapter, that they meet the three objectives of sustainably increasing agricultural productivity, building resilience to climate variability, and reducing GHG emissions from agriculture (FAO, 2014). CSA practices are climate informed agricultural practices that enhance food security, increase farm incomes, and development (CCAFS Coordination Unit, 2014b).

To identify CSA practices in Rakai, I spoke with experts (extension officers) and held focus groups discussions. It appeared that farmers use already farm techniques, which are also covered by the definition of CSA. Sometimes it is not really clear, if certain agricultural practices have been adopted as CSA or if these practices are based on farmers' own experience or traditional knowledge. As said in chapter 1, with CSA practices farmers can try to manage climate risks; though for this change is required in their agricultural technologies and approaches and make them sustainable approved (CCAFS Coordination Unit, 2014b). Actions to be taken should focus on activities on-farm and should be supported by technology, policies, institutions, and investments. This means that not only interventions are needed at farm level, but also at the level of ecosystem and landscape management. Extension officers should focus in their provision of services on resource efficiency and

resilience. CSA is not a set of practices that can be universally applied, but is an approach that involves different elements embedded in local contexts (CCAFS Coordination Unit, 2014b). Not all farmers do use the same package; they mix the use of various technologies (de Bruijn and van Dijk, 2005b). Other factors are that smallholder farmers are often poor; they have less access to capital and often have shortage in land. For instance, for many farmers chemical fertilizers and irrigation is too expensive. They do not have access to credit and cannot afford to invest in farm development (IISD, 2013). This said, CSA practices are very dynamic, and in every part in the world they need to be adjusted to the social, economic, and ecological environment. In the research context I looked at the CSA practices from CCAFS survey in e.g. Rakai (Meinzen-Dick et al., n.d.):

- **"Agroforestry**: Planting trees together with crops on the farm. These are trees that produce or are primarily used for fruit, fodder, or fuel wood production or that provide other benefits, such as reducing runoff or erosion, enhancing soil fertility, providing shade, and medicines.
- **Terraces and Bunds**: Physical structures placed along the contours to slow the speed of water.
- **Water Harvesting**: Structures for collecting water from a surface area, to be used for irrigation or for improved filtration. These can be both larger and smaller systems, encompassing individual farm and plot level systems to larger ones. These can include water ditches, water pans, and dams.
- **Use of Irrigation**: Covers all types and systems of irrigation, from both ground and surface water sources.
- **Zai Pits/Planting Pits/Negarims**: Pits for planting and help in conserving water; they can be of different sizes.
- **Mulching**: The practice of leaving crop material on the fields after harvesting to improve soil texture, prevent erosion, and help in water filtration.
- **Composting**: Removing crop residues to allow to decompose and then adding back to the soil. It is used to improve soil fertility and texture and allow for improved water filtration.
- **Livestock Manure Management**: This is the collection of livestock manure. Livestock manure can be stored and then applied to fields.
- **More efficient use of fertilizer**: Changing fertilizer application involves applying appropriate amounts of fertilizer. This could be increasing fertilizer use to increase yields and improve soil fertility where it has been under applied, reducing fertilizer where is has been over-applied fertilizer, or switching fertilizer types based on crop requirements. It also refers to the use of fertilizer practices that produces more yield with the same fertilizer (ceteris paribus) or to the same yield with less fertilizer; for example, the mixing of fertilizer components to reflect actual soil needs, deep placement of fertilizer, microdosing, changing from one fertilizer application at the beginning to three (smaller) fertilizer applications, changing application based on extension advice.
- **Using Improved, high yielding varieties**: Purchasing or breeding varieties to improve and increase the yield.
- **Using stress tolerant varieties**: Use of varieties adapted to climate challenges that a particular region faces. Stress tolerance includes drought/flood/saline/submergence and pest resistant seeds.

- **No till/minimum tillage**: Opening only where the seeds are placed, with as little soil disturbance as possible.
- **Improved grain storage**: Where grain is treated, raised off the floor, covered, and kept ventilated.
- **Improved stoves**: Stoves that burn fuel (wood and charcoal) more efficiently.
- **Cover cropping**: Crops that are grown to ensure that fields are covered by vegetation in between seasons. They are designed to protect soil against erosion and may enhance soil fertility and suppress pests" (Meinzen-Dick et al., n.d.).

4.5 Traditional agriculture practices

Farmers protect themselves against climate hazards by introducing traditional knowledge. Farmers have their own traditional methods on risk management for crop productivity, since their livelihoods are often directly affected by extreme weather events and climate variability. Scientists define this as indigenous knowledge systems (IKS). These are used by local communities to cope with and adapt to climate hazards. For example, IKS can be used in soil conservation, weather forecasting, selection of planting seeds, and protection of crops. These are local alternatives for sustainable agricultural development. This systems can vary from tree planting (fruit trees or fig trees (Extension officer 2, 2014)), agroforestry, planting quick maturing and pest resistant crops varieties (i.e. drought tolerant and early-maturing varieties), avoiding environmental degradation, adopting modern farming techniques, constructing water-harvesting basins on small scale e.g. from rooftops, constructing water channels to prevent floods, and animal rearing and setting up poultry to diversify livelihoods. Also practices as mulching, manuring, watering crops, swamp reclamation, contouring and terracing, and planting root crops could be seen as IKS. IKS indicators which are used by farmers are; for example, "fruit production of certain trees at the onset rainy season and temperatures during dry season, intensity and direction of winds, cloud cover, behaviour of birds and insects, as well as different phases of the moon throughout the year among others" (Tolo et al., 2014: 454) or the use of traditional equipment (traditional hand hoes), organic fertilizers, and animal rearing (IISD, 2013). These IKS indicators could, according to Tolo et al. (2014), be divided the IKS system in four ways of protection:

1. Soil conservation, for example:
    a. Crop rotation: used to maintain soil fertility and avoid recurring pests and diseases;
    b. Mulching: with use of banana leaves, grass or maize stems. For the soil to retain moisture and improve soil conditions;
    c. Use of cow dung: to improve soil fertility.
2. Forecasting planting seasons, for example:
    a. Knowledge on rainy season patterns: know the rainfall months in local calendar year;
    b. Movements of groups of birds: signifies rainy season. Prepare gardens;
    c. Swarming of butterflies: signifies dry season. No more planting of crops and seeds.
3. Selecting suitable seeds, for example:
    a. Damages vs. undamaged seeds: undamaged seeds selection for planting;
    b. Disease resistance varieties: disease-resistant strains selection for planting;
    c. Water soaking seeds: only denser seeds as opposed to floating ones are selected for planting.
4. Storage technologies/ prevention of diseases in seeds/ crops, for example:

a. Dry place storage: to avoid fungal attacks;
b. Mixing seeds with ash: to prevent weevil/ fungal attacks;
c. Partial harvesting of root crops: to avoid pests attack and rotting in storage area (Tolo et al., 2014).

CSA practices have overlap with these IKS. According to Tolo et al. (2014), it should not be forgotten that farmers already have traditional knowledge and have their own understandings of agricultural technologies, which are used by local communities to cope with and adapt to climate hazards. This should be kept in mind when looking into the CSA adoption process (Tolo et al., 2014). Especially, their knowledge, experience and constraints can benefit when working with CSA. It depends from farmer to farmer which equipment they use. It depends also on the access to capitals as assets, knowledge, and social relations (Tolo et al, 2014). Benefits from IKS are that they are "found to be socially desirable, economically affordable, sustainable, and involve minimum risk for rural farmers and producers, and above all, they are widely believed to conserve resources" (Tolo et al., 2014: 453). Though farmers face also constraints by adopting CSA, they have limited technology knowledge and due to lack of resources it is easier for them to stay with their old habits (IISD, 2013).

4.6 Uganda's land tenure system

In order to be able to get access to land, land tenure rules are important. In Uganda there are various land tenure systems: customary, mailo, freehold, and leasehold. Land tenure is part of the social, political and economic structures in a society. The FAO (2015) defines land tenure as "the relationship, whether legally or customarily defined, among people, as individuals or groups, with respect to land (for convenience, "land" is used here to include other natural resources such as water and trees). Land tenure is an institution, i.e. rules invented by societies to regulate behaviour. Rules of tenure define how property rights to land are to be allocated within societies. They define how access is granted to rights to use, control, and transfer land, as well as associated responsibilities and restraints. In simple terms, land tenure systems determine who can use what resources for how long, and under what conditions" (FAO, 2015). The problem by land tenure is that only a few people hold the land titles (AMKN platform, 2014). Society exile to community lands as wetlands and forests. "In practice, most forms of holdings may be found within a given society; for example, common grazing rights, private residential and agricultural holdings, and state ownership of forests. Customary tenure typically includes communal rights to pastures and exclusive private rights to agricultural and residential parcels" (FAO, 2015). These community lands are conflict sensitive. The four land tenure systems in Uganda are:

- Mailo land: this is a common land system in the central part of Uganda. As an agreement of the Buganda kingdom and the British colonizer, the land was divided between the Kabaka, his chiefs and the colonial government. The titles under mailo tenure are registered. Mailo land ownership is permanent and passed on from one generation to another. Within the mailo system there is a difference between mailo owners the tenants and the holders, those who actually work the land and may borrow or rent if from the tenants;
- Leasehold land: Leasehold is a system whereby land is held based on an agreement between the lessor and the lessee. This system can be secured on all the other forms of tenure system. Terms and conditions in this system are not clear and the lessee can easily lose the land when it is reclaimed. There are two types of leasehold, namely, private leases given to

individual landlords and official or statutory leases given to individuals and/or corporate groups under Public Act terms;
- Freehold land: Freehold tenure has some similarity with mailo tenure. In this system people can convert the other land tenures into freehold and secure land titles from their district land offices. Often used in districts not covered by the Buganda kingdom;
- Customary land: in this tenure system the land is owned and disposed of under customary regulations (Semakula and Mayanja, 2012).

In Uganda, till 1900 land was regulated according to customary law, which meant that in most communities land was owned communally or individually. In most communities where men could have private land, inheritance was done according to a patrilineal system. According to customary law, women could not inherit land, but could make use of their husbands' land rights after his death till they return to their own family or remarry outside their husbands' family. Though in every community the customary laws were different, it depends from community to community how those rights were arranged (Wanyeki, 2003).

In the Rakai District the most important land tenure regime is that of mailo. It is the main system within the Buganda kingdom. The basic of mailo means a square mile or equivalent to 640 acres. The history behind the mailo system started around 1900, when the kingdom of Buganda signed an agreement with the British-administered Uganda Protectorate. Whereby, the land was for the *Kabaka* (the Buganda king) and his *obutongole* (the chiefs), which were given each a mailo (World Digital Library, 2015). In 1927 some rights and duties of both the mailo owner and the tenant or holder were established. In 1937 these laws were further regulated by minimizing the obligation to the landlords and strengthen the peasants who were the productive base of the agricultural sector as well as protecting them from eviction.

Before 1962, Uganda was a colony of Britain. Since 1962 Uganda is an independent country (CIA, 2014). In 1967 a new constitution was adopted. Customary land rights were further protected in the Public Land Act of 1969: "A person could legally occupy, in customary tenure, any rural land not alienated in leasehold or freehold. The controlling authority could only grant a freehold/leasehold on any land occupied by customary tenure with the consent of the customary holder" (Kisamba-Mugerwa, 1998). This meant for land rights that the National Parliament had the power to regulate land and had state control over minerals and water on the land of landowners. In 1975 the Land Reform Decree (LRD) "abolished on paper all private rights to land and converted mailo holdings to 99-year leases. In the case of charitable and religious institutions, freehold land was converted into 199-year leases" (Kisamba-Mugerwa, 1998). It means for individuals that they could lease land for the duration of 99 years, to build on or use it for agriculture.

After years of civil violence and exclusion of ethnic groups Museveni became president in 1986 and he is currently still the president of Uganda. The newest constitution was adopted on 8th of October, 1995 and was amended in 2005 (Immel and Chalk, 2013; CIA, 2014). With the new constitution came the Land Act of 1998. Where land ownership from the state was changed to the citizens of Uganda. The Constitution and the Land Act decentralised land administration from the centre (the Uganda Land Commission) to the districts and sub-districts institutions (Nakirunda, 2011).

Women also got more land rights during the years. In early laws women's land rights were restricted to usufruct. Since 1972 women's inheritance rights were defined; the inheritance for women became

15 percent of their husbands' estates (Wanyeki, 2003). However, these rights were never really implemented in practice. Within the new constitution, legal equality and protection in political, economic, social, and cultural spheres was included, along with prohibition of laws, cultures, customs, or traditions that violate the dignity, welfare, or interest of women (Tripp, 2004; 5). In addition, the Land Act states that women's land rights are protected and any customary action which deprives women of rights became illegal. Despite the formal legal recognition of women's land rights, no government institution is responsible of protecting women's land rights (Nakirunda, 2011). In practice, only seven percent of the land is owned by women in 2003. Wanyeki argues that it can be stated that women owning land depends on the age of women, but also on their marital status, having children etc. (Wanyeki, 2003). Tripp add that women who have no security of tenure are less likely to invest or improve land (Tripp, 2004).

Other problems associated with land are mentioned in the Rakai District such as lack of productivity, land degradation, land shortage, land fragmentation, landlessness, land conflict, and soil exhaustion (Tolo et al., 2014). Land tenure is seen as an issue in the Rakai District, whereby population pressure is decreasing the already limited land available per capita. Sometimes landlords do not want their tenants to plant cash crops, allow to plant trees, adopt climate-smart farm practices, or adapt to climate variability. It is a two way, tenants on mailo land are also less interested in investing in land they do not own. All these problems contribute to poor land-management practices as deforestation and lead to increase in soil erosion (IISD, 2013; Katusiime, 2014). Katusiime even argues that "insecure land tenure rights in Uganda make farmers avoid long-term investments that could help them adapt to climate change and manage resources sustainably."

All in all, to keep in mind for chapter 5 and 6 when analysing the results: different land systems have consequences for tender security of farmers, the status of access to land has influence on farmers' decision-making on agricultural investments and development, and there is gender inequality in land rights.

4.7 Environmental Policies in Uganda

Uganda has many national environmental policies. These policies are developed and updated to address the adverse effects of climate variability and to achieve poverty reduction by environmental sustainable development (Ampaire and Happy, 2014).To reduce the impacts of climate hazards, the government of Uganda tries to raise awareness of the problems related to climate variability and the government wants to reduce risks by creating policies on climate variability and agriculture. Important national environmental policies in Uganda are: the National Climate Change Policy (2012), NAPA (National Adaption Programme of Action) (2007), National Land Policy (2013) (see section 4.6), National Wetland Policies, National Agriculture Policy (2011), Forestry Policy (2001), National Environmental Act. Cap 153 (1998), National Forest plan (2002), National Forestry and Tree Planting Act. 8/2003 (2003) and the National Environment Statute (1995) (Ampaire and Happy, 2014).

Uganda also signed international agreements as the International Climate Change Agreement of the UNFCCC (UN Framework Convention on Climate Change) in 1992, ratified in 1993 and the Kyoto Protocols in 1997 (Climate Change Unit, 2013; Government of Uganda, 2007; Friis-Hansen et al., 2013). The reduction of effects of climate vulnerability and adapt to the effects of GHGs is the most important for Uganda (Apuuli et al., 2000). To make the international arrangements legally binding the Ministry for Water and Environment developed a national climate change action plan in 2007:

the NAPA (National Adaption Programme of Action). This is a plan of action to identify priority activities with regard to climate change adaptation. Projects under NAPA are farm forestry and community tree growing, land degradation management, strengthening meteorological services, community water and sanitation management, water for production, draught adaptation, vectors, pests and disease control, indigenous knowledge and natural resource management, and climate variability and development planning. The implementation is a complex process, where many ministries, commissions, and the local government are involved (see Annex 7) (Friis-Hansen et al., 2013).

Disaster risk management is the responsibility of the Department of Relief, Disaster Preparedness and Management the responsibility of the office of the Prime Minister. This department is responsible for coordinating risk reduction, preparedness, prevention, mitigation and response actions. In 2010 the National Policy for Disaster Preparedness and Management was approved. The policy ensures to establish disaster policy and technical committees at all levels (city, district, sub-county, and village) (IISD, 2013).

In addition to disaster risk management, climate change adaptation covers a specific section. In 2008 the Climate Change Unit (CCU) was developed under the Office of the Permanent Secretary in the Ministry of Water and Environment, to focus on increasing its technical capacity, develop an overarching climate change policy and implementation strategy, and participate in climate change negotiations. Their responsibility is also raising awareness at local government and at community levels (IISD, 2013). Scholars see policy gaps within the policies on climate risk reduction: the management of coordination, prioritization, and information could be better. There is limited financial and human capacity (IISD, 2013) and the policies are formulated by the national government and the process is seen as unidirectional and top-down. Even more striking is the problem that both the decision-makers and the public have difficulties to understand and face risks through climate variability (Ampaire and Happy, 2014).

Other important national environmental policies:

- The National Climate Change Policy (2012). This policy is not yet approved and therefore not entirely implemented (Ampaire and Happy, 2014). The aim of this policy is to coordinate climate resilience and sustainable development for a GHG development path in Uganda. The objective is to “ensure that all stakeholders address climate change impacts and their causes through appropriate measures, while promoting sustainable development and a green economy” (MWE, 2012: vi). It focuses on the mainstreaming of gender in climate change issues and wants to integrate gender in education and trainings (MWE, 2012).The policy is cross-cutting with other policy themes as agriculture and livestock, water, forestry etc. The policy focuses on adaption in policies; for example, within agriculture and livestock by promoting “climate change adaptation strategies that enhance resilient, productive and sustainable agricultural systems” (MWE, 2012: vii).
- National Agriculture Policy (2011). The objective is “to promote food and nutrition security and household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition, providing employment opportunities, and promoting domestic and international trade”(MAAIF, 2011: 25). Gender should be integrated in all agricultural interventions, ensuring gender equity. It also should

take into account diverse livelihood needs of women, men, youth, and the vulnerable (MAAIF, 2011).

- National Agricultural Advisory Services (NAADS) (2001). The national agriculture programming was implemented by NAADS. The aim of the programme was to promote food and nutrition security and household income through increased productivity and market oriented farming. The idea was that it should be demand-driven, bottom-up, and decentralized. In practice implementation, supervision, and monitoring are limited, partly due to limited funds (IISD, 2013: 35).
- National Wetland Policies. "Objective is to promote the conservation of Uganda's wetlands in order to sustain their ecological and socio-economic functions for the present and future generations" (Ampaire and Happy, 2014: 17).
- The National Environmental Act. Cap 153 (1998). "An Act to provide for sustainable management of the environment" (National Environmental Act. Cap 153, 1998: 1). And The National Environment Statute (1995). "A statute to provide for sustainable management of the environment" (National Environment Statute, 1995: 6).
- Forestry Policy (2001) objective is the "protection of important natural resources on behalf of the people of Uganda that is sustainable management and use of the natural resources" (Ampaire and Happy, 2014: 19). The Ministry of Water, Lands and Environment came up with a National Forest plan (2002) to focus on poverty eradication, economic development, and sustainable forest resource management. Especially, focusing on the poorest and most vulnerable of Uganda (MWLE, 2002). Further replenishment: the National Forestry and Tree Planting Act. 8/2003 (2003) was developed for conservation, sustainable management, and development of forest and for example, to promote tree planting among the people of Uganda (National Forestry and Tree Planting Act. 8/2003).

