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ECOLOGICAL AGRICULTURE IN UGANDA

AND THE CONTRIBUTION OF FARMER INNOVATION

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Pictures by the author (stated if otherwise)

Pictures on the cover (from left to right): Dan Lukwago form Kasejjere showing manual fertilization of vanilla, farmer innovator Vincent Lutalo from Kasejjere explains his innovation, Robert Lwanga from Migyera shows his cross-breed cow, farmer innovator in Kasejjere explains her innovation.

This thesis was written on the basis of field research that was conducted in Uganda from 18th of April till the 22nd of July. The research was initiated by the author and designed in consultation with the Centre for International Cooperation. The views expressed in this thesis are those of the author and do not necessarily reflect the views of the Centre for International Cooperation or PROLINNOVA.

TABLE OF CONTENTS

APPENDIXES

LIST OF TABLES

LIST OF FIGURES

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ABBREVIATIONS AND ACRONYMS

CBD	Convention on Biological Diversity
CBO	Community-Based Organization
CIA	Central Intelligence Agency
CIS-VU	Center for International Cooperation of VU University Amsterdam
CT	Core Team
EA	Environmental Alert
FAIR	Farmer's Access to Innovation Resources
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environmental Facility
IK	Indigenous Knowledge
IIRR	International Institute of Rural Reconstruction
IST	International Steering Committee
IUCN	International Union for the Conservation of Nature
KEA	Kikandwa Environmental Association
LISF	Local Innovation Support Fund
LPI	Living Planet Index (of the World Wildlife Fund)
MEA	Millennium Ecosystem Assessment
NAADS	National Agricultural Advice
NACIA	Nalukonge Community Incentives Association
NEMA	National Environmental Authority
NRM	Natural Resource Management
NSC	National Steering Committee
PID	Participatory Innovation Development
POG	PROLINNOVA Oversight Group
PROLINNOVA	Promoting Local Innovation in ecologically-oriented natural resource management and agriculture
PRA	Participatory Rural Appraisal
R&D	Research and Development
RRA	Rapid Rural Appraisal
SOER	State of the Environment Report
UBR	Uganda Biodiversity Report
UNCCD	Convention to Combat Desertification from the United Nations
UNEP	United Nations Environmental Program
WRI	World Resource Institute
WWF	World Wildlife Fund

SUMMARY

There is a growing realization that the conservation of biodiversity is a prerequisite for ensuring agricultural production and food security. Nevertheless, agriculture is one of the direct causes of the impoverishment of biodiversity. While nature conservation mainly focuses on protected areas, the land under agricultural production is often neglected but reveals a great potential for biodiversity conservation. Ecological agriculture or, in short, ecoagriculture is a concept for nature conservation that incorporates the need for agricultural development. It aims at building the strengths of natural ecosystems into agricultural ones. The absence of 'ecological thinking' within agricultural development has greatly diminished the natural capacity of farming systems to for example fight pests and diseases or maintain its nutrient balance.

Since farming is the main source of subsistence for Uganda's rural poor, and the country simultaneously exhibits one of highest biodiversity levels in the world, ecoagriculture is highly applicable here. The PROLINNOVA program strives to promote "ecologically-oriented agriculture" through farmer innovation. The Local Innovation Support Fund was implemented in two farming communities in 2007; respectively in Kasejjere and Migyera in central Uganda. The implementation acted as a pilot in order to gain insight in the means of implementation. With the aim of expanding its future scope, by targeting eight more communities, it was important to assess the effectiveness of the program in terms of promoting ecoagriculture.

It was found that in Kasejjere people were all practising some ecoagricultural methods, and that 16 out of the 19 innovations that were supported through the LISF were ecoagriculturally sound. However, innovators were not always aware of the link between their innovations and their contribution to ecoagriculture. In Migyera, it was found that the implementation of the LISF had been inadequate, as almost all indentified innovators were not aware of the intention of the fund, and money mostly was spend on farming measures, like fencing or building water dams, instead on 'real' innovations. This research showed that where sensitization of farmers on the topic of innovation and ecoagriculture was inadequate, this directly corresponded with the implementation success of the LISF.

PROLINNOVA does not have a working definition of 'ecologically-oriented agriculture' and ambiguity within the program exists on how farmer innovation should be linked to ecoagriculture. Setting up an official working definition and integrating the concept of ecoagriculture more into the LISF would greatly enhance its success in the future. Since the LISF followed a decentralized approach in Uganda, meaning that the handling of the fund and the screening of the innovations was done by the Community Based Organization that was active in both communities. The use of the TEES-test, a set of criteria that are used to screen innovations in the field were, in both communities, not used to its full extent. This was mainly due to the fact that no training on how to use these criteria was given to the Community Based Organizations.

The inadequate guidance during the implementation and the lack of sensitization in Migyera meant that the objectives of the LISF were not fully exploited there. In Kasejjere, where the LISF has been more successful, there are still some recommendations that could be made for the improved design of the second phase of the LISF. Overall, the LISF has great potential in both communities; however better guidelines for implementing the LISF on the local level are needed to secure the quality of the program. Clear guidelines and sound implementation will determine the success of PROLINNOVA in the long-term.

CHAPTER 1 INTRODUCTION

In this chapter the research is introduced by giving the context in which it was placed and by formulating the underlying problem statement (section 1.2). The research questions will be presented accompanied by their sub-questions (section 1.3). This chapter ends by giving an outline of this thesis (section 1.4).

1.1 INTRODUCTION TO THE RESEARCH PROJECT

There is a growing realization that the conservation of biodiversity is a requirement for ensuring agricultural production and food security (Thrupp, 2000). Small-scale farmers in developing countries that practice traditional agriculture are often seen as the safe guardians of biodiversity. (Altieri 2002, 2004) In the debate on how to make our agricultural systems more sustainable the role of small-scale farmers is becoming increasingly important (Thrupp 2000; Altieri 1999). The PROLINNOVA program is committed to promote ecologically-oriented agriculture and natural resource management through farmer innovation. The Local Innovation Support Fund, one of the programs implemented by PROLINNOVA, was piloted in four farmer communities in Uganda in 2007. The LISF pilot project was the direct reason that this research was conducted.

1.2 PROBLEM DESCRIPTION

With a projected human population growth of 50 percent by the year 2050 the world food demand is expected to be more than doubled (Green et al., 2005). This indicates that the demand from agricultural areas will increase enormously over the coming years (Tilman et al., 2002). The expansion and intensification of the world's agricultural lands poses the challenge on how to produce enough food without jeopardizing the state of the natural environment.

The past two centuries have been characterised by a dramatic decline in biological diversity (WWF, 2008). The Living Planet Index (LPI), a measure of the state of world's biodiversity, using population trends, based on data from 1970 to 2005, showed an overall decline in the populations of terrestrial, marine and freshwater species of about 27 percent over the last 35 years (WWF, 2008). With extinction rates, according to scientists from the International Union for the Conservation of Nature (IUCN), 100-1,000 times higher than the expected natural rates, the speed by which natural systems are being altered is alarming (IUCN, 2009).

The Global Biodiversity Strategy has listed agriculture as one of the direct causes of the impoverishment of biodiversity (WRI, 1992; Ayyad, 2003). The loss of biodiversity has occurred across all ecosystems but the loss of terrestrial biodiversity is mainly driven by the associated effects of the intensification of agriculture, like pollution, land conversion and the use of monocultures. (Butler et al., 2007)

Data from the Food and Agriculture Organization (FAO) has indicated that currently only 12 percent of the earth's land area (16,6 million km^2 out of a total of 132,4 million km^2) is used for agriculture production (Scherr and McNeely, 2002). However, reinterpretation of this data by scientists showed that land units were only indicated by the FAO as 'agricultural' when crops or planted pasture covered 60 percent of the analysed unit, thus only indicating medium and large scale farming systems. However, when also including land units with at least 30 percent under agricultural use – the outcome is very different. It shows that approximately 10 percent of the global land area is under intensive agricultural use; 17 percent is cultivated more extensively and another 40 percent is in grasslands, used for grazing of domestic livestock

(Wood et al., 2000; Scherr and McNeely, 2002). This adds up to almost 70 percent of the earth's surface being under agricultural production. Compared to the 10 percent of the surface that is under legal protection in the form of nature reserves, this reveals the enormous potential for nature conservation outside the borders of nature reserves (Kaihura & Stocking, 2003).

Farming systems with less than 60 percent crop cover are usually these of small scale farmers. This type of farming system is often found in developing countries where the majority of farmers own small plots of land, using indigenous farmer methods to practice low input agriculture that is adapted to the natural environment (Thrupp 2000; Altieri, 2002). These traditional forms of agriculture commonly support a high degree of biodiversity and rely on its associated benefits, like ecosystems services (Thrupp, 2000). In many modern farming systems ecosystem services have been replaced by artificial substitutes, but in low-input agriculture, where due to lack of financial capital and market access, external inputs cannot be afforded, conserving biodiversity is an effective strategy to create a stable and productive farming system (Ayyad, 1992; McNeely et al., 2005).

Biodiversity is a fundamental attribute of any agricultural system as it provides the basis for ecosystem services. These services are underpinning agricultural production and agricultural systems should thus be managed in such a way that they support biodiversity. Ecological agriculture combines the needs to produce more food and to conserve biodiversity. The idea behind ecoagriculture is to integrate biodiversity conservation within the farmed landscape, building upon the foundation of organic farming, agro ecology, conservation biology and traditional farming methods. Ecoagriculture thereby places food security and rural livelihoods at the centre of the approach. (McNeely and Scherr, 2003)

In Uganda farming is the main source of subsistence for the rural poor. It thereby also accounted for 42 percent of the country's Gross Domestic Product (GDP) in 2002 (Aliguma, 2008). Agriculture is thus an extremely important sector in Uganda. With an average annual population growth rate of 2,8 percent the pressure on agriculture and natural resources in Uganda will increase tremendously the coming years and thereby poses great challenges for food security. Uganda is for the largest part covered by subsistence farmland. Subsistence farmers often use traditional farming methods, but are also driven by poverty and food insecurity that lead to unsustainable practices. Being one of the most biodiverse countries in the world creates an urgent need for a sustainable development of the agricultural sector in Uganda in order to conserve its valuable biodiversity. The need to expand the agricultural sector together with the need to conserve biodiversity and ensure food security make Uganda a country with a great potential for ecological agriculture.

PROLINNOVA is an international NGO-led program that promotes ecologically-oriented agriculture and natural resource management (NRM) through farmer innovation in Uganda. PROLINNOVA believes that farmer innovation is an increasingly important part of agricultural research and development (R&D). With the Local Innovation Support Fund (LISF), the program strives to make funds for agricultural research and development accessible to farmer experimenters and the local agencies supporting them.

There are many NGO's that are concerned with promoting ecoagricultural initiatives that have been demonstrated positive impacts on the livelihoods of small scale farming households (Pretty 1995). One important factor that is often limiting the spread of these ecoagricultural innovations is that for the most part NGOs promoting these farmer initiatives have not analysed or systemized the principles that determine the level of success of the local innovations. Factors that determine the development of innovations, like socioeconomic and environmental conditions, are often not documented (Altieri 2002).

The effectiveness of the LISF program in Uganda mainly depends on its actual implementation but is also highly depending on the guidelines and criteria that are provided by the higher levels of the PROLINNOVA program. Moreover, as the LISF will be expanded in Uganda in a second phase of the program (distributing the fund to eight more CBOs) it is important to shed light on the presently running mechanisms and point at the possible ways of improvements.

1.3 RESEARCH OBJECTIVES

This research project has two main objectives. Firstly, the research seeks to examine the extent to which ecoagriculture is already being practiced by small scale farmers in respectively the villages of Kasejjere and Migyera in central Uganda. Secondly, the research aims to assess the effectiveness of the Local Innovation Support Fund in promoting ecoagriculture through farmer innovation. So, the research questions related to the two study sites; Kasejjere and Migyera, are:

1. **To what extent is ecoagriculture being practised by farmers?**
2. **What is the effectiveness of the LISF in promoting ecoagriculture through farmer innovation?**

To be able to answer the first research questions the following sub-questions were formulated:

1. What are the agroecological characteristics of the two study sites?
2. What type of ecoagricultural practices do farmers use?
3. What drives farmers to choose these farming practices?
4. What knowledge do farmers have on ecoagricultural (related) concepts?
5. What effort do farmers make regarding environmental protection?
6. What is the role and influence of the local CBO in promoting ecoagriculture?

In order to answer the second research question the following sub-questions were formulated:

7. How is ecoagriculture defined within the PROLINNOVA program?
8. How is the LISF implemented?
9. How are innovations assessed on their ecoagricultural soundness?
10. How do the farmer innovations relate to ecoagricultural principles and concept?

1.4 OUTLINE OF THE REPORT

This report consists of seven chapters. In the following chapter the theoretical framework that was used during this research will be explained in detail. In chapter three the context of this research will be presented providing background information on Uganda with particular focus on agriculture and biodiversity and introducing the PROLINNOVA program. Chapter four describes the methodology that was used during the research is presented. Chapter five analyses and discusses the results and in chapter six a concluding discussion is given. The final chapter presents recommendations for PROLINNOVA.

CHAPTER 2 THEORETICAL FRAMEWORK

In this chapter the concept of ecoagriculture that was used as a theoretical framework for this research will be explained in detail. The theoretical framework is later used to analyse and discuss the results of this research. The first section of this chapter starts with a short history of agricultural development (section 2.1). This is followed by a detailed description of the ecoagriculture theory (section 2.2).

2.1 A SHORT HISTORY OF AGRICULTURAL DEVELOPMENT

In the middle of the 19th century the era of modern agriculture began, characterized by the development of synthetic fertilizers, the use of machinery powered by fossil fuels and large-scale production of monocrops. This development continued in the 20th century, when technology further advanced, and inorganic pesticides, livestock vaccines and improved transportation and storage systems became available. Since the 1900s these science-based production systems have dominated the developed world and are spreading amongst the high-value export crop systems in developing countries (McNeely and Scherr, 2003).

In the late 1960s, due to international efforts, the 'Green Revolution' was started, an attempt to extent the benefits of these modern agricultural technologies to staple food production in developing countries. The 'Green Revolution' was especially a success in high quality, irrigated farmlands where production significantly increased. However, in the 1960s and 1970s, the environmental side effects of these new production technologies came to light, revealing a decrease in wild biodiversity and a high concentrate of pollutants in soils. Critics started to condemn the modern agricultural techniques as having little regard for long-term sustainability and resource conservation (McNeely and Scherr, 2003).

In addition to all the environmental accusations, modern agriculture also proved to have little benefits for poor farmers in developing countries. These farmers, often farming in more arbitrarily environments and with lower productivity, were unable to adopt modern agricultural methods, since they either couldn't afford to use them or the methods were not appropriate in their specific situation (Altieri 2002; McNeely and Scherr, 2003). Farmers in developing countries continued to keep using low-input agricultural systems, since they were excluded from access to credit, information and technical support, and remote from infrastructure or markets, that would have contributed to a transfer to modern agriculture (Pingali et al., 1997; Pretty, 1999; Altieri, 2002).

However, population growth kept on spurring the modernization and intensification of agricultural systems, as global food demands increased, resulting in excessive forest clearance, soil erosion and a global loss of biodiversity. All these developments were the inspiration for some commercial farmers to adopt the principles of organic agriculture to produce food more sustainably. Increasingly more farmers and agribusinesses started to embrace the science of more ecologically oriented production systems. Ecological concerns started to integrate within the modern agricultural production systems, leading to a new field of study; agroecology (Altieri 1990). The importance of ecology within agricultural systems was slowly being recognized by scientists resulting in numerous scientific studies over the years (McNeely and Scherr, 2003; Pretty, 1999).

Simultaneously with the recognition of the importance of ecology in agriculture, there also emerged a fundamental change in natural resources related development thinking. This change resulted in a more participatory approach to agricultural research and development whereby more attention was paid to the

needs and knowledge of local people. This development contrasted with the strong belief in the superiority of scientific knowledge that dominated the 20th century whereby interventions were passed down through extensions agents, without considering the views and knowledge of local people. This top-down, science-based agricultural research and development resulted in an immense dependency and alienation of local people (Scoones and Thompson, 1998; Altieri, 2002).

2.2 ECOAGRICULTURE

The concept of ecological agriculture was born out of the conclusions drawn by Jeffrey McNeely, a conservation scientists and Sara Scherr, an agricultural economist, as they were reviewing spatial information provided by the Millennium Ecosystem Assessment (MEA). They realized that the land that is needed for the global expansion of agriculture would coincide with the land needed for the conservation of habitats and species. Therefore they came up with management strategies that would accommodate both of these objectives (Buck et al., 2004).

Ecological agriculture, by the founders shortened to the more popular term ecoagriculture, also arose from the developments within the debate on natural resource management and rural development. As it was gradually recognized that nature conservation on its own, neglecting the economic and social interest of local people who directly depend on the natural resources, was insufficient, the emphasis shifted from top-down conservation strategies to more integrated strategies that stressed the interaction between human and nature, and on achieving fair reconciliations between them (Scoones and Thompson, 1994; Critchley, 1998; McNeely and Scherr, 2003).

Ecoagriculture is based upon the concepts of agroecology, organic farming and conservation biology. The ecoagriculture approach does not advocate one single practice but is instead an aggregation of approaches for producing food while aiming at integrating biodiversity conservation into agricultural development efforts (Buck et al, 2004; Magdoff, 2007). Ecological agriculture thereby places food security and rural livelihoods at the centre of its objectives. The aim of the approach is to achieve reconciliations among the objectives that are normally in competition; the need to conserve biodiversity, the need for food and the need to secure livelihoods (McNeely and Scherr, 2003; Buck et al., 2004; Magdoff, 2007).

The absence of ecology within the precedent development of agriculture has greatly neglected the assets of ecological farming systems like efficient use of energy flows, the diversity of both above ground and soil organisms, self-sufficiency, self-regulation and resilience (Magdoff, 2007). Ecoagriculture in contrast aims at building the strengths of natural ecosystems into agricultural whereby negative ‘externalities’, known from conventional farming systems, can be eliminated. Ecoagriculture applies ecological principles to agricultural systems and stresses the need for ‘ecological thinking’ in agricultural development (Magdoff, 2007). The intention of the approach is not to look at farms and farm fields as isolated units but as complete systems that interact with the surrounding and comprise a fully working ecosystem (McNeely and Scherr 2003; Magdoff, 2007).

2.2.1 BIODIVERSITY AND ECOSYSTEM SERVICES

Biological diversity or biodiversity is most simply said ‘the variety of life’ and refers at all levels of biological organization; it compasses all forms, levels and combinations of natural variation and is thus a very broad concept (Gaston and Spicer, 2005; p.3). The official definition within the Convention of Biological Diversity (CBD) gives a more comprehensive definition: “the variability among living organisms

from all sources, including inter alia, terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part; which includes diversity within species, between species, and of ecosystems" (CBD, 2009).

Biodiversity is the foundation of the world's agriculture, since all the domestic crops that are currently used are all derived from wild species that have been modified by selective breeding and domestication (Altieri, 1999). In addition to harbouring useful plant and animal species, biodiversity also supports and maintains ecological services, better known as ecosystem services (Altieri, 1999, Diaz et al., 2006).

The simplification of biodiversity and thus the degradation of ecosystem services within agricultural systems results in an artificial ecosystem that requires constant human intervention to provide external inputs to ensure production. Modern agricultural systems have become so highly productive only by depending on external inputs (Altieri, 1999). Ecological agriculture on the other hand, is inspired by the features of natural ecosystems that ensure their productivity through the internal regulation that is provided via ecosystem services (Altieri, 1999). By making use of these natural processes, farming systems can mimic natural ecosystems, resulting in greater resilience.

These natural processes, or so called ecosystem services are "the benefits provided by ecosystems that support human life on Earth" (Diaz et al., 2006). The persistence of these services is largely dependent upon the maintenance of biodiversity (Altieri, 1999). Ecosystem services contribute to human well-being by supplying numerous functional and aesthetical assets (Constanza et al., 1998). Ecosystem services are crucial for agricultural production. Over the last years the importance of these e services and their direct, often causal, linkages with the status of biodiversity have gained increasing attention in the scientific world.

In 2001 an initiative of former United Nations Secretary-General Kofi Annan to assess the effect of ecosystem change on human well-being, resulted in the Millennium Ecosystem Assessment (MEA, 2005, CBD, 2008). Combining the work of 1360 experts, the assessment provided a state-of the-art appraisal of the trends and conditions of world's ecosystems, the services they provide and the options to restore, enhance and conserve natural capital worldwide (MEA, 2009). The MEA acknowledged four distinct types of ecosystem services; supporting, regulating, provisioning and cultural services (see table 1).

Table 1. *Ecosystem services as listed by the Millennium Ecosystem Assessment (MEA, 2005; Swift et al., 2004)*

Ecosystem Service	Examples
1. Supporting	Nutrient cycling, oxygen, soil formation, primary production and biodiversity.
2. Regulating	Climate, air, water and pest and disease regulation, erosion control, pollination.
3. Provisioning	Freshwater, wood, fibre, food, natural medicines, biochemicals, genetic resources.
4. Cultural	Spiritual and religious values, cognitive development, recreation, eco-tourism.

Ecosystem services are essential for agricultural productivity. The Convention on Biological Diversity has pointed out the most important services to agriculture being (CBD, 2008):

- Regulation of pests and diseases;
- Nutrient cycling, such as decomposition of organic matter;
- Nutrient sequestration and conversion, as in Nitrogen-fixing bacteria;
- Regulating soil organic matter and soil water retention;
- Maintenance of soil fertility and biota; and
- Pollination by bees and other wildlife.

One fundamental component of the agricultural system is the soil, whose structure, composition, chemistry and hence fertility is determined by the quality of the associated ecosystem services (CBD, 2008). Pollination is one of the most valuable services that are provided by ecosystems. Pollinators maintain the diversity of ecosystems by facilitating the reproduction of many plant species. Examples of pollinators include flies, moths, butterflies, wasps, beetles, bats, and hummingbirds, but bees are the principal agents of crop pollination (CBD, 2008).

2.2.2 FOOD SECURITY AND RURAL LIVELIHOODS

As mentioned earlier, rural livelihoods and food security are in the centre of the ecoagriculture approach. Increasing the agricultural productivity of small scale farmers in developing countries is stressed, not only to meet market demands, but moreover to reduce rural poverty and raising living standards (McNeely and Scherr, 2003). Local farmers often still practice traditional agriculture that forms the basis for conservation (e.g. nature, soil and water conservation). This local and traditional knowledge has provided many communities with the ability to sustainably manage their farming systems, thus ensuring food security, reducing hunger, providing nutrition, and sustaining livelihoods (CBD, 2008). Nevertheless, small scale farmers also face serious production constraints and are often too poor to invest in farm improvements or other external inputs. This makes that they sometimes cannot even secure their own food demands. In addition, due to poor infrastructure, inadequate food storage and market systems, farmers are often also not able to produce for the market.

The degradation of natural resources directly determines the productivity of a farming system. A decline in soil fertility for example, directly undermines production capacity and thus food security and livelihoods of rural people (Pinstrup-Andersen, 1998). Safeguarding these natural resources is thus a necessity to ensure long term productivity. Within the ecoagriculture strategy local farmers are seen as important factor that determine this management of natural resources. Ecoagriculture opts for a central role for farmers in the planning and implementation of ecoagricultural interventions (McNeely and Scherr, 2003). As agricultural ecologists have started to respect the traditional wisdom and indigenous knowledge of farmers in developing countries, more attention is being paid to participatory research and the involvement of the 'end users' of biodiversity (Altieri, 1999).

2.2.3 ECOAGRICULTURAL STRATEGIES

The ecoagriculture strategy as it was designed by McNeely and Scherr comprises six strategies that consist of several aggregated measures. Three strategies are specifically designed to make space for wildlife within farmed landscapes. These three strategies primarily focus on the unproductive areas within the farmed landscape. The other three strategies intend to enhance the habitat value of productive areas. These are the strategies as proposed by McNeely and Scherr (2003):

1. Create biodiversity reserves that also benefit local farming communities
2. Develop habitat networks in nonfarmed areas (e.g. wetlands, woodlots, windbreaks)
3. Reduce (or reverse) conversion of wild lands to agriculture by increasing farm productivity
4. Minimize agricultural pollution
5. Modify management of soil water and vegetation resources
6. Modify farming systems to mimic natural ecosystems (e.g. agroforestry, fallows)

For this research, the first and second strategy can be neglected since it requires community effort or governmental intervention. As this research primarily focuses at farmer innovation and farm management

done on an individual basis these two strategies are not considered to be applicable. The other four strategies will be briefly discussed, in relation to this research.

Reduce (or reverse) conversion of wild lands to agriculture by increasing farm productivity

Since the conversion of land for agricultural purposes is one of the biggest threats to biodiversity, increasing the productivity of already existing farmland is an appropriate measure. The conversion of land in developing countries is often driven by population pressure, lack of alternative employment and a lack of knowledge regarding sustainable farming practices (McNeely and Scherr 2003). Through increasing the quality of farmland by i.e. using specific cropping patterns, improved crops or adding organic matter to the soil, the agricultural productivity can be improved. Agricultural innovations to increase this production and thereby support sustainability are being recognised as important drivers for controlling land conversion and protecting biodiversity (McNeely and Scherr, 2003).

Minimize agricultural pollution

Reducing the use of agricultural chemicals (or agrochemicals) can greatly enhance biodiversity in high-input system (McNeely and Scherr, 2003). But also in low-input systems, where agrochemicals are not (heavily) used, the application of natural agrocides is of great importance. The use of locally available nutrients, rather than artificial fertilizers has a greater ability to enhance soil fertility and maintains natural ecosystem processes. Thereby, the use of natural agrocides eliminates any negative health impacts caused by synthetic pesticides (Magdoff, 2007).

Modify management of soil, water and vegetation resources

Improving the internal strengths of the agricultural system by means of modified management of soil, water and vegetation is most applicable in the case of small-scale farming. This strategy comprises several methods that are derived from traditional farming. These methods serve to increase farmers' natural capital and the long-term flow of farm output. A comprehensive overview of these methods and their associated benefits to biodiversity and/or farmers methods are given in table 2.

Table 2. *Ecoagricultural practices to manage soil, water and vegetation resources (summarized from: McNeely and Scherr, 2003; Magdoff, 2007; WOCAT, 2007; NatureUganda, 2008)*

Soil management	**Benefits for biodiversity and/or farmers**
Cover the soil	Habitat for beneficial insects, adding Nitrogen and organic matter to the soil, reduces erosion, enhances water infiltration to the soil, retains nutrients
Crop rotation	Promotes soil fertility, promotes the cultivation of various crop types
Organic matter addition	Promote nutrient availability, good water and air relations, ensures good conditions for plants' roots
Reduce soil compaction	Reduces erosion, helps water infiltration and storage and drainage of precipitation, conserves soil nutrients
Water management	**Benefits for biodiversity and/or farmers**
Terraces	Reduces soil erosion, reduces water requirements, improves water availability
Trenches	Reduces water requirements, improves water availability
Vegetation management	**Benefits for biodiversity and/or farmers**
Crop diversity	Creates ecological niches, enhances yields, reduces land degradation
Agroforestry	Nitrogen fixing abilities, provides forage and nesting sites for birds, soil nutrient conservation, native trees improve
Fallowing	Regenerates soil fertility, provides habitats for wildlife, supports annual plants with good pollen and nectar resources
Border planting	Creates habitats for wildlife, provides organic matter
Natural fencing	Creates habitats for wildlife, creates natural boundaries and small habitat networks

MODIFY FARMING SYSTEMS TO MIMIC NATURAL ECOSYSTEMS

Agricultural systems should exhibit as many functional attributes as natural ecosystems, like vegetation that is adapted to the local climate, closed nutrient cycling and soil preservation. The occurrence of different mosaics of tree species or crop types can imitate the structure of natural habitats and therefore has the ability to create niches for wildlife. Agroforestry for example, is an integrated tree-crop system that provides numerous ecosystem services. Trees on farmland reduce soil erosion, protect crops against wind, produce wild food products and contribute to soil fertility by producing litter.

CHAPTER 3 UGANDA AND THE PROLINNOVA PROGRAM

This chapter will introduce Uganda, the location where the research was conducted. It will give some general background information as well as more detailed information regarding agriculture and biodiversity. This information allows the reader to place this research in its right context. In addition the PROLINNOVA program will be introduced. The Local Innovation Support Fund will be explained more extensively, especially focusing on the implementation in Uganda.

3.1 THE REPUBLIC OF UGANDA

The Republic of Uganda is situated in the Eastern part of Africa and with its 241,038 square kilometres a relatively small country, compared to other African countries (see figure 1) (NEMA, 2007). The country is landlocked and borders to Kenya, Sudan, Tanzania, the Democratic Republic of Congo and Rwanda. Uganda is home to almost 33 million people and has an estimated annual population growth of 2,7 percent. Off all the people in Uganda, around 95 percent lives in rural areas of which 45 percent under the poverty line. (CIA, 2009) This high number of rural inhabitants makes Uganda one of the least urbanized countries in Africa (Bachou & Labdarios, 2002).

The access to land is a fundamental asset for most Ugandan people and is the main source of subsistence of the rural poor (Karahuga-Bureho, 2002). Generally, land is acquired through inheritance rather than purchase, and it is kept under customary law, which in most areas still takes precedence over stationary laws (Asiimwe, 2002). The recent decentralization process of 1991 that divided the country into 80 districts intended to empower local people and institutions and to hereby contribute to sustainable development (Francis & James, 2003).

Figure 1: Location of Uganda (www.heifner.org)

3.1.1 CLIMATE AND GEOGRAPHY

Uganda has a plateau landscape, which arises from the eastern and western branches of the Rift Valley. Around two-third of the country is over 1,000 meter altitude characterised by flat terrain alternated by some mountainous elements. Except from the semi-desert in the Northern part, most of the country exhibits fertile soils and sufficient water bodies (NEMA, 2007; SOER, 2008). Almost 25 percent of the countries surface is covered by water, the river Nile that runs through the country, originates from Lake Victoria, the largest lake in Africa and the second-largest freshwater body in the world. Of the total land area 4 million hectares is occupied by arable crops, whereas permanent crops use 1,5 million hectares, land for grazing and pastures occupy 5 million hectares and forests cover 6,5 million hectares. The balance comprises mountainous elements, swamps, urban areas and infrastructure (Aliguma, 2008).

Uganda experiences a tropical equatorial climate with two raining seasons a year from December to February and June to August. Temperatures range from 15 to 31 centigrade, with an annual average of 21 degrees. Most parts of the country receive an average annual rainfall between 1,000 and 2,000mm, but rainfall patterns are often irregular and vary highly per region (SOER, 2007; CIA, 2009).

3.1.2 AGRICULTURE

It is estimated that 75 to 85 percent of the countries' surface is suitable for agricultural production and that over 80 percent of the total population is engaged in agriculture, both crop and livestock production (Aliguma, 2003; Rueker et al., 2003). Soils in Uganda are either sandy clay loams, volcanic or alluvial. Most of the soils in the central region are classified as good; Western and Eastern regions as good to moderate; and the Northern region as moderate to poor (Rueker et al., 2003). These soil characteristics together with the favourable climate make Uganda into a potentially rich country in terms of agricultural capacity (Aliguma, 2003).

The country is divided into twelve distinct agro-ecological zones, which influence the food consumption patterns and the choice of crop cultivation. Depending on the agro-ecological zone, traditional cash crops that are grown are coffee, cotton, tobacco, tea and sugar cane. The main traditional food crops are maize, beans, cassava, Irish potatoes, sweet potatoes, groundnuts, bananas and finger millet. The central and western region of Uganda heavily depend on the green cooking banana whilst the northern and eastern region depend more on cereals like finger millet, sorghum and rice.

Agriculture forms the backbone of Uganda's economy, with a share over 42 percent of the National's GDP in 2002; it is an important driver for economic growth (Aliguma, 2002). The agricultural sector is build upon both (semi-) subsistence farming systems, characterized by a low-input and a low productivity, and large enterprises, cultivating cash crops. In Uganda there are around three million smallholder farm households of which 80 percent have less than four hectares of farmland. In these households the hand-hoe is used as the predominant technology for cultivation. The majority of these households produce insufficient amounts of food to feed their families and to generate enough income to provide basic needs. This state of affairs can be attributed to the heavy dependency on rain-fed agriculture, inadequate agricultural technologies and extension services, under developed post-harvest systems, insufficient agricultural credit, poor infrastructure and distribution network, as well as ineffective markets (Aliguma, 2003; SOER, 2007). All these factors contribute to the low productivity and inadequate farm incomes which in their turn generate poverty, particularly in rural areas (Aliguma, 2003).

Livestock production is an integral part of the agricultural sector and accounts for 17 percent of the agricultural GDP in 2003 (SOER, 2007). The livestock sub-sector contributes to food security and cash income on household level. The national cattle herd is for 90 percent owned by smallholder farmers, that practice mixed farming, and by pastoralists. The total livestock population was estimated to consist of around 6 million cattle, 6 million goats, one million sheep, 1,6 million pigs and almost 27 million poultry in 2000 (Rueker et al., 2003).

3.1.3 BIODIVERSITY

Although its small size, that accounts for only 0,18 percent of the worlds' total surface area, Uganda with its 18,783 recorded species is the ninth richest country in the world in terms of biodiversity (USAID, 2006). Winston Churchill once described Uganda as being "the pearl of Africa' being blessed with so many natural resources and appearing as a lush and green country compared to others (SOER, 2007). Although it's immense natural capital, Uganda is also a victim of environmental degradation. A perennial report on the state of Uganda's Biodiversity (UBR) is published by the government that presents the analysis of trends regarding biodiversity (UBR, 2008).

In 2008 the report focused on four groups of ecosystems: savannah, wetlands, forests and cropland/natural vegetation mosaic (UBR, 2008). The forests in Uganda have been severely degraded over the past years due to agricultural conversion, the urban demand for charcoal, overgrazing, uncontrolled logging and policy failures (UBR, 2008). In addition, the wetlands, that covers around 13 percent of the lands' surface and are often extremely biodiverse, providing habitats for migratory birds, fish, amphibians, insects, plants and trees, are under threat. Due to cultivation in these wetlands, poor drainage of waste water and exploitation of fish and vegetation, these wetlands are becoming seriously degraded (UBR, 2008).

Uganda, as mentioned in the UBR report, faces both a loss in species as a loss in ecosystems. In 2008 the Living Uganda Index was produced, based upon the Living Planet Index from the WWF. This index showed that the species richness - based on known species - has declined with 10 percent since 1970 and that habitat cover of forests and wetlands declined with 60 percent in that same period of time (UBR, 2008).

The major driver of biodiversity loss in Uganda is the growing population that is highly demanding towards the country's natural resources. This larger population demands more food and thus more land is converted to serve as agricultural land. Furthermore, game hunting, uncontrolled logging and the use of pollutants all pose serious threats to Uganda's biodiversity (SOER, 2007; UBR, 2008).

3.2 THE PROLINNOVA PROGRAM

PROLINNOVA (Promoting Local Innovation in ecologically oriented agriculture and natural resources management) is an international decentralized NGO-initiated program that operates in the field of participatory innovation development (PID) to create a global learning network in agriculture and NRM by stimulating, identifying and up-scaling farmer-led local innovations (PROLINNOVA, 2009). The program operates in several developing countries, including Uganda. The aim of the PROLINNOVA program is to facilitate local farmers in enhancing food security, sustainable livelihoods and in developing environmentally friendly practices through participatory processes and integrating scientific and indigenous knowledge (IK) (PROLINNOVA, 2008a, 2009). The vision of PROLINNOVA is a world where farmers play a fundamental role in agricultural research and development (R&D).

The PROLINNOVA program is steered by the Secretariat, based in the Netherlands, and supported by the International Support Team (IST) that monitors country-level activities through overall program coordination, networking, capacity building, coaching, web-based knowledge management, publishing and advocacy. The International support Team consists of the International Institute of Rural Reconstruction (IIRR) in the Philippines, ETC EcoCulture and the Centre for International Cooperation (CIS-VU) in the Netherlands. The core donors of the PROLINNOVA program are the Dutch Ministry of Foreign Affairs and the Rockefeller Foundation. In addition, the program has numerous activity-based donors, depending on the nature and the location of the project. The overall PROLINNOVA program is monitored by the PROLINNOVA Oversight Group (POG) (see institutional chart in figure 3) (PROLINNOVA, 2009).

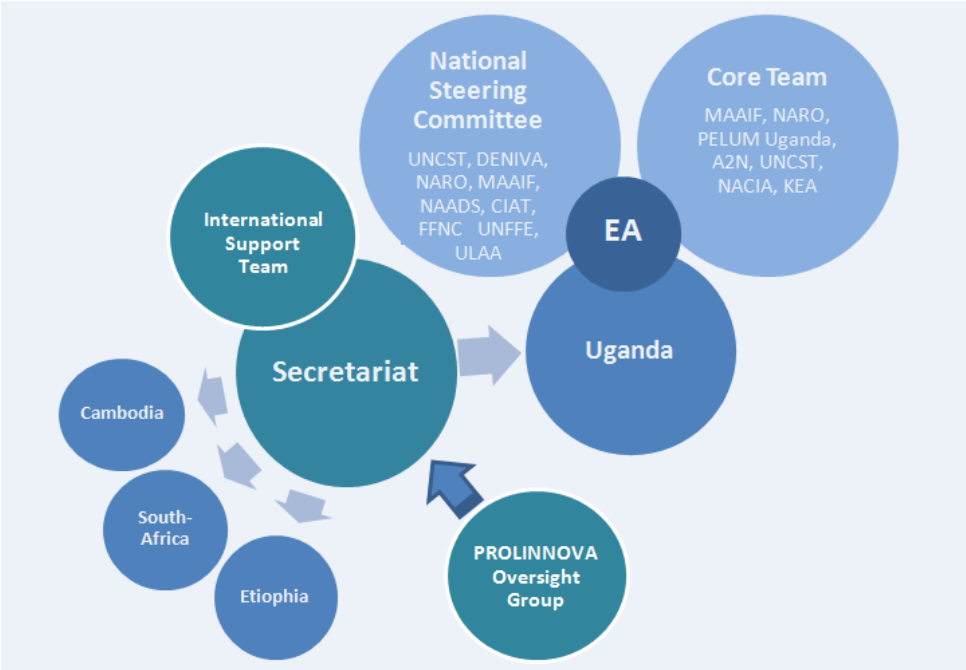

Figure 2: Institutional organization of PROLINNOVA with specific focus on the Uganda country program

Under the umbrella of the PROLINNOVA program the FAIR program (Farmer's Access to Innovation Resources) was launched in 2006. The FAIR program intended to ensure local land-users' access to innovation resources. The first phase of the FAIR program, that run from 2006 to 2008, was implemented in five countries; Ethiopia, Cambodia, South-Africa, Nepal and Uganda. From out the FAIR program the idea for a locally managed innovation support fund came into realization (PROLINNOVA, 2008b).

The Local Innovation Support Fund (LISF), initiated within the FAIR program, aims to enhance the livelihood security of local people by strengthening local control over innovation processes in natural resource management. "Local innovation in agriculture and natural resource management is the process to which individuals or groups discover or develop new and better ways for managing resources, building on and expanding the boundaries of their existing knowledge" (Waters-Bayer et al., 2005, p.76). The fund is meant for agricultural research and development that is accessible to farmer experimenters and the local agencies supporting them (PROLINNOVA, 2006). The LISF program aims to create and sustain area-based funding mechanisms to support farmers' experiments and research on their own innovations (e.g. by enabling them to contact and work together with scientists) and to stimulate learning and sharing processes among farmers (e.g. by organizing farmer exchange visits). The LISF was piloted in the five countries under the FAIR program in 2007.

Two main models for processing fund applications emerged from the LISF pilots, the centralized, multi-stakeholder approach and the fully decentralized, farmer-managed approach. In the centralized approach, farmers' applications are sent to the facilitating NGO, while key partner organizations and farmer representatives are invited into the screening committee that formulated criteria and took major decisions. The decentralized model, hands the responsibility for the screening procedure over to the respective CBOs, which generally form their own committee for this. The facilitating agency does assist the CBO in developing screening criteria and organizing the screening process (e.g. by providing forms). This decentralized approach enables a relatively high accessibility for farmers while keeping the costs involved in the screening very low. The disadvantage, as also recognized by PROLINNOVA, may be the

initially lower levels of quality of the screening when farmers are learning the principles of the LISF (PROLINNOVA, 2009).

In each country where PROLINNOVA is active a local nongovernmental organization (NGO) is responsible for the implementation and facilitation of the PROLINNOVA program. This NGO functions as the local secretariat, enabling the work of the National Steering Committee (NSC) which is made up of people from government research, extension and education, other NGOs and farmer groups. The NSC defines the country program activities, ranging from farmer-led research to policy advocacy and gives the country program strategic guidance, helps mobilise resources and is the apex structure for accountability. The Core Team (CT) on the other hand provides technical support to the program and is responsible for day-to-day implementation of the program' activities (see figure 3).