5. The use of Climate-Smart Agriculture in Rakai

In this chapter the use of Climate-Smart Agriculture in Rakai will be discussed. With the theoretical framework in mind, the way in which farmers come to make decisions concerning CSA will be explained. To do this, I will first discuss households' dynamics; who is within the household responsible for management, production, and selling decisions? What could be seen as male and female crops? In the same section the agricultural techniques are mentioned which are used by farmers. Section 5.2 describes the access to capitals. Then in section 5.3 the pathways which farmers take will be presented, including the different dimensions as size and vulnerability. In the next section gender gaps will be explained; how male and female farmers make their decisions and who gain, maintain and control access to capitals. To understand the gender dimensions between male and female farmers, their differences in roles, rights, and responsibility, and how these influence CSA adoption will be discussed. This section is followed by a conclusion.

In order to understand the results in this chapter better, first the farmers' characteristics are discussed. As mentioned (in chapter 3) the sample of the farmers, (semi-)structured interviewed and studied, existed of nine men and nine women. Table 5.1 shows some of the characteristics of the farmers. The average age of the interviewed farmers is 46 years and most respondents are currently married. All the men claim to be the head of the household against three women who claimed to be head of the household. One of the male interviewee stated it like this "in case of decision I am the head, but when I am away the wife can lead the family" (Interview 12, 2014), the wife replaces him as head of the household when he is not around. The composition of the households varies per family, often even the grandchildren are living within the households. In this research I counted the people who were actually living within the house, so I did not count the number of children of their own and also the children living elsewhere were not included in the total number of people composing the household. A remark has to be given before going to the results. As explained in section 3.3 not every participant of the sample of the (semi-)structured interviews did not meet the criteria of being a smallholder farmer. While in the focus groups discussions it seems that many of them were smallholder farmers. This will result in different perspectives in answers to the questions.

Table 5.1: Farmers' characteristics

Social identity	Men	Women	Total
Age Average	30-83 45	28-58 47	28-83 46
Marital status	8 married 1 single	6 married 3 single	14 married 4 single
# household members Average	5-9 8	3-12 6	3-12 7
Head of household	9	3	12
Parish	Kiyovu 4 Kasensero 3 Kanoni 1 Bitabago 1	Kiyovu 6 Kasensero 1 Kanoni 2	Kiyovu 10 Kasensero 4 Kanoni 3 Bitabago 1
Sub-county	Lwanda 9	Lwanda 9	Lwanda 18

5.1 Household dynamics in Rakai: farming activities

I want to focus on the dynamics within the households: who is responsible for the management, production, and selling of produce? First, I will describe the difference between male and female crops. Then I will explain the daily activities, on-farm activities, and off-farm activities of men and women to get an overview of the household dynamics. In the end I will highlight what technologies farmers are practicing.

5.1.1 Male and female crops and trees

There is a difference in male and female crops, male focus more on cash crops well women more on subsistence crops. The outcomes from focus groups and the interviews on main crops and fruit trees in the Rakai District were almost the same as mentioned in section 4.2.3, namely: avocado, beans, maize, different kind of banana sorts (matooke, small sweets, and long sweets), cassava, coffee, eggplants, ground nuts, guava, Irish potatoes, jack fruits, lemon, mangoes, oranges, papayas, sweet potatoes, tomatoes, and watermelons. Rarer crops seem to be: cabbage, coco yams, cow peas, green pepper, onions, passion fruits, pumpkins, star fruits, tobacco (grow by one female farmer), and vanilla (grow by two female farmers). Common trees with no fruit production are: calliandra, eucalyptus, figs, greveria, annola, albezia, and pine. Farmers did not mention growing crops as tea, cotton, soya beans, sorghum, millet, and pineapples. There is a difference to perceive between male and female crops and trees:

- Male crops and trees: beans, coffee, maize, and figs.
    - Other, but less common male crops: cassava, mangoes, and eucalyptus.
- Female crops and trees: beans, cassava, maize, banana, and fruit trees in general.
    - Other, but less common female crops: avocado (fruit tree), coffee, ground nuts, Irish potatoes, jack fruit (fruit tree), mangoes (fruit tree), sweet potatoes, oranges (fruit tree), and papayas (fruit tree).

Farmers sometimes decide to replace crops by introducing new crops (see different bean varieties photo 5.2). Crops as sorghum and millet are decreasing in the area. According to the farmers they reduce the soil fertility, take a long time to mature, they are no longer consumed, and because of less rainfall the quantity decreases. Male farmers told me also that they did not longer grow tobacco, because they cannot consume it, it is bad for their health, it is labour consuming, and it siphon pests and diseases to other crops (Focus groups 1, 2, 3, and 4, 2014).

5.1.2 Daily activities

- Women: take care of the children, prepare the food, fetch water, wash, collect firewood, and practice many other household activities;
- Men: fetch water;
- Children: support many household activities.

Already within the focus groups discussions (1, 2, 3, and 4, 2014) it became clear that women and children did the daily activities most of the time within the house. It was evident that the children support the women after school time. The men only fetch water when the wells are far away and men are often more mobile than the women and children.

5.1.3 On-farm activities

- Women: till, rear animal, cultivate, plant, mulch, collect manure;

- Men: till, rear cattle, spray pesticides and herbicides;
- Children: till, cultivate, collect manure, spray.

On-farm activities are mostly done by women. Especially, farm practices such as cultivation. The activities male practise varies per farmer. For example, some men do the heavy work to lighten the weight of women by practicing tilling and spraying activities. Children often help on the farm after school and they help with whatever there is to practice, like tilling and cultivating. Though often family or husband and wife practice activities together, such as animal rearing, tilling, spraying, cultivating, weeding, and irrigation.

5.1.4 Off-farm activities

- Women: handicrafts as weaving and mat making;
- Men: make bricks, own shops, business, sell produce, rent out own land, middle-men, employment other farms etc.;
- Children: school.

Society expects from men to take responsibility to look for extra income. Men try to find and have jobs such as local councillor, teacher, gardener, boda-boda driver (a motorcycle taxi driver), bar owner, and drama performer. They act often as middle-men and also sell the produce from their own farm such as foods, processed foods (as maize flour), fire wood, and livestock. Meanwhile, women try to earn some extra income themselves. Women often make handicrafts and sometimes even sell some farm produce from their own plots. Within this sub-county, male and female farmers have formed a coffee cooperation to get higher prices for their coffee beans. The children have the responsibility to go to school.

During the interviews it became clear that in my sample, some women were having special positions such as village health counsellor (part of Village Health Teams - VHTs), microfinance treasurer, and LC2 leader and LC3 court member (see further section 5.2.1 special positions in political capital). Still, most women told me they depend on the income of their husband (such as teacher) and one woman even explained me she relies on the allowance from her husband, who is living with his second wife (Interview 3, 2014).

All in all, farmers state they lack cash and have to pay high taxes; they need more money for school fees, to buy food, to practice future plants, to use means of transportation, to buy improved seeds, to practice agricultural techniques, to buy water, to buy resources as fertilizers and batteries, to hire labour and so on.

5.1.5 Management decision-making

Which and who makes management decisions differ across households. It partly depends on who is the household head (male-female); in this study often the men (see table 5.1). In general men are the owner of the land and make decisions concerning the use of most part of the land, except the plots they gave to their wives to manage. Besides men being owner of the land, they are also the owner of the trees on that land. However, fruit trees often are the responsibility of and managed by women. Also when women are head of the household they are responsible for the land they hold or own. Women could get access to land in case of inheritance or when the husband bought land for her.

5.1.6 Production decision-making

Production decisions on the farm depend on how the farm is managed. Management decisions focus on house and land ownership, while production decisions focus more on the production on the farm. Tree planting is the responsibility of men, while women often harvest the fruit trees. I lack data on who decides to cut the trees, but it is the men who decide to sell the firewood and timber from trees, while women and children are the ones to collect firewood for home purposes.

Crops are the responsibility of both male and female members of the household members, though planting the crops is mostly done by women. Men and women could both decide, together or separately, to introduce new crops. Women get often access to separate working plots, given by the husband or family inheritance, on these plots the women can make their own. They make decisions over their own crop and are allowed to use the (fruit) trees on this part of the land. It depends per household, but some women also own the harvest of these crops and trees.

5.1.7 Making decisions to sell produce

Decisions to sell produce are made by the husband or in consultation with the wife. Although men often make the decisions on tree produces such as bark clothes, firewood, and coffee. These men also are in charge of the money they earned. Men do not need to justify themselves, as a man explained “if he gets 40,000, he can give the wife 30,000, then 10,000 remains in his pocket.” I asked him where to put that 10,000? And he said “you never know” (Interview 12, 2014). This could mean I can do whatever he wants with his money.

Women who are household heads do not need to discuss sell options with anybody; they make the decisions to sell individually and are responsible for the money. Married women can sometimes sell the crops from their own plot. A woman explained “the crops they are hers. The husband is responsible for coffee and trees like mangoes and figs.” “She tells the husband, that she has harvested and that she is going to do this” (Interview 7, 2014). Another woman (Interview 10, 2014) explained her husband is the one selling “she can get a good price, but not knowing who is to buy, and the husband can come with one trader {middle-man} and he decide to sell off, and they can sell of even though the price is low” (Interview 10, 2014). Besides the harvest of crops, women can sell the handicraft that they make themselves.

5.1.8 Agricultural technologies

In this section I will identify which technologies that can be labelled as CSA (as listed in section 4.4) are practices by farmers; see table 5.2. Though farmers practice these technologies it is not necessarily that farmers learned about these practices in trainings or as coping strategy. It is possible that it is already existed knowledge or own experience, than these practices are IKS (see section 4.5). In section 5.2.5 a list will be given on traditional knowledge practices and in section 6.2.9 a list will show the actual CSA practices by farmers.

It is clear that farmers, who use agricultural technologies, use multiple techniques together and mix them (see table 5.2 on technologies). Farmers mention many farm technologies, which help the fertility of the soil, which is used in CSA practices to adapt to climate variability.

This research will especially focus on farmers who use agroforestry. Sixteen farmers, nine men and seven women, say they use agroforestry as a technology. Agroforestry is a practice which could be seen as CSA but also as IKS; for example, the planting of fig trees is a traditional practice. Though

agroforestry also happens to be a CSA practice; farmers learn from trainings and extension officers to plant trees with crops on their farms. Besides, they teach them not to cut the trees; if they cut a tree, they have to replace it with a new tree. Farmers acknowledge the benefits of trees on their farm: they produce shade and soil conservation, act as windbreakers, give fruits, and give produce to sell such as bark clothes (from fig trees, see photo 5.1), firewood, and timber. Nevertheless, trees bring also constraints they compete for light and water with crops. During the focus groups discussions (1, 2, 3, and 4, 2014) other drawbacks were mentioned, trees provided a home for monkeys that ravage the crops (such as maize and banana), trees belong to men, mango trees produce a low harvest, and the price of mangoes and avocadoes are also very low in the harvest season.

Table 5.2: Agricultural technologies

Technologies	Men	Women	Total
Agroforestry	9	7	16
Terraces and Bunds	6 (N=7)*	6 (N=7)*	12 (N=14)*
Water Harvesting	2	4	6
Use of Irrigation	5	7	12
Mulching	9	9	17
Composting	6	6	12
Livestock Manure Management	6	9	15
More efficient use of fertilizer	4	4	8
Using Improved varieties**	8	6	14
Improved grain storage	5	1	6
Improved stoves	6	5	11

* N= means No answer of participants

** In this table the use of improved, high-yielding varieties and the use of stress-tolerant varieties are combined in using improved varieties.

The interviewee also did not give any information on like practices cover cropping, no till/minimum tillage, and zai pits/planting pits/negarims (as listed CSA practices in section 4.4 from CCAFS survey in e.g. Rakai).

Besides agroforestry, farmers make use of other technologies. Some farmers use to make terraces and bunds. I got the information of this practice mostly out of the pictures made during the interviews by the farmers. Farmers often told me they dig channels in there garden; however, they made no distinction between the terms contour bands, channels, ditches, trenches, and terraces. It was also hard to make a distinction as CSA or IKS practice. From the pictures it seems farmers protect their farms with terraces and bunds to slow the speed of rainwater. One farmer says he needs to protect his farm from hill erosion, so he constructed channels to stop soil erosion. Most farmers use water channels to harvest water for automatic irrigation.

It seems that women use irrigation more than men. This can be explained because they take care of the smaller gardens (to grow cabbage, green pepper, and onions), in which drip irrigation is a common practice. Some farmers learned to use drip irrigation systems in young (coffee) tree siblings.

The use of fertilizer is not immediately a CSA practice; it has to be learned to use proper and efficient. A major constraint in using fertilizers is that it is too expensive to buy this fertilizer. The benefit, according to the farmers, is that it highly increases the quantity of the harvest. It seems that farmers lack knowledge on the increasing risks fertilizers bring along.

The use of improved varieties (seeds), both high yielding varieties, as well as stress tolerant varieties, is only common when seeds were given by NGOs and Governmental organizations (see further explanation of this practice in chapter 6).

The use of improved stoves is less common (see section 5.2 economic capital); however, important as CSA practice. These stoves need less firewood, which is both helpful for farmer (has to collect less firewood) as for the environment (less cut of trees).

Almost none of the farmers have access to improved grain storage. One farmer said he uses community storage, four farmers explained that they have an improved storage in the house; the rest of the interviewees just saved their produce in bags or used other methods in the house.

A very common farm practice, which is not classified as a CSA practice and therefore not included in table 5.2, is the spraying of herbicides and pesticides to reduce pests and diseases within crops and trees. Farmers claim it helps them in the quality and quantity of their farm produce. However, it is a very expensive method. Farmers have to buy the pesticides and herbicides, some have to hire a knapsack sprayer, and some even hire labour. This is also explained by Interview 14: “it is taught that it is not good to be spraying herbicides and pesticides most of the time, because I am a good farmer I hire labour, I do not want to get used to those chemicals and the labour I hire they have gadgets of protecting their body while spraying” (Interview 14, 2014). A major constraint is that by wrongly using spraying techniques, the chemicals have an effect on the health of farmers and the environment. Besides that, the knapsack sprayer is also very heavy; this is why it often is the men to spray within the farm.

Besides these practices, other common technologies which could be both covered as CSA and IKS are the use of organic compost, mulching, and livestock manure management.

A remark has to be given; unfortunately, it became not very clear from the results what technologies are used by smallholder farmers. From comparing the results with the focus groups discussions, an expectation is that the smallholders practice less of these technologies.

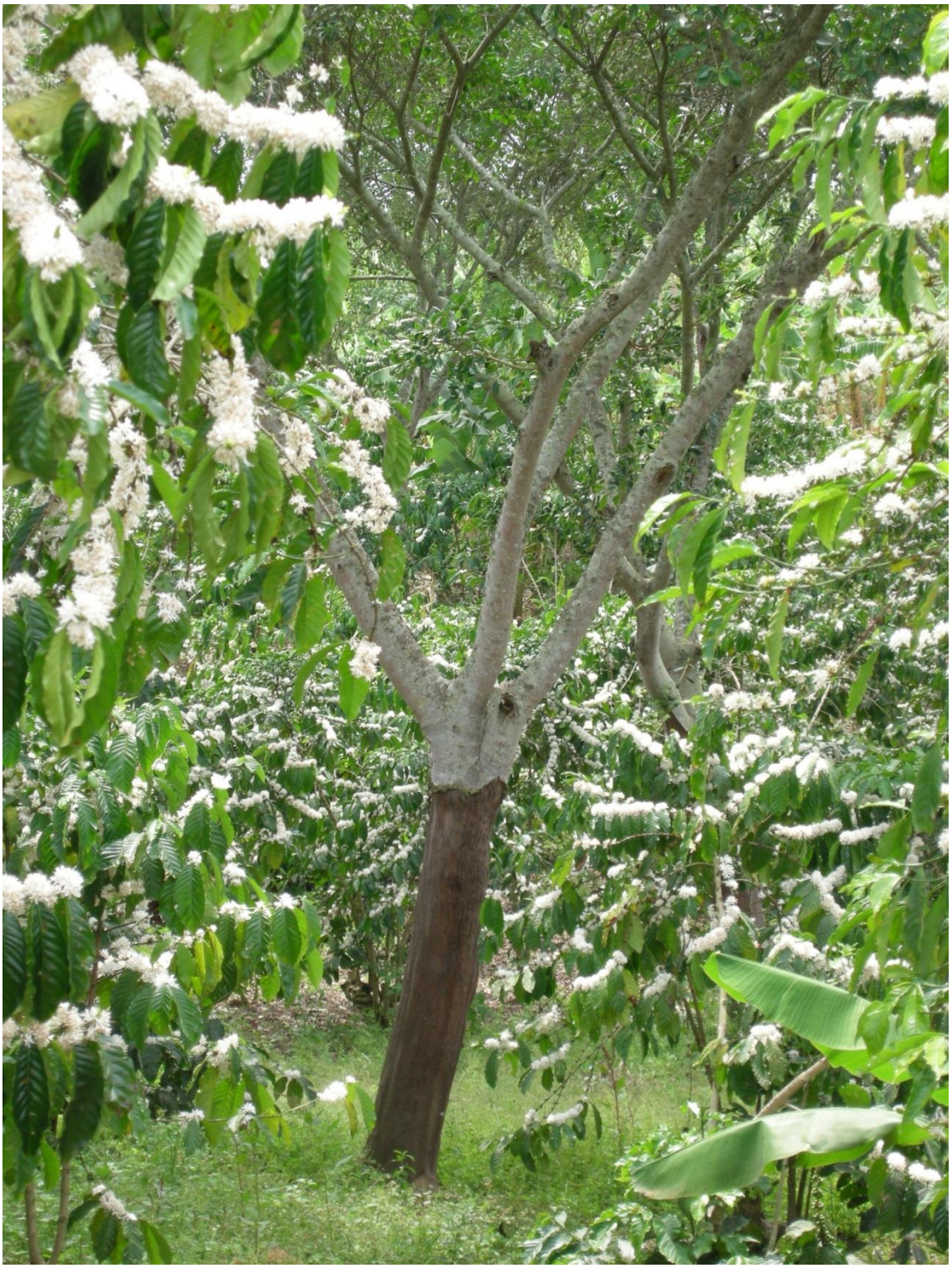

Photo 5.1: Fig trees, with the purpose of agroforestry in coffee plantation and used to make bark clothes (Interview 13, 2014)

Photo 5.2: Different varieties of beans, owned by female farmer (Interview 3, 2014)

5.2 Access to capitals

In this section the five capitals (political, economic, social, cultural, and human see section 2.2) will be analysed, while taking into account the access farmers have to capitals.

5.2.1 Political capital

In exception to the previous order of the five capitals I used, I will start with the political capital in this chapter. This because the sample of the interviews has mainly outliers. By starting with political capital, I will be able to consider the other capitals from this perspective. The special positions of the farmers provide a basis to understanding the social identity and power relations in the context and how they benefit from the mechanisms of access. Their webs of power could help them to gain resources (Ribot and Peluso, 2003).

As mentioned above in table 5.1, usually men are the head of the household. According to my data, from this sample both men and women have special positions in this district. Table 5.3 shows the amount of special positions of farmers in their society. What it shown is that five out of nine men have a special position, against seven out of nine women. This high number of women with special positions is uncommon and thus means that my group sample cannot be representative for the whole community.