In Uganda the NGO Environmental Alert (EA) facilitates the PROLINNOVA program by maintaining the communication with the international secretariat as well as with the local actors. Environmental Alert has a longstanding reputation on the field of agriculture and development and has proven therefore proven it eligibility to PROLINNOVA to guide the implementation of the LISF pilot program. The NSC in Uganda is made up of nine organizations and/or institutions. The Core Team consists of seven members including representatives from the two CBOs under study (see table 4).

Table 3. Members of the NSC and CT of PROLINNOVA Uganda (PROLINNOVA, 2009)

National Steering Committee (NSC)	**Core Team (CT)**
National Agricultural Research Organisation (NARO)	Ministry of Agriculture, Animal Industries and Fisheries
Ministry of Agriculture, Animal Industries and Fisheries (MAAIF)	National Agricultural Research Organisation
Uganda National Council for Science and Technology (UNCTS)	Participatory Ecological Land Use Management (PELUM)
National Agricultural Advisory Services (NAADS)	Africa200Network (A2N)
International Centre for Tropical Agriculture (CIAT)	Uganda National Council for Science and Technology
Faculty of Forestry and Nature Conservation (FFNC)	Kikandwa Environmental Association (KEA)
Uganda National Farmers Federation (UNFFE)	Nalukonge Community initiatives Association (NACIA)
Uganda Local Authority Association (ULAA)	
DENIVA (Network of Ugandan NGOs/CBOs)	

CHAPTER 4 METHODOLOGY

This chapter presents the methods that were used during the research. The first section gives a brief introduction on the research design. In the second section the mode of conduct regarding the literature study an institutional review are discussed. The third section presents the conceptual framework that was designed by the author and used as a guideline throughout the research. The following section discusses the methods that were used during the actual fieldwork. The chapter ends with a justification of the data analysis and a discussion of the barriers and constraints that were faced during the research.

4.1 RESEARCH DESIGN

The main aim of this research was to examine to what extent ecoagriculture is being practiced by small-scale farmers in Uganda and to assess the effectiveness of the Local Innovation Support Fund in promoting ecoagriculture through farmer innovation. Primary data was collected in the field between the 18th of April and the 21st of June 2009 using participatory methods, mainly in the form of semi-structured interviews. Fieldwork was carried out in two farmer communities in Uganda; respectively in Mityana and Nakasongola district. Secondary data was collected by means of a literature study, an institutional review and through conducting stakeholder interviews. In addition, three Core Team Members of PROLINNOVA were interviewed to get a full understanding of the PROLINNOVA program and the implementation of the Local Innovation Support Fund in Uganda.

4.2 SCIENTIFIC LITERATURE STUDY AND INSTITUTIONAL REVIEW

Prior to the fieldwork a literature review was done in order to gain sufficient knowledge on ecoagricultural concepts and principles. The information that gathered during this literature study was used to design the conceptual framework that acted as a guideline during the design of the interview questions (see section 4.3 for conceptual framework). When designing the interview guide for the fieldwork, it was important to know what types of questions were eligible to gauge farmers' knowledge and awareness on ecoagricultural concepts. Additionally, during the farm observations, the transect walks and the interviews it was useful to have sufficient knowledge on ecoagricultural principles, so that information according this could be sought continuously during the whole period of the fieldwork.

Background information on the general and natural/agricultural context of Uganda and on that of the communities was collected by reviewing scientific, governmental and other institutional documents. Since in both study sites a Community Based Organization was active, acting as an in-field facilitator of the LISF, these CBOs could have been influencing the development of ecoagriculture in the specific study site. Therefore an interview with the chairmen and a review of the institutional documents was done. In addition, the historical timelines that were made by the executive committee of the CBOs provided information regarding activities and happenings that may have been influential. Since not all information about the communities was readily available through official documents, some further collection of information was done during the fieldwork, consulting the village chief and other key informants. Also the Master's thesis of Kim Hagen, a former ERM student that conducted her research in Kikandwa sub-county in 2008, provided useful background information on the area (Hagen, 2008). Information on the PROLINNOVA program and the implementation of the LISF was sought through consulting official documents, provided by the PROLINNOVA country coordinator and accessing documents through the

internet. The country coordinator of Uganda was interviewed twice about the implementation procedure of the LISF and on ecoagricultural concepts in general.

4.3 CONCEPTUAL FRAMEWORK

The ecoagricultural soundness of a farming system can be assessed by quantitatively measuring biodiversity levels on farms, either in terms of species richness or habitat diversity (Duelli, 1997; Altieri, 1999; Meul et al., 2004; Bolwig et al., 2006). Since ecoagricultural farming systems have the ability to enhance and restore biodiversity levels, this would have been a direct indicator. Due to time constraints and the specific knowledge about Ugandan biodiversity that was needed, quantitative measurements were not feasible. However, next to the literature that describes the methods for conducting quantitative biodiversity measurements, a smaller collection of scientific sources advocates for a qualitative approach, whenever quantitative research is either not appropriate or feasible *(*Altieri, 1994, 1999; McNeely and Scherr 2003; Altieri, 2004; Meul et al., 2004; Brookfield & Stocking 2009). It was therefore chosen to do indirect, qualitative measurements by means of participatory research (see section 4.4.3).

A conceptual framework, adapted from various literature sources related to eco agriculture, was designed and used as a guideline during the participatory research. The framework recognizes farmers' management, knowledge and effort as indicators for the ecoagricultural soundness of a farming system (see table 5). Farmers' management comprises household characteristics like family size, capital and educational level and natural capital like land size and ownership. It thereby looks at the farming practices that are used by the farmer and if he/she has innovative qualities. In addition, the indicator farmers' knowledge focuses on the total knowledge a farmer has relating to ecoagricultural concepts and ecoagricultural farming methods. The third indicator, farmers' effort is concerned with the extent to which a farmer is involved within a CBO or local farming organization and in what way he or she is making effort to conserve local biodiversity. It is supposed that the way a farming system is managed has direct effect on the quality of the system (Meul et al., 2004).

Table 4: Typology of a qualitative measurement method to assess the ecoagricultural soundness of a farming system (adapted from: Altieri 1994, 1999; Brookfield & Stocking 1999; McNeely and Scherr 2003; Altieri 2004; Meul et al., 2004).

Farmers ' Management	*Organization*	• Household characteristics
		• Natural capital
	Practical	• Farming methods
		• Innovation
Farmers' Knowledge	*Environment*	• Environmental awareness • Identification of problems
	Farming	• Knowledge on sustainable farming practices • Knowledge on poor farming practices • Source of knowledge
Farmers' Effort	*Involvement*	• Membership farming organization/ CBO • Activities within organization • Sharing knowledge
	Conservation	• Conservation efforts

4.4 FIELDWORK

The core of the research in Uganda consisted of field-visits to two very different farmer communities. Fieldwork in Kasejjere village in Kikandwa sub-county (Mityana District) was undertaken between 28th April and 17th May (extended by 4 days between 15th and 18th June) in cooperation with Kikandwa Environmental Association (KEA). The second fieldtrip took place in Migyera village in Nabiswera sub-county (Nakasongola District) between the 27th of May and 5th of June in cooperation with Nalukonge Association for Community Initiatives (NACIA) (see figure 4). The fieldwork was carried out together with Zsófia Anna Bossányi, a fellow ERM student from the Faculty of Earth and Life Sciences who studied the effects of the LISF on gender equality within the two communities. For both researches the same research sample was used, but the collected datasets allowed the elaboration of two entirely different reports.

4.4.1 STUDY SITE SELECTION

For the research to be a success, it was important that the selected communities were willing to host students. Since the fieldwork consisted entirely of participatory methods, a cooperative environment was crucial in this respect. The communities were selected primarily because they were two out of the four communities under the LISF pilot program in 2007 and willing to share information on this. Both communities were, by the time of the research, selected for the second round of funds that is to be disbursed in 2009 under the LISF 2. In both communities a Community Based Organization (CBO) was active with proven fund management and organizational skills, which were requirements in order to receive money from PROLINNOVA. The CBO acted as the host organization during the two fieldwork periods, facilitating interpreters and accommodation.

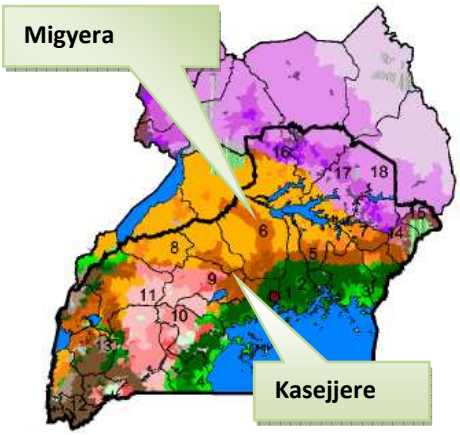

Figure 3: Location of the two study sites in Uganda (Ruecker et al., 2003)

In addition, the study sites were chosen because of their distinct ecological characteristics and therefore difference in farming systems. In Mityana district (Kasejjere village), characterized by a hilly topography, sufficient water supply and relatively fertile soils, people were mostly involved in subsistence crop farming complemented with some cattle farming. In contrast, Nakasongola district (Migyera village) is characterized by a flat topography, water shortages and on some places heavily degraded soil, mainly due to termite infestation and droughts. People were mostly involved in cattle keeping with some additional crop farming. These dissimilarities in farming systems, due to geographical and climatic variations, made an interesting case to examine how ecological agricultural concepts are practiced and perceived in two totally different settings (see section 5.1 for complete overview of study sites characteristics).

4.4.2 RESEARCH SAMPLE

To assess the effectiveness of the LISF in promoting ecoagriculture through farmer innovation, two communities were selected that participated in the pilot program in 2007. The primary targets of data collection were the individuals who were identified as local innovators and received money from the LISF. All the innovators were member of the local CBO (KEA or NACIA), since the membership was a prerequisite for applying for the LISF. Secondly, members of the CBO that were not identified as innovators were interviewed. To be able to separate the effect of the LISF and the CBO a third group was

targeted; people that were not a member of the local CBO In total 49 interviews were conducted in the three groups of respondents (see table 6). Attention was paid to include both men and women in the three target groups. However, in both areas it proved to be difficult to approach non-members for several reasons, which is further explained in section 4.7.

Table 5. Research sample per group of respondents as it was used during fieldwork in Kasejjere and Migyera

Study site	**Kasejjere**			**Migyera**		
Type of respondent	Women	Men	**Total**	Women	Men	**Total**
Innovator	7	7	**14**	2	6	**8**
Member	2	3	**5**	4	4	**8**
Non-member	7	1	**8**	5	2	**7**
Total	**16**	**11**	**27**	**11**	**12**	**23**

4.4.3 PARTICIPATORY RESEARCH

Throughout the whole fieldwork period, qualitative research methods were used. To collect the primary data, Participatory Rural Appraisal (PRA) tools were applied. Participatory Rural Appraisal is a survey methodology, which is widely utilized in developing countries to indentify and qualify the needs and opportunities for sustainable rural development (Chambers, 1994; Zarafshani, 2002).

Participatory Rural Appraisal approach originated in the 1990s and is derived from to the already existing Rapid Rural Appraisal approach (RRA). The RRA approach emerged in the 1970s as an answer to the top-down way of conducting research practised up till then. The PRA approach distinguishes itself from the older RRA approach as it involves local people in the process of data analysis and elaboration as part of their empowerment. The PRA approach enables local people to express, share, enhance and analyze their knowledge on a particular topic. In contrast with other, more conventional, techniques, PRA acknowledges the importance of indigenous knowledge (IK) and emphasizes the intensive and direct participation of local people. Scientific methods and knowledge remain very powerful and effective in some cases, but local knowledge often holds information that is unreachable for scientists. Therefore, the use of indigenous knowledge can often be supplementary to scientific information since participatory methods often tend to generate information that is broader, more descriptive and exclusive than scientific information (Zarafshani, 2002).

The use of PRA methods does demand a strong involvement within the community to apply the often time-consuming, indirect methods for data collection. Moreover, attitude and behaviour were key aspects of successful data obtaining. Throughout the fieldwork, a patient and adaptive, willing to learn, attitude was of great importance. It was essential to leave space for various ideas and comments and keep conversation open to anybody regardless of his/her age, gender, and status (Jackson and Ingles, 1998). Several participatory tools were used during the fieldwork. The methods were chosen in a sensitive manner, adapted to the abilities of the local people and in accordance with the research objective. As a result, some of the methods were applied exclusively in Kasejjere and others only in Migyera. The participatory tools that were used during the fieldwork are described below.

TOOL 1: THE SEMI-STRUCTURED INTERVIEW

In both communities the semi-structured interview proved to be the most suitable method, allowing us to collect additional information whenever necessary. Semi-structured interviews can be defined as "guided conversations in which only the topics are predetermined and new questions or insights arise as a result of the discussion and visualized analyses" (Kanan, 1999). Although the intention was to apply a semi-structured method exclusively, in several cases the interviews tended to become structured ones, due to some difficulties that were faced during the process. These barriers and constraints are discussed in section 4.6.

The interview consisted of more than 50 questions and took on average between one and two hours, depending on the interviewee to be an innovator, non-innovator or non-member. Interviews were conducted on a location chosen by the interviewee. In almost all of the cases (46 out of 49) this resulted in an invitation to the respondent's home. After the interviews farm observations were carried out. These normally took another 30 minutes, depending on the size of the farm and the willingness of the farmer to guide us. In general, people were happy to host us, show us their farms and answer questions.

Figure 4: Interview with community members in Kasejjere (left) (picture made by Zsófia Anna Bossányi) and an interview with members of the executive committee of NACIA (right).

The interview guide consisted of five sections. The sets of questions in section 1, 4 and 5 concerning general demographic questions, questions about the CBO, innovations and the LISF were designed together. Section 2 regarding livelihood changes was designed by Bossányi, whereas section 3 was designed by Kranstauber. The questions regarding knowledge and awareness on ecoagricultural concepts were directly linked to the conceptual framework (see table 5). For the full design of the interview guide see appendix 1.

The five sections were as follows:

- General questions (based on the identification sheet for innovators (elaborated by Critchley, 2008)
- Questions on everyday life, rules and norms of the society/ attitude of the individuals
- Questions on ecoagricultural concepts and farming knowledge
- Questions concerning the CBO: perceived impacts and knowledge about the CBO
- Questions on the innovation: perceived impacts and knowledge about the LISF program

Initially the interviews started with an open approach, i.e. asking an entirely open question and willing to have discussions or free conversations. However, due to multiple language difficulties we often had to fall back on using simpler and relatively closed questions (see section 4.7).

The following example shows how the initial questions were altered when experiencing difficulties:

- According to you, how has people's opinion/perception changed about/towards you, since you received LISF?
- Do you think that people look at you differently since you received LISF? If so, how?

TOOL 2: TRANSECT WALKS

A transect walk is a mixture of observation and semi-structured interview, which can be used to collect information about the natural attributes of an area (e.g. habitats, common trees, water sources, soil characteristics) as well as about the demographic characteristic of certain communities. Transect walks are often conducted with a key informant of the community. In Kasejjere numerous transect walks were performed, starting with an extensive walk on the second day of our stay around Kasejjere village with two key informants. During this walk a list of households was prepared, which was used later on to randomly pick non-member respondents for interviewing. In addition understanding on the specific land tenure systems was gained.

TOOL 3: SEASONAL CALENDAR

In Kasejjere a seasonal calendar were made during the focus group meeting. Calendars are often made of a distinct period of time, to indentify farming activities, labour intensity, crop varieties, climatic variations and income patterns. The calendars gave us a general impression of how a year looked liked for a farmer in Kasejjere. Data collected by means of this exercise was used as general background information.

TOOL 4: HISTORICAL TIMELINE

A historical timeline is a method to collect and structure data about important events of the communities under study. In both communities an institutional timeline was made, marking important events in the history of the CBO in question. Taking into consideration that there were not many official documents of the Community Bases Organizations available, it was a particularly important tool. A timeline of NACIA was prepared by the executive committee of the organization. In 2007 a detailed timeline of KEA was set up by Hagen, which was extended during our fieldwork.

In addition, in Migyera village, a timeline was set up by the community members specifically focussed on environmental and climatic conditions. These timelines gave us some insights in the environmental changes, challenges and disasters people faced in the past. It thereby shed some light on the relationship between humans and their surroundings. Furthermore, the events indicated on the timeline, gave us an idea of people's perception of the environment, for example if they recognized any benefits.

TOOL 5: FARM OBSERVATIONS

In addition to participatory tools described above, farm observations were carried out in Kasejjere. The aim of the observations was to collect data on what type of practices farmers used, if these were either deliberately or unconsciously practiced and if any of these practices were in compliance with one or more ecoagricultural principles. Farm observations were only carried out in Kasejjere, were crop farming was the main source of food and income. Since people in Migyera were to a far lesser extent involved in crop farming, and cattle's farming was practised on large plots of land, full observations were impossible.

4.5 DATA ANALYSIS

Data retrieved during the fieldwork was processed by using Microsoft Excel. The conceptual framework was used as a guideline to structure the results. For both data sets (Kasejjere and Migyera) the answers to the interview questions were scored resulting in a ranking of the most often mentioned answers. By scoring all the answers we were able to determine what were the predominant perceptions/thoughts regarding ecoagricultural (related) concepts within the two communities. Using this scoring method enabled us to compare the answers between different groups of respondents (e.g. farmers in Kasejjere and Migyera, members and non-members of the CBO or innovators and non-innovators).

The innovations of farmers were documented, analysed and linked to ecoagricultural concepts and principles if appropriate. A list of innovations and their connection with ecoagriculture was prepared. The effectiveness of the LISF for promoting innovations in ecoagricultural agriculture was assessed by using information derived from the interviews with Core Team members, studying institutional documents and data that was collected during the interviews with farmers.

4.6 BARRIERS AND CONSTRAINTS

The language barrier between the researcher and the participants generated multiple uncertainties throughout the research. Everyone who contributed to the research, including us, used English as a mediating language. Almost all the farmers spoke a local language, most often Luganda, and didn't speak English well enough to fulfil a complete interview without an interpreter.

During the interviews also the interpreters themselves faced difficulties with asking open questions which forced us to ask more closed question, resulting in a more structured interview then planned. Almost all interviews were recorded in order to cross-check some questions of which we thought either the question, translation or answer wasn't clear. Bilinguals in Kampala checked some recordings and according to these revisions, the level of distortion was considered to be acceptable. However, multiple personal interpretations, due to difference in cultural background, level of education, world view and language characteristics were expected to result in much information remaining unknown or being distorted. As an example, the word 'nature' that was intended to be used in the question "In your opinion, what do you think is nature?" had to be changed into "In your opinion, what do you think is the environment?" since the word 'nature' was not translatable into the Luganda language according to our interpreters. However, in the English language, this distinction between nature and environment does exist. Unfortunately, we were not able to include this nuance difference, within the research. According to the Cambridge Dictionary (2000) the word nature emphasizes more the elements and processes that make up the world, as where the word environment is more emphasizing the overall surrounding.

Nature

"All the animals, plants, rocks, etc. in the world and all the features, forces and processes that happen or exist independently of people, such as the weather, the sea, mountains, reproduction and growth"

Environment

"The air, water and land in or on which people, animals and plants live"

Secondly, during the period of our fieldwork in Kikandwa people went through a difficult period, which seriously affected the efficiency of data collection. The lack of expected rainfall made it extremely difficult

for people to meet their food demands which caused tension in the village. Some people that were willing to participate suffered from Malaria, wherefore the interviews had to be cancelled. On top of this, two important and highly respected village members diseased, what brought a period of grief in the community for two days, making any fieldwork impossible.

Thirdly, it turned out to be difficult to approach non-members of KEA and NACIA. Members proved to be much more open and willing to share information with us then non-members. We found some non-members who were willing to participate after various failed attempts. This resulted in a smaller sample then intended. Some members who were initially not selected for interviews felt offended and insisted on a visit from us. Trying to avoid any conflict within the community we answered all the requests, but sometimes with the consequence that time was limited during other (planned) interviews.

At fourth, the circumstances during the fieldwork in Kikandwa were very basic and no facilities like electricity were available. Here for it wasn't possible to process all the collected data on the spot, but forced us to do all the data processing in Kampala and The Netherlands. These conditions did significantly influence the effectiveness of data collection.

CHAPTER 5 RESULTS AND ANALYSIS

This chapter presents and discusses the results of the research, following the two research questions. Detailed information about the two study sites is presented in the first section. In the second section, the results regarding the extent to which ecoagriculture is being practiced in the two study sites will be presented. The third section shows the results regarding the effectiveness of the Local Innovation Support Fund.

5.1 STUDY SITE CHARACTERISTICS

Throughout the fieldwork period, information regarding physical, social and natural aspects of the two study sites was collected through the means of consulting official government documents (e.g. development plan of the sub-county, District State of the Environment report) and interviewing key informants within the two study sites. This information was used as background information as well as to compare the dissimilarities between the two sites. These different characteristics possibly influence the way in which ecoagriculture is being practiced and to what extent and determines the types of innovations created by farmers. An overview of the characteristics on both sub-county level and village level including information on the Community Based Organization are given in the next sections. An extensive overview of all the study site characteristics is given in table 7.

5.1.1 KASEJJERE VILLAGE

Kasejjere village is one of the 56 villages that are situated within Kikandwa sub-county. Kikandwa sub-county lies within the boundaries of Mityana District, 68km north-west of Kampala. The sub-county covers approximately 166 km^2 and is generally covered with fertile soils. The combination of fertile soils and the fact that it has a bimodal rainfall regime make it an intensively used area for agriculture. In 2008, the population of Kikandwa sub-county was estimated to be 28,436 with 14,050 females and 14,186 males. Although the sub-county is relatively close to the capital city of Uganda and the Kampala-Hoima primary route runs across it, as a result of the poor local roads, most of the villages are rather isolated.

The sub-county is characterized by a hilly topography with altitudes ranging from 1,066 to 1,548m above sea level. Land in the sub-county is normally covered with well-drained loam soils with a fine texture. The area is endowed by wetlands that provide numerous direct and indirect benefits for people's livelihoods in the area. As recognised in the District's State of the Environment Report, wetlands serve as a source of water, provide land for cultivation and grazing, provide mulching materials and act as a source of natural materials like papyrus that can be used for craft making. Next to these direct benefits, wetlands support important ecological services e.g. flood control and water filtration, and they underlie esthetical and cultural value.

The sub-county faces several environmental problems that are caused by human interventions and/or induced by naturally prevailing conditions The main problem is land degradation that is mainly caused by unreliable rainfall patterns, destructive farming methods (e.g. bush burning), deforestation and overgrazing. The increasing population in the area has contributed considerably to the growing demand for agricultural land, resulting in land and forest clearing (SOER, 2007). A comprehensive overview of all the characteristics of Kikandwa sub-county is given in table 7.

The natural environment of Kasejjere can be described as small plots of land used for crop farming interspersed by a large variety of deciduous trees and grasslands (see figure 6). Kasejjere village is a farming community of around 250 hectares populated by 1,710 people of which 1,150 are under the age of 18. Almost all the people in Kasejjere are basically subsistence farmers, cultivating food crops for household consumption and whenever possible selling some produce to other community members or the trading centre. Most people generate their income by selling cash crops (e.g. coffee, tobacco and vanilla), making baskets, producing local distillate or selling livestock. Recently some of the aforementioned food crops have been produced for the markets as well, since the demand from Kampala has increased along with the prices (interviews 7 and 8).

From 1998 onwards the community of Kasejjere faced a period of low yields resulting from a period characterised by poor land management practices. People massively cleared land to be able to cultivate more crops and produce charcoal. Unfortunately, as a direct result of these practices, the soil lost its fertility after two or three seasons, which directly affected food security and people's livelihoods (interview 7). In 1999 the Kikandwa Environmental Association was founded by John Kaganga, a community member of Kasejjere, to address the alarming low rates of agricultural productivity, the resulting high levels of food insecurity and the rapid increase of environmental degradation within the region. In 2004 KEA was officially registered as a Community Based Organization under the Local Government of Mubende District (now Mityana District) followed by an official recognition as a NGO-CBO at the Ministry of Justice and Affairs in that same year.

Figure 5: The natural environment of Kasejjere.

According to Mr. Kaganga Kasejjere faced several environmental problems over the last decades, many of them caused by human activities. In the early 1980s community members started distilling alcohol in wetlands causing water pollution and a decline in available fish. The late 1980s were characterized by a noticeable decline in biodiversity as the amount of grasshoppers, white ants, bush rats, rabbits, bees and mushroom in the area started to decline (interview 7 and 8). In the period around 1996 the population of the whole sub-county started to grow, resulting in land clearing for agricultural purposes and charcoal production. From 2000 onwards the larger herds of cattle, due to the growing population, caused serious problems of overgrazing in the region (Hagen, 2008).

Within the Kasejjere there is one primary school that was established by the Kikandwa Environmental Association. This Green Hill Education Centre pays special attention to environmental education by promoting sustainable agricultural practices amongst the pupils. In addition the school promotes tree planting by maintaining nursery beds for tree seedlings that can be brought home by the children. By

educating children KEA aims to expand its scope by targeting more households than would otherwise be possible.
While not using the specific term “ecoagriculture” in their official constitution or brochures, Kikandwa Environmental Association does promote ecoagriculture within the community in various ways. By means of sensitization workshops community members are informed about sustainable farming practices and stimulated to plant trees on their farm. The association thereby stresses the importance of environmental protection and environmental education for the youth.

Although KEA is registered as an NGO and cooperates with several actors and institutions on District and regional level, its real scope is confined to Kikandwa sub-county, since most of its members are inhabitants of this area and most of its activities are carried out within the sub-county, specifically in Kikandwa town, Kasejjere, Nakwaya, Kabongezo, Nakaseta, villages (Hagen, 2008).

5.1.2 MIGYERA VILLAGE

Migyera is one of the villages within Nabiswera sub-county. Nabiswera sub-county is located in Nakasongola District of central Uganda. The sub-county lies 140km north of Kampala in the sub-humid “cattle corridor”. The sub-county is made up by a generally flat topography with minimal altitudinal differences. The vegetation is savannah woodland characterized by short grasses interspersed with trees and shrubs, predominantly *Acacia spp.* Nabiswera is one of the sub-counties that is most affected by the droughts despite the fact it has a bimodal rainfall regime it is subjected to very unreliable raining patterns. During the wet seasons streams originate that act as temporary water sources. The Lugogo River in the south and Lake Kyoga in the north provide permanent water sources for cattle. Due to its topographical characteristics, Nabiswera sub-county experiences serious water shortages throughout the year. The supply of water for livestock is a particular problem and can result into a loss of livestock between 4- 10 percent per year.

The sub-county faces several environmental problems that are caused by human interventions and/or induced by naturally prevailing conditions. The main problems are the loss of woodlands due to charcoal production, soil exhaustion due to overgrazing bush burning and the overexploitation of other natural resources due to brick making, for example. Additionally, the infestation of termites is a serious problem. Termites have wood-eating habits and thereby use soil to create their nests, this causes loss of pasture, soil erosion and destruction of fences and houses. Since termite activity is being accelerated by drought, it has been a problem hard to overcome in a sub-county with such a dry climate (SOER, 2007).

The woodlands in the sub-county are severely degraded by human activities. A high demand for charcoal is coming from Nakasongola town and Kampala, since the charcoal coming from this area is known for its high energy content. The extensive utilization of woodlands for charcoal production in combination with the high number off freely grazing cattle resulted in decline in biodiversity over the past years. The woodlands in the sub-county are not particularly high in biodiversity, compared to other woodlands in Uganda, but still support some wild game such as ungulates (Reed buck, Bush buck, Oribi, Uganda kob), leopards and monkeys, whose numbers, according to the State of the Environment Report of 2007, have been declining in the past years. The reduction of the sub-counties’ honey production also suggests a decline in suitable forage habitats for bees or a reduction in the number of bees in the region. In table 7 the characteristics of Nabiswera sub-county are listed together with these of Kikandwa sub-county.

Land arrangements within the sub-county are extremely ambiguous and conflicting. The majority of the people in the area are descendants of cattle herders, who used to gradually migrate across the country looking for pastures. Some people originally come from Mbarara district in the south-west. Before the Land Act that was put into force in 1998, all land in the sub-county was in possession of five landlords, and most inhabitants were squatters or lessees. The new land act enabled inhabitants to acquire their own land, resulting in most households receiving around 30 m^2 of grazing fields (interview 35). However, as the implementation of the land act was not accurate, people still face uncertainties about ownerships. These uncertainties complemented by the inability of preventing one's animal to graze on others' land, cause conflicts among community members.

The village of Migyera is being characterized by a flat topography with largely open areas interspersed with shrubs and trees. Soils in Migyera are generally dry and eroded (see figure 7). Migyera village spreads around the Migyera trading centre, an agglomeration of several shops, motels and houses alongside the Kampala-Gulu road. The precise number of inhabitants of Migyera is unknown and was not found within the sub-county development plan. People in the sub-county are mainly cattle keepers since the environmental circumstances do not allow extensive crop farming, due to drought, soil exhaustion, termites and wild game, people tend to dependent more on their cattle for sustaining their livelihoods.

Figure 6: Pastures (left) and degraded and eroded soil (right) in Migyera.

The Nalukonge Community Initiatives Association (NACIA) was founded in 1998 by the current chairmen Paul Mugame when water shortages and land degradation became a serious problem to the community members, affecting their agricultural output and livelihoods. The association was officially registered at the district administration in 2002. The main objective of NACIA is to increase the output of livestock and crops to secure income and food for the community members. The association currently has 37 members of which 8 are women.

In 1999 the Nakasongola District was identified by the Convention to Combat Desertification of the United Nations (UNCCD) as region endangered by desertification. In the light of the UNCCD, NACIA received support from the United Nations Development Program (UNDP) and the Global Environmental Facility (GEF) in terms of support with writing an official constitution and preparing a work and budget plan. Additionally technical support concerning water harvesting and financial support was given which resulted in the installation of several water tanks and dams. In 2002 a grant from the GEF was received to carry out activities like tree planting, beekeeping trainings, termite control, water harvesting and an exchange tours. Several trainings by entomologists concerning termite control were given and experimentation in this field was carried out over the years, applying different types of chemicals, insecticides and predator ants. In 2004 further experimentation on termite control was conducted by National Agricultural Research Organisation (NARO) and supported by PROLINNOVA.

Table 6. Overview of study site characteristics on sub-county level (summarized from the State of the Environment Report of Nakasongola and Mubende (2006), sub-county development plan of Nabiswera and Kikandwa sub-county)

Characteristic	Kikandwa sub-county	Nabiswera sub-county
Farming system	Mixed farming	Cattle farming
Natural vegetation	Forest savannah mosaic	Savannah woodland
Annual rainfall (mm)	1,000-1,400	500-1,000
Average maximum temp (°C)	25	35
Altitude (m)	1,000 – 1,600	1,000
Sub-county area (km^2)	165,92	*Data not available*
Sub-county population**	28,436	24,446
Population density (per km^2)	171,3	*Data not available*
Agro-ecological zone	Lake Victoria Crescent	Lake Victoria Crescent
Land use***	*Data not available*	35.8 % cattle farming 15.8 % crop farming 36.8 % woodlands 6.8 % open water 4.8 % wetlands
Income generation**	1. Food crops 2. Cash crops 3. Local brew	1. Cattle farming 2. Retail trading 3. Small scale agro-processing
Soil characteristics	Loam soil Well drained	*Data not available*
Main food crops**	Banana Cassava Yam Sweet potatoes Ground nuts	Ground nuts Cassava Maize Sweet potatoes Cotton
Main cash crops**	Coffee Tobacco Vanilla Sugar cane	Coffee Cotton
Stocking rate (livestock*/km^2)	*Data not available*	34 (2004)
Environmental constraints**	Soil exhaustion Pests and diseases Droughts	Droughts Water shortage Termite infestation Crop damage from wild animals
Main threats to biodiversity	Human population pressure Soil exhaustion Wetland degradation Deforestation Bush burning	Human population pressure Game hunting Deforestation Overstocking Bush burning

**)* *Cows, goats, sheep*

***)* *As mentioned in the district' Development Plan and/or Environmental Outlook report (2008)*

****)* *On district level*

5.2 ECOAGRICULTURE WITHIN THE TWO STUDY SITES

To examine to what extent ecoagriculture is being practised in the two study sites the conceptual framework as presented in the methodology was used as a guideline during the data processing, focussing on farmers' management, knowledge and effort (see section 4.3). Farmers' management looks at household characteristics like family size, capital and educational level and natural capital like land size and ownership. It thereby looks at the farming practices that are used by the farmer and if he/she has innovative qualities. The indicator farmers' knowledge focuses on the knowledge a farmer has relating to ecoagricultural concepts and ecoagricultural farming methods. The indicator farmers' effort is concerned with the extent to which a farmer is involved within a CBO or local farming organization and in what way he or she is making effort to conserve local biodiversity. This section will first discuss the results found in Kasejjere followed by the results found in Migyera.

5.2.1 ECOAGRICULTURE IN KASEJJERE VILLAGE

FARMERS' MANAGEMENT

All respondents in Kasejjere were practising subsistence farming. They all had either no or little capital and limited access to markets and health services. Out of the 26 respondents, 10 people received post primary education, under which there were no non-members of KEA. Only 2 respondents didn't attend any educational program.

All the land in Kasejjere was either individually owned or owned by a clan. There was, by the time of the research, no communal land that was managed by the whole community. It was found that the land tenure system in Kasejjere is very complicated. Land arrangements and rules of inheritance are often still based on customary law, since the transaction costs of legal entitlement are very high. It is for this reason that many people in Kasejjere do not legally own the land they use for cultivation. Land is often still entitled to deceased parents or grandparents. In Kasejjere the average land size under the respondents (per household) was 2,56 hectares (n= 26) of which only 0,82 hectares was legally owned (thus registered at the local government) and 1,73 hectares was only accessed by people meaning that the land used was not officially entitled to that person (see figure 8).

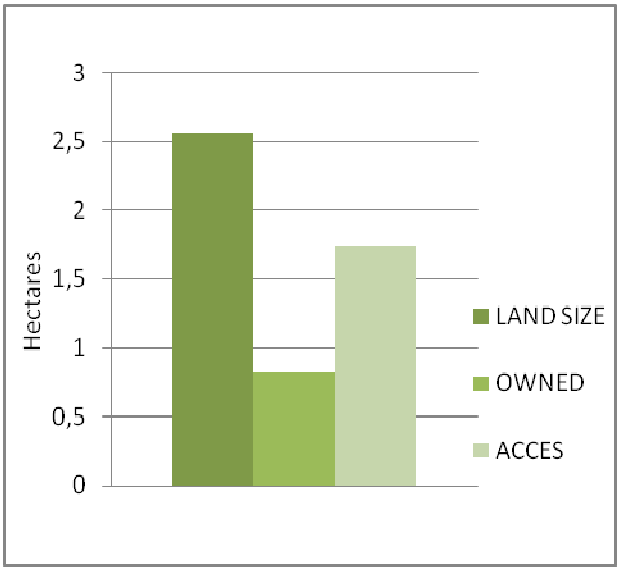

Figure 7: Land ownership amongst respondents in Kasejjere (n = 26)

The ownership of land for a great part determines the extent to which ecoagriculture is being practised, as people tend to invest less and put less effort in land that is not officially entitled by them. It was found that some respondents faced uncertainties regarding the future ownership of the land that they were now hiring. Long-term investments, like planting trees, were because of this not made (interview 7 and 18).

The small plots of land of farmers are all used for mixed farming. The fertility of the soil and the bimodal rainfall regime allows the cultivation of various crops throughout the year (see table 8). Most farming systems in Kasejjere are based on agroforestry as croplands are often interspersed and surrounded by trees. The ecoagriculture theory promotes trees within the agricultural landscape, as they enhance soil fertility and soil biodiversity by producing litter. Perennials in and around farm field, especially native species, have the ability to form a landscape mosaic that promotes suitable habitats for wild animals. Besides the functional benefits that trees have for biodiversity they also have a direct use value for farmer by providing food (e.g. mangoes, avocado) or providing other resources like timber and medicines (McNeely and Scherr 2003).

Table 7.The main crops, trees and livestock types in Kasejjere (summarized from the seasonal calendars made by farmers during a group workshop in Kasejjere, 2009)

Food crops	**Food crops**	**Cash crops**	**Trees**	**Livestock**
Cooking banana	Yam	Coffee	Mango	Cows
Yellow banana	Cassava	Sugar cane	Passion fruit	Sheep
Sugarcane	Ground nuts	Tobacco	Avocado	Goats
Maize	Vegetables		Jackfruit	Pigs
Sweet potatoes	(e.g. pumpkins,		Guava	Chickens
Irish potatoes	beans,		Moringa	
Watermelon	eggplant)			
Pineapple				

The agroforestry systems in Kasejjere were almost all cultivated with polycultures during the growing seasons. These polyculture systems, in which two or more crops are grown together lower the risks for pests and diseases and ensure a diverse diet. These polyculture systems simultaneously support biodiversity since these small plots of land with a diverse cropping pattern, interspersed by trees and surrounded by natural vegetation, create a mosaic landscape that can result in a much greater biodiversity as it provides more ecological niches (Altieri, 1999; McNeely and Scherr, 2003). The diversity and spatial mix of crop, trees and livestock components on a farm can greatly enhance the habitat value of a farming system (McNeely and Scherr, 2003).

Fallow land is very typical in the area. Most respondents did let land rest for one or more seasons, although it was not always mentioned during the interviews during farm observations three forms of fallow land were recognized; grass fallows that haven't been cultivated for one or two seasons, bush fallows that have been set aside for more than a year and bush/forest fallows that have been set aside for more than five years allowing trees to reach a mature status. The presence of the fallow system in Kasejjere provided mosaics of spatially interacting fallow and cropped plots. The use of fallow systems is an excellent example of ecoagriculture as the essence of the ecological process of soil regeneration is captured (Altieri, 2002). Fallow land thereby temporarily accommodates space for wildlife as bush and tree fallows are an ideal place for birds to create nests or for insect to forage. These birds and insect have an indispensable value when it comes to pollination or organic matter breakdown. As was observed in

Kasejjere and confirmed by Mr. Kaganga, farmers experienced difficulties with vanilla fertilization as bee populations had been declining in the region since the 1980s (see picture on cover) (interview 7 and 15).

All farmers in Kasejjere made, due to the lack of capital, use of locally available sources and tools. The farming systems didn't depend on mechanisation, chemical fertilizers and other technologies to meet production demands. In Kasejjere the hand hoe is the predominant tool used for cultivation. The remoteness of the village, the slope in combination with the lack of financial resources makes people directly dependent on this simple tool. The hand hoe reduces soil compaction compared to a plough and thereby enables pore space in the soil, resulting in a higher uptake of rainfall and a decrease of erosion. Loose soils promote plant growth and soil biodiversity (McNeely and Scherr, 2003).

When asking what type of problems people faced the last two years related to agricultural production respondents mostly mentioned the lack of rain of the last two years. This year, the absence of sufficient rainfall caused the first planting season (February-March) to fail. This resulted in lower yields than average and frustration amongst farmers. In addition, rainfall often followed a more erratic pattern that was frequently accompanied by hailstones (see table 9).

Among other things, various pests and crop diseases, that were also observed during the time of the fieldwork, like the cassava mosaic virus and the bacterial banana and coffee wilt, lead to lower yields and a lower quality of agricultural products. At the time of the fieldwork there was no locally produced organic pesticide that proved to be effective in fighting these particular pests and diseases (BBC, 27/09/2009) (see box I).

Table 8. Problems faced related to agriculture the last two years as mentioned by the respondents in Kasejjere

Problems	Kasejjere (n=19)
Drought (lack of rain)	19
Pests/diseases	12
Soil depletion	4
Lack of capital	3
Hailstones	3

Box I: Disease endangers food security

27th August 2009 (BBC)

Food supplies in several African countries are under threat because two diseases are attacking bananas, food scientists have told the BBC.

Crops are being damaged from Angola through to Uganda - including many areas where bananas are a staple food. Experts are urging farmers to use pesticides or change to a resistant variety of banana where possible. Scientists have been meeting in Tanzania to decide how to tackle the diseases, which are spread by insects. Christopher Chemirehreh, of the Kawanda Agricultural Research Institute in Uganda, said people were particularly vulnerable in the areas where the diseases were found. "It's a big danger because the affected areas have the banana as their staple crop," he told the BBC's Focus on Africa programme. "So if they fail to control the bacterial wilt, their incomes are affected and their food is affected, so it's a very big problem."

FARMERS' KNOWLEDGE

During the interviews in Kasejjere the term 'environment' was quite well understood. However, the respondents did often struggle with formulating a real definition instead of giving their opinion on the prevailing situation. But overall the respondents in Kasejjere were acquainted with the term, as all respondents at the end managed to give a definition, sometimes after requesting further explanation. Most mentioned answers were '*the surrounding'*, *'trees'* and '*people*' (see table 10). The fact that '*the surrounding*' was most often mentioned could have been due to the fact that in the Luganda, but also in the English language, that is the exact translation. As explained before, due to language constructs we were not able to use the word 'nature' instead of 'environment', wherefore the intended nuance had disappeared.