What also stand out are four chairmen of the Local Council 1 (LC1) (not including an elder man, who used to be chairman LC1). Furthermore, three men are chairpersons of their farmers groups. In the meantime, women often occupy a special position within religious organizations. Other functions wherein farmers have special positions are: agricultural organizations, health organizations, and within the clan as clan leader. One man is even involved in a drama group “for entertainment and passing information about AIDS” (Interview 8, 2014). A last remark on table 5.3 is that nine farmers have multiple special positions in their community, against five farmers (mostly men) who have no special position at all. It could be assumed that these farmers with special positions have benefits in the access to technologies and could even be example farmers in excellent farm practices.

The benefits farmers get out of these positions is not only an increase in status. When men and women work as VHT or NGO volunteer they get mobile phones, bicycles, and sometimes even motorcycles to mobilize the community. These gifts can also be used by them in daily life, which makes them even more mobile. It can be assumed that farmers with special positions have easier access to NGOs and the government and this can help them to get access to farm inputs and investments such as water basins.

Relations with the government differ from farmer to farmer. Some farmers know who to contact in case of agricultural problems or explanation of environmental policies, though some are not aware. Especially, women say their husbands or their older children contact chairpersons or the police for security. In the focus groups it became already clear that farmers sometimes enforce their own ruling, without counselling the LC for laws. For example, farmers pay bribes, chase persons from the village, let thieves work to replace for stolen items of their farm, attack in the night on private owned wetlands, chase cattle keepers from their farmland, guard with their community for thieves, and personally cut the roots of the eucalyptus trees of their neighbours. In the interviews the outcomes were mostly focused on paying bribes to local leaders or land owners to make it possible to use water supplies and to have access to grazing land.

Table 5.3: Political capital: Special community status

Special position in community	Men	Women	Total
No special position	3	2	5
VHT (Village Health Team) and health councillor	1	2	3
Chairman LC1	4	0	4
Chairman LC2	0	1	1
Member LC3 court	0	1	1
Member LC1	0	2	2
Government consultant	1	0	1
Special position in religious organization	0	4	4
NGO volunteer	2	1	3
Chairperson farmers group	3	1	4
Other special position in farmers group	0	1	1
Community based trainer (CBT)	1	0	1
Director drama group	1	0	1
Master of ceremony	1	0	1
Clan leader	1	0	1
Total farmers with special positions	6	7	13

5.2.2 Economic capital

Economic capital consists of access to technology, labour, crops, knowledge, land, livestock, cash, water etc. (de Bruijn and van Dijk, 2005a). Lack of capital to invest in agriculture is common in Lwanda. For example, farmers explain that because of their lack of money, they are struggling to pay for food, water, school fees, or farm inputs. Of all the respondents, fourteen out of eighteen had in some kind of way access to cash sources: credit, loans, microcredit, or saving groups (whereby, gifts are a form of resource). Table 5.3 contains an overview of formal and informal sources of access to cash generating by farmers. The table shows no significant difference between men and women in access to these forms of cash, though some women state they have no access to cash because their husband is the one who has access to credit or saving groups. Some women also claim to have access to credit, but in reality their husband is the one controlling the money.

Table 5.4: Economic capital: access to credit

Cash	Men	Women	Total
Credit and loans	2	2	4
Personal loan	2	1	3
Microfinance	0	2	2
Saving groups	6	7	13
Gift sharing	2 (N=8)*	6 (N=8)*	8 (N=16)*
No access to cash	2	2	4

* N= means No answer of participants

Farmers complain that it is difficult to get access to cash, by means of services of banks, NGOs, and microcredit institutions. Undervalue of collateral, too little income, and high interest rates are constraints male and female farmers face. Women's specific constraints are that they only have

access when their husband allows it. The husband is the one having access to cash; women often have no collateral at all.

Only two families, of all the farmers I interviewed, had access to microfinance in the past. Though they have recently paid back the amount they borrowed. One of the women working as a treasurer for the microfinance office in Lwanda told me that farmers have six months to pay back the amount of lent microfinance; a loan starts from 300,000 shillings to a maximum of three million (Interview 11, 2014). One man explained to me that in his villages, the LC1 chairman helps the farmers by being the guarantor to get a groups bank account (Interview 18, 2014).

Another notable fact is that loans are provided by NGOs in the Rakai District; though none of the respondents said they make use of these loans. Instead, some farmers explained that they have personal loans from their friends or from other farmers. The farmers, in my sample, only use NGO credit in combination with saving groups. It could be stated that saving groups are highly used in the communities, while formal credit and loans are more difficult for farmers to access. Still five farmers have not access to these saving groups. Saving groups are not only included in farmers' groups of NAADS or NGOs, but also in religious groups and women development groups. It could be stated that the access to credit, loans, and microfinance is low and that male and female farmers more and more use saving groups instead.

A notable fact is that women say to exchange gifts more often than men do. Only two women and six men answered that they did not have access to gift sharing. Gifts are given by friends, family, or persons who want to become friends. Gifts could be seeds (for example, from fruit trees), farm inputs, daily used products etc. Some farmers receive luxury gifts such as solar panels from their friends or their children in Kampala, while others receive luxury gifts because they volunteer in a project or act as a agricultural consultant for the government (a possible reason could be because of their social position). An explanation for the higher amount of women to exchange gifts as opposed to men could be found in the fact that women are often more involved in women development group or religious institutions, where it is a normal habit to exchange gifts.

Table 5.5 shows the kinds of assets farmers have access to. These assets are resources which farmers need, to function in society and to practice farming. Below I will explain the number of persons for every access of assets as hired labour, livestock, radio, improved stoves, tools, means of transport, and electricity.

Labour is hired by farmers to prepare the farm in time, before the rainy seasons come, for weeding, spraying with herbicides and pesticides, collecting water, tilling, ploughing, and making compost. Labour is often hired for heavy work such as spraying, tilling, and carrying water. The average of farmers hiring labour is around 3.5 persons per job such as weeding, harvesting, planting etc. Hiring labour is a big expense for some farmers; however, that is why they will sometimes only hire "in order to catch up in time" (Interview 6, 2014) or when money is available. This means that labour is needed to keep the farm running or as an investment in the development of the farm. When farmers have no cash to pay labour, sometimes food is paid in exchange for the amount of labour. Labour is often paid by the head of the household. Sometimes it depends on whose plot the hired labour is working and then the 'owner' of that plot pays the wage. A woman explains that she depends on her brother as head of the household: "I pay for labour when the brother is away, I just need to inform him and then I pay of" (Interview 17, 2014). Hiring labour is a decision a farmer needs to make.

Table 5.5: Economic capital: Access to Assets

Access to assets	Men	Women	Total
Average number of hired persons per job	3.8 persons (N=8)*	3.1 persons (N=8)*	3.5 persons (N=16)*
Livestock:			
- Cattle	6	2	8
- Pig	2	7	9
- Chicken	1	7	8
- Ducks	1	2	3
- Goats	0	6	6
- Bees	0	1	1
Radio	8	8	16
Improved stove	6	5	11
Tools:			
- Hoe	8 (N=8)*	8	16 (N=17)*
- Panga	9	8	17
- Wheelbarrow	4	5	9
- Spade	4 (N=5)*	5 (N=8)*	9 (N=13)*
- Slashes	6	5 (N=7)*	12 (N=16)*
- Sickle	5 (N=6)*	4 (N=8)*	9 (N=14)*
- Knapsack sprayer	7	6 (N=8)*	13 (N=17)*
- Fork hoe	2 (N=4)*	3 (N=8)*	5 (N=12)*
- Jerry cans	5 (N=5)*	9	14 (N=14)*
Means of transport:			
- Own bicycle	4	2	6
- Own motorcycle	4	0	4
- Bicycle in family	0	5	5
- Motorcycle in Family	0	6	6
- Access to boda-boda	4	8	12
- Access to taxi	3	2	5
- No means of transport	0	1	1
Electricity:			
- from town	0	2	2
- Solar panels	1	3	4

* N= means No answer of participants

Table 5.5 shows that women (and children) are rearing the small livestock: pigs, chicken, ducks, goats, and bees. I asked them who were responsible for the livestock and what livestock they had. Men rear the big livestock: cattle. They do not often let cattle graze on their own farm; instead, they opt to let them do so on their neighbours' or on community land. Cattle are also used as dowry to marry someone's daughter.

Within the households, the radio is seen as a family item. It is seen as the most important source to get access to knowledge. Both men and women use the radio as an information source on news, policies, trainings, and agricultural practices. Besides educational programs, farmers listen to

entertainment, such as music and sport. Weather forecast, health information, market information, and development programs are programs which are especially listened to by men. One explanation why the radio is a common knowledge source is because it is a very mobile asset and could be brought into the field (constraints of radio in the field see box 5.1). Some men claim to be the owner of the radio, while in other families the children are the ones who have bought the radio. In particular, in most households the radio belongs to the whole family. One man claimed not to have one, but still have access to listen to the radio in public places (Interview 6, 2014) and a woman told me their batteries were empty and she had no money to buy new ones (Interview 3, 2014).

Box 5.1: Radio in the gardens

It is very common for farmers to bring their radio into the field. Although one farmer claims never to bring her radio: "They do not move with the radio. That when you are there {in the garden}, it can start to rain when you are still working. When coming back you can have firewood or food on your back. So you do not move with the radio into the gardens" (Interview 17, 2014).

Improved stoves are owned by many farmers (11 persons). Farmers gain the knowledge to build improved stoves from NGOs, family members, or other farmers. However, they have to build the stove themselves or with the help of their group members. Still six farmers do not have access to these stoves and two women claim their stoves need to be renovated.

Tools are mostly owned by the family; however, the head of the household is the one who buys the tools. Common tools are hoe, panga, spade, slashes, sickle, knapsack sprayer, and jerry cans. Less common are the wheelbarrow and the fork hoe. Farmers have no access to a tractor or water pump. Especially, the access to knapsack sprayer (13 farmers) is much higher than expected. A knapsack sprayer is an expensive tool, but often they are given by NGOs or government organizations. An explanation could be because of their special positions. Also other tools are given to farmers by NGOs or even NAADS. The rest of the tools they need to buy themselves. One female farmer, whose brother is the head of the household, explained her situation to me like this: "the brother is not here, he has other work. He buys {the tools}, but they are used by the people who are here" (Interview 17, 2014).

Means of transport such as bicycles and motorcycles are owned by the males in the households. Women often do not even know how to ride bicycles or motorcycles. Instead of riding themselves they walk, ask family members for help, or hire a boda-boda driver when they need to travel. It is safe to conclude that women are less mobile in the communities.

One-third of the farmers I interviewed have access to electricity. This could be electricity from the town or from solar panels. However, the majority of the farmers do not have access to any kind of electricity.

Others luxury items (which are not included in table 5.5) are mobile phones. They are very common in the Rakai District, men and women both own them. One woman even told me she got a mobile phone as mobilizer of an NGO group. TVs are also generally owned by farmers that have access to electricity.

Besides luxury items, access to knowledge is also not mentioned in the table, because it is hard to measure the knowledge of farmers. During the focus groups discussions (1, 2, 3, and 4, 2014) both

men and women explained they want to have access to more knowledge. Many farmers say they have knowledge on CSA practices, though they lack the money for improvements or to buy needed materials. The most common source of knowledge is the radio, but farmers also learn skills during training sessions, demonstrations and field trips. Three women argue they do not have any knowledge on CSA practices and one man claims that other farmers do not share the knowledge they received in trainings.

Table 5.6 shows the access of water by farmers. Water is a basic resource for farmers. Water sources can be divided in sources for domestic use (drinking, cooking, and washing) and farm use (irrigation and livestock). In Lwanda there is water scarcity and water sources are often far away or even dirty. When farmers need water for domestic use, they sometimes buy clean water from the town Lwanda. Farmers have several sources for their water: water on the farm and community water sources. Water sources on the farm could be a tap, basin, and a big barrel to catch water. The water sources close to home are used by women, especially for domestic use. Remarkable is that four women have access to basins (these are big and have to be built with expensive materials such as tarpaulin, are made from cement, or are big plastic reservoirs) on their farm, against one man (see Box 5.2). Almost every farmer uses community water sources. The most common community water sources are wells, boreholes, and springs or wetlands. Wells are more commonly used by women; these are closer to the farm than springs or wetlands, which are often used by men to fetch water. An explanation could be that men are more mobile. Especially, when community water is not reachable during the dry season, sometimes farmers need to look for other water sources, which could be far away. That is why "in this area women do not fetch water, it is the men" (Interview 5, 2014). Other farmers buy water for consumption because of the lack of time to look for it. Boreholes, accessible in the community, are built by governmental institutions and are mostly used for domestic purposes. Other community sources are more often used by farmers to irrigate their crops; especially, wetlands are more often used for irrigation and livestock rearing. Farmers even grow cabbage, tomatoes, and green pepper close to the wetlands.

Box 5.2: Water basins

Remarkable is that four women have access to a basin on their farm, as opposed to one man. Often these basins come from NGOs (Interviews 3, 4, 10, and 16, 2014). These basins could be filled by rainwater that drips via PVC pipes into the basin. Interview 3 (a mobilizer for an NGO) explains that she told the NGO of her water problem and that they helped her with some materials, such as cement and tarpaulin to build the basin.

Maybe even more interesting is the story of Interview 4 (2014), a chairman for LC1. He received the water basin from the government. "They lobbied from the government and were given a water basin. It is for the community. This basin was given by the local government. The good thing is that I am using it almost alone, because most of the neighbours were given other basins from either World Vision or CIDI. So the basin that was meant for the community, I am now using it alone, because others have the basins. Being a leader I continued lobbying from other organizations like World Vision, CIDI, so that they can get. Because they had a problem of water in this area, so the others in the community have received thanks."

Table 5.6 Economical capital: Access to water

Access to water	Men	Women	Total
Community water:	8	7	15
- Well	3	6	9
- Borehole	4	4	8
- Spring/ wetlands	5	1	6
Water on farm:	2	5	7
- Basin	1	4	5
- Tap	0	1	1
- Big barrel	1	0	1

Table 5.7 shows the access farmers have to land. The average land holding is 14 acres (1 acres = 0.4 Ha), which adds up to a land average of 5.6 Ha. As stated in section 4.1 the average in Rakai is less than one hectare or between one and five hectare. Only one percent of the farmers have access to more than five hectare. This means that this sample differs from the average in the region. In the sample not every farmer is a smallholder, but some are also middle-size farmers. It should be stated that one farmer says to own 81 hectares, which is a big outlier. Land is in fact unequally divided among farmers. Some farmers claim to own land themselves, but still lease (on top of the land they own) community land or make use of family land. One farmer rents land from an institution called DATIC (District Agriculture Training and Information Centre). This used to be a training centre for farmers, now it is no longer functioning.

Most farmers (10) have access to mailo land and are either tenant (2) or owner (8) of this mailo land. Farmers with less than one hectare have difficulties using CSA practices. For example, digging water channels takes many land away from their land size. Especially, women do not own land and/or cannot make their own decisions about how they want to use the land they farm on. In general, men are in control of the land. Women normally only have access to parts of land which are given by their husband. This can also give constraints; however, as mentioned in Focus group 1 (2014): “overall conclusion trees belong to man. Even although they give you a plot of land, on which you can grow your trees, when the time of leaving, you leave your trees there.” The exceptions to this are two farmers who are Muslim and whose land inheritance is regulated by sharia law. This law states that the land has to be ‘equally’ divided among sons and daughters, whereby a son gets two shares and a daughter one.

Land tenure brings many constraints. In the focus groups farmers said that holding land was often for short periods: they could only plant seasonal crops such as beans, maize, sweet potatoes, and tomatoes. Cassava and bananas were not allowed on these land holdings, because they take too long to mature. Other constraints are land grabbing, land shortage, big family and land inheritance, grazing cattle, and land conflicts (see box 5.3). The use of wetlands and the conflicts over it were not specifically part of my research material and the research questions.

Table 5.7: Economic capital: Access to land

Access to Land	Men	Women	Total
Land size average	19 Acres <1- 81 Acres	9 Acres 2 <30 Acres	14 Acres (N= 15)* <1- 81 Acres
Land title - Own - Husband - Family (father, brother etc.) - Clan	 3 0 1 0	 0 2 2 1	 3 2 3 1
Mailo land Tenant	1	1	2
Mailo land Holder - Owner - Husband - Family	 4 0 1	 1 2 0	 5 2 1
Rent land from DATIC	1	0	1
Land decision-making - Owner - Husband - Both/family	 4 0 5	 3 3 3	 7 3 8
Access to community land	1	1	2

* N= means No answer of participants

Box 5.3: Land conflict

One of the female farmers (Interview 3, 2014) had land conflicts with her neighbour. Her husband lives with his second wife and she acts as head of the household. As a female she faces some constraints in her community and has a land conflict with her male neighbour: "They went together to the chairman LC1 and they took the case to the police. When I went there, I had not the change to get out of that problem and I liked to take the case to the district and to the court. But there is no way how I could get there, because the husband was not around. These days the man, who is disturbing me, has stopped. He has stopped for some time. I wanted to take the case to LC3. When I went to LC3 to report that chairman of LC3 called the man, but the man did not come. The neighbour wanted to talk to the husband. But when the husband came they went to the sub-county and they went to the court. The court closed the case, put there demarcations. The neighbour refused to come and these days the neighbour has removed the demarcations. This land is mailo land, I am the owner of that mailo land, and it has 10 acres. The land is bought by the husband, but I have the title. The husband bought the land for me. It is mine and the children, because the husband lives in another village and he has another wife"

5.2.3 Social capital

Table 5.8 gives an overview of the people farmers share their agricultural knowledge with or who they see as knowledge sources. Almost all farmers say they share the knowledge with their family members. Women sometimes only have the husband to share the knowledge with (Interview 7, 2014). Family members teach each other traditional methods, but also methods they learned from

training sessions. Friends, farmer group members, and saving group members are other common knowledge sources. However, not every farmer belongs to such groups. Sometimes the husband sends his wife to these farm groups or to community meetings; for example, when he is too old. Friends also share and exchange tools such as knapsack sprayers or give each other tree seeds. Men share their knowledge more with their neighbours, while women share their knowledge more within ceremonial groups. Knowledge is rarely shared in public places like markets or bars. In addition to these knowledge sources, farmers learn from the radio, training sessions, demonstrations, and community meetings. Rarer sources are car speakers and middle-men.

Table 5.8: Social capital: Sharing knowledge

Sharing knowledge	Men	Women	Total
Husband/Wife/Family	8	9	17
Friends	6	6	12
Neighbours	8	5	13
Farmers or savings group	6	5	11
Ceremonial group	0	7	7
Other groups (development groups, drama groups, boda-boda groups)	2	0	2

Women are the ones who join more often ceremonial groups and religious groups. These groups differ in their purpose. Ceremonial groups are often established in the village and sometimes within religious organizations to assist during burials. Religious groups are for religious devotions and livelihood development. In some religious groups or NGO groups, women come together in women development groups. Within the community social security networks should be arranged (such as living nearby police station), some communities lack these social security networks though.

Table 5.9 contains an overview of the access to markets. There is a lack of (inter)national market and farmers often do not have knowledge on current market prices. Every week there is a big local market and every day there is a small market in Lwanda town. Production is mostly sold to middle-men who come to their farms. Still, two out of nine men sell their produce directly at the local market or on the roadside. One female farmer explained that she gave the produce to the school, to reduce on school fees. Five farmers were selling their coffee with help from a new coffee cooperation. Three men and no women were middle-men themselves. However, in Focus group 1 (2014) and pre-test interview (Pre-test interview 1, 2014) women also act as middle-men, but during the interviews it did not come up again. In the Focus groups (1, 2, 3, and 4, 2014) restaurants were also mentioned as customers. As appears from the focus groups and the interviews a constraint, according to male farmers, is that middle-men often deceive women with low prices. This is why the interviewed men wanted to be in control of selling the produce.