Table 9. Perception of the environment as mentioned by the respondents in Kasejjere

Environment	**Kasejjere (n=26)**
Surrounding	16
Him/herself/people	8
Trees	8
Plants	4
Forest	4

When asking respondents to explain why the environment is important to their farm most people gave answers within the field of resource provisioning (e.g. soil, water, crops and cattle). "*The environment is a source of life and it supports my crops*" (Interview 19). The majority of the people had a sufficient level of understanding regarding the functionalities of the environment. It was observed that the interviewees that were not a member of KEA were less knowledgeable on these issues and less talkative in that respect. We found that people regard trees as a highly important feature for farm productivity. Respondents conceptualised the importance of trees for their farms in various ways, but the most important being rainfall attraction, enhancement of soil fertility through litter production and the provisioning of shade for crop protection (see table 11). In many cases the trees on farms were safeguarded by farmers, regarding them as having high value (some trees provide fruits or medicinal products or acted as a source of fuel wood).

Table 10. The importance of the environment for farm productivity as mentioned by the respondents in Kasejjere

Importance farm	**Kasejjere (n=21)**
Provides resources	11
Trees bring rainfall	8
Trees add fertility to soil	8
Trees provide shade	6
Rainfall	5

A seasonal calendar was made by community members indicating rainfall and cropping patterns throughout an average year (see appendix 4). This calendar indicates the great variety in crops cultivated by farmers as well as a distinct rotation pattern per growing seasons. Rotating crops each season and cultivating more than one crops type on one piece of land (intercropping) enhances soil fertility and supports soil biodiversity. It was found that both crop rotation and intercropping were only sporadically mentioned during the interviews when asking what people thought were good farming practices. "*Farmers that don't change their crops seasonally destroy the soil*" (interview 21). Nevertheless, during farm observations (n=17) it revealed that almost everyone is practising crop rotation and intercropping

(see table 12). By using crop rotation and intercropping patterns, farmers in Kasejjere were able to maintain soil fertility and make more efficient use of space (interview 20 and 21). Not rotating crops was by many respondents seen as a poor farming practice (see table 13).

Table 11. Good farming practices as mentioned by the respondents in Kasejjere

Good farming practices	Kasejjere (n=19)
Mulching	11
Terracing	10
Use manure	7
Intercropping	4
Crop rotation	4

Mulching, the addition of organic matter to the surface, is a successful ecoagricultural technique to regenerate soil fertility. The availability of organic matter in the soil enhances the occurrence of soil (micro) organisms (e.g. earthworms, ants, bacteria, fungi) that in their turn accelerate the breakdown of organic matter providing nutrients for crop growth (Altieri, 1999; McNeely and Scherr, 2003; Magdoff, 2007). It was found that mulching was practised by nearly all the respondents, but only mentioned eleven times during the interviews. Mulching was often practised with various grass types, banana leafs or other organic waste.

Making terraces on the farm field was by many respondents regarded as a good farming practice but this didn't imply that they were actually practising it themselves. Terraces are a means, by which rainwater can be used more efficiently, by slowing down the velocity of water moving along the surface. Reducing this velocity prevents the erosion of soil as well as the removal of soil nutrients (WOCAT, 2007). As was also mentioned by Mr. Kaganga, terracing is a technique that requires lots of labour and knowledge and he estimated that only 25 to 30 percent of the people in Kasejjere are using terraces or have the knowledge to make them (see table 15).

In addition, during the interviews the use of manure was often regarded as a good farming practice. Again we noticed that almost all respondents made use of manure, but it was not proportionally mentioned as a good farming practice. Cow dung was the most commonly used fertilizer followed. The idea to use chicken droppings as fertilizer was recently introduced in the village through a farmer exchange organized by PROLINNOVA (interview 7). The use of organic fertilizer was in many cases the only option to maintain soil fertility as inorganic fertilizers were either too expensive or not available in the area. It is for this reason that people rely on low-input mechanisms to ensure crop production. The advantage of using organic fertilizers instead of inorganic types is the avoidance of soil and water pollution.

When asking people what they thought were poor farming practices it was found that most answers were the direct opposites of the answers received with the questions what people thought were good farming practices. It was also found that the response on this question was not as lively as on its positive counterpart (see table 13).

Table 12. Poor farming practices as mentioned by the respondents in Kasejjere

Poor farming practices	Kasejjere (n=18)
Not rotating crops	6
Cutting trees	6
Burning bushes	5
Not mulching	4
Not making terraces	3

When asking respondents what inspired them to manage their farms they way they do, a vast majority of the people mentioned KEA as their source of inspiration. Through workshops organized by the chairman of KEA people were able to inquire knowledge on farming as well as on environmental protection. The strong conviction and activities of KEA in the field of tree planting were clearly recognisable in the answers of our respondents. People further mentioned other trainings organized at the sub-county level and family knowledge as important sources of knowledge (see table 14). "*I use the practices that I was told by KEA; I don't use chemicals and share my ideas with other people*" (interview 10).

Table 13. The source of inspiration regarding farming practices as mentioned by the respondents in Kasejjere

Inspiration	Kasejjere (n = 18)
KEA	10
Other trainings	6
Family knowledge	5
Friends	2
School	2

According to Mr. Kaganga, chairman of KEA and a highly authorized person within the village, people in Kasejjere have been unaware of sustainable farming practices until 2004 when a student from the Baraka College in Kenya visited Kasejjere to conduct fieldwork as part of his study. Sensitization workshops were held by KEA in cooperation with the student amongst community members, informing people about soil management (e.g. making contour lines, use of compost, intercropping, mulching and fallowing). Mr. Kaganga informed us that all these practices were not common until these workshops were held. When people saw that these sustainable farming practices had a positive effect on the agricultural output more people started to adopt the practices. Currently, as Mr. Kaganga states it, three groups of farmers can be indentified within Kasejjere 1) people that fully practice sustainable agriculture, 2) people that partly practise sustainable agriculture and 3) people that don't practice sustainable agriculture (interview 7) (see table 15).

Table 14. Typology of farmers in Kasejjere practising sustainable agriculture according to Mr. Kaganga (interview 7)

Typology of farmers	Share within Kasejjere
Fully practising	25-30%
Partly practising	60%
Not practising	10-15%

Partly practising sustainable agriculture, according to Mr. Kaganga is mulching, the use of manure, crop rotation and intercropping. The people that fully practise sustainable agriculture make additional use of contour lines, terraces, trenches as opposed. Mr. Kaganga points out that tree planting at farm boundaries is still hardly practised by anyone although it's an important feature of sustainable agriculture in his opinion. Within Kasejjere less than 10 percent of the farmers use chemicals to spray their crops as a

protective against pests and diseases, in addition, only one percent of the people use chemical fertilizers (interview 7).

FARMERS' EFFORT

In addition to people's farming knowledge it was of interest and importance to see what effort people make to deliberately conserve the environment. Of particular interest was if the link between functional biodiversity and farm productivity was made, and if effort to conserve this biodiversity was made accordingly. It was again found that the conservation of trees was highly valued by the respondents followed by the aversion to bush burning. Few people mentioned practices that they did deliberately to protect the environment. The active members of KEA were most aware of environmental protective measures and often engaged in tree planting. Most non-members generally mentioned nothing specific (see table 16). An active member of KEA said: "*I protect the environment, I don't use plastic bags and I use cow dung to preserve the soil*" (interview 10).

Table 15. Individual activities undertaken to protect the environmental as mentioned by the respondents in Kasejjere

Protect environment	**Kasejjere (n=16)**
Not cutting trees	8
No bush burning	5
Not burning rubbish	4
Not using wetlands	3
Reforestation	2

During one of the interviews with Mr. Kaganga it became clear that bush burning and tree cutting had been an often seen activity up till a few years ago. Tree cutting for charcoal production used to be a fast way of making money that was especially attractive to the youth. At that same time, due to unsustainable farming practices, soil lost its fertility quite readily, bush burning was there for done to convert fallow land to new agricultural land. Because of these developments, KEA started to sensitize people on environmental conservation and particularly on the importance of trees. This could be why so much emphasis on these topics was given during the interviews. A member of KEA mentioned: "We are learning to plant trees instead of opening op new land" (interview 11).

During farm observations and various transect walks more practices and interventions were observed that were not mentioned during the interviews. These practices did fit well in the concept of ecoagriculture. In the whole of Kasejjere people made use of natural boundaries to fence off their farmlands. Either particular bushes were used or poles overgrown with plants. These small and modest interventions create biodiversity-friendly boundaries in between farm fields by providing habitats, suitable forage spaces and room for wild fauna.

5.2.2 ECOAGRICULTURE IN MIGYERA VILLAGE

FARMERS' MANAGEMENT

Since Migyera is a cattle farming community, the focus during the fieldwork was entirely put on cattle farming. All respondents in Migyera were engaged in cattle farming either by managing their own land and cattle or they worked as hired labour. Compared to Kasejjere the number of livestock owned by the respondents in Migyera was far higher (see table 17). The average number of children per household under respondents was 5,39. From the 23 respondents only five attended post primary education and seven respondents did not receive any education whatsoever.

Table 16. Average number of livestock per household (among respondents) per study site

Livestock	Kasejjere (n = 26)	Migyera (n = 23)
Cows	5,0	94,6
Pigs	9,0	5,0
Goat/sheeps	3,0	28,7
Chicken	63,8	17,3

As mentioned earlier land arrangements in the area are, even after the Land Act in 1998, still ambiguous. For this reason people still face uncertainties about the ownership of their land. Since fencing materials are expensive and the financial capacity of households is low, it is hard to prevent someone else's cattle to graze on some others land. This often results in conflicts among community members and counterworks initiatives for sustainable land management. The chairman of NACIA mentioned that since the land is individually owned compared to the former communal ownership, people tend to take more responsibility over their land, resulting in less overgrazing and better managed water sources (interview 35). Respondents in Migyera on average owned 77,1 hectares of land (n=23) per household that was almost completely used for keeping cattle. Some respondents used a half to one and a half hectares for a garden that was usually situated directly near the respondents' house. Of the 77,1 hectares land around 46 hectares was legally owned (n= 15) compared to around 30 hectares that was only accessed by the respondents (n =8) (see figure 9).

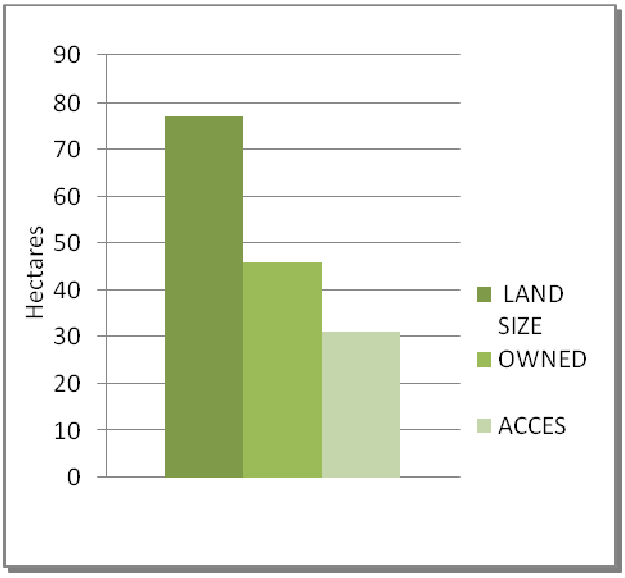

Figure 8: Land ownership amongst respondents in Migyera (n=23)

When respondents were asked what type of problems related to agriculture they faced within the last two years the absence of rainfall, the infestation of termites and the lack of water resources were mentioned as most tangible problems. In addition, the hindrance caused by wild animals and the lack of pasture for cattle were also mentioned as major problems (see table 18). The hinder people receive from the occurrence of wild animals was stressed even more during one of the group workshops (see section farmer's effort).

Table 17. Problems related to cattle keeping faced the last two years as mentioned by the respondents in Migyera

Problems	Migyera (n=18)
Drought (lack of rain)	8
Termites	8
Lack of water	7
Wild animals	5
Lack of grass for cattle	5

FARMERS' KNOWLEDGE

It was found that the respondents in Migyera often had difficulties with conceptualizing the term 'environment'. They mostly struggled with giving a real definition; instead they gave their opinion on the prevailing situation. We often got answers like "it is very hot", "it is not good", and "it is very dry". For this reason we obtained less response then in Kasejjere but the answers that were mentioned were often corresponding with the ones we received in Kasejjere (see table 19).The fact that respondents saw the question as an opportunity to express themselves about the current situation did provided information about the relationship between the people in Migyera and their environment.

Table 18. Perception of the environment as given by the respondents in Migyera

Environment	Migyera (n=20)
Surrounding	6
Trees	6
Him/herself/people	4
How God made things	3
Situation as it is	3

Respondents considered the environment most important as a provider of grass for their cattle. Secondly, the provisioning of resources (e.g. water, soil) was mentioned as an important feature of the environment (see table 20).

Table 19. The importance of the environment for cattle keeping as mentioned by respondents in Migyera

Importance for farm	Migyera (n=19)
Provides grass for cattle	13
Provides resources	9
Trees provide shade	4
Trees bring rainfall	3
Rainfall	2

When respondents were asked what they thought were good farming practices fencing was mentioned as the most important. Since grazing can be quite uncontrolled in the area fencing off gardens is an important intervention to prevent cattle from entering and destroying and/eating crops. Fencing gardens was also a necessity as wild animals often entered gardens. The pruning and cutting of bushes was considered being a good farming practice as clearing land from bushes allows more grass to grow which enables more grazing (see table 21).

Table 20: Good farming practices as mentioned by respondents in Migyera

Good farming practices	Migyera (n=20)
Fencing	10
Cutting bushes	6
Use manure	5
Weeding	5
Not overgraze	4

Overgrazing was prevented by some farmers by locking in cattle or closing off a certain area of land by making use of poles and branches. Night paddocks were used by some farmers to lock in the cattle during the night, this to also prevent attacks from wild animals (see figure 10). Larger paddocks were used to collect cattle for a period of time in order to use the dung as natural fertilizer to stimulate vegetation growth. After a certain period of time, when grass started to grow again, these paddocks were shifted to another location. The fencing of larger areas to let land rest for a significantly longer period of time was often done using poles and barbed wire.

Figure 9: Paddock made of poles and branches (left) and the first grass that grows again on degraded land (right)

When gauging respondents opinion on poor farming practices it was found that overgrazing is one of the biggest frustration amongst farmers (see table 22). Poor fencing or inadequate management still causes overgrazing in the area, resulting in less available pastures and thus poor fed cattle, which is worth less on the market. During the interviews it was found that, like in Kasejjere, people regarded trees as a valuable landscape element. The area is known for its charcoal production and Mr. Mugame informed us that the last years have been characterized by extensive tree cutting. Trees are considered to provide shade for both crops and cattle, attract rainfall and posses medicinal functions.

Table 21. : Perception of poor farming practices as mentioned by respondents in Migyera

Poor farming practices	Migyera (n=15)
Overgrazing	8
Cutting trees	8
Burning bushes	5
Not fencing	2
Not spraying animals	2

FARMERS' EFFORT

During the interviews in Migyera a very low response was received on the question regarding environmental protection. Many respondents got confused by the question and were unable to answer it. It turned out to be difficult for people to link their activities with the concept of environmental protection.

In some cases the respondent used night paddocks as a way to restore the vegetation, but this was by the respondents not seen as a measure to protect the environment (see table 23).

Table 22. Individual activities undertaken to protect the environment as mentioned by respondents in Migyera

Protect environment	Migyera (n=15)
Nothing	7
Not cutting trees	6
No overgrazing	3
Fight termites	1

During a group workshop with farmers, a mixed group of men and women (n = 12), were asked to indicate the benefits and threats they experience from the occurrence of wild animals. It was of interest to see what people thought were the right interventions to lower these threats. As it was heard from Mr. Mugame that in Nabiswera sub-county more wildlife occurred compared to Kasejjere it was interesting to see what the relationship between humans and wildlife is and how this effects farmers' management and determines farmers' conservation efforts (see table 24) (see box II). Participants of the workshop indicated that the occurrence of wild pigs and monkeys was very high, and that the only solution to lower the threats that are caused by these animals was to kill them. This was also seen as the solution to lower the threats caused by leopards.

Table 23. Threats and benefits as experienced by farmers and solution as proposed by farmers in Migyera during a group workshop held at the NACIA office (01/06/2009).

Wild animals	Occurrence	Threats	Benefits	Solutions
Wild pigs	HIGH	Eat our crops Kill our animals (e.g. calf)	Some eat them	Kill them
Leopards	MEDIUM	Eat goats, calf Kill people	Nothing	Kill them
Dogs	LOW	Bite children Kill goats Kill hens	Nothing	Kill them
Antelope	HIGH	Destroys crops	Nothing	Fence
Snake	MEDIUM	Bite people Bite cows	Nothing	Kill them
Monkey	HIGH	Eat crops Eat young chickens Spread diseases	Nothing	Kill them

Box II: Aida Ampiri sharing her experiences of wild animals

Mrs. Ampiri (35)

"I have tried to fence my garden, but the wild animals keep on coming in. Antelopes, monkeys, wild pigs and moles destroy my crops. Last month, monkeys entered and destroyed almost all my crops. I have to guard here during the day to prevent animals to enter my garden". "It is hard work".

5.3 EFFECTIVENESS OF LISF IN PROMOTING ECOAGRICULTURAL INNOVATIONS

This section presents and analysis the results regarding the effectiveness of the LISF in promoting ecoagricultural innovations within the two study sites. It is structured according the sub-questions that were presented in section 1.3. First it will be discussed how ecologically-oriented agriculture is defined within the PROLINNOVA program followed by a discussion of how the LISF was implemented in the two communities under study. Lastly, the innovations of the farmers that received the LISF in 2007 will be assessed on their ecoagricultural soundness.

5.3.1 ECOAGRICULTURE WITHIN THE PROLINNOVA PROGRAM

Since promoting farmer innovations in ecologically-oriented agriculture is the of the main objective of the PROLINNOVA program a working definition of what ecologically-oriented agriculture means within the program was sought. It was found that no official definition of 'ecologically-oriented agriculture' existed within the PROLINNOVA program and neither in the LISF country program. An interview with the Country program Coordinator also revealed that there is little awareness on the link between PROLINNOVA and ecoagriculture on the local level (interview 1). During the interviews with Core Team members we found that there is sufficient knowledge on this subject within the Core Team, but unfortunately not efficiently consulted by the country coordinator.

The fact that PROLINNOVA is a decentralized program, implemented by a network of NGOs, aided by an International Support Team (IST) and monitored by an international Oversight Group (OG), makes that the outcome of specific projects is highly dependent on both international and regional actors. Therefore a strong and clear working definition of ecologically-oriented agriculture that is used throughout all levels would greatly increase the clarity within the program and improve its effectiveness. The quality of the information flow towards the facilitating agency, country coordinator, chairmen CBOs, farmers, farmer innovator, is highly dependent on the provisioning of information from the secretariat. For the PROLLINOVA to be a success it is essential that the right information is received by the different parties.

The interview with the chairman of NACIA for example revealed that he was not familiar with the concept of ecoagriculture and the connection with farmer innovation (interview 35). The chairman of KEA in contrast was far more knowledgeable, moreover because he had been following several trainings and workshops next to these organized by PROLINNOVA (interview 7). However, it was found that in both CBOs no training specifically focussed on ecoagriculture was given prior to the disbursement of the LISF and that the importance of farmer innovation for ecoagriculture was never stressed (interview 7 and 35).
Since there was no special attention given to ecoagriculture during the implementation of the LISF it was observed that farmer innovators were mostly not aware of the intended link between their innovation and the protection of the environment. The unexploited opportunity to sensitize people about the environment and how they can contribute to its conservation by means of innovation was identified as a serious weakness of the program.

5.3.2 IMPLEMENTATION OF THE LISF IN KASEJJERE AND MIGYERA

In KEA three meetings were held by the country coordinator from Environmental Alert to introduce the LISF within the community. These meeting aimed at sensitizing people on the concept of innovation and explain the procedures for application. For the LISF pilot in KEA 31 people applied, eventually resulting in 19 applicants receiving the fund. Each applicant in KEA had to fill in a form that was distributed by Environmental Alert, in which they had to explain their innovation and budget needs in detail. During the

interviews in Kasejjere it was found that among the respondents almost all the members of KEA were aware of the possibility to apply for the LISF. This was observed differently among the non-members. One respondent said: "*I have never heard about the LISF and I don't know any innovator*" (interview 19). Non-members had - almost without an exception- never heard of the LISF. This indicates that the scope of the LISF was quite limited and that not all potential participants were reached. It was also observed that there was almost no communication between community members regarding the existence of the fund. One of the respondents had never heard of the LISF while his neighbour applied for the fund and received money (interview 27).

In Migyera the LISF was introduced during a meeting with the chairman and one of the Core Team members whereby a few members of NACIA were present. No other sensitization meetings were held to inform people about the LISF, the concept of innovation or the possibility to apply for the fund. The remoteness of villages and houses also played a major role in the implementation success of the LISF, as almost all people lived far away from the NACIA office; it was difficult to reach all potential applicants. It was found that almost all non-members were unaware of the fund and were never informed in any way. Especially for women, who are due to cultural believes not allowed to ride a bike, it was almost impossible to attend NACIA meetings in town.

After the sensitization workshops and introduction of the LISF both KEA and NACIA received full responsibility over the identification and selection of innovators and the management and distribution of the fund. Environmental Alert did assist the CBOs in setting criteria and organising the screening process, e.g. by providing forms (PROLINNOVA, 2006). For guiding the farmer application procedure, both KEA and NACIA created a special LISF executive committee. The screening of innovations was in both communities done according the general screening criteria that were designed by PROLINNOVA. These criteria acted as a guideline to assess the applications for the LISF within the two communities (see table 25). In the consent with PROLINNOVA, KEA used a simplified version of this guideline (Hagen, 2008). One of the executive committee members said "" The screening sheet was helping us very well". The screening of innovations by NACIA was done following the general criteria to assess innovations.

Table 24. Main screening criteria for the LISF grants across all countries (PROLINNOVA, 2007)

- It must be one's own idea
- If a technique is being developed, it must be technically, economically, environmentally and socially sound
- Replicable amongst the poor and vulnerable
- The value addition achievable through LISF support
- The applicant must be willing to contribute at least a certain percentage of the costs of the total budget of the activity for which support is requested, which could also be in kind
- Applicant must be willing to work according to an agreed plan
- Applicant must be willing to monitor, record progress and report to a PROLINNOVA partner or the CBO
- Applicant must be prepared to share his/her results with others, receiving visitors, teaching others

The above mentioned criteria that were established by PROLINNOA were partly based on the TEES-test. This TEES-test, described by Critchley (2007) who is the member of the International Support Team responsible for Uganda, looks at the broad merit of a technical innovation. The TEES-test, as described by Critchley (2007) stands for:

- ✓ **T**echnical effectiveness: Does it work well? Is its performance good or better than current alternatives?
- ✓ **E**conomic validity: Do the benefits outweigh the costs? Is it affordable to the target group?
- ✓ **E**nvironmental friendliness: Are there any negative environmental impacts? Is off-site pollution or land degradation caused?
- ✓ **S**ocial acceptability: Is it anti-social? Has it good potential to spread to others?

The only criterion from the TEES-test that somehow qualified to assess an innovation on its ecoagricultural soundness was the requirement for an innovation to be environmentally sound. No guidelines for using the TEES-test were provided by PROLINNOVA and neither KEA nor NACIA received training on this subject (interview 7 and 15). In KEA the executive committee was aware of the existence of the TEES-test but used simplified criteria others than these proposed by the TEES-test, mainly on arbitrary basis. In NACIA this was found to be different as the chairman said: "*I have never heard of the TEES-Test, it was never explained and that's why we didn't use it*" (Interview 35). The TEES-test was thus not used by NACIA.

In both communities the provisioning of information regarding the intentions of the LISF and about ecoagriculture was inadequate. However, it was found that the LISF had been far more successful in Kasejjere. Due to the poor sensitization in Migyera almost no applications for 'real' innovations were done. Moreover, most people applied for the LISF to finance technical projects like fencing and building water dams. These measures are, if money is available, done by all community members and can thus not been seen as an 'own idea'. The inadequate guidance of NACIA eventually led to the disbursement of the fund that was not based on any of the criteria provided by PROLINNOVA. It turned out that it generally were the respected and active members of NACIA that received the money. Applications were not individually screened following the criteria of PROLINNOVA but disbursement of the money was more based on "who needs it the most". Since fencing and building water dams are very costly measures only 11 people were able to receive money from the LISF. During interviews one of the respondents that received money from the LISF said: "*The amount given was not enough to fence my whole farm, we need more money*" (interview 39). People receiving money from the LISF were generally unsatisfied with the amount. All this shows that there was no awareness on the real intention of the LISF, that there was no attention for small innovations and that overall the LISF was more seen as development aid.

5.3.3 FARMER INNOVATIONS

The effectiveness of the Local Innovation Support Fund in promoting ecoagriculture was partly assessed by identifying the farmer innovations within the two communities and examine how these relate to the concept of ecoagriculture. It was found that the first two ecoagriculture strategies, as described in section 2.2.3 were not feasible to implement on a household or individual level. These two strategies that are mainly concerned with biodiversity conservation on the landscape measures need community effort with strong involvement of a CBO, NGO or local government body. These strategies were not seen as applicable in the context of this research that is concerned with individual innovations. The other four ecoagricultural strategies were suitable to implement on a small scale, and were thus in theory realizable in the two study sites.

In Kasejjere a total of 19 innovators received the fund of which 16 innovations were ecoagriculturally sound, and related to one of the ecoagriculture strategies (see section 2.2.3) (see box III). Farmers were generally very proud of their title as an innovator, but it was still found that the link between their innovation and the contribution to environmental protection was hardly made. The fact that innovators were not sensitized on positive effect of their innovations on the environment and eventually farm productivity, severely diminishes the capacity of the LISF to empower people within the field of natural resource management.

In table 26 the 16 innovations that were granted in Kasejjere are classified according to the ecoagricultural strategy they relate to. Some innovations were in compliance with more than one strategy; this is indicated by the number of the strategy in superscript.

Table 25.The relation between farmer innovations and ecoagriculture in Kasejjere (n=16).

Ecoagricultural strategy	Type of Innovation
Strategy 3: Reduce land conversion by increasing farm productivity	➢ Organic fertilizer (Haruna Nsubugo)[4] ➢ Organic fertilizer (Leonnard Kitali)[4]
Strategy 4: Minimize agricultural pollution	➢ Organic pesticide (Teddy Nkalyango) ➢ Herbal medicine for passion fruit trees (Rose Kamalwa) ➢ Herbal pesticide for vegetables (Eleth Nakirembe) ➢ Herbal pesticides for vegetables (Christopher) ➢ Swine fever medicine (Joyce Nantongo) ➢ Herbal medicine (John Musisi) ➢ Natural bee-chloroform (Dan Lukwago) ➢ Natural de-wormer (Virisita) ➢ Hatching chicks (Stephen)
Strategy 5: Modify management of soil, water and vegetation resources	➢ Digging trenches to avoid soil erosion (Mary) ➢ Seed preservation (Salongo Kakembo) ➢ Waste water management (Oliver Nakyeve) ➢ Preserving Amaranthus seeds (Margaret Nabatanzi) ➢ Crop protection by making trench around termite hill filled with salt/ash mixture (Vincent Lutalo)

Seven innovations in the field of natural agrocides were found. All agrocides were home made with the intention to treat plant or animal diseases/pests. Farmers used only locally available resources, like herbal plants, ash from charcoal, red pepper and sometimes salt. The agrocides differed in their composition, as some contained only one herbal plant species, while others were made out of various types. The natural agrocides mainly acted as replacements of their synthetic counterparts. Natural agrocides are mainly used because they require low-input and locally available resources, since people lack the financial capital to purchase synthetic agrocides. In addition, the remoteness of the village made that people didn't have market access and thus no opportunity to buy agrocides. During the interviews it was found that the innovators were, almost without exception, not aware of the positive effect that natural agrocides have on the environment. Innovators, as they mentioned during the interviews, developed their natural agrocide, purely because external inputs were not affordable or available.

Box III: Margaret Nabatanzi
Farmer innovator in Kasejjere

Ms. Nabatanzi (44)

What: Growing wild *Amaranthus dubius*
How: Wild *Amaranthus dubius* is planted and the seeds are harvested to make different food products
Ecoagriculture: conserving wild biodiversity, reduce pressure on other species, opportunity for farmer to diversify business and increase income

As mentioned earlier the implementation of the LISF had not been as successful in Migyera as it was in Kasejjere. During the interviews in Migyera it turned out to be very difficult to identify what were exactly the innovations within the LISF program. Most respondents that were identified as innovator were unfamiliar with the term 'innovation' and had difficulties with describing their own innovation. During the fieldwork it gradually became clear that people that had received money from the LISF were not at all aware of the intention of the fund and had spend the money on technical interventions.

Due to this poor introduction of the LISF in Migyera the potential of the fund was not fully exploited. If people had been sensitized on what local innovation means and in what field these could be developed, there could have potentially been more applications and 'real' innovations. For example, there were no applications for innovations in the field of crop farming, whilst crop farming in the area is, due to environmental conditions, rather challenging. Innovations that could have positively affect crop yields; pest and disease resilience and soil nutrient conservation would have been of great importance in Migyera. It was also found that women in Migyera are often responsible for crop farming and have valuable knowledge on medicinal functions of plants and trees. One respondent informed us:"I use some medicinal trees to treat cattle diseases and to boost milk production" (interview 44). This indicates that by stimulating the involvement of women in the LISF, innovations could have been more diverse. The absence of any site-specific training given by the country coordinator neglected the problems that people face in Migyera and thus in which field innovations could most valuable. The absence of any site specific implementation guidelines is also discussed in the chapter 7 where some recommendations to PROLINNOVA will be made. Since there was such an ambiguity in Migyera regarding the 'innovations' an overview of the innovators and their innovations could unfortunately not me made.

CHAPTER 6 CONCLUDING DISCUSSION

This final chapter will draw conclusions from the analysed results that were presented in the previous chapter. It will thereby answer the two main research questions as presented in section 1.3.

Ecoagriculture is the aggregation of approaches and practices that aim at building the strengths of natural systems into agricultural ones. By mimicking natural ecosystems, agricultural systems can make more efficient use of energy flows, increase the diversity of above ground and soil organisms, create self-sufficiency, enable self regulation and enhance the systems' resilience.

In Kasejjere, all respondents practiced agriculture without external inputs. They made use of natural agrocides to fight pests and diseases and used ecoagricultural methods to conserve soil fertility. These ecoagricultural methods, like fallowing, crop rotation, intercropping, mulching and the use of manure were all commonly used under respondents. It can thus be said that ecoagriculture was highly presented in Kasejjere. The fact that respondents almost all practised ecoagriculture can have various reasons. First, due to the socioeconomic conditions in the area practising agriculture is for the most people the only way to ensure their food security and livelihoods since other off farm employment opportunities are very scarce. The fact that people have little or no capital make that farming is practised by using locally available resources and simple tools. The absence of modern agricultural techniques is mainly caused by these socio-economic conditions. Therefore it appears that practising ecoagriculture is thus not so much a choice but rather a necessity in an area where agricultural output is directly linked with livelihoods. Secondly, the lack of education and agricultural extension services in Kasejjere make that people depend on their own knowledge and the often traditional methods they learned from grandparents. Thirdly, the role of KEA in promoting ecoagriculture in Kasejjere should be stressed, since the association has been active for over ten years and is since 2004 very much involved in sensitizing people on ecoagricultural farming practices. People in Kasejjere are encouraged by KEA to plant trees on and around their farm, use cow dung as manure and to apply several other ecoagricultural practises. KEA, by the time the research was conducted, is still a very active association..

However, it was also found that respondents that were not a member of KEA were less aware of ecoagricultural concepts and practised less ecoagricultural methods. The respondents that were KEA members on the other hand, were sensitized on the subject of environmental protection and more talkative in this respect. This indicates that sensitization on ecoagricultural farming practices by KEA has been very effective. Since most people in Kasejjere have no further access to extension services or agricultural knowledge, KEA is in that respect an important authority for farmers in the area.

The development of ecoagriculture in Kasejjere is also being constraint by several factors. First, the vague land arrangements in the area make that some farmers are very limited in the implementation of ecoagricultural methods, as they do not have full responsibility over the land they cultivate and are thus not eager to make (long-term) investments. Secondly, the growing population in the area is putting an increasing pressure on agricultural land and yields. As the population of Kasejjere has kept growing over the last decades (interview 7), the pressure on natural sources also increased. The area already went through a period of serious degradation whereby, according to Mr. Kaganga, many biodiversity has been lost[1] (interview 7). Although the area may appear like a natural system, many ecosystem functions could already have been lost, due to the degradation of these natural resources. The continuous population

[1] The exact numbers were not known

growth could in the future seriously affect ecoagricultural practices as people are forced to cultivate more or more intensively.

To ensure the further development of ecoagriculture in Kasejjere, education on ecoagricultural concepts and practices is of great importance. Since farmers in Kasejjere live in an underdeveloped area where the pressure on agricultural land will increase the coming years e.g. due to population growth, sustainable use of natural resources is crucial. Providing education through KEA has proven to be effective in Kasejjere as it empowered people and made farming systems more in consent with ecoagricultural principles. Since two third of the population in Kasejjere is below 18 years old, there is also a great potential to educate children on environmental protection and ecoagriculture. To maintain the existing ecoagricultural farming systems in Kasejjere, it is of great importance that future generations are sensitized in this respect. The Green Hill Education Centre that was founded by KEA is already making a valuable contribution.

In Migyera, where a total different setting was found, the extent to which ecoagriculture was being practised could not so much be assessed by using information gathered during farm observations, like this was done in Kasejjere. Moreover, it was based upon the outcomes of the interviews. Compared to Kasejjere, respondents in Migyera tended to be less aware of ecoagricultural concepts, or less talkative in that respect. During the interviews it became gradually clear that NACIA had not been so active over the last three years, thus indicating that the respondents didn't receive trainings or sensitization.

Overgrazing in Migyera was by some respondents haltered by establishing paddocks. These paddocks promoted vegetation growth and thus restored pastures. The fact that some people own large herds of cattle make it difficult to manage grazing and measures like paddocks are often too small to fight the immense land degradation in the area. However, paddocking is a good ecoagricultural practice that enables vegetation growth and restores the nutrient balance in the soil. During the fieldwork it could not be indentified who was the first that came up with the idea to use paddocks.

In order to halter the overstocking of the land in Migyera, community effort would be needed to establish more paddocks or fence more land for a longer period of time. However, cattle in Migyera are a financial asset and can be seen as the living capital of a farmer. The more cattle is owned, means a greater buffer in times of scarcity. Convincing farmers to make their herds smaller in order to sustain pastures would thus be a difficult task.

The fact that people in Migyera were living in an area where also large wild animals occurred, would in the ecoagricultural theory be seen as a opportunity to protect wildlife by means of community effort. However, people in Migyera experienced so much hindrance from these wild animals that the only solution they saw was to kill them. Without any help from outside e.g. in the form of education, removal of wild animals, training on how to deal with this, people have no other choice than continue to kill these animals.

From the discussion above we can conclude that in Kasejjere ecoagriculture was highly presented. In Migyera this was more difficult to assess, but the research showed that respondents were less aware of ecoagricultural concepts and less talkative in that respect. The LISF could in both communities contribute. In Kasejjere it could promote ecoagriculture even more by sensitizing people and introduce the idea of farmer innovation, in Migyera it could increase the awareness of farmers on ecoagricultural methods and stimulate them to practise more ecoagricultural methods. The effectiveness of the LISF within the two communities was dependent of several factors.

Firstly, it heavily depended on the clarity within the program. However, no working definition of ecologically-oriented agriculture was found within the PROLINNOVA program and also the LISF program did not sufficiently incorporate ecoagriculture in its implementation. The fact that no working definition was used resulted in ambiguity within the program. The objectives of the LISF should be clear and to ensure the quality of its implementation both the country coordinator, the chairmen of the CBOs, the farmers and farmer innovators should receive the same information and work according the same principles. The fact that the country coordinator was not enough informed about ecoagriculture, and thus gave no trainings to the CBO on this specific topic, undermines the effectiveness of the program as a whole.

Secondly, the provisioning of information was found to be of great importance. The communication between the country coordinator and the chairman of the CBO turned out to be decisive. The chairman of KEA, for example, was well informed on the LISF and its objectives, since he received three trainings from PROLINNOVA. The chairman of NACIA was also informed but had not been able to pass down this information to community members. This research showed that if sensitization of farmers on the topic of innovation and ecoagriculture had been inadequate, this directly corresponded with the implementation success of the LISF. In Migyera, for example, the sensitization of community members had been insufficient; resulting in a weak implementation of the LISF whereby it did not reached its objectives. In Kasjjere, on the other hand, sensitization on the topic of farmer innovation by the country coordinator and the chairman had been adequate, resulting in various ecoagricultural sound innovations. However, in Kasejjere not enough attention was paid to ecoagriculture and the link with farmer innovations. This resulted in a low awareness amongst innovators regarding the importance of their innovation for the protection of the environment. Nevertheless, it should be kept in mind that the concepts of innovation and ecoagriculture have their foundation in the Western scientific world and could have been difficult to transfer to these two rural communities.

Overall it can be said that the implementation of the LISF has been far more successful in Kasejjere than in Migyera. This is mainly due to the fact that people in Kasejjere received more sensitization. The guidance during the LISF implementation has been more extensive in Kasejjere. In addition, Migyera received some larger grants in the past as it was involved in projects of the UNDP, GEF and UNCCD. The relatively small amount of money that was disbursed by PROLINNOVA, without sufficient explanation of where it was meant for, could have probably seen as development aid that could be used for technical measures.

There is a great potential to improve the LISF on some critical points to ensure better implementation in the second round of the LISF. Although the LISF had been more successful in Kasejjere, there are still points for improvement for both communities. As PROLINNOVA is currently working on the design of the LISF 2, a set of recommendations is developed, using the findings of this research to enable improvements within the program in the future. The next chapter will present the recommendations.

CHAPTER 7 RECOMMENDATIONS

This chapter will make some recommendations based on the findings of this research. The recommendations are meant to serve as points for improvement for the further development of the PROLINNOVA program and the implementation of the second phase of the LISF.

The findings of this research showed that ecoagriculture is weakly presented within the PROLINNOVA program and the implementation of the LISF in Uganda. Following recommendations towards PROLINNOVA are meant as suggestions on how to improve the program in respect to incorporating the concept of ecoagriculture in the future. The recommendations can be seen as 'ideas for improvement' for the next phase of the LISF.

During the research it became apparent hat across different levels the term ecoagriculture was not understood properly (e.g. chairmen of CBOs, country coordinator). This ambiguity diminishes the overall effectiveness of the program. The importance of ecoagriculture and the relation with farmer innovation should be stressed by strongly recognizing and incorporating ecoagricultural principles and concepts in all levels of the program. The flow of information between the authority; PROLINNOVA and the 'end-users'; the beneficiary of the fund should be controlled. This can be achieved by:

I. **Set up a working definition of the term 'ecologically-oriented agriculture' that is used and understood within all the levels of the PROLINNOVA program.**

Since the site specific conditions often determine to a great extent what type of innovations are developed, an assessment of these conditions could be used to adjust the trainings and workshops given by the country coordinator to these specific sites. Providing area-specific trainings could potentially result in a greater variety amongst innovations or stimulate innovations in unexplored areas of ecoagriculture. Therefore it is recommended to:

II. **Undertake a pre-assessment of the agricultural, ecological and socio-economic conditions of the area prior to the implementation of the LISF.**

As it was found that in Migyera the implementation of the LISF had been inadequate and that community members were not sensitized compared to Kasejjere it is recommended to:

III. **Guide CBOs more extensively during the implementation phase and are provided with sufficient training and information to ensure the efficiency and effectiveness of the program. Both the members of the CBO, chairman and community members should be sensitised sufficiently to ensure sound innovations within ecoagriculture.**

Since indentifying innovators and recognizing sound ecoagricultural innovations are the main features of the PROLINNOVA program the process of which this is done should be adequate. Moreover, as the LISF follows a decentralized organisation in Uganda and the screening of innovations is thus done by the CBOs, clear guidelines regarding the use of the TEES-test or training on how to screen innovations should be given. Therefore it is recommended to:

IV. **Make better use of the TEES-test and other screening criteria that are used to assess innovations and provide adequate guidelines for the CBOs on how to use these.**

Since the PROLINNOVA program aims to expand the scope of the LISF in the future and is preparing for the second phase of the LISF in Uganda (targeting eight more CBOs) adequate documentation could greatly improve the transparency and accessibility of the program. Documenting innovations thereby provides ideas and inspiration for others enabling the spread and up-scaling of local innovations. To accomplish this, it is recommended to:

V. **Improve the documentation of the LISF by structurally gathering information on farmers, their innovations and the setting in which innovations were developed.**

GLOSSARY

Agrochemicals

A generic term for the various chemical products used in agriculture

Agroecology

The scientific study of the relationship between agricultural crops and the environment

Agroforestry

An integrated approach to agriculture whereby the interactive benefits from combining trees and shrubs with crops and/or livestock are used

Biodiversity

The genetic, species and ecological diversity of the organisms in a given area

Cash crops

Crops that are sold rather than consumed

Composting

The biological degradation of organic material under aerobic (oxygen-rich) conditions to produce compost, a nutrient rich soil amendment and conditioner

Conservation biology

The scientific study of the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction.