Table 5.9: Economic capital: Access to markets

Access to Market	Men	Women	Total
Middle-men	7	8	15
Local market/ road side	2	0	2
Coffee association	2	3	5
School	0	1	1
Being middle-men	3	0	3

5.2.4 Cultural capital

Part of cultural capital is the religions farmers practice. Religious networks give access to all kind of things as web of power, social identity, assets etc. As showed in table 5.10, most farmers are Catholics. Remarkable is one man, who said he was not practicing any religion while later in the interview he corrected himself as being a protestant. Religion is especially practiced by women, they form women development groups, ceremonial groups and are more often volunteers for their religious organizations (as shown in table 5.3). These groups help them; for example, in livelihood development (teaching skills such as hand craft making), practice as groups' savings or gifts sharing. Though not every religious organization provides farmers with saving groups (Interview 3, 2014) and not every farmer has access to a social group or to cash source.

In the focus groups men report a much higher education level than women, who mostly quit after primary school. In the interviews (see table 5.10) there was no significant difference in the education level of both men and women (men: p5, p6, 3xp7, s3, 3xs4 and women: p3, 3xp6, s2, s3, 3xs4, (p stands for primary school and s for senior school); however, Interview 13 (2014) told me the former name primary 7, is now called senior 4). It could be stated that these well educated women do not belong to the average women in the Rakai District.

Table 5.10: Cultural capital: Farmers' characteristics

Characteristics	Men	Women	Total
Education level	P5-S4	P3-S4	P3-S4
Religion			
- Catholic	4	5	9
- Protestant	3	3	6
- Muslim	1	1	2
- None	1	0	1

Table 5.11 shows farm practices used in Rakai, which already belonged to the (traditional) knowledge of farmers. Practices defined as CSA practices could also be own experience or coping strategy. This does not mean that all farmers' knowledge is traditional knowledge. Farmers do not always learn practices from organizations or the government, sometimes these practices are well known family or community practices. Like making compost; "I construct the pit and puts weeds, grass and ash, and after a while I transfer it to the field" (Interview 13, 2014). Not only compost, but also mulching is an old habit, to cover the soil with maize stocks, banana stems, and use of grass. Remarkable is that especially women define mulching as traditional knowledge, while men more often categories improved grain storage as traditional knowledge. These technologies can be seen as the indigenous knowledge system (IKS) of farmers. Another common practice is the use of agroforestry technologies; fig trees used to be planted in banana plantations and are nowadays also very common in the coffee plantations.

Farmers' traditional knowledge is transferred from mother to daughter and from father to son. Both male and female farmers practice traditional knowledge. For example, grandparents teach their grandchildren about coffee drip irrigation; to protect coffee siblings, bottles with a hole are used to slowly irrigate the young plant. However, not every farmer is familiar with this practice (six farmers: three men and three women do not use or does not know how to use the practice). This drip irrigation could also be used in small gardens, where often tomatoes, cabbages, onions, and green peppers grow. Another common traditional practice is digging small canals for harvesting water or draining excess water.

A last practice used by farmers is the use of spraying herbicides and pesticides, and applying fertilizers. This practice is farmers' knowledge although not traditional. This is a common but new practice, though it is also not a CSA. It is mostly practiced by the males of the households. However, this practice is not only being taught by family members, farmers learn how to use it from friends (coping strategy) and during training sessions from NGOs. "In the past I used not to spray, but these days if you do not spray and if you do not apply fertilizers you cannot get good yields" (Interview 4, 2014). Spraying exists next to old traditional knowledge of herbal treatment of diseased crops, such as catching weavers with traps and feed them to the birds, cut down affected banana trees and to apply hot ash on it, and the use of urine from animals to mix it with ash to pour on bananas (matooke). This last practice should help to protect the not affected crops around the banana crop.

Table 5.11: Farmers' knowledge

Farmers' knowledge	Men	Women	Total
Agroforestry	3	2	5
Terraces and bunds	0	1 (N=3)*	1 (N=6)*
Water harvesting	1	0	1
Use of irrigation	0	1	1
Mulching	3	8	11
Composting	3	1	4
Livestock manure management	1	1	2
Use of fertilizer	1	0	1
Using improved varieties**	0	0	0
Improved grain storage	4	1	5
Improved stoves	1	1	2

* N= means No answer of participants

** In this table the use of improved, high-yielding varieties and the use of stress-tolerant varieties are combined in using improved varieties.

The interviewee also did not give any information on like practices cover cropping, no till/minimum tillage, and zai pits/planting pits/negarims (as listed CSA practices in section 4.4 from CCAFS survey in e.g. Rakai).

Remarks on these practices are the sample group. The sample is divers but has consequences to the results. To be expected is that smallholder will not have access to CSA practices or NGO training sessions. Also to apply knowledge they need resources as land and credit. Also it is likely that smallholder farmers have more coherence in their enterprises; for example, because they all grow matooke, beans, maize, and cassava. Then the government and NGOs should focus to develop special practice and training program for them; for example, to grow cash crops as coffee.

5.2.5 Human capital

Human capital relates to the psychological and physical constitution of farmers. Farmers have no or just a little access to health centres, which also often lack drugs. Farmers make more often use of traditional medicines from trees and plants; for example, for cough. Three females said they have access to or are VHTs. VHTs services provide among others training sessions on AIDS and handing out condoms.

More practical within human capital is the fact that women complain about carrying the knapsack sprayer, they find it too heavy. As said above one man hires labour for the knapsack sprayer from a medical point of view. Some farmers are aware on the physical constraints and danger of spraying with pesticides.

Also getting old in this community gives constraints, because there are no facilities. Elderly; men and women depend on their family members, who need to take care of them. Men and women who have less energy depend; for example, on the harvest of their produce on their family. Also sick people have problems going to community meetings. For example, one woman cannot join training sessions on improved stoves, because she cannot walk long distances and she does not have access to other means of transportation.

When women are pregnant they still need to take care of their household, even just after childbirth. In some cases women have friends who can help them.

5.3 Pathways of farmers

To get insight in the pathways of farmers, the context is important. Households face crop failures on their farm. Important in the decision-making process are the high-risk conditions of the farmers, which could affect the decision-making process on adopting CSA practices. Some dimensions to be considered which influence this process are: the size and scale, time horizon, kind of assets, environmental factors, and vulnerability of farmers (de Bruin and van Dijk, 2005a).

Size and scale: the idea was to focus mainly on smallholder farmers. However, it became clear that most farmers could be characterized as middle-size farmers. The farmers mostly belong to local communities and have a local market for their produce. Only one male farmer was a commercial farmer, he had a big coffee plantation with lots of fig trees (see photo 5.1) (Interview 13, 2014). One other male farmer explained that he was not trading any of his crops, but he used all for food and still he had difficulties to survive (his land was <1 acres). Remarkable is that most female farmers in the interview sample did not belong to the category of smallholder farmer. They were married to men with good jobs or were having special positions themselves in the local community.

Time horizon: the time horizon shows the background of decisions of farmers. If their uncertainty is high, the shorter their time horizon is. I asked all farmers about their future plans, their plans for next season and in a couple of years. In general, farmers were only looking to next season. They wanted to plant their crops early, before the rain starts. The most common strategy was to plant maize, beans, coffee, Irish potatoes, or cassava next season. Their long term plans were to build better houses, plant coffee, and buy all kinds of luxury products. The biggest constraint is the lack of income and money. It seems that farmers have troubles talking about their future plans. Besides their future plans I also asked about their changes on their farm in the past 5 years. Farmers planted coffee (three men and three women). They also planted other types of trees and crops for food security,

such as figs, bananas, vanilla, Irish potatoes, fruit trees, cassava, maize and practiced all sorts of CSA practices, such as mulching, terraces and bunds, agroforestry, use improved seeds. Below I will further explain the practiced CSA, when taking off pathways.

Kind of assets: farmers have all kind of assets, as shown in section 5.2.2. The most important is that men are the owner of land, transport, and the ones selling the produce. Women often have access to these assets, but men control their access. Except for women who are head of the households; they often are the ones having their own assets.

Environmental factors: these factors influence the decisions of farmers and their farm management. Farmers must adapt to the environmental risks they face on their farm. The risks are very different for each farmer; some are living far from water sources, while others live in town and are connected to tap water and the electricity system. Farmers living close to the hill side are more affected by run-off and soil erosion and need to prepare their farms for these risks. Another constraint of living close to the hills is the monkeys; they destroy the crops. Other risks could be the seeds they bought in shops, which often appeared to be fake seeds. Farmers risk also other kind of community problems like land conflicts, neighbours rearing animals on their farm, and thieves. One woman told me all her tools were stolen the night before (Interview 1, 2014), while another farmer told me he did not mulch his coffee, because then it looked too good and would be stolen (Interview 13, 2014).These community problems are not direct effects because of climate variability that is why they are not a focus in this research. But they certainly affect farmers' decision-making to adopt CSA practices; safety and social cohesion contribute in the risk factors of farmers. It could be reasons why farmers do not invest in their farm and could even lead to social inequality.

Vulnerability: farmers face different vulnerabilities because of climate variability. Farmers say they notice climate variability. The outcomes correspond with the literature found in section 4.3. Especially, farmers notice changes in rainfall: unpredictable rainfall patters, insufficient rainfall, heavy rainfall, and heavy storms. Both women and men who have been interviewed talk about these effects. Other effects are due to the sunshine such as droughts, which bring diseases and pests, and negatively affect yield, soil erosion, and lack of soil nutrients. According to Extension officer 2 (2014) women are the ones, who suffer the most from climate variability, because they are responsible for food. "So when there is water shortage due to drought, I experience crop failure and off course that means much when the crops fails. There is famine and less food in the house and less income and I learned from training sessions that it is always the women {farmers} who suffer." "During climate change {drought}, you may find women who are going to work for food. Since they are the people who fetch water, they might have to walk long distances, and lose a lot of time" (Extension officer 2, 2014). Another big constraint is the weather forecast, people start to plant early before the rainy season, to prepare in time before the rain comes: "you may prepare your land by planting early; you expect the rain to come but the rain does not come. Or it comes too late when the plants already died" (Interview 14, 2014). When trees and crops are affected by diseases and pests the yield is lower. This means farmers are lacking food and the income out of their produce reduces. One farmer even explained that he sold his cattle because of the unavailability of grasses, while another told me his livestock died. Farmers say they adapt to the effects of climate variability by planting trees, replant trees, do not cut down trees, and not to plant crops in wetlands because of policies. Also they make use of mulching, fertilizers, manure, use improved crops, and water harvesting. These are practices they learned in training sessions or were taught by other farmers.

These dimensions show that farmers have difficulties; some farmers are more vulnerable to specific forms of risks than others. This could mean they have different risk positions. Some lack some kind of capitals (as mentioned in section 5.2); for example, land. These farmers make different kind of decisions comparing to large scale farmers, who are less food insecure.

The hierarchical position of farmers also influences farmers' risk position; although in this interview many farmers have special positions in society. Important to understand is how farmers do understand why they make farm changes.

During the interviews I looked deeper in the historical perspective of farmers, the pathways. Pathways help by focusing on the evolution of decisions-making units over time. It refers to strategies, whereby farmers and households make decision to deal with risk. I asked questions on the changing conditions on the farms in the last 5 years, but also how they see their future (next season and in 10 years) (see Annex 5 – pathway questions). The interview sample is very divers. I exchanged eighteen detail views and every one of them had their unique combination to practice and adopt CSA. So the conditions farmers experiences differ among the actors and their knowledge, experience, and understanding of the environment may differ. This means that it is likely that their pathways may be distinctive. As said above, farmers told me they experienced weather changes as droughts, rainfall variability, and change of season patterns, whereby they more and more experience pest and diseases. For farmers it is difficult to understand why they had to adapt to some changes, sometimes they just use specific farming technologies because it is traditional knowledge or because they are trained to adopt those practices. For the farmers it was hard to mention the differences between the practices used in the past and the practices they are using nowadays. Mostly they gave answers like they changed to other more food secure or more income generating crops. As explained in Focus group 1 (2014): "for me the climate change has made me change my decision. Instead of banana growing, I resorted to growing more drought-resistant crops, like maize, beans, to enable to increase food production. These crops not only depend on natural conditions, they also need fertilizers to grow. When you have your land and dig big holes, you can grow food that can be sustaining your homes." Farmers make choices to change to other crops, like they want to grow maize, beans, cassava, coffee, Irish potatoes. In other crops men and women choices differ. Women want to change to banana (matooke), fruit trees, sweet potatoes, and vanilla, while men want to change to cabbages, fire wood trees, tomatoes, and onions.

It seems that the last years, farmers' awareness of CSA practices; for instance, on agroforestry, have increased. As one farmer told me that "the governments send agricultural officers to train us to adapt to the weather changes" (Interview 16, 2014). Almost all farmers told me they were taught not to cut the trees, replace cut trees, and plant trees. Planting new trees (as figs and fruit trees) also have a future purpose; in the long run they provide fruits for food and extra income (I will quote from the focus groups discussions, these quotes resemble what farmers told me during the interviews). "Nowadays I plant trees because of climate change, for getting enough rainfall" "Initially I cut down trees and not replaces them, but now I have resorted to cut down one tree and planting two others" (Focus group 2, 2014). Another practice is the use of fertilizers "because climate change has become worse and worse, I have to apply these methods. When the rain rains these little amounts, they can not only depend on those little amounts for water supply. That is why I apply the fertilizers in my production" (Focus group 1, 2014). Farmers make use of improved seeds "I am using seeds that require less water for irrigating and those that can grow in a shorter period" (Focus group 2, 2014)

(see different bean varieties photo 5.2). Other practices farmers mention are to collect mature, make compost, mulch, construct contour bounds, dig channels etc. “Initially all I had to do was to go in their gardens; plant and sow my crops and wait for the time of the harvest. But now, I have to plant, to spray, to prune, and take care of the garden.” “You did not have to dig water trenches and water their farms, all I had to do is plant the crop and wait for the time of the harvest” “Times have really changed. Initially all you have to do is to dig a hole, plant your maize, and bean seeds and they grow. But now you have to add manure or fertilizers into the holes so you are able to realize the quantity you want and for quality” (Focus group 1, 2014). Besides CSA practices farms also learn how to deal with pest and diseases “I was trained like looking after matooke {bananas} that I have to remove the bugs, not using the same sharp tools to cut. That it has helped me, because I have not yet received that problem anymore. So I have seen a change that maybe I do not get the disease anymore for matooke” (Interview 15, 2014). Training has helped to get rid of crop diseases, the farmer expect that this will be constant in future times.

In addition to the change of crops and changing to other farm practices, farmers started new enterprises as vanilla, coffee, and livestock. In some cases farmers became poorer, because they experienced food insecurity or their livestock died. One male (with less than <1 acres land) told me he could no longer be a middle-men, he lost food production on coffee and banana, and lacked income and he was food insecure (Interview 12, 2014). This made him even more vulnerable to climate variability.

Farmers found it difficult to make future plans, they know which crops to use next season, but if you ask them how they see their farm in 10 years, they could not give any answer. They focus on getting good yields and to be food secure. They often told me they lack money and knowledge to invest in their farm. Their main future plans are to buy cattle, get access to electricity, reconstruct their houses, and built a shop. If I look to the question on how farmers make decision on adoption of CSA, I get eighteen different answers. This means that to focus on one policy will not affect the community. A standard packages should be avoided and focus on facilitation.

5.4 Gender dimensions of decision-making

In this section the gender dimensions within the decision-making process will be discussed. Important are the characteristics of household members. As mentioned above in section 5.1 men and women have different roles within the household, on-farm, and off-farm. Women are more working within the house and on-farm, while it is expected from men to find cash income. However, this does not mean that men do not have daily activities and on-farm jobs and that those women cannot find extra income. In section 5.2 it becomes clear that there is a difference in the access to capitals between men and women. Men are often the ones having access to loans and credits. As said a difference between the (semi-)structured interview and focus groups sample could be made. Again; the women in my interview sample are outliers and many of those women have special positions within the community. These special positions give them access to NGOs and governmental organizations. By having these special positions these women easily receive gifts. It is also easier for them to advocate for water sources and getting access to saving groups. For example, a woman who is a mobilizer for CIDI told me “I got help from CIDI for the tank {basin}; some of the materials were mine” (Interview 3, 2014). These women not only have special positions in the community, most of them are also well educated, which helps them to understand the CSA practices provided by NGOs and governmental organizations better. Interview 17 (2014), educational level S3: “trainings and

assistance, you utilize the knowledge that you have received on the trainings and it will help you to expand and get enough money." This high level of education and the ability to acquire new knowledge also applies to male farmers. One big constraint is that women lack means of transportation, this could contribute to the fact that women stay more often at home and practice household and on-farm activities.

When focusing on the rights male and female farmers have, it is especially about land rights. Land rights enable people to adopt CSA practices. Land is very unequal divided, smallholder farmers (both male and female) depend on holding land. When having a small plot it can be assumed that farmers do not adopt CSA practices, because this will contribute to land shortage. Though I did not found any farmer who was not adopting any CSA practices. One of the reasons can be found in the information given by Extension officer 2 (2014), a forest officer. He told me they promote CSA and especially agroforestry among all farmers. They tell farmers to plant trees; "every farmer should be able to plant 5 trees". When I asked the extension officer what number is realistic for smallholder farmers he answered that one or two is also enough "it depends on the size of the land." Another reason why farmers plant trees is because of tradition; the bark clothes made of fig trees have a high demand in the area. Uncertainty to take into consideration is the bundle of rights on the land. Often the male farmers are seen as the owner of the land, but they do not always have the titles or can make the decisions on the use of the land. Tree planting by land tenants is uncommon. Normally the landlords allow farmers only to plant seasonal crops. This means that not every farmer with a small plot is able to adopt every CSA practice. One male farmer explained his struggle to get higher yields; therefore he wants to make channels. However, this reduces his land size: "like to protect the land, I want to make channels; however, it reduces my land. The practices are needed because then the soils do not go away {soil erosion}, because of those heavy rains and the crops can yield. You can get high yields" (Interview 12, 2014).

As argued the responsibilities of male and female farmers differ. Women take care of the food, while men take care of selling produce and get extra income. Whereby, women depend heavily on eatable crops and trees, while men focus more on cash crops. These crops are aim within agroforestry practices. Maize and beans are also the crops which are often given by NGOs and governmental organizations to farmers such as improved seeds (see photo 5.2). The difference between men and women on livestock manure management is that women are rearing most animals, all the small livestock, while men are only responsible for the cattle (see section 5.2 economic capital).

Women often do not have the same access to assets as men have. The social roles of women sometimes lead to dependence on men. That is not unusual in a patriarchal society. As explained by Doss (2013a) men and women have different ways to get access to capitals. Women also have means to get access to cash; for example, an amount of their husband's money, off-farm activities, of via saving groups. This money is often used "to have domestic materials or goods and even for consumption" (Interview 10, 2014).