Ecoagriculture

Conservation strategy and a rural development strategy that aims at conserving biodiversity, enhancing agricultural production, and improving livelihoods

Ecological niche

The functional role and position of a species (population) within a community or ecosystem, including what resources it uses, how and when it uses the resources, and how it interacts with other populations

Ecology

The scientific study of relationships between organisms and their environment

Ecosystems

A specific biological community and its physical environment interacting in an exchange of matter and energy

Ecosystem services

Benefits supplied by natural ecosystems and supported by biodiversity

Fallow

An agricultural practice that leaves a farmland unseeded during one or more growing seasons to regenerate soil fertility

Green Revolution

Dramatically increased agricultural production; usually requiring high inputs of water, plant nutrients and pesticides.

Habitat

The place or set of environmental conditions in which a particular organisms lives

High input farming system

A farming system that is heavily relies on external inputs like fertilizers and pesticides for its production

Indigenous knowledge

Long-standing traditions and practices of certain regional, indigenous, or local communities

Local innovation

The process to which individuals or groups discover or develop new and better ways for managing resources, building on and expanding the boundaries of their existing knowledge

Low input farming system

A farming system that for the largest part makes use of natural resources instead of external inputs

Monocropping (monocultures)

Extensive planting of a single crop species that enables efficient production but encourages pests and disease infestation and conflicts with wildlife habitat

Mulching

An agricultural practice whereby the ground is covered with either natural products or synthetic materials that protect the soil, save water and prevent weed growth

Negative externalities (related to agriculture)

Detrimental impacts that are the result of agricultural production

Organic agriculture

Is the form of agriculture that relies on crop rotation, green manure, compost, biological pest control to maintain soil productivity and control pests, excluding or strictly limiting the use of synthetic fertilizers and synthetic pesticides, plant growth regulators, livestock feed additives, and genetically modified organisms.

Pollination

Pollination is the process by which pollen is transferred in plants, thereby enabling fertilisation and sexual reproduction.

Multicropping (polycultures)

The cultivation of multiple crops on the same place, imitating the natural ecosystem

Sub-humid

A climate zone that is characterized by hot, humid summers and cool winters

REFERENCES

Aliguma J. (2008) "Small farmer participation in export production: The case of Uganda" Agricultural Management, Marketing and Finance
Accessible online:http://www.fao.org/AG/AGS/subjects/en/farmMgmt/pdf/Uganda.pdf

Altierri M.A. (1999) "The ecological role of biodiversity in agrocecosystems" *Agriculture, Ecosystems and the Environment* **72**: 19-31

Altieri M.A (2002) "Agroecology: the science of natural resource management for poor farmers in marginal environments" *Agriculture, Ecosystems and Environment* **93**: 1-24

Altieri M.A. (2004) "Linking ecologists and traditional farmers in the search for sustainable agriculture "*Frontiers in Ecology* **2**(1): 35-41

Asiimwe, J. (2002) Women and the Struggle for Land in Uganda. In Tripp A.M., Kwesiga, J.C. *The Women's Movement in Uganda: History, Challenges and Prospects*, Fountain Publisher, Uganda

Ayyad M.A. (2003) "Case studies in the conservation of biodiversity: degradation and threats "*Journal of Arid Environment* **54**: 165-182

Bachou, H., D. Labadarios (2002) "The nutrition situation in Uganda" *Elsevier Science* **18** (4) 356-358

Bolwig S., D. Pomeroy, H. Tushabe and D. Mushabe (2006) "Crops, trees, and birds: Biodiversity change under agricultural intensification in Uganda's farmers landscapes" *Danish Journal of Geography* **106** (2): 115- 130

Brookfield H. and M. Stocking (1999) "Agrodiversity: definition, description and design" *Global Environmental Change* **9**: 77- 80

Buck L.E., T.A. Gavin, D.R. Lee and N.T. Uphoff (2004) "Ecoagriculture: a review and assessment of its scientific foundations" Cornell University, Ithica, New York

Butler S.J., J.A. Vickery, and K. Norris (2007) "Farmland biodiversity and the Footprint of Agriculture" *Science* **315**: 381- 384

Convention on Biological Diversity (2008) "Biodiversity and Agriculture. Safeguarding Biodiversity and Securing Food for the World"

Chambers R. (1994) "Participatory Rural Appraisal (PRA): Analysis of Experience" *World Development* **22**: 1253- 1268

Critchley W. (1998) "From soil conservation to sustainable land management: A new approach For Africa" in: "Sustainable Land Management: Some Signpost for South Africa". University of the north press South Africa

Critchley, W. (2008) Working with farmer innovators – a practical guide, Centre for International Cooperation, Amsterdam, The Netherlands

Diaz S., J. Fargione, F. Stuart Chapin III and D. Tilman (2006) "Biodiversity Loss Threatens Human Well-being" *Plos Biology* **4** (8): 1300-1305

Duelli P. (1997) "Biodiversity evaluation in agricultural landscapes: And approach at two different scales" *Agriculture, Ecosystems and Environment* **62**: 81-91

Duelli P. and M.K. Obrist (2003) "Biodiversity indicators: the choice of values and measures" *Agriculture, Ecosystems and the Environment* **98**: 87-98

Environmental Alert (2007) Guidelines for Local Innovation Fund Applicants, Internal Document, EA, Kampala, Uganda

Francis, P., James, R. (2003) Balancing Rural Poverty Reduction and Citizen Participation: The Contradictions of Uganda s Decentralization Program. *World Development* **31** (2) 325–337

Gaston and Spicer (2005) Biodiversity: An Introduction. Second edition. Blackwell Publishing.

Green R.E., S.J. Cornell, J.P.W. Scharlemann and A. Balmford (2005) "Farming an the fate of wild nature" *Science* **307**: 550-554

Hagen, K. (2008) From Land Degradation to Innovation. MSc Thesis Environment and Resource Management, Vrije Universiteit, Amsterdam, The Netherlands (unpublished)

Jackson, W., A. Ingles (1998) Participatory Techniques for Community Forestry: A Field Manual. Australian Agency for International Development, IUCN – The World Conservation Union, World Wide Fund for Nature

Magdoff F. (2007) "Ecological agriculture: Principles, practices, and constraints" *Renewable Agriculture and Food systems* **22** (2): 109-117

Karuhanga-Beraho (2002) The Women's Movement in Uganda and Women in Agriculture In: Tripp A.M., Kwesiga, J.C. (Eds.) *The Women's Movement in Uganda: History, Challenges and Prospects*, Fountain Publisher,Uganda

Kaihura F. and M. Stocking (2003) Agricultural biodiversity in smallholder farms of East Africa. United Nations University Press

Kikandwa sub-county (2008) Development Plan of Kikandwa sub-county FY 2008-2009, Kikandwa, Mityana, Uganda

Kikandwa Environmental Association (1999) The Constitution of Kikandwa Environmental Association, Mityana, Mityana District, Uganda

McLaughlin A. and P. Mineau (1995) "The impact of agricultural practices on biodiversity" *Agriculture, Ecosystems and Environment* **55**: 201-212

McNeely J.A and S. Scherr (2003) Ecoagriculture. Strategies to Feed the World and Save Wild Biodiversity. Island Press

Meul M., F. Nevens, D. Reheul, H. Gulinck and G. Hofman (2004) "Gebruik van bio-indicatoren voor ecologische landbouw: mogelijkheden en beperkingen" Stedula publicatie 5. Steunpunt Duurzame landbouw

Millenium Ecosystem Assessment (2005) Biodiversity Synthesis Report. Accessible online: http://www.millenniumassessment.org/documents/document.354.aspx.pdf

Nabiswera sub-county (2008) Development Plan of Nabiswera sub-county FY 2008-2009, Nabiswera,Nakasongola, Uganda

Nalukonge Community Incentives Association (2002a) The Constitution of Nalukonge Community Incentives Association. Nakasongola, Nakasongola District, Uganda

Nalukonge Community Incentives Association (2007) LISF Proceedings. NACIA, Migyera, Migeera parish, Nakasongola, Uganda

National Environmental Management Authority (2007) National State of Environment Report (SOER) Uganda 2006-2007.

NatureUganda (2008) "Conserving Biodiversity on Farmland". A guide to Agricultural Extension Work

Pinstrup-Andersen P. and R. Pandya-Lorch (1998) "Food security and sustainable use of natural resources: a 2020 vision" *Ecological economics* **26**: 1-10

Pretty J. (1999) "Can Sustainable Agriculture Feed Africa? New Evidence on Progress, Processes and Impacts" *Environment, Development and Sustainability* **1:** 253–274

PROLINNOVA-Uganda (2007) The guidelines for implementing LISF. EA, Kampala, Uganda

PROLINNOVA (2008a) Annual Report. Internal document given by country coordinator, EA, Kampala, Uganda

PROLINNOVA (2008b) Farmer's Access to Innovation Resources, Synthesis of Lessons Learned.

PROLINNOVA-Uganda (2008c) Uganda Farmers Access to Innovation Resources (FAIR) Phase 2 Work Plan. Uganda County Program, Environmental Alert, Kampala, Uganda

Ruecker G.R., S.J. Park, H. Ssali and J. Pender (2003) "Strategic Targeting of Development Policies to a Complex Region: A GIS-Based Stratification Applied to Uganda" Centre for Development Research

Scherr S.J. & J.A. Mc Neely (2002) "Reconciling Agriculture and Biodiversity: Policy and Research Challenges of 'Ecoagriculture', opinion article for the International Institute for Environment and Development

Scoones,I., Thompson, J. (1994) Knowledge, Power and Agriculture – Towards a Theoretical Understanding. In Sconnes, I., Thompson, J. (1994) Beyond Farmer First, Intermediate Technology Publications, London, UK

Swift M.J., A.-M.N. Izac, M. van Noordwijk (2004) "Biodiversity and ecosystem services in agricultural landscapes—are we asking the right questions?" *Agricultural ecosystems and the Environment* **104**, 113-134

Thrupp L.A (2000) "Linking agricultural biodiversity and food security: the valuable role of agrobiodiversity for sustainable agriculture" *International Affairs* **76**: 265-281

Tilman D., K.G. Cassman, P.A. Matson, R. Naylor and S. Polasky (2002) "Agricultural sustainability and intensive production practices" *Nature* **418**: 671- 677

USAID (2006) “Uganda Biodiversity and Tropical Forest Assessment” . Final report. No.351
Accessible online: http://www.epiq2.com/pubs/uganda_biodiversity_final.pdf

Waters-Bayer A. L. van Veldzhuizen, C. Wettasinha and M. Wongtschowski (2005) “Developing Partnerships to Prolote Local Innovation” in Research and Development for Sustainable Agriculture and Natural Resource Management. A sourcebook. Volume 2: Enabling Participatory Research and Development p. 74 - 83

Wood S., K. Sebastian and S.J. Scherr (2000)” Pilot Analysis of Global Ecosystems: Agroecosystems” International Food Policy Research Institute and World Resources Institute, Washington, D.C.

World Resource Institute (1992) “Global Biodiversity Strategy” Accessible online: http://archive.wri.org/publication_detail.cfm?pubid=2550

WOCAT (2007) “Where the land is greener”. Case studies and analysis of soil and water conservation initiatives. Editors: Liniger H. and W. Critchley

WWF (2008) Living Planet Index 2008. Accessible online: http://assets.panda.org/downloads/living_planet_report_2008.pdf

Zarafshani K. (2002) “Some Reflections on the PRA Approach as a Participatory Inquiry for Sustainable Rural Development: An Iranian perspective” *Proceedings of the 18th Annual Conference. Durban. South Africa*

INTERNET SOURCES

Central Intelligence Agency (2009) World Factbook Uganda. https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html (last update, September 2009)

Environmental Alert (2009) http://www.envalert.org/general/index.php (updated 2009 August)

PROLINNOVA (2009) www.prolinnova.net (updated in September 2009)

The International Union for Conservation of nature. www.iucn.org/biodiversity. (last update, August 27, 2009)

ANNEX 1: INTERVIEW SHEET

Name:
Age:
Place of Origin:
Religion:
Tribe:
Klan:
Status in the family:
Status in the community:
Highest level of completed education:
Marital status:
Family size: <10 10-18 >18
Current/ main occupation:
Organization /network:

General:

1. Do you, yourself, own certain resources, such as land?
If yes, how did you get it?
If no, how do you access resources?
2. How do you generate your income?
3. a. Do you have a bike? Do you think it is/ it would be useful to have a bike? If so, why?
b. Can you ride a bike? If no, would you like to learn to ride a bike?
4. Have you ever travelled outside of your district? If so, when, where, how long?
5. Do you have access to credit? If so, what type? Since when do you have it? What do you use it for?
6. Have you ever received training/ help from an extension agent? If so, please describe what was it about?

Daily activities, rules and norms

7. a. How does your average day look like?
b. How do you feel about this?
c. Does it differ from the activities you have done 5 years ago? If so, please describe how!
d. If you need help with anything, who do you ask?
8. Do you consider these activities to be typically something for women/men? If so, why?
9. Do you think that men/women would be able to carry out these activities? If so, which ones and why?

10. How many hours do you work per day?
11. Do you sometimes have time for yourself? If so, how do you spend your free time?
12. What type of activities your wife/husband do?
13. Who is responsible for childcare in your family?
14. Do you have friends? If so, how many/ who are they/ how often do you meet/ where/ on what occasions?
15. Are there things that you cannot do because you are a woman/ man? If so, what are these things?
16. a. What are the general expectations towards women/men in your community?
In other words (if respondent doesn't understand the question): How should a good women/ men in your community behave?
b. Have these general expectations changed within the last 10 years? If so, how?

17. How the decisions are made within your household?
18. If you want something else than your husband, what happens?
19. Do you like being a woman/ man?
20. Overall, do you think women's or men's lives are more difficult? Why?

Farming and Nature

21. According to you, what is nature? Could you give examples! (What is biodiversity?)
22. Do you enjoy nature? If so, why?
23. How important is nature for you / for the productivity of your farm?
24. a. What do you do to keep your farmland in a good condition?
    b. What inspired you to do so?
25. Do you do special things on your farm to make sure you don't harm nature? If so, please give examples!
26. In the last 2 years which specific problems did you face?
27. How do you think you can solve these problems?
28. a. What do you consider to be poor farming practices?
    b. How do you feel about this?
29. Do you tell others about how you manage your farmland? To who? What do you tell?
29. How do you think your farm differs from other farms?

KEA and NACIA

30. When did you join KEA/NACIA?
31. Why did you join KEA/NACIA?
32. Is your husband/wife is a member of KEA? If not, why?
33. What sort of activities are you involved in within KEA/NACIA?
34. How has your life changed since you joined KEA/NACIA?
35. How has your everyday activities changed since you joined KEA/NACIA?
36. a. How often do you attend KEA/NACIA meetings?
    b. Does it happen that you cannot join the meeting? If so, why does it happen?
37. a Do you feel confident to speak up at KEA/NACIA meetings?/ Do you feel that people listen to you?
    b. How has it been in other meetings/generally speaking up in public (before and after joining KEA/NACIA)?
38. Do you think people look at you differently since you joined KEA? (e.g. jealousy, respect)
39. Has your relationship with your wife/husband change since you joined KEA/NACIA?
40. What are the main problems that women face in your community?
41. What do you think, how has KEA affected women's livelihoods?
42. a. What is the role of KEA/NACIA in your community?
    b. How do you see this in the future?
43. Do you think that more man or more women will join KEA/NACIA in the future? Why?
44. What do you think are the most important accomplishments of KEA/NACIA?
45. How would you like to see your community in the future? How can KEA/NACIA contribute to accomplish this?

KEA for non-members

30. Have you ever heard about KEA/NACIA?
31. How would you describe the activities of KEA/NACIA?
32. What is your opinion about KEA/NACIA?
33. Why have you not joined KEA/NACIA?
34. Would you like to join KEA/NACIA in the future? Why?
35. What do you think about the members of KEA/NACI (women and men)?
36. How do you think your farm differs from those of KEA/NACIA members?

40.-44. SAME as for members

Innovation/ Fund/Support

45. What is your innovation?
46. How did you come up with this idea?
47. Why did you come up with this idea?
48. When did you come up with this idea?
49. Did you create your innovation alone? If together with someone, with whom?
50. Did your innovation become income generating? If yes, how did you spend the extra income?
51. How did you hear about the LISF?
52. a. Did you decide yourself how to spend the money? If not, whit whom?
    b. How did you exactly spend the money?
    c. Was it enough?
53. Did your innovation become income generating?
    If so, how have you spent the extra money?
54. Did the LISF improve your innovation? If so, how?
56. How has the LISF affected your livelihood?
57. Has your innovation improved the quality of your farmland? If so, how?
58. Do you think people look at you differently since you received the LISF? If so, how?
59. Do you think about yourself differently since you have received the LISF? If so, in what way?
60. Do you think there is a difference between women and men innovators? If so, what are these?

For non-members/non-innovators:

45. Have you heard about the LISF?
46. Could you describe in few sentences what LISF is!
47. Did you apply for the fund? (IF MEMBER) If not, why did you not apply?

If yes, what do you think why did you not get it?

48. What do you think about the innovators?
49. Do you think that the innovators' farms differ from your farm? If so, how?

ANNEX 2: LIST OF INTERVIEWEES

Core Team members
Interview 1 – Ronald Lutalo (in 2 parts)
Interview 2 – Stella Lutalo
Interview 3 – Frederick Musisi Kabuye
Interview 4 – Magdalena Ogwanga

Stakeholders
Interview 5 – Nature Uganda
Interview 6 - Makerere

Community members Kasejjere
Interview 7 – John Kaganga
Interview 8 – John Musisi
Interview 9 – Teddy Nakalyango
Interview 10 – Margaret Nabatanzi
Interview 11 – Mary Rose Kamalwa
Interview 12 – Joyce Nantongo
Interview 13 – Oliver Nakyeve
Interview 14 – Eleth Nakirembe
Interview 15 – Dan Lukwago
Interview 16 – Joseph Butya
Interview 17 – Haruna Nsubuga
Interview 18 – Salongo Kakembo
Interview 19 – Vincent Lutalo
Interview 20 –Leonard Kitali
Interview 21 – Jackson Kamia
Interview 22 – Ephraim (Second name unknown)
Interview 23 – Agnes Musita
Interview 24 – Gertrud Nasuwuga
Interview 25 – Navagala Sirira
Interview 26 – Nakwoga Mary
Interview 27 – Peter Solongogi Salongo
Interview 28 – Namusisi Bulinina
Interview 29 – Nalubega Skovia
Interview 30 – Nabotebe Justin
Interview 31 – Nagugo Agnes
Interview 32 – Goreth Kasolo

Community members Migyera
Interview 33 – Skovia Kamirimbi
Interview 34 –Slyvia Ruzindana
Interview 35 – Paul Mugame
Interview 36 – Rukira Fred
Interview 37 – Geodffrey Sebwato
Interview 38 – Rwamuhuku Stephen
Interview 39 – Natalo Stephen
Interview 40 –Noweri Georg
Interview 41 – Lubega Ruth
Interview 42 – Namara Violet
Interview 43 – Mpyra Aida
Interview 44 – Kezia Luanga
Interview 45 – Margaret Lauwhusa
Interview 47 – Andrew Semuzana
Interview 48 – Emanuel Kiriri
Interview 49 – Maya Lameck
Interview 50 – Robert Luwange
Interview 51 – Josephin Muharatama
Interview 52 – Kevina Kebirunga
Interview 53 – Kuebazo
Interview 54 – Gloria Tasoba
Interview 55 – Dodo Rogyesz

ANNEX 3: HISTORICAL TIMELINES MADE IN MIGYERA

Timeline of NACIA

July 1998 – Formation of Nalukonge Community Initiatives to Combat Desertification (NCI)

August 1998 – Formation of 6 ranch committees constituting NCI

1999 - The Convention to Combat Desertification (CCD) comes in with a grant

1999 - The activities under the CCD are carried out

1999 - Chairperson, NCI, attended the 1st National Forum on CCD (anti-desertification Campaign)

2000 - The chairperson attends the LLC1 Conference at Gweru, Zimbabwe (together with the National Focal Person on CCD)

2002 - Formation of NACIA (legal recognition) as a CBO.