In this research no significant differences in use on CSA practices is found, though male and female farmers have different decisions to make within the household. A possible explanation for this is that I did not interview smallholders, but middle-size farmers and women with good positions within the communities. These women had often the chance to get in contact with training facilities. In this no

direct gender difference is found, but it can be stated that there is a difference in social equality between smallholder, middle-sized, and large-sized farmers.

Though through the difference in access and control of capitals, men and women experience different risks through climate variability. To achieve gender equality in the Rakai District, this gender analysis should be considered in the adoption process of CSA practices. These gender differences could also be used by extension officers to be alert on monitoring, implementing, and evaluating environmental policies. Policy makers should take action to ensure better access for women to land, labour, and means of transportation. Also action should be taken to ensure for both male and female farmers access to water supplies, electricity, better roads, improved stoves, improved seeds, credit, market information, and weather forecast. This means that policy makers should develop suitable environmental policies to mainstream gender and social inequality; in chapter 6 the policy link between gender and CSA adoption will be further explained.

5.5 Conclusion

The purpose of the chapter is to gain insight into the decision-making processes of both male and female farmers in the research area of Rakai, Uganda, by looking into the capitals, pathways, and gender dimension. All farmers claim they are affected by climate vulnerabilities as rainfall variability and droughts. Men and women make different decisions on their farm to protect them from these climate hazards. They have diverse household activities (daily, on-farm, and off-farm) and both have different access to capitals. Men own the land, control the hire of labour, and have means of transportation, these are all advantages in the adoption process of farmers systems, while for women only could be said that they are more often in religious groups and own the most small livestock. These distinctions in combination with differences in male and female crops seems to give the impression that men and women make different decisions according to CSA practices; though no significant results are found in this research (more quantified data is needed). The adoption of farm practices are based on the choices of crops they grow; for example, the choice to use agroforestry; men combine coffee with fig tree, while women combine banana or beans with fruit trees, and on the activities they practices at home; for example, improved stoves and water harvesting practices help women with their workload in their daily activities. The most relevant technologies in this research are agroforestry, terraces and bunds, water harvesting, use of irrigation, mulching, composting, livestock manure management, more efficient use of fertilizer, use of improved seeds, improved grain storage, and improved stoves. These farm practices are embedded in traditional farmers' knowledge as well as CSA. In the next chapter I will focus on the policies and services provided to adopt CSA. To take into consideration is the high amount of the sample having special positions; this could influence the access to these policies and services and thereby the adoption process of CSA. A last aspect that influences farmers' behaviour is the pathways of farmers. Farmers seem to have difficulties with describing the pathways they took; also the pathways per farmer could be stated as distinctive. Coherent was that they often do not recall if the systems they use are traditional knowledge or trained by NGOs or governmental organizations. Also they have just a short time horizon when looking to future perspectives and not make plans to overcome climate hazards.

6. Adaptation of CSA in local environmental policies

This chapter offers an understanding of provided services from local government and the national environmental policy implementation on CSA, including a gender analysis. As said in chapter 5, the most relevant CSA practices for men and women farmers are agroforestry, terraces and bunds, water harvesting, use of irrigation, mulching, composting, livestock manure management, more efficient use of fertilizer, use of improved seeds, improved grain storage, and improved stoves. This chapter identifies the CSA practices taught by government and NGOs and makes a distinction with traditional farmers' technologies. For this chapter I want to know if getting access to these local services and the knowledge on policies is on equal level for men and women and how the policies influence the adoption of CSA by male and female farmers. First, local services and responsibilities will be described, as well as some national environmental policies on climate change adaptation. Secondly, there will be a focus on the implementation of environmental policies in the local context. The chapter ends by describing to the knowledge farmers have on these environmental policies and the policy constraints.

6.1 Local services and responsibilities

As explained in section 4.7, Uganda's environmental policies on national level are several such as the Climate Change Policy (still need to be approved), National Adaption Programme of Action (NAPA), the Forestry policy, and National Wetlands policy (see also section 4.7). These are developed to reduce the impacts of climate hazards and to achieve poverty reduction by environmental sustainable development (Ampaire and Happy, 2014; Climate Change Unit, 2013). In this section I want to look to the policies in the Rakai District. I make a distinction between the regulations (the policies on paper) and policies programs offered by the government. With the help of two extension offers I tried to get a better inside in the policy process. First, the policy structure of the Rakai District will be given; next, the local environmental policies.

The governmental structure of the Rakai District is of importance to understand the implementation, monitoring, and evaluation of policy programs. The district is divided into three counties: Kooki, Kakuuto and Kyotera. These counties are subdivided in eighteen sub-counties and three town councils. The District is the higher local government, while the twenty-one sub-counties are the Lower Local Governments (LLGs). The District council (LC V, stand for Local Council) is headed by a chairman LC V, who is also the heads of the executive arm. The administrative unites of the Rakai District consist of a chief administrative officer and a technical planning committee (TPC). The different services which are included in the district departments are: health, work and technical services, production and marketing, education, statutory bodies, gender and community services, finance, planning, internal audit, management support services, and natural resources. Important boards are the district service commission, the land board, and the standing committees of council. The main sources of funds to the district are the central government grants, local revenues, and donor funds. The political units within in the Rakai District (LC V) are: county level LC VI, sub-counties and 3 town-councils (Rakai, Kyotera, Kalisizo) (LC III), Parishes/ wards (LCII), and Villages (LC 1). The District, town councils, and sub-counties are local governments. The counties, parishes, and villages are administrative units. There is a specific land board at district level with 5 members (in 2009: included two females and three males). In contrary to the LC I-V members, they are appointed and

not elected. They hold meetings to solve land disputes and process land titles (Rakai Local government, 2009).

Besides the governmental structure, there are also many different NGOs working on services in the community. NGOs mentioned by the farmers are: World Vision, LACA (Local Action Committee on AIDS), RACA (Rakai Counsellors' Association), CIDI (Community Integrated Development Initiatives), CAPCA (Central Archdiocesan Province Caritas Association), MADDO (Masaka Diocesan Development Organisation), VI Agroforestry, BRAC (Bangladesh Rural Advancement Committee) on Microfinance, and probably there exist even more NGOs. See table 6.1 for the most common NGOs. Women more often belong to groups as CIDI and MADDO. Another remarkable outcome is that CIDI and MADDO work within the Church, where they discuss agricultural practices (Interview 3, 2014). Though one woman, who belonged to a group of MADDO, explained that the NGO is no longer coming for trainings (Interview 7, 2014). Still three farmers told me they do not have contact with any NGO; these persons appear not to have any special position in their community either.

Table 6.1 NGOs

NGOs	Men	Women	Total
VI Agroforestry	4	2	6
BRAC	0	1	1
CIDI	4	7	0
LACA	1	1	2
MADDO	2	6	8
World Vision	3	3	6
No NGO contact	1	2	3

To support the needs to adapt to climate variability, the government of the Rakai District formulated their own policy: the Rakai District Environment Management Bill. This bill should provide for public participation in the conservation, protection, and management of natural resources. Although this bill was formulated in 2006, it has never been approved by the judiciary and therefore has never been implemented (Ampaire and Happy, 2014). Besides the Rakai District Environment Management Bill the NAADS programme was practiced in Rakai; farmers were getting trainings and farm input from NAADS (Extension officers 1 and 2, 2014). According to the literature, the NAADs program helps with the district production technical team to teach farmers modern methods of farming and also provides financial assistance so as to increase production levels (Rakai Local government, 2009). Extension officer 2 explains that they encourage to plant crops for food security as cassava and sweet potatoes, to storage food, and to plant trees. They encourage farmers to introduce new crops and mix enterprises. One of the extension officers is the forestry officer in the Rakai District. He (Extension officer 2, 2014) explained the forestry policy program: "One of the policies is that you will encourage people to plant trees on their farm that is agroforestry. That is one of the government policies. Then the other one is the development of the private sector in forestry. The other one is training of women. The other one is collaborative forest management, where you deal with communities also to manage forests. To benefit from forest resources and also enterprises targeting women, like necessaries for income." To support the farmers I made a distinction of different services provided by NGOs and the government, namely farmers groups, saving groups, training sessions and demonstrations, farm inputs, field tours, marketing, and information access. This will be further explained in the next section 6.2.

6.2 Local implementation of environmental policies

In the previous section the local environmental policies are explained. This section will focus on the governmental services; the access of farmers to these services, how the services function, and how local environmental policies via these services are put into practice, all viewed from a gender perspective.

6.2.1 Farmers groups

Many farmers organize themselves in farmers groups. These groups are mobilized by the government (especially, NAADS) and by NGOs (such as CIDI). These groups can be mobilized for training sessions, demonstrations, access to other kind of information, and some farmers even have the possibility to participate in field tours. Groups mobilized by NAADS or NGOs often get farm inputs which are divided among the group members. All farmer groups have nominated a mobilizer, a person who can be contacted by NAADS or the NGO. If training sessions are given, the organization contacts this person and the persons mobilize the group. The mobilizer is often elected by the farmers and can go to extra training sessions to train the farmers when the organization is not around (Extension officer 1, 2014).

As shown in table 6.2, eleven farmers joined a farmers group. Within the farmers group, farmers are provided with knowledge on; for instance, CSA adoption, but they also share their own experiences of their farm practices. Other benefits are that often saving groups are established within these groups (see section 6.2.2 on saving groups), a few groups have storing places for the harvest of their group members, and some group members cooperate to work on each other's farm. They move from farm to farm as group to work on farm practices; for instance, to build improved stoves. Even one farm group is controlling the farms on outbreaks of pests and diseases; when found the farmer can expect a fine. Also it is for a group of farmers easier to bargaining on seed prices (Interviews 3, 4 and 6, 2014). However, many farmers still do not have access to these farmers groups; especially youth are difficult to mobilize within these groups. CIDI therefore started special groups for youth. When a farmer is not participating in a group, they also do not get the farm inputs offered by NAADS or the NGOs. Remarkable is that out of seven farmers, who are not involved in a farmer group, at least three of them do not have any special position in the community. The participation of women in these groups does not seem to be a problem. However, it seems that in general fewer women are involved. During the Focus groups discussions (1 and 3, 2014) a few women complained they were not able to access these groups, because their husband refuses them to go. Another complaint of a farmer on the NAADS programme is: "I expected the NAADs to help people; they were helping almost only the rich" (Interview 12, 2014), this indicates social inequality and a bias in policy implementation.

Table 6.2 Number of farmers participating in a farmers group

Farmers group	Men	Women	Total
Total in farmers group	6	5	11
Government group (NAADS)	2	3	5
NGO group	4	2	6

In the time that I was in Rakai it became clear that the NAADS program was not really working and there were rumours the program stopped. However, Extension officer 2 (2014) explained me that the programme of NAADS was still intact; however, a reorganisation was going to safe on the budget

6.2.2 Saving groups

Saving groups are organized for farmers especially by NGOs or religious organizations (see table 6.3). In these saving groups, farmers learn "the culture of saving." How much you can borrow depends on the shares the farmer bought. It is a kind of credit saving within society, which help farmers to overcome food shortages; farmers are then still able to go to the market and to buy supplies in times of food insecurity (Extension officer 2, 2014). Extension officer 2 (2014) explained also a project called the Community Driven Development project (CDD). Here a grant of 1.5 to 5 million is given to a group of farmers, depending on their plans; this grant does not have to be paid back later. A plan will be approved if it is sustainable; when farmers received the money, they need to utilize it to sustainable use and improve their farm (Extension officer 2, 2014). However, I did not hear any farmer about this project.

Table 6.3 Number of farmers participating in saving groups

Saving groups	Men	Women	Total
Total in saving groups	6	8	14
NAADS saving groups	1	3	4
Saving groups in farmers group (NGO)	5	6	11
Religious institutions saving groups	1	5	6
Women development group	0	3	3

Most farmers who are members of farmer groups also have saving groups within their farmer groups (see table 6.3). Nonetheless, there are also other saving groups suppliers, like NGOs, religious institutions, and women development groups. Especially, the religious institutions and the women development groups are popular by the female farmers. Some farmers have on multiple places access to saving groups. It can be stated that the saving groups are highly used by women. It is not strange that a high number of farmers (14) make use of these saving groups, because the interest rates are low and in some savings group every month a member gets a free gift (Interviews 4 and 7, 2014).

6.2.3 Training sessions and demonstrations

Training sessions and demonstrations are being given both by NGOs, as well as by government organizations (such as NAADS) (see table 6.4). NGOs that provide the farmers of the sample training sessions are MADDO, CIDI, CAPCA, World Vision, and VI Agroforestry. Also DATIC a former trainings institution provided local farmers with training session; however, this programme was shut down. It is for farmers also possible to attend training sessions from multiple organizations. Training sessions and demonstrations are often combined with gifts of farm input; for example, to introduce and explain new seeds varieties. These training sessions and demonstrations are given to both male and female farmers. Almost all farmers have access to training sessions and demonstrations (see table 6.3: 16 farmers). Most of the time via their farmer groups, though this is not a necessary as explained by Interview 15 (2014): "I am not in a farmers group, but I can attend meetings from NAADS. It is no problem to attend, except when they give out inputs they do not give it to me. But just to get knowledge they do not refuse me." Two farmers claimed to have no access; they are also persons who have not any special position in their society. Extension officer 2 (2014) explained a limitation in the training session and demonstration selection procedure of farmers. To select farmers for training sessions and demonstrations the extension officer explained that they first mobilize the role-farmers of a community together in a community meeting. These farmers select persons who are willing to participate and want to take up the programmes. "Because you might find that you want the farmer

to plant 1 acre of trees, but then he is a small land holder. So they sit together and they say what will we do about it and then they say this one has the capacity. Me I am able to plant half an acre or a quarter of an acre. So in that way through community interaction and that is how the best way we can select. What the farmer needs and what we can do" (Extension officer 2, 2014). This citation suggests a bias. The policy process seems to be based on the participation of farmers. It is impossible for me to see who are actually participating; including the smallholders or not.

Table 6.4: Number of farmers participating in training sessions

Training sessions	Men	Women	Total
Total in training sessions	8	8	16
NAADS trainings	5	6	11
NGO trainings	7	7	14
Institution trainings	2	0	2

It is supposed that farmers put in practice what they have been taught during the training sessions. In these training sessions and demonstrations pass multiple topics. Demonstrations are given on seed and tree variations, soil management, and water harvesting (incl. irrigation systems to water the crops) etc. For example, "NAADS encourage farmers to plant trees" (Extension officer 1, 2014). Farmers are taught on CSA practises as making compost, contour digging, mulching, agroforestry, controlling on pests and diseases, building improved stoves, and planting pits etc. During the training farmers are shown the use of tools, moister the land, planting trees and crops, weeding, harvesting, post-harvest handlings, and integrated methods of pest and disease control. Within the training sessions and demonstration they especially focus on main crops such as banana (matooke), beans, coffee, and maize. Besides focus on these crops, the government tries to make farmers aware on the use of multiple enterprises, like having both livestock and coffee (Extension officers 1 and 2, 2014).

Extension officer 2 (2014) explained that besides going to the communities for training sessions, some groups also come to his home to attend trainings on his demonstration plot. Here he can train farmers groups on practices in agroforestry and water harvesting. He can show examples on which crops to intercrop or plant around the boundaries of the plots. Also he gives recommendations which trees to plant with the different crop species; for example, in banana the use of fruit trees as oranges, mango, and jack fruit. Even he recommends the use of figs trees, which are also already traditionally used by farmers on their plots. The fig trees have as benefit that they could be used to make bark clothes from, also they match well with coffee trees and could improve the soil fertility (Extension officer 2, 2014).

On the contrary, there is always the chance that farmers do not want to adopt these practices (Interview 12, 2014). Within the focus groups it was already said that especially men avoid training initiatives.

6.2.4 Farm input

As said above in section 6.2.3, most training sessions of governmental organizations and NGOs are combined with the distributions of farm inputs. What is handed out varies, like (improved) seeds, siblings, farm tools, fertilizer etc. (Extension officers 1 and 2, 2014). Farm inputs of organizations should be for sustainable purpose. For example, organisations supply farmers improved seeds, which need shorter time to mature or are resistant to pest and diseases and farmers do not need to take into account the change weather any longer. They do not need plant early anymore and can produce

food within a shorter amount of time. For example, farmers used to have indigenous sweet potatoes which took five to nine months to harvest; now they can use seeds which mature in two or three months. The benefit to use these improved seeds is that the productivity of these seeds are more certain and it helps farmers to protect themselves from rain variability.

In table 6.5 an overview of farm input to farmers from governmental organisations or NGOs is given. NAADS and NGOs are the most common sources to get inputs from. It seems that almost every farmer has an item in their house given by an organization. Farmers most mentioned inputs during the interviews are: (improved) seeds, livestock, farm tools, and basins. Extension officer 2 (2014) told me that he had to give away 400 fruit tree sibling to smallholders that day, which means that 200 households will be benefited with fruit trees. Besides farm inputs also other domestic items are given to farmers: bicycles, mobile phones, drugs, mosquito nets, and school fee sponsoring. Sometimes farmers or the LCs lobby by organization for inputs, like for the water basins (see box 5.2). One of the farmers told me he got a cow and a shelter from MADDO (Interview 18, 2014). However, he had to bring in some money himself, this means that it is an input which could not be afforded by everybody in society. He explained me further that, when MADDO gave the cow, they sometimes come for demonstrations and they also help to monitor the input (for instance, in case of health problems, they help with bringing it to a vet officer). To make the program sustainable the farmer has to give a new born calf back to the organization for a new group member.

Table 6.5: Number of farmers that received farm input

Farm input	Men	Women	Total
Total access to farm input	7	9	16
Farm input from Government (NAADS)	7	8	15
Farm input from NGO	7	8	15

Farm inputs also face constraints: it is possible that the farm input is sold by the farmer to get extra income, farmers receive extra inputs during election time, and in one group NAADS just only came ones to hand out input and never came back. Besides these constraints it could also be possible that the farmers lack knowledge on the farm inputs. Furthermore, to make the programs sustainable some programmes ask back a part from the farm input in a later stadium (for example, seeds), this could lead to troubles for some farmers to give these inputs back. Like, when crops fail to grow farmers are left with nothing. A last constraint is that the farm input is not properly tuned on persons by policy makers; for instance, one woman was given a bicycle by the government; however, as woman she was not able to use it (Interview 10, 2014).

6.2.5 Field tours

Field tours are organized to learn about new farm practices; for example, on agroforestry, improved stoves, and the use of fertilizers. Field tours are less common, as shown in table 6.6 only eight participate. Field tours are often not given to every group member, but to one or two representatives of the group, this because the field tours are often held at demonstrations plots; for example, in the city of Masaka. There they are taught on new technologies and when back from the field it is expected from them to train the other group members. Often within a group one man and one woman are able to participate, though this table shows that more women participate in field tours than men. The biggest constraint of field tours is that not all farmers have access to them and group members are depending on the representatives.

Table 6.6: Number of farmers participating in field tours

Field tours	Men	Women	Total
Total access to field tours	3	5	8
NAADS field tours	1	0	1
NGO field tours	0	3	3
Institution field tours	1	0	1

6.2.6 Marketing

Farmers do not receive help with marketing of their produce. According the farmers there is a lack in marketing information and market conform prices. These are reasons of farmers to sell their produce to individual middle-men (Interview 17, 2014). Instead, of help with marketing, farmers are encouraged by extension workers to plant food secure crops: "so that those ones can mitigate in times there are crop failures and still have crops that can sustain farmer during the time of food shortage" (Extension officer 2, 2014). The forest officer encourages crops such as fig trees, jack fruit, oranges, mangoes, pine trees, sweet potatoes and banana. Crops that are discouraged are Eucalyptus and Sorghum. Also the extension officers explain to farmers that they should not focus on just one enterprise, but they should mix them; for instance, the use of livestock and crops (Extension officer 2, 2014). Though this seems not be working in the community "in the past, they used to tell us that if you want to get a good market all the members should be concentrating at least for one enterprise so that that enterprise attracts middle-men, but you see in the community everyone is growing alone like growing cassava, growing maize, everyone is growing" (Interview 15, 2014).

An important historic circumstance, within the marketing perspective, is the liberalization of coffee market and price in 1991. The cooperative union was replaced by coffee traders, exporters, processors, and farmers' groups and organizations. Coffee became marketed by individual persons and collective bargaining became limited (IISD, 2013). However, just when I came to Rakai a coffee farming association (the Rakai Coffee Hub) started with the help of the organizations CIDI and CAPCA in the sub-counties: Lwanda, Kagamba, Kasali, Dwaniro, and Lwamaggwa. Here the coffee of local farmers was processed in a new built factory, with all kind of new machines. The idea behind the association is that it helps to mobilize and market the coffee for a fair price (Extension officer 1, 2014). Of my group sample only two male and two female farmers were yet involved in this cooperation.

6.2.7 Access to information

Local implementation of environmental policies is part depending on local sources. Information access is all the means of farmers to get extra knowledge on; for example, CSA, environmental policies, or livelihood development. Extension officer 2 (2014) discusses several sources to get climate-smart information by farmers (see table 6.7). Common sources used by policy workers are radio programmes, car speakers, and all kinds of literature. New is deploying the internet, but most farmers are not connected and do not use email. Text messages are send to reach farmers; most farmers seem to have mobile phones (see section 5.2.2). Though farmers did not mention receiving any text message. There media sources besides radio are middle-men, car speaker, and newspapers.

Not only media is used as information source, also the governmental organizations try to be a source for information. A common information source for farmers is the use of community meetings (at village, parish, or sub-county level), whereby persons as political leaders, LC chairmen, and civil

society organizations are present. It is expected from farmers to attend these meetings. In these meetings they are told about government policies, programmes and services for persons, and even the challenges the government face (Extension officer 2, 2014). From the farmers' sample, four women claim not to attend the meetings against two men. To contact officials on policies, problems, agricultural knowledge or other kind of information, farmers mostly contact agricultural officers on sub-county level or district level. Some also contact the LC1 or LC3 chairman. For more agricultural knowledge five male farmers say they contact NAADS, against two female farmers. Men are more accustomed to contact the authorities: four men against one woman. The woman gives as explanation that her husband contacts the authorities (Interview 2, 2014). One LC1 chairman explains how he deals with problems. For every kind of problem there is someone in the LC, who the farmers can contact; for example, there is somebody responsible for women development. When the problem is more complex, like in the case of land problems, he sent the complainer to the sub-county (LC3). At LC3 level there is a land committee (Interview 4, 2014). According to Extension officer 2 they involve local staff in the implementation, monitoring and documentation process. Like, they contact natural resource based staff and community development workers of organizations, for their programmes on forestry and fisheries (Extension officer 2, 2014).

Other sources of information according the Focus groups discussions (1, 2, 3, and 4, 2014) were women development groups, research institutions, and religious groups. Four of the women who I interviewed belong to a women development group, wherein they were working on CSA programmes (constructing channels and improve stone placements). Within these developing groups women learn also skills on making hand crafts like weaving and learn practices to raise their children. Religious institutions are used especially by women to get more knowledge on livelihood development, saving groups, or for gift exchanges. Five out of the nine women I interviewed belonged to such religious group, against only one man. There could be stated that these religious organisations are especially used by women. There are also NGOs who help farmers with information and who farmers can contact for help. According to Interview 6 (2014) they teach farmers on agricultural practices and even brought some trials to their village; which types of beans grow best with the causes of climate variability. The farmers can also contact the NGOs afterwards if they face problems with the crops, like pests and diseases outbreaks. Then the NGO give information on improvements (Interview 6, 2014).

Table 6.7 Information source: who farmers contact for information

Sources	Men	Women	Total
Media:			
- Radio	8	8	16
- Newspaper	1	0	1
- Mobile phones	0	0	0
- Car speakers	1	0	1
Government organizations:			
- LC1 chairman	3 (N=5)*	1	4
- LC3 chairman	2	2	4
- Government officials	6	3	9
- Agricultural officers	5	5	10
- NAADS	8	7	15
- Community meetings	5	4	9
NGOs	8	7	15

* N= means No answer of participants

Last to focus on is the use of the radio as source for farmers. In section 5.2 (economic capital) it appeared that sixteen farmers had a radio in the house. Especially, via policy programmes, news and agricultural programmes farmers get knowledge about policies, services and CSA practices. Table 6.8 shows an overview of the different programmes men and women listen to at the radio. Farmers listen to several programmes. However, women say they listen more to news, policies and announcements, while men tune their radio more on trainings about agricultural development. One woman complains even that radio is her only source on policy knowledge "I lack information from anyone, just hear it from the radio" (Interview 7, 2014).

Table 6.8: Radio programmes

Radio programmes	Men	Women	Total
Policies and announcements	5	7	12
News	4	8	12
Weather forecast	1	0	1
Market information	0	1	1
Health information	2	0	2
Agriculture and development trainings	7	2	9
Entertainment and sports	4	5	9

6.2.8 Gender mainstreaming in local environmental policies

As shown in the sections above the services provided by government and NGOs are almost gender equal. Both men and women have bene taken in count to participate in the many services provided. For instance, women are extremely encouraged to participate in the farm groups (Extension officer 2, 2014). Extensions officers encourage all (women, men, youth, and disabled) to get involved in the provided services (Extension officers 1 and 2, 2014). They reflect that women are more on the farm than men; men are more involved in trading and have more mobility. Though the women are busy on their farms, they encourage them to undertake these training. Problems of gender were already taken in consideration by extensions workers. As Extension officer 2 (2014) explained me; he sees in the society often the burden women have when fetching water: "there is the problem of water shortage, so when there is water shortage due to up around drought, they experience crop failure and off course that means much when the crops fails. There is famine and lets food in homes and less income, and this can also rest ability in homes, when there is no food. And we find, in trainings that it is always the women that who are suffer. For example, you find that during climate variability that women are going to work for food. And also they are the people that most of the times collect water. If they have to walk a long distance, it means that they lose much productive time" (Extension officer 2, 2014). Other problems, which I expected because of lack of transport, were that women could not easily access public spaces. However, it seems they are often going to training sessions and field tour. To take in consideration here is the fact that the women of my interview sample have high social positions; this may gave a distorted view with real smallholder farmers. Farmers with higher status in society or with leadership positions are close to policy makers and the government. It is likely that these farmers have higher access to governmental services. Chapter 5 showed that farmers, who had less social status, had less access to capitals than middle-size or large-size farmers.

Women seem sometimes even to be empowered. As explained by Interview 2 (2014): "I am the member of a group, assistant by CIDI and I am the one who knows how to get the seeds, from the good supplier or shop and I buy myself not the husband." According Extension officer 2 (2014) he also gives agroforestry trainings to specific women. Besides attempting governmental programs, it is

often women who are leaders in farmers groups. According the Extension officer 2 (2014) the policy of the government is to have 30 percent of women in leadership positions. In his opinion women leaders do better than men: “they are more transparent and they are good mobilisers. Once you make a programme it is more likely to succeed then with men” (Extension officers 1 and 2, 2014).

Still I also heard other sounds from some women. For instance, women do not attend training sessions because their husband did not allow them to go to trainings because of suspicion of adultery and gossip. Or women only go to the training sessions when the husband is not around (Interview 7, 2014). It is often still the men, who are the ones who have access to the authorities (see table 6.7).

Besides women the extension officers focus on youth, because they otherwise disregard to come. There are even specific programmes focusing on youth, for me it was possible to attend one of these youth programmes.

A last remark is a focus of programs should also be on the poor and not only on middle-size or large-size farmers. It seems possible that the poor in the society are left out, as “farmers say ‘this one and this one have nothing to benefit.’ Yet, the programme should encourage a poor person to come out of poverty, to improve on him, so that he can also improve on his livelihood” (Extension officer 2, 2014). Though this said, Extension officer 2 (2014) also told me (as explained in section 6.2.3) that they let farmers decide who can be benefitting from the program, and this still means that the poor can be left out, which can subconsciously lead to social inequality (Extension officer 2, 2014).

6.2.9 CSA practices

In section 5.1 the technologies used by the farmers are mentioned (see table 5.2). In section 5.2 under cultural capital the traditional methods are mentioned (see table 5.11); for example, mulching is a common practice as traditional knowledge and used from own experience. This practices is also adopted a CSA practice, which is taught in trainings. In this section table 6.9 shows the number of farmers actual taught these technologies as CSA practices in trainings and adopted them as such. I asked farmers on where they were they have learned about the practices, in this table can be found the answers given such as in trainings or from government and NGOs. Though section 5.2 showed that farmers already practice a lot of technologies already, because this is part of the way they practicing agriculture. CSA practices less relate to these farmers. Though the benefits of the CSA practices are; especially, the visible difference in harvest quantity when using these practices and to keep the soil fertile. For instance, agroforestry is seen as a big benefit for the farm; in the long term the trees provide food and provide money. Improved stoves and water harvesting have a high impact on the daily activities of women. When women have access to these CSA practices, they have more time for other farm activities. Besides benefits, these CSA practices also bring constraints, such as higher workloads, lack of knowledge, scarcity of land, and lack of money. Specific gender gaps, mentioned by women are that the trees are owned by men and men are also the owner of the cash crops. Besides these gender constraints, often the men help women on the farm in case of heavy jobs as digging channels and spraying fertilizers.

Specific CSA practice constraints are according farmers:

- Compost making: it is much work, and the workload is high (Interview 10, 2014);

- Agroforestry: too much shade, quality of the soil reduces with some trees, and gender gap "The wife does not normally, go in to such. Looking after the trees. Because for her, she mainly deals with matooke (banana)" (Interview 5, 2014);
- Improve grain storage: According to Extension officer 2 (2014) storage houses should be farmers' initiative. The extension officers encourage farmers' food storage places and farmers should not just dry crop produce on the ground, but on tarpaulin. Indeed, according to the farmers the government encourage groups to have storing places; however, they do not help them with these practice (Interviews 3 and 4, 2014).

One last constraint to adopt CSA practices is that farmers often say they have the knowledge taught for some practice, but not the possibility to take it in practice; for example, because the lack of money.

Table 6.9: CSA practices

CSA practices	Men	Women	Total
Agroforestry	5	6	11
Terraces and Bunds	3 (N=3)*	2 (N=3)*	5 (N=6)*
Water Harvesting	1	4	5
Use of Irrigation	1	2	3
Mulching	5	4	9
Composting	3	3	6
Livestock Manure Management	2	4	6
More efficient use of fertilizer	3	2	5
Using Improved varieties**	7	6	13
Improved grain storage	1	0	1
Improved stoves	1	3	4

* N= means No answer of participants

** In this table the use of improved, high-yielding varieties and the use of stress-tolerant varieties are combined in using improved varieties.

The interviewee also did not give any information on like practices cover cropping, no till/minimum tillage, and zai pits/planting pits/negarims (as listed CSA practices in section 4.4 from CCAFS survey in e.g. Rakai).

Besides CSA practices, extension officers also train farmers other farm practices, like the spraying of herbicides and pesticides, pruning for pests and disease control, weather forecast traditional signs, and the use of water channels. Farmers claim that these practices help them to improve their soil fertility or crop productivity as well.

6.3 Policy awareness and policy gaps

This section will focus on the awareness and knowledge of national environmental policy by farmers (as described in section 4.7); to identify how environmental policies are locally implemented and to find out how national policies function in local communities.

According to Ampaire and Happy (2014) there is locally a lack of policy implication, because local implementers are not involved in the formulation process. Also there is inadequate knowledge on policies at different levels, a lack of coordination among different actors, limited availability of resources, and corruption in political interference. In addition, lack of policy implementation could (in)directly increase farmers' vulnerability to climate change effects (Ampaire and Happy, 2014). My main findings correspond with these constraints:

- There is a lack of policy knowledge; for example, on land rights for women;
- The policies are very top-down oriented;
- Within LC1 and LC2 there is a lack of knowledge on policies and services;
- Extension officer 2 (2014) explained a lack of a means allocated by the national government for projects on district level. This is also the case, because of the many sub-counties within the district. With the effect that within the NAADS project there is a lack of capacity to monitor farmer groups. Often farmers told me they only got once a training and farm input from NAADS;
- LC1 chairman earn small wages, the LC1 chairman get only 10,000 Ugandan shilling a month by the national government (Interview 4, 2014);
- Farmers and Extension officer 1 (2014) speak of corruption "the government is not strong for implementation of the policy there is much corruption" (Interview 2, 2014) or bribe payment in all levels of politics (from national down to village level): "the chairman is a hard man and he wants money. When you go there, when you want a letter, to get these stamp, you have to pay first" (Interview 3, 2014) (see also box 6.1);
- No democracy: there are villages which did not have elections for years (Interviews 3, 4, and 5, 2014) and multiple interviewees complain that the LCs are no longer functioning in their village. This means farmers need to contact a higher governmental organization, like LC3 or they take the law in their own hand, by chasing away cattle keepers, cut roots of eucalyptus trees etc. (see section 5.2.1).

According to Extension officer 2 (2014) they monitor and evaluate the projects every day, week, and quarter, even with the farmers. "To see what is missing and where they appreciate it. You are getting their needs" (Extension officer 2, 2014). In the monitoring process there are also some gaps. There is no law enforcement especially during elections, because policy officers are scared of losing votes. There is no project enforcement in the area; for example, no enforcement on giving back seeds by farmers to the projects, so the sustainability is in discredit.

According the farmers on national level the government is responsible for roads, security, water, taxes, health care, and the enforcement and implementation of policies. On district level there is a community development officer (CDO) for family affairs (Interviews 4 and 5, 2014) and the LDC on land conflicts (the land committee board) (Interviews 6 and 8, 2014). At parish level there are training sessions, councillors, and health centres. Sub-county level is according to the farmers responsible for security of the farmers, workshops from agricultural officers, roads, community meetings, health, farm inputs, community land, and land problems. In the village they are responsible for community meetings, sharing knowledge, clean roads, meetings on policies and rule of law, and the ceremonial groups for burials. Though farmers claim some lack on services by the government as weather forecast, cooperative stores, hospital, roads, tractor, school fees, and provision of community water.

Box 6.1 Collect votes

A policy failure is the manipulation to collect votes before election times. LC1 and LC3 officers try to collect votes. This has effects on the implementation of environmental policies according Extension officer 1 (2014): "here, the environment, the leaders, here in the sub-county. The environment is not kept well, because these people, who want votes. When they see somebody cutting trees. They do not mind. When you come to take them that is not good, this petition. 'Come on' they say 'leave

our people with the char wood burning.' Also we have a big hill. All the trees on this hill are cut. All of them are cut. The politicians are there. When you want to tell them that when you cut trees, you plant a new one. They just say, 'huh leave our people, we want votes'." The LC1 and even LC3 "let us down" (Extension officer 1, 2014).

Not only the extension officer explained the manipulation of votes, also many farmers "MP give seeds for new votes" (Interview 14, 2014) "not monitor policies on cleaning roads, want to get votes" (Interview 15, 2014). "When you go to the local leaders to implement the government programme like the policies. These elected people, they intervene and they tell you do not disturb my votes" (Interview 1, 2014). "They do not allow anybody to remove on any tree, without planting. It is supposed to be observed by LCs. In fact due to political problems, sometimes it has become weak. The policies have become weak. Because somebody may say that 'I will reduce my vote'" (Interview 6, 2014).

Beside problems with the government, farmers face constraints themselves. Farmers have no knowledge who to contact in case of policy problems or where to get policy information with the divers policy levels (LC1 to LC5). Farmers contact in case of community problems mostly the LC1 and LC3 chairman and with farm problems the agricultural officers. Besides problems with the LCs, farmers do not follow the laws and neglect the programmes (Interviews 14 and 15, 2014). Other farmers explained that the community had trainings on polices, but they did not bring it in practice in their community (Interview 8, 2014). Not only do they not follow the taught practices, they also do not participate in meetings when there are no inputs promised (Interview 10, 2014). Interview 15 (2014) is of opinion that the government should more enforce the implementation of policies. Besides, those farmers that do not want to participate; there are also farmers who lack policy knowledge. According Extension officer 1, farmers lack knowledge in policies (Extension officer 1, 2014). Box 6.2 explains the awareness of farmers and how they think they are provided with policies.

Box 6.2 Supportive policies

It is difficult to get to understand if farmers are aware of the different policies. Though some claim that policies are very supportive. Here are some reaction on how policies support them as farmers:

"Policies help me to protect, protect my people and my surroundings and to improve the economy. Because the economy is rising according the policy, if the policy is not there the economy can be destroyed by other people. I mean that everybody is working, what he is working and expect that nobody is going to take it illegally, nobody is going to disturb. Because I have somewhere to report, but if somebody is saying that he has nowhere to report, people with their power they just cut the trees and they get lost" (Interview 6, 2014).

"The policies stop us from bush burning. They help me to dig channels. The government helps to protect the farmer crops from thieves" (Interview 8, 2014).

"Those policies when you follow them you can easily get food from fruit trees, and you can easily get firewood. The whole community, they have to follow those policies. That if you do not follow them they cannot exist" (Interview 15, 2014).

"The policies help me,…, if you are caught burning, you will be charged" (Interview 3, 2014).

Extension officer 2 (2014) talks about two ways to give policy knowledge to farmers; one is a community meeting where they are told about the government programmes and the implementation and the other way is the use of political leaders and civil society organizations. Sources to bring policies to farmers are radios or community meetings (as mentioned in section 6.2.7). Women abide more the policies than men and he children grow up with knowledge on policies nowadays. Though farmers want more advocacy by the LC1 for help from the government "that the Chairperson LC3 they lobby to the district and then the district to the nation" (Interview 17, 2014). Some communities lack to organize community meetings on regular basis.

To identify how national environmental policies are locally implemented, I focused in this research on some policies (see also section 4.7) and one district bill (see more in section 6.1): Climate Change policy, Forestry policy, National land policy, National wetlands policy, National agriculture policy, and the Rakai District environment management bill. Besides these policies, I focused on water supply, infrastructure, and women in leadership positions.

6.3.1 Climate Change policy

As said the Climate Change policy is not yet approved and also not known by the population. Extension officer 2 (2014) explains that the government encourages savings, introduces new crop varieties, and plead for an enterprise mix. If you ask farmers, what they know about this policy you get a variety in answers. Most of all they know not to cut trees, not to cultivate in the wetlands, and not to burn charcoal. Farmers know to contact the agricultural officers on agricultural and climate variability matters. Farmers explained that trainings helped them to adapt to climate variability and weather changes. It is clear that farmers lack also the knowledge on climate variability. They think that "the policies have helped us to have enough rainfall" (Interview 16, 2014). In the trainings they are also taught not to burn plastic bags because of air pollution, not to cut banana with BXW with the same tools, and to cut the whole coffee tree which is affect with coffee diseases (CTB) and not only their branches.