- Trainings in formation and administration of CBOs
- Acquisition of GEF/SGP grant for the CODETTIC project

2002 – 2005 – The CODETTIC project activities:

- Tree planting
- Soil erosion control
- Beekeeping trainings
- Termite experimentation
- Water harvesting/water tanks
- Mbarara farm tour

February 2003- Official Launch of CODETTIC project by Honoured Minister MAAIF

June 3, 2003 – The World Environmental Day celebrated/ national function hosted by NACIA

2004 – The NACIA group visits the Isingiro farmer about Biogas and low-cost water tanks (IGAD/SWESU)

2004 – 5 low-cost water tanks built after the Isignio visit

2005 - Joint experimentation on termites (NARO) – using local predator ants

2005 – The Ethiopian team visits NACIA

2005 – PROLINNOVA 1st visit to NACIA (mr. Alex Lwakuba)

April 2005 - LISF idea introduced

August 2006 – Signing of LISF contract with EA

July 2007 – Another Ethiopian exchange visit

2006 – 2008 – Training and workshops attended by NACIA members (executives)

- Sharing meetings
- Plan and review meetings at National level
- Farmer Led Documentation (FLD) workshop (dec 2006)

April 2008 – NACIA participates in NLPIP Governmental program

September 2008 – NACIA starts participating in NAADS Governmental program

March 2009 – Chairperson attends International PROLINNOVA meeting (2 weeks) at Tamale, Ghana

April 2009 – NACIA goes on training in funding management

TIMELINE OF THE ENVIRONMENT IN MIGYERA

Group 1:

Prolonged drought in 2009: from August 2008 – June 2009
After that, long drought, people faced famine and water problem
In the middle of 2009- 2008 people lost their animals (e.g. cows, goats) because of drought
2007- we got a lot of rainfall and we grow crops and our animals were healthy
2006- people were poor because there was a caratin of animals, our animals were sick, suffering.
2006- our children died of measles and malaria
2004- we got government aided schools, mosquito nets, free immunisation, tarmac roads in the villages
2003- we got money, valley dams, termite drugs, barbed wire, and poles from NACIA. We got money from honey
2002- people started to cut trees and burning charcoal for generating money. NACIA started
2001- there was a private diary to collect milk and people got jobs, but the private cooler was taken back. It could collect about 300 litres and now we lack it
2000- people learnt to join groups and to borrow some money. Other failed to pay back the amount because of high profits
1999- we got hospitals and Government aided schools
1998- subdivision of lands and we learnt to build permanent houses and we could not shift/mean migrating
1997- we got bore holes and valley dams
1994- **drought and hippo** killed people looking for water

Group 2:

2009**- Draughts**, scarcity of water, excessive destruction of crops by **wild animals**, death of cattle due to draught
2008 (Mar-June) - Rains (May- Sept) Dry season
2007- Heavy rains, High crops yields
2006. Piped water system installation in Migeera town and UWESO School opens in Nalukonge village
2006- (Jan-May) Dry season, cattle death, famine; (May-Dec) Draughts, effect of draughts, affected school-going children attendance, Migration of some farmers in search of water and pasture
2005- Measles Epidemic and Whooping Cough (among children), famine, dry season (Dec-Mar)
2005- Earth-quake- affected women pregnancy and destroyed buildings
2004-2005- Tree Planting (Moringa and Pine), Trenching
2005-2009- **Wild dogs kill** and eat people's goats, sheep and calves; Rabid dogs attack people and livestock
2000- Electricity Installation in Migeera town
1997- Above normal rains throughout the year, floods affecting roads and displaced people in low lying areas
1993-1998- Ranging restructuring exercise by government (reallocation of land to small-scale farmers
1992-1994- Long dry season, **wild animals** destroyed crops; CBPP (Epidemic of contagious bovine pleuroneumonia) disease killing cattle
1990-2009- Increasing prevalence of and destruction by termites
- land degradation process
- increasing rate at which trees are cut for charcoal due to the rise in the prizes of charcoal caused by the high demand in urban centers
1980- the longest **draught**- killing very many cattle and causing famine

Seasonal calendar Kasejjere village 2009 (men)												
	Jan	**Feb**	**Mar**	**April**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
Rainfall	1	1	3	5	5	3	1	2	3	5	4	2
Crops	*Harvesting:* Maize Beans Cassava Sw. potatoes Banana Irish potatoes Fruits	*Harvesting:* Maize Cassava Sw. Potatoes	*Planting* (1): Beans Maize Cassava Irish potatoes Banana Millet Soya bean Sorghum	*Planting:* Beans	*Planting/ Weeding:* Sw. potatoes	*Weeding/ Pruning season:* Coffee Bananas Passion fruit Oranges Mangoes	*Harvesting/ Preparing:* Fruits Beans Maize Irish potatoes Bananas Cassava Millet Soya bean Sorghum	*Planting(2)/ Preparing:* Onions Maize Sorghum Millet	*Planting:* Beans Soya beans Groundnuts Greens Cassava Irish potatoes	*Planting/ Weeding:* Sw. potatoes Bananas Matooke Coffee seedlings	*Harvesting:* Coffee Onions Greens Irish potatoes	*Harvesting:* Sorghum Maize Millet Groundnuts Cassava Bananas
Activities	Preparing land Harvesting Drying seeds	Preparing land Harvesting annual crops Drying seeds	Planting Preparing land	Planting	Weeding Planting	Weeding Pruning	Harvesting Drying seeds	Harvesting Preparing Planting	Planting Weeding	Planting Harvesting Weeding	Harvesting	Harvesting Drying seeds
Labor intensity	5	4	4	4	3	2	5	5	5	4	3	2
Food	5	4	3	3	1	3	5	5	4	4	5	5
Income	5	3	2	1	1	2	4	5	5	5	5	5

	Name/age/status/ household size (Kasejjere)	*Natural*	*Physical*	*Financial*	*Social*	*Human*
1.	**Ms. Margaret** 43 years Household head 7C (not home) 4C (at home) Innovator	2 acres (access trough mother) 0,5 acres (owned)	1 cow 3 chickens 3 hoes, 1 knife	Hires labour (occasional) Selling seeds Selling food products Selling animals	KEA, KEA Women group, Bambula Parish Women group Friends: 10 Help:	Primary 7 Counsellor Sub-county, Pastor in church, chairperson Bambula Parish Women group Training: sub-county
2.	**Mrs. Teddy** 28 years Married 5C (at home) Innovator	3 acres (access through husband)	3 goats 9 pigs 1 chicken tools?	Selling pigs and chicken	KEA, KEA women group Friends: 4 Help:	Senior 3 Secretary of KEA women group
3.	**Ms. Mary Rose** 38 years Household head 4C (at home) 2C (not home) 3GC (at home) Innovator	2 acres (owned trough mother)	3 cows 8 pigs 10 chickens 4 goats bike (-) tools?	Selling crops and pigs	KEA, KEA womengroup Friends: uncountable Help:	No education
4.	**Ms. Joyce** 36 years Household head 3C (at home) 3C (not home) Innovator	12 acres (owned trough husband)	8 cows 9 pigs 7 chicken 2 goats 5 hoes, 2 pangas, 3 knives, 2 axes bike (-)	Hires labour (occasional) Trading (maize, coffee) Selling crops	KEA, KEA womengroup Friends: uncountable Help: John	Primary 7 Head of building committee in church, member general committee KEA, LISF committee member (publicity)
5.	**Ms. Betty** 49 years Household head 2C (at home) 4C (not home) Innovator	1 acre (owned, bought)	1 pig 10 chicken 6 hoes, 2 pangas, 1 knife bike (-)	Salary from tailoring Selling banana wine Selling animals Selling baskets and mats	KEA, KEA womengroup, NRM Friends: 10 Help:	Senior 1 Chairperson NRM Training: sub-county, Bucadef
6.	**Ms. Oliver** 30 years Daugther 2C (at home) Innovator	0,5 acres (acces trough mother)	400 chicken 2 pigs 3 hoes, 1 spray, 1 panga, 1 spade, 1 axe, bike (-)	Salary from school Selling animals Credit from NAADS	KEA, Baraka Alumni, Nakasete farmergroup Friends: 2 Help: mother, brother, boyfriend	Diploma in Agriculture Primary school teacher, modelfarmer NAADS Training: workshops in Luweero/Kampala/Hoima

7.	**Mrs. Eleth** 45 years Married 3C (at home) 3C (not home) Innovator	4 acres (owned trough mother)	1 cow 2 pigs 185 chickens 10 goats 6 hoes, 3 pangas, 6 slashers, 2 knives, 2 axes, 1 spade, bike (-)	Selling animals Selling crops	KEA, KEA womengroup Friends: 5 (best) Help:	Senior 4 Vice-chairperson Nakwaya womengroup, vice-chairperson ICAD Training related to farming Bucadef
8.	**Mr. Dan Lukwago** 31 years Single Innovator	0,5 acres (owned, bought)	3 cows bees tools? Bike (+)	Selling animals Selling crops	KEA Friends: uncountable Help: friends	Senior 6 (?) Secretary KEA, CBF NAADS, drugs distributor
9.	**Mr. Joseph Butya** 62 years Household head 5C (at home) 3C (not home) Innovator	13 acres (owned, inherited, rented)	5 cows 2 pigs 2 goats 5 hoes, 3 pangas, 1 knife bike (+)	Selling coffee Selling local brew Selling crops	KEA Friends: uncountable Help:	Primary 6, head of men Catholic church
10.	**Mr. Jackson Kamya** 49 years Household head 7C (at home) 1C (not home)	8 acres (owned, entitled)	2 cows 2 pigs 1 goat 30 chickens 10 hoes Bike (+)	Selling crops Selling local brew Trading animals Credit KCBO	KEA, KCBO Friends: uncountable Help: KEA members or KCBO members	Senior 3, elder in church, chairperson LC3 Training: health, farming, rearing animals
11.	**Mr. Salongo Kakembo** 39 years Household head 10C (at home) Married Innovator	4 acres (access, rent)	Animals? Tools? Bike (+)	Selling crops Selling seeds	KEA, Kasejjere farmergroup Friends: >100 Help:	Primary 7 Modelfarmer Training: Mityana district
12.	**Mr. Vincent** 42 years Single 3C (at home) 3C (not home) Innovator	4 acres outside Kasejjere (access, bought)	Animals? Tools? Bike (+)	Salary from KEA Green Hill Education Centre Selling crops Credit Uganda Micro Finance	KEA Friends: uncountable Help:	Grade 3 Head master KEA Green Hill Education Centre
13.	**Mr. Ephraim** 73 years Household head 2C (at home)	8 acres (owned through father)	3 pigs 15 chickens 5 hoes, 1 spray	Hires labour (occasional) Selling crops Selling animals	KEA Friends: uncountable Help: God	Senior 3 Training: growing Vanilla

	7C (not home)					
14.	**Mr. Leonnard Kitaali** 79 years Household head Married 1C (at home) 7C (not home) 6GC (at home) Innovator	5 acres (owned through father)	4 cows 1 pig 1 goat 6 chickens Tools? Bike (+)	Hires labour (occasional) Rents houses in Kampala Selling crops (occasional) Credit NAADS	KEA Friends: uncountable Help:	Senior 3, retired sub-county chief, member executive committee KEA Training: ?
15.	**Mrs. Agnes Musita** 38 years Married 5C (at home) 3C (not home)	10 acres (owned/access?)	Animals? Tools?	Labour? Selling crops Shop	KEA, KEA womengroup, SACCO fundraising Friends:	Senior 3 (?)
16.	**Mrs. Gertrude** 50 years Married 15C (at home)	3 acres (owned, bought) 12 acres (access trough husband)	Animals? Tools?	Selling animals Selling crops	KEA, KEA womengroup, NRM	Primary 7, vice-chairperson NRM
17.	**Mrs. Sirira Navagala** 52 years Married 5C (at home) 3C (not home)	13 acres (access trough husband)	1 cow	No income Credit trough district	KEA, KEA womengroup Friends: 25	Primary 5 Treasurer KEA womengroup, head of women in church
18.	**Mr. John Musisi** 69 years Married 16C Innovator	1 acre (owned trough father) 5 acres (access, renting)	2 cows 11 hoes, 5 pangas 1 spade, 1 axe 2 knives, 1 sickel Bike (+)	Hires labour every planting season Selling crops Selling animals	Friends: uncountable Help: parliament member or John Kaganga	Senior 3
19.	**Mrs. Nakwoga Mary** 37 years Married 16C	6 acres (access through husband)	1 cow 3 pigs 4 hens		Friends: Help: husband	Primary 6
20.	**Mr. Haruna Nsubuga** 35 years Single Innovator	2 acres (access through Klan communal land)	6 cows 2 hoes, 1 panga 1 slasher	No labour Selling crops Coffee trade Rearing cows/chickens	Friends: uncountable Help: fellow farmers	Senior 1

21.	**Mr. Peter Salongogi** 63 years Household head Married 6C (at home) 9C (not ome)	5 acres (owned, bought)	2 cows 2 pigs 1 chicken 4 hoes, 1 panga, 1 spade	Trading local brew Selling crops Selling animals	Ex-member cooperative society Friends: >100 Help: neighbour	Education? Community worker elderly group
22.	**Mrs. Namusisi Bulanina** 38 years Married 7C (at home) 1C (not home)	8 acres (access trough husband)		No income	Friends: 3 Help: husband & few friends	Primary 7
23.	**Ms. Scovia Nalubega** 45 years Household head 4C (at home) 4C (not home)	4 acres (owned, trough grandmother)	1 cow 1 sheep 6 chickens 5 hoes, 1 panga, 1 axe, 2 knives, bike (-)	Trading local brew Selling crops	Friends: uncountable Help: older brother, Jackson Kamya	Primary 7
24.	**Mrs. Justin Nobotebe** 30 years Married 7C (at home)	10 acres (access through husband) Plot outside Kasejjere	Animals? Tools?	Selling local brew Selling crops Selling animals	Friends: <5 Help: husband	Primary 7
25.	**Mrs. Agnes Nagugo** 21 years Married 2C (at home)	10 acres (access trough husband)	2 goats 5 pigs 8 hoes, 5 slashers, 4 pangas, 1 axe	Labour? Selling mats Selling crops	Friends: 7 (best) Help: husband, community, Jackson Kamya	Primary 7
26.	**Mrs. Goreth Kasolo** 35 years Married 5C (at home)	8 acres (access trough father in law)	4 cows 3 pigs 5 goats 10 chickens 6 hoes, 2 axes, 2 slashers, 2 pangas, 3 knives, 2 spdes Rides husband's bike	Labour? Selling crops Selling animals	Friends: 10 (best) Help: husband & friends	Primary 6

	Name/age/status/ household size (Migyera)	*Natural*	*Physical*	*Financial*	*Social*	*Human*
1.	**Mr. George Noweri** 54 years Household head 10C Innovator	150 acres for cattle (owned) (of which 0,5 acres for gardening)	20 cows Bike (+)	Selling cows Credit form Uganda Micro Finance	NACIA Eldeka Kalitas (Catholic organisation) Friends: 20	Primary 2 Chairmen of primary school
2.	**Mrs. Slyvia Ruzidana** 30 years old Married 4C (at home) Innovator	2 acres for a garden (owned)	10 cows 7 goats 2 chickens	No income	NACIA Friends: 8	Senior 6 Secretary of Youth Organisation Chairmen building committee church, LC2 position, parish councillor
3.	**Mr. Paul Mugame** 45 years old Household head 4C (at home) Innovator	100 acres for cattle (owned)	50 cows 10 goats 12 sheep Motorbike (=)	Selling animals Renting houses Mobile phone shop Selling cattle salt Credit from Uganda Micro Finance	NACIA, Eldeka Kaltitas Friends: uncountable	Diploma in accountancy Chairmen of NACIA, treasurer secondary school, board of governance
4.	**Mrs. Josephin Muharatama** 70 years old Married	No land	-	No income	Friends: 9	Primary 7
5.	**Mr. Andrew Semuzana** 79 years old Household head	640 acres for cattle (owned)	100 cows 10 goats 5 chickens Bike (+)	Selling cows Selling milk	NACIA Friends: 10	Primary 3
6.	**Mrs. Skovia Kamirimbi** 37 years old Married 4C (at home) Innovator	No land	10 cows 4 goats 15 chicken	No income	NACIA Friends: 10	No education Member NACIA executive committee
7.	**Mr. Fred Rukira** 46 years old Household head 8C Innovator	320 acres for cattle (access, lease)	30 cows 3 goats Bike (+)	Selling milk	NACIA Friends: uncountable	No education LC1 defence
8.	**Mr. Frank Karuhanga** 32 years old Household head	No land	Bike (+)	Salary as cattle keeper	Friends: 2	Primary 3 Treasurer Eldeka Kalitas

	2C (at home)					
9.	**Mr. Geofrey Rwamuhuku** 62 years old Household head 1 (not at home) Innovator	85 acres for cattle (owned)	40 cows Bike (+)	Selling cattle	NACIA Friends: uncountable	Senior 2 Vice-chairmen LC1
10.	**Mr Stephen Ntalo** 60 years old Household head 2C (at home) 6C (not at home) Innovator	640 acres (owned) (of which 2 acres for gardening)	150 cows 100 goats 30 chickens Bike (+)	Selling cattle Selling milk Credit Migyera money lenders	NACIA Friends: 10	Senior 4 Land Committee member at sub-county
11.	**Mr. Emanual Kiriri** 51 years old Household head 9C	40 acres (onwed)	13 cows Bike (+)	Selling cattle Hires labour	NACIA	Primary 3
12.	**Mrs. Ruth Lubega** 62 years old Married 8C (not at home)	30 acres (access, trough husband)	10 cows 5 chickens Bike (-)	Selling handcrafts Credit Uganda Micro Finance	NACIA Friends: uncountable	No education Head of women in church
13.	**Mr. Maaya Lamech** 34 years old Married 1C	40 acres (owned) 3 plots in Kampala and Migyera (owned)	20 cross-breed cows 70 goats 30 chickens Motorbike (+)	Salary from motel Selling milk	NACIA, Eldeka Kalitas Friends: uncountable	Senior 4
14.	**Mr. Robert Lewange** 40 years old Household head 15C (at home)	70 acres (owned) (of which 10 acres for gardening)	30 cows 10 goats, 10 sheep 5 pigs 40 chickens, 6 beehives Bike (+)	Selling crops and farm products Credit from Eldeka Kalitas	NACIA, Eldeka Kalitas, NAADS, Save the children Friends: uncounatble	Primary 5 Church leader
15.	**Mr. Godfrey Sebwato** 70 years old Household head 7C Innovator	782 acres (owned)	400 cows 50 goats Bike (+) Motorbike (+)	Selling crops Selling cattle Renting houses in Kampala	NACIA, Eldeka Kalitas, governmental rangeland organisation Friends: uncountable	Senior 4 LC1 chief

16.	**Ms. Violet Namara** 40 years old Household head 6C (at home)	No land		Salary as cattle keeper	Friends: few	Primary 6
17.	**Ms. Aida Mpyra** 35 years old Household head 3C (at home)	70 acres (owned) (of which 3 acres for gardening)	??	Selling chickens Selling handcrafts	NACIA Friends: 9	Primary 4
18.	**Ms. Kezia Luanga** 70 years old Household head 4C (not at home)	1280 acres (access, trough husband) (of which 2 acres for gardening) Plot in Migeera	80 cows 8 goats	Selling milk	NACIA, Wamukembe Friends: uncountable	No education Adult classes
19.	**Ms. Kevina Kebirungu** 70 years old Household head 5C (not at home)	30 acres (access trough Kezia Luanga's land)	20 cows	Selling handcraft	NACIA, Eldeka Kalitas, Wamukembe Friends: uncountable	No education Church leader
20.	**Ms. Kyabazo** 36 years old Household head 3C (at home)	5 acres (access trough Kezia Luanga' land)	3 cows Bike (-)	Selling bananas Selling crops	Friends: 3	No education
21.	**Mr. Rogers Dodo** 37 years old Household head 7C (at home)	6 acres (owned) (of which 1 acre for gardening)	3 cows 3 goats 1 sheep Bike (+)	Selling milk	Friends: 6	Primary 5
22.	**Mrs. Margaret Namhiusa** 28 years old Married 2C (at home)	30 acres (access, through husband)	10 cows 30 goats 10 chickens Bike (-)	Selling cows Hotel business	NACIA Friends: uncountable	No education
23.	**Mrs. Gloria Tashobie** 27 years old Married 4C (at home)	640 acres (access, trough husband) (of which 5 acres for gardening)	Bike (-)	Selling milk Selling crops Hires labour	Friends: uncountable	Senior 4