6.3.2 Forestry policy

The forestry policy is designed to promote and develop private forestry and for sustainable management of government's central forest reserves (Ampaire and Happy, 2014). In Rakai I spoke with the forestry officer (Extension officer 2, 2014), he explained to me some of the projects. The Extension officers 1 and 2 explained that cutting trees is very common in the area. They encourage farmers not to do this "one of the policies is that you will encourage people to plant trees on their farm that is agroforestry. That is one of the government policies. Then the other one is the development of the private sector in forestry. The other one is training of women. The other one is collaborative forest management, where you deal with communities also to manage forests. To benefit from forest resources, and also enterprises targeting women, like necessaries for income. And of course research on farm research" (Extension officer 2, 2014). Furthermore, he explains they try to motivate farmers to protect the trees and not to burn the bushes. Every famer should replant trees if they have cut one, they amount depends on the land size. With small land they encourage to plant fruit trees "because these farmers benefit both for shade and of course the other increased value" (Extension officer 2, 2014). Also in some groups there are projects from NGOs on community

planting, two male and two female farmers mention they planted as group on each other's farm trees like figs, calliandra, gaveria.

Lately, there is an increase in coffee planting in Rakai, this also means more diseased coffee crops. Farmers are also taught about the treatment of diseased coffee trees by pruning. Extension officer 2 sees this lacking in the community. Farmers do not prune the coffee, because they will lose the branches with coffee fruits. Another purpose taught on coffee is that farmers are encourages to use the fig trees in the coffee plantation; this is a traditional practise. From the fig trees farmers make bark clothes and they help to improve their soil fertility.

Both men and women know who to contact in case persons violate these practices (agricultural officers) or in case they need tree seeds (shops and NGOs). Farmers are taught on tree policies during training sessions and meetings "I learned when you cut down a tree, you plant if you do not plant, you get problems of heavy wind. So they do not have those problems, they act as windbreakers" (Interview 17, 2014). Where some are proponents "the policies helped me to plant trees and to be an example for the community {as LC1 chairman}" (Interview 4, 2014). Others disagree with the policies "I should have practiced timbering, but the government do not allow us to do timbering" (Interview 18, 2014). Still some farmers lack in not cutting the trees. Some farmers told me "that those of not cutting down trees, it is beneficial as if they get good air and even getting rainfall, enough rainfall" (Interview 10, 2014). Also person have lack of knowledge on the policy "I realize after cutting the tree. That is the biggest problem, but after realized that cutting the tree is a problem, which can affect everybody than I started replanting the tree; fig tree. I cut the fig tree, with the purpose of getting firewood" (Interview 2, 2014). In the meanwhile, the implementation at local level is not effective.

6.3.3 Rakai District environment management bill

The Rakai District environment management bill is not known by anybody; even the extension officers could not give more information on this bill.

6.3.4 National land policy

According to a LC1 chairman (Interview 8, 2014) they get trainings about the policies concerning lands and how to settle land disputes. Well known among the farmers was that you should not sell of their land, and not enter or graze on someone else's land without permission. According to Extension officer 1 (2014) knowledge on land inheritance for gender equality just had started. "But long ago, women are not allowed to get land. But nowadays, things have changed. Even women have started to holding land" (Extension officer 1, 2014). However, these laws are not yet well implemented.

This district is part of the Buganda kingdom; this means that there are clan leaders in the community. Farmers often have mailo arrangements as explained in section 4.6 and 5.2.2. Sometimes in land inheritance the clan has customary laws on land tenure. In extraordinary cases both sons and daughters could have the right of part of the land, according to Interview 2 (2014) "women also have to get a part if the father or mother have directed. Though the women get a smaller part, the big one is for the men, because the women always move to another area." Which means that women, after marriage, move to their husband's household. However, in case of conflicts most farmers do not contact the clan leaders, because they are far away. Instead they contact the LCs. Mostly farmers prefer to got to the LC1 chairman; LC3 level (see also box 5.3 on land conflicts). LC1 and LC3 can send farmers to the land committee board in the sub-county. As explained by a chairman: "I enter in those

cases, but when the problem is more difficult, I send the complainer to the sub-county" (Interview 4, 2014).

6.3.5 National wetland policy

For the policy on wetlands, some other acts and bills are in order. Like the Land Act, Cap.227 Section 44 sub-section 4, government or local government cannot lease land. Also wetlands are public amenities, and policy states that it should not be fenced to exclude any users. Which means that in Rakai there should not be leased wetlands and fenced 'former' public lands. Even wetlands are mentioned in the Rakai District environmental management bill, which prohibits wetland degradation. According to Ampaire and Happy (2014) no penalties are administered due to poor linkages between the district environmental office and affected communities (Ampaire and Happy, 2014). Extension officer 1 (2014) just started with telling farmers not to cultivate the wetland. He remarks: "the sub-counties, it is big. They can go there and find they have planted and we go there and tell them not to plant again" (Extension Office 1, 2014). Also farmers are aware they cannot cultivate in the wetlands (six male – nine females).

The wetland acts are not always put in practice. Wetlands are fenced and used for private purposes "recently there was a situation of that. Where someone bought land, which had the wells and the grass. We approached the officials. Went to the courts of law. And we were able to recover their wetland. Sometimes even we report these situations of individuals, the opinion of the farmers are ignored. Closing up the well, require more water supply and it affects the women activities" (Focus group 3, 2014). Men and women are highly aware they cannot use the wetlands to cultivate. Though there are still people using it and the laws are not implemented by governmental officers. Farmers say they use the wetland for crops which need irrigation; people use these lands because of lack of rainfall or shortage of land (Interviews 5, 6, and 8, 2014). One local leader spoke on enforcement, though he told me he could not: "I can find that when somebody is near a wetland, he assumes that all that part is his. I can advise him, but he can refuse" (Interview 5, 2014). Wetlands maintain to help farmers in water supply for crops and grass for animals and mulching.

6.3.6 National agriculture policy

Not a main policy, but still I asked farmer if they knew something about agricultural policies. However, they had no awareness.

6.3.7 Water sources

Water scarcity is the main problem in the area .Though not every farmer has access to water facilitations build by the government. It is well known among farmers to keep the wells clean and not to graze livestock around the wells which are meant for domestic purpose.

6.3.8 Infrastructure

Infrastructure is important for the mobility of the farmers; it can help farmers to have more easily access to the local market or to authorities etc. Farmers told me there is a lack of good roads. The policy of the road is divided among the community themselves, and the different levels of the government. Modern roads are built by the LC3 or the district, the community is responsible for the roads in the village and around their farms.

6.3.9 Women in leadership positions and equal rights

In the local councils there are according to farmers women in leadership positions. One woman told me she sees profit in being a leader as women "it is possible to mobilize the women and maybe train them. That is my opportunity, that during mobilization it is easier for them to mobilize man and women to attend to meetings. I do not know whether it was my chance that they can easily mobilize, but men do much work for them {women leaders}, they do not normally want to attend trainings except ladies. Men concentrate on other work. Naturally men do not attend in trainings and meetings, but those who happen to attend they listen to me" (Interview 15, 2014).

Male and female farmers say they have equal rights with the other sex in leadership positions. "Women representative are given the same posts as were given to men, they have equal rights. They perform well" (Interview 18, 2014). However, not everybody is happy with women representatives (Interviews 3 and 7, 2014) and some explain they have lack of technical knowledge, because they lack power (Interview 6, 2014).

One man tries to explain how the policies work on gender equality: "women rights, they are very strong, but the way they are been explained they also changed the way how it is. Some of them, especially those ones who break laws, women, they keep on challenging their husbands, saying them we are equal. The people who have introduced these women rights, they think that equal rights, the way they are referring; they think that you should also respond equally. But what the government are advising that, we are not saying that a lady, a wife should not cook food for the husband, we are sharing the activities, when somebody is not there, if the man is there, let the woman do the work. Some of the fathers are living very far, some of the fathers you find them, economically it is low. So they advise the people that they should not to expect the word women rights as something it brings the family to collapse. So they brought it for the government, so the policy is there and it is active" (Interview 6, 2014).

6.4 Conclusion

In this chapter the local services and laws are explained, their local implantation by civil servants and NGO officers, and policy awareness among farmers. Within the policies gender mainstreaming is included, in services women are considered as participants. Though when focusing on the land act, policies on land inheritance and land rights are not enforced for women. Although extension officers claim they are working on to promote this. These all have effect on leading CSA adoption in the right direction. Political services (of governmental organisations and NGOs) encourage farmers (male and female) to use improved seeds, help them to get access to credit, and help them with the founding of a coffee marketing cooperation. Male and female farmers are influenced to adopt CSA to access services by the government such as training sessions and demonstrations, especially through promotion of extension officers the adoption of agroforestry is entirely used among the farmers in the district. Besides the implementation of CSAs in training sessions and demonstrations, CSA is already embedded in local knowledge. By implementing services and designing local programs, there should be awareness among extension officers on what farmers are already practicing and they should respond to this. Also not the standard package has to be provided to middle-size farmers and smallholders, the trainings should be adapted to different social groups. Often the national environmental policies are to town down oriented and local implementation should be context-specific. Besides focusing on the services it is for farmers often not obvious what the environmental

policies contain. Awareness and knowledge on environmental policies lack. It is therefore difficult to understand were farmers base their decision on.

Environmental policies influence decision-making processes of smallholder farmers on CSA adoption, farmers receive knowledge on the practices and they depend on services from the government to stay food secure. The core of this chapter is that policy awareness is lacking among farmers and LC1 members. Beside that there is no awareness, the policies are moderately implemented. These two facts make it difficult to understand where farmers base their adoption decisions on.

7. Discussion

The dynamics of farmers' decision-making and policy implementation on climate change adaptation have been explored here by unravelling the roles, responsibilities, rights, and context of female and male smallholder farmers. Unfortunately, the results I have found those not cover the entire population. The first question addressed the most relevant Climate-Smart Agricultural (CSA) practices of smallholder farmers, of men and women, in the Rakai District. Climate-Smart Agriculture is seen as key to sustainable increasing agricultural productivity, building resilience to climate change, and reducing GHG emissions from agriculture (FAO, 2014). These practices are needed to empower local farmers in the Rakai District, Uganda to protect them from natural hazards, because of climate variability. Based on focus groups discussions, pre-test interviews, and (semi-) structured interviews the most common farm practices adopted as CSA or embedded in traditional knowledge are terraces and bunds, water harvesting, use of irrigation, mulching, composting, livestock manure management, more efficient use of fertilizer, use of improved seeds, improved grain storage, and improved stoves, with a special focus on agroforestry. The choice to focus on agroforestry is that it is adopted by both men, who look often after coffee plantations with fig trees, as well as by women, who practice it in their banana plantations and in combination with other subsistence crops and fruit trees.

The second question asked on who controls, gains, or maintains the capitals within the smallholder farmers' households and how that influence female and male decision-making on agriculture. This could be answers based on an analysis of the decision-making approach (de Bruin and van Dijk, 2005a) and the theory of access (Ribot and Peluso, 2003). I will answer this question in combination with the examination of the third question on gender dimensions; related to the adoption and the use of CSA practices in the farmers' households. Farmers' behaviour to adopt CSA practices depends on the livelihood of these farmers, which are influences by factors as the access to the capitals (economic, social, political, cultural, and human), the context, and farmers' understanding. The adoption of CSA is also influenced by gender differences in access to these capitals. It is found that men control land, means of transportation, and the market for selling the produce. The money, earned is often controlled by the men and can among others be used to buy tools and to hire labour. These are all advantages in the adoption process of innovative farmers systems. Women, on the other hand, have access via their husband to these capitals, are more often united in religious groups, and own the smallest livestock. Within the farm men and women make also different decision based on their diverse household activities (daily, on-farm, and off-farm). Whereby it is expected in society that women practice daily activities at home and on-farm and men look for income sources off-farm. These distinctions in combination with differences in male and female crops seems to give the impression that men and women make different decisions according to CSA practices; though no significant results are found in this research (more quantified data is needed). A last aspect that influences farmers' behaviour is the pathways of farmers. Farmers, male and female, seem to have difficulties with describing the pathways they took. They often do not recall if the technologies they use are based on their own experiences or trained by NGOs or governmental organizations.

The fourth question asked was how environmental policies influence decision-making processes of smallholder farmers on CSA adoption. Within the policies gender is included and therefore directing CSA adoption in the right direction, when focusing on gender mainstreaming. Male and female

farmers are influenced to adopt CSA to access of services by the government through; for example, training sessions and demonstrations. Especially the promotion by extension officers to adopt agroforestry is entirely known among the farmers in the district. Though it is often not obvious by farmers what the environmental policies contain. Awareness and knowledge on environmental policies therefore lack. It is therefore difficult to overtake were farmers base their decision on. It is not clear what the relation between policies and adoption is, because adoption might be already embedded in local farming. Not only by smallholder farmers, but also the local councils lack awareness on national policies; therefore, the policies are moderately implemented.

It seems that male and female smallholder farmers' decisions on the adoption of CSA practices in agroforestry farms in the Rakai District, Uganda are based on their livelihood accessories. Therefore, the understanding of farmers to decide to adopt CSA can be used by stakeholders in the field. It can help stakeholders to find and to address bottlenecks to climate change adaptation experienced by smallholder farmers. To listen to the smallholder farmers they can improve the implementation of National Environmental Policies within the Rakai District. Though, the influence of environmental policies on male and female behaviour on CSA adoption should be re-examined.

In this research a broad theoretical framework was used. To understand the process of smallholder farmers' decision-making, a theoretical understanding on livelihood, decision-making approach by de Bruijn and van Dijk (2005a), the theory of access by Ribot and Peluso (2003), policy processes, and gender analysis by Doss (2013a) were needed. The use of many frameworks made it more complex. The underlying idea is that men and women make different decisions on their farm because of their diverse livelihood, which depend on their access to economic, social, political, cultural, and human capital, the context, their understanding, gender dimension, and policy programs. In this context the framework worked well. A better understanding in gender was created on the access to capitals and decision-making of farmers as well as how farmers' behaviour is influenced by the way national environmental policies are implemented and adopted in local society. An aspect is the use of the five capitals (economic, social, political, cultural, and human) of de Bruijn and van Dijk (2005a). Capitals is a common approach among scholars; for example, I could also had use the four capitals of Krantz (2001); natural, economic or financial, human and social capital. Krantz focus is more on natural resources. Nevertheless, I did not choose to use these capitals because they lack in focusing on the political dimension, which is of great importance in my framework by understanding the web of power and looking to environmental policies. Sometimes the theoretical framework faced problems with the methodology; especially, in the group sample. This had to focus on smallholder farmers, but in the meantime it is mostly middle-size or large-size scale farmers in the (semi-)structure group sample. Compared with the sample of the focus groups discussions, this was different, herein more smallholder farmers were included, and this became especially clear when looking to their perspectives. However, in this research I did not a detailed study to the focus group sample. Also the fact that women often had special positions, made the group sample in the interviews not representable for the general smallholder farmers in the Rakai District.

During the research, other limitations came up. First, there is a research needed on what is actually happening by the smallholder group on CSA decision-making. In this research the focus was shifted to social inequality, instead of gender inequality. In a follow-up research should than also be focused on how policies could concentrate more on these smallholder farmers. In this research it became clear that there is a discourse in participation of smallholder farmers. It is not clear if they are

reached if communities can make decisions themselves on who can participate in services of the government and NGOs.

Secondly, also the theoretical framework on measuring the CSA practices in terms of decision-making by smallholder farmers has been applied to one specific case study. This regarded smallholder agroforestry farmers in the Rakai District, Uganda. However, the time was insufficient to focus on other CSA practices specific and to apply smallholder farmers in other contexts (such as agricultural sector, district, or type of farmer). This limits the possibility to compare my research with others. The choice of agroforestry was therefore also guided by the case of Rakai, were they use many agroforestry in banana and coffee plantations. If the study was done using another case, it is possible that other relevant outcomes will be found and other CSA practices will be off more relevance. On the other hand, the framework of the five capitals, theory of access, policy process, and gender dimension would be applicable on other cases too.

A third limitation of my report is that, although we interviewed some stakeholders (such as local farmers, extension workers etc.) that work closely with CSA practices, I did not had the opportunity to interview a bigger group of smallholder farmers to make the information more valid. This limited the understanding of the reality of the agricultural sector in the Ugandan - Rakai District context from smallholder farmers' point of view. Further, only two extension officers were interviewed. The point of view of the coffee cooperation, NGOs, and government officials was not taken into account. Having interviewed also these stakeholders, the concept of CSA could have been discussed even more into depth.

A fourth limitation of my research is that I mostly focused on CSA and then especially agroforestry. The concept of Climate-Smart Agriculture is debatable. Most information I used during my research on CSA in the Rakai District, comes from one source IITA/CCAFS/CGIAR/CIDI. To focus on sources of one stakeholder group is a bit delicate, especially if they are dependent on a donor program. Besides, CSA practices are definitely not the only way to look deeper into agricultural technologies. It would have been interested to know how other technologies could be innovative. In further research it would be good to focus on other farm technologies present and not only from a CSA point of view. It needs to be taken into considerations that some topics can be sensitive and care has to be taken when measuring CSA practices and other agricultural technologies.

To recommend, it is not in the interest of smallholder farmers to focus on carbon reduction policies in Uganda, as wanted by the international donor agenda. Local farmers need resources and practices (such as easier access to improved seeds and water sources) to overcome food insecurity and poverty. An example, help with marketing of some farm produce is needed, such as mangoes, where prices fluctuate heavily. Also focus in policies should be from the local farmers' perspective; a bottom-up approach is needed to overcome climate variability, based on already existing traditional knowledge. Additional policy implementation on environmental policies should be further considered, especially in the light of gender equity. Not only environmental policies, but also the implementation on the land act. Land tenure is still unequally divided among farmers; many farmers are still smallholders and face food insecurity. Also gender inequality is a fact within land tenure. There is more research needed on gender in land tenure in the Rakai District, Uganda, as well as on training sessions about CSA practices and water scarcity.

Last, I would also recommend working with already existing group; for instance, women are already often organized in religious groups and men; for example, in boda-boda groups. Work with local leaders, besides the local council such as clan leaders and religious leaders (catholic, protestant, Muslims etc.) could be of importance. Furthermore, these local leaders of LC1 and LC3, the contact persons of farmers, should be trained on policy implementation, awareness on climate variability, and knowledge on CSA practices.

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Interview list

Extension officer 1, 2014 – Male

Extension officer 2, 2014 – Male

Focus group 1, 2014 – Female

Focus group 2, 2014 – Male

Focus group 3, 2014 – Female

Focus group 4, 2014 – Male

Interview 1, 2014 – Female

Interview 2, 2014 – Female

Interview 3, 2014 – Female

Interview 4, 2014 – Male

Interview 5, 2014 – Male

Interview 6, 2014 – Male

Interview 7, 2014 – Female

Interview 8, 2014 – Male

Interview 9, 2014 – Male

Interview 10, 2014 – Female

Interview 11, 2014 – Female

Interview 12, 2014 – Male

Interview 13, 2014 – Male

Interview 14, 2014 – Male

Interview 15, 2014 – Female

Interview 16, 2014 – Female

Interview 17, 2014 – Female

Interview 18, 2014 – Male

Pre-test 1, 2014 – Female

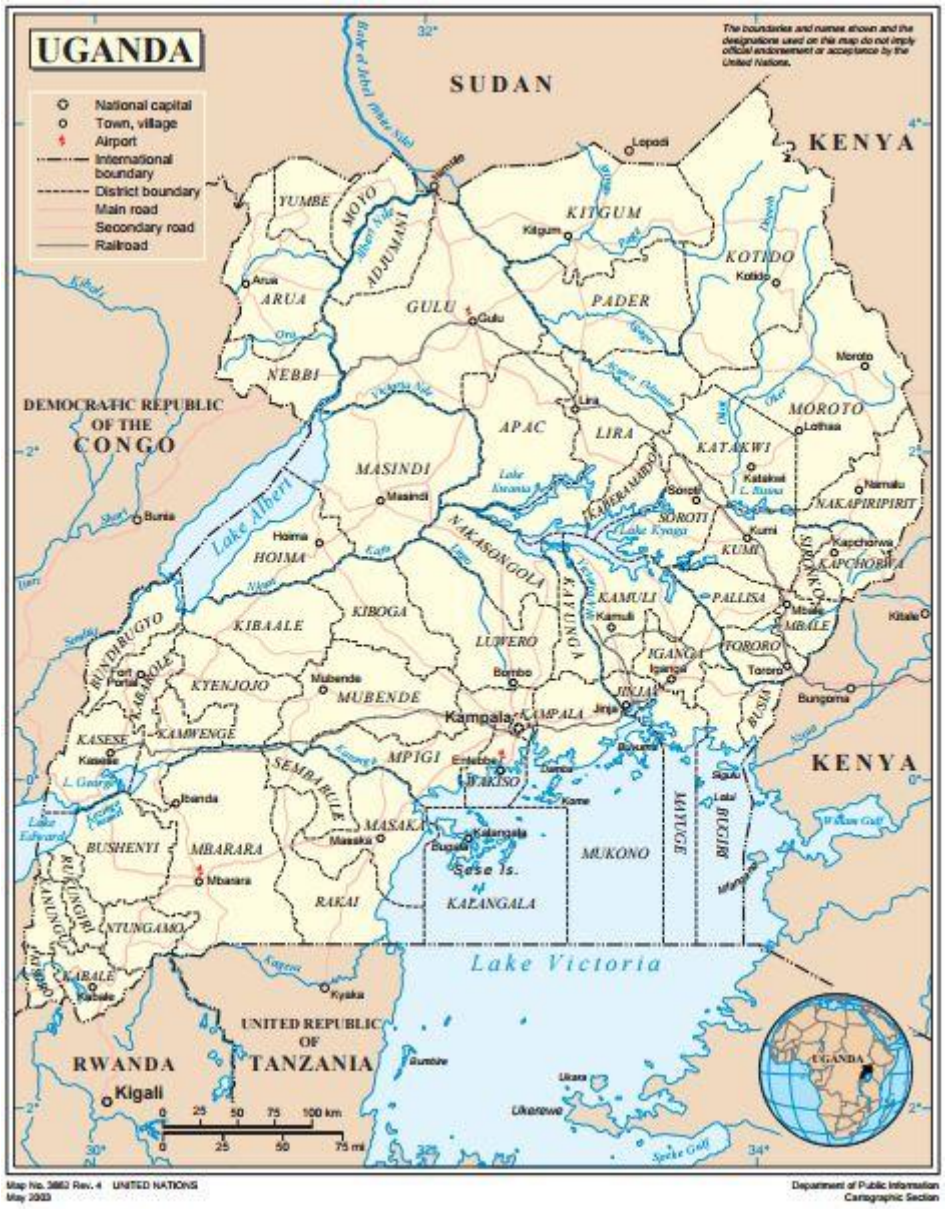
Pre-test 2, 2014 – Female

Pre-test 3, 2014 – Male

Pre-test 4, 2014 – Male

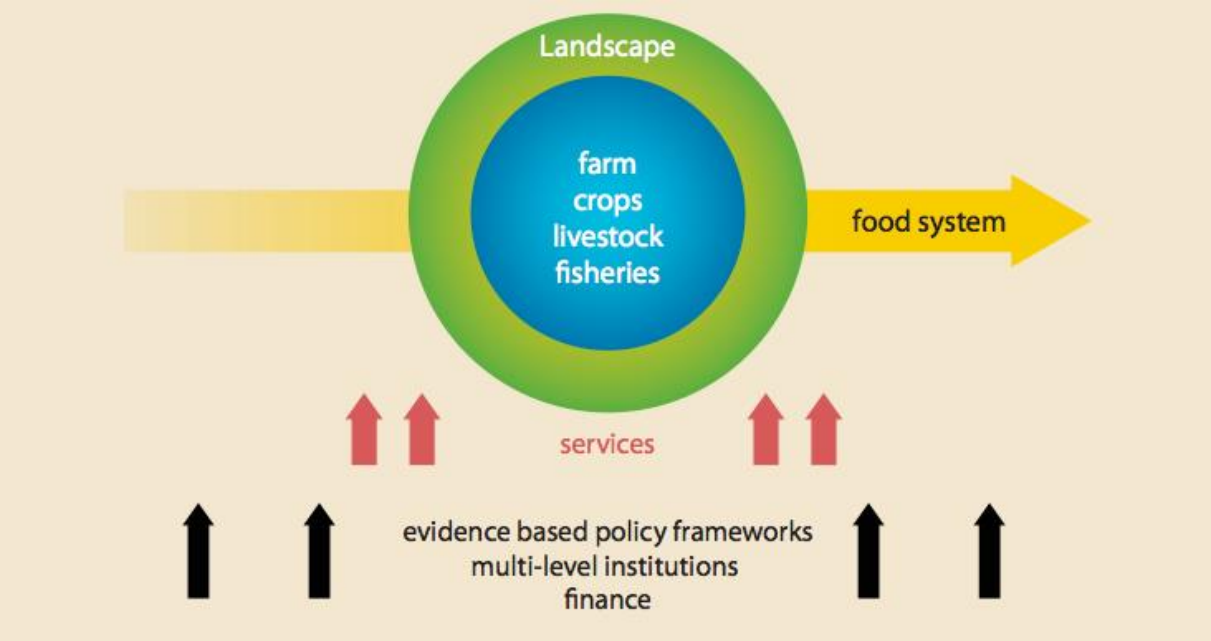
Appendix

Annex 1: Map of Uganda



Source: UN, 2003.

Annex 2: Climate-Smart Agriculture adaptation



Source: CGIAR, CCAFS and FAO, 2014

Annex 3: Livelihood approach

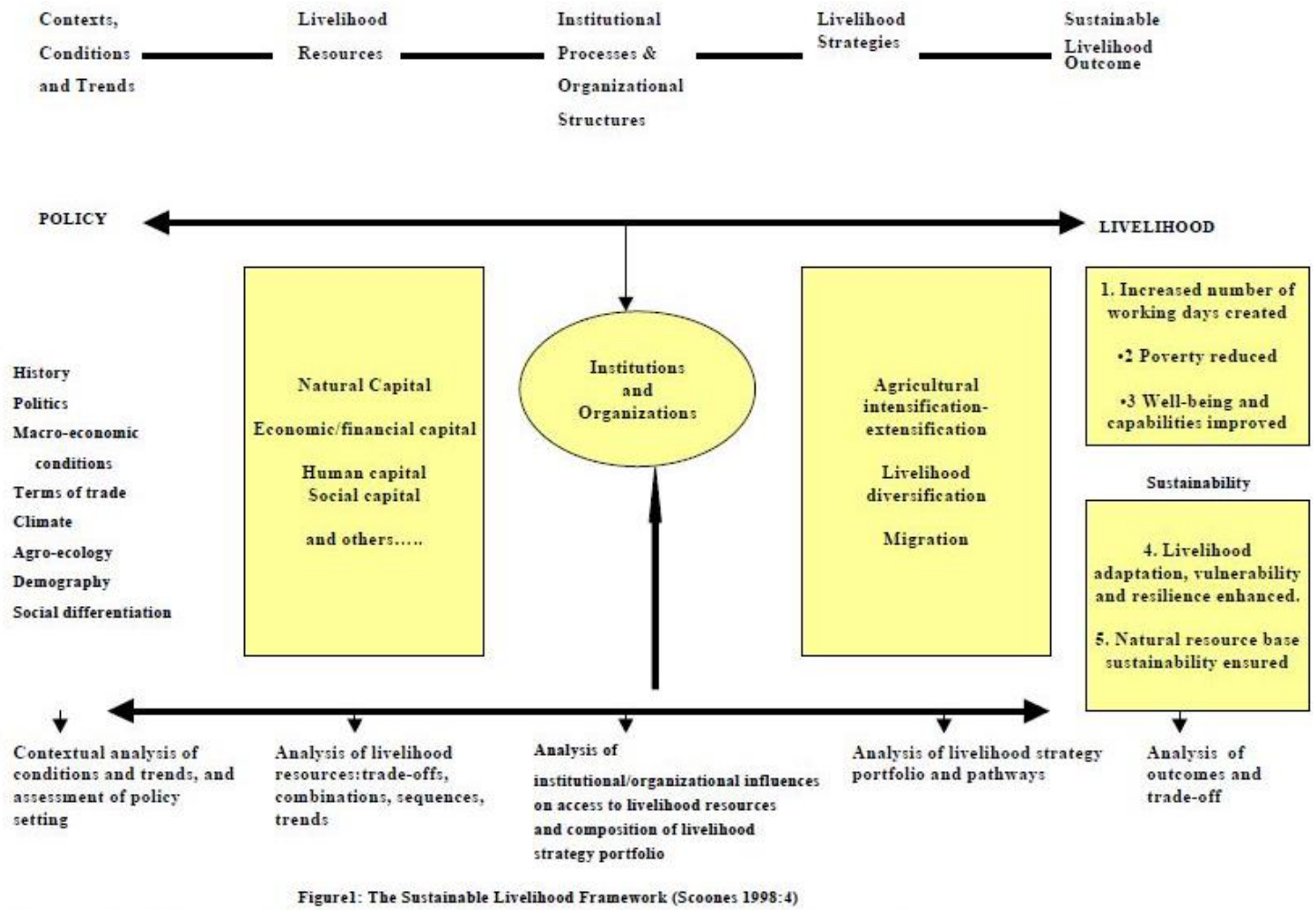


Figure1: The Sustainable Livelihood Framework (Scoones 1998:4)

Figure. 1. Sustainable rural livelihoods: A framework for analysis

Source: Krantz, 2001.

Annex 4: Data collection scheme

Weeks → / ↓ Activities	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Field notes	X	X	X	X	X	X	X	X	X	X	X	X	X
2. Focus groups discussions			X	X	X	X							
3. Expert interviews			X	X	X	X	X	X	X	X	X	X	
4. (Semi-)structured interviews							X	X	X	X	X	X	
5. Participant observation				X	X	X	X	X	X	X	X	X	
6. Literature review	X	X	X	X	X	X	X	X	X	X	X	X	X

Annex 5: Example questions semi-structured interviews

Owner trees:

Who is the owner of the trees? Differentiate between woodlots and fruit trees.

- Who planted them?
- Who is managing them or looking after?
- Who sells them?
- Who decides on how to use the money?
- How is the income used?
- Where did you get the seeds from the trees?
- What constraints do those trees bring or what kind of problems do they give?
- How about problems with:
    - Animals: Monkeys, birds, domestic animals
    - Harvest
    - Market or prices
- What benefits do those trees bring?
- What long term benefits do you see?
- How about benefits on:
    - Intercropping
    - Materials: Food, Bark cloths, Fuel wood, Fencing material
    - Yield productivity
    - Shade
    - Water and soil conservation

Religion:

What kind of religion do you have?

What kind of religious groups do you have in your community?

- Are you involved in those groups?
- What services do these groups provide?
- How about:
    - Saving groups
    - Women development
    - Livelihood development
    - Social function in ceremonies
    - Gifts

Government policies and services:

Which services or programmes have you been able to access from the Government/NGO?

- How about:
    - Trainings and demonstrations
    - Saving groups
    - Credit/ loans
    - Farm inputs (improved seeds, fertilizers, water)
    - Field tours
    - Marketing
    - Information access

What environmental or agricultural policies do you know that are active in the area?

- Are there policies that work on:
    - Infrastructure: roads, energy
    - Water
    - Food security

- Food storage
- Land/ land inheritance
- Forest
- Women rights
- Improved stoves
- Wetland protection

How do the policies help you?

- Have you or the community benefit from policy activities?
- What policy constrains are there?
- How is the government functioning?
- Where did you learn about these policies?
- Who do you contact for these policies if you want more information?
- Are you involved in community meetings on policies?
- What do you discuss?
- Do women participate in these meetings, in case yes how?

What do you want from services from the local government?

- Who is responsible/ in charge?

Pathways:

What do you know about climate change?

How do those changes affect your gardens?

- What risks/ problems do you see for your farm?
- Have you previously experienced some climate hazard? What?

How do you protect your farm from possible weather changes?

What practices did you change the last 5 years?

- How do the changes help your farm?
- What difference did these changes bring in your daily work on the farm or in life?

What practices are you planning to do for your farm for next season?

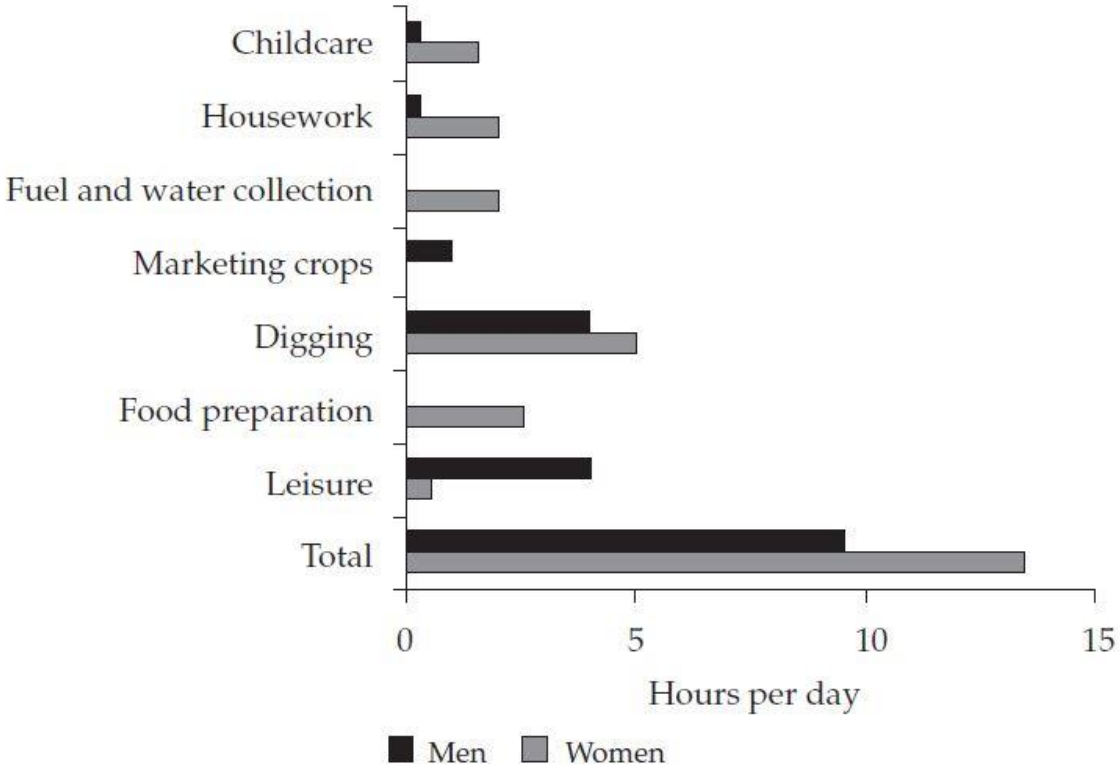
How would you like to see your farm in 10 years?

- What resources do you have to start to establish this?
- What resources do you need to really going to use this practice?

How do the policies or the government help you to adapt to climate change effect?

Annex 6: Role men and women daily activities Rakai

Figure 2.1. Allocation of Time by Men and Women in Katebe, Rakai

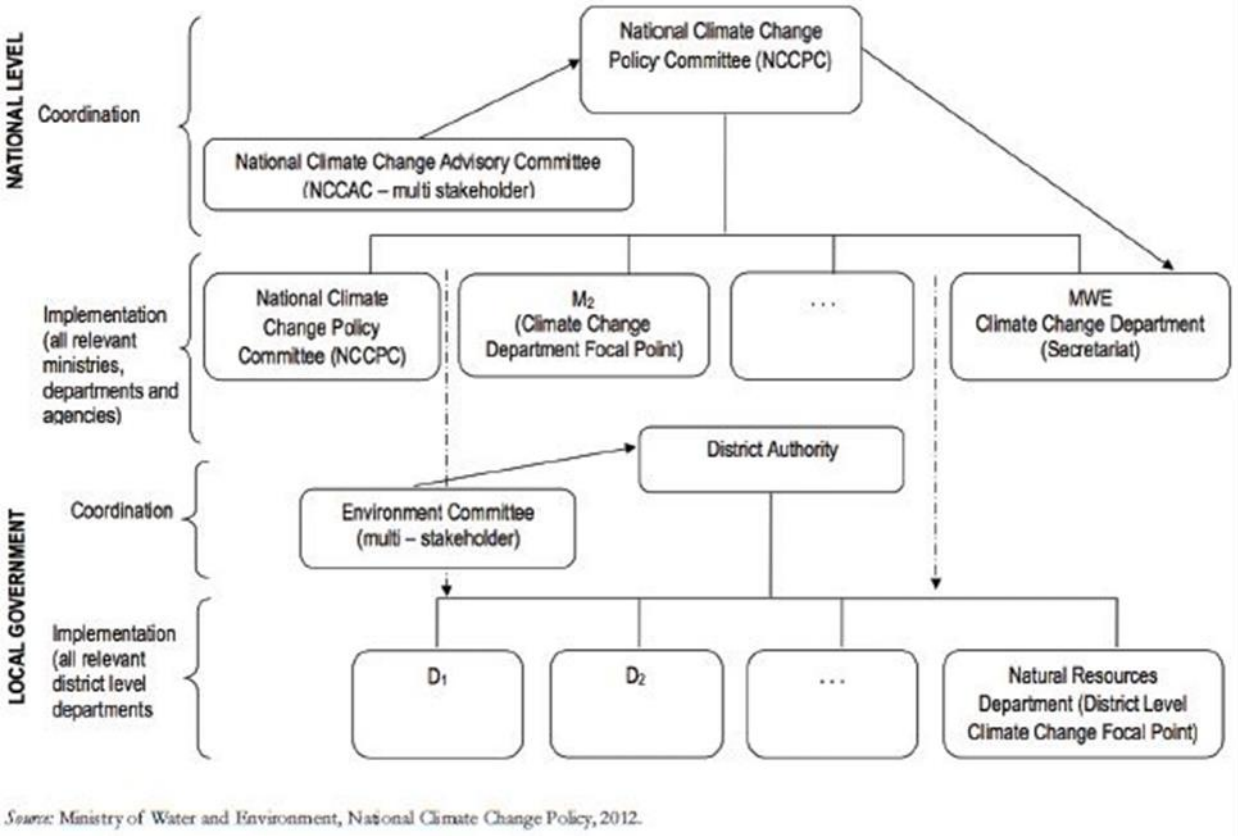


Source: UPPAP (2002).

Source: Ellis et al., 2006.

Annex 7: Climate change action scheme, Uganda

Figure 5. Institutional architecture for climate change action in Uganda



Source: Ministry of Water and Environment, National Climate Change Policy, 2012.

Source: Friis-Hansen et al., 2013.