ANNEX FOUR

Scoping for Ecoagriculture Practices in Selected Landscapes in Kabale, Kayunga and Kisoro Districts - Uganda

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In collaboration with:

Environmental Alert
Kabale District Local Government
Uganda Agroforestry Development Network (UGADEN)

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List of acronyms

A2N	African 2000 Network
ADRA	Adventist Development Relief Agency
CIDI	Centre for Integrated Development Initiatives
DRC	Democratic Republic of Congo–
INED	Integrated Environmental Defence
NAADS	National Agriculture Advisory Services
NAHI	Nature Harness Initiatives
NARO	National Agricultural Research Organisation
NGO	Non-Governmental Organisation
PMA	Plan for Modernisation of Agriculture
PRIME west	Productive Resource Investment for management of environment in Western Uganda
UBOS	Uganda Bureau of Statistics
UGADEN	Uganda Agroforestry Development Network
UNFFE	Uganda National Farmers Federation
WID	Wetland Inspection Division

Executive Summary

This study to document ecoagriculture practices was carried out in Rushebeya-Kanyabaha wetland landscape in Kabale district, Echuya-Chahafi-Kayumbu landscape in Kisori district and Nazigo-River Nile landscape in Kayunga district. These landscapes represent distinct areas ranging from mountainous to hilly and generally flat areas with undulating hills. The selection of these landscapes largely depended on where intensive agricultural production and environment/biodiversity conservation overlap.

The project specifically involved documentation of working ecoagriculture innovations, proving a synthesis and lesson learning and also establishing a community of practice for ecoagriculture innovators. Ecoagriculture practices were documented in the categories of agricultural practices, livelihoods and ecosystems and biodiversity management for each landscape.

Ideally, landscapes attributes differ in different landscapes save for Kabale and Kisoro where the topography is almost similar. Both Kisoro and Kabale landscapes are hilly and mountainous and have a high population density compared to that of Kayunga, which is gently sloping. All landscapes have over 90% dependence on agriculture for their livelihoods. Major crops grown include Irish potatoes, cabbages, sorghum and bananas in Rushebeya-Kanyabaha landscape, pineapples, vanilla, cabbages and coffee in Nazigo-River Nile landscape. Irish potatoes, tomatoes, onions and wheat are the main crops grown in the Echuya-Kyahafi-Kayumbu landscape.

The three landscapes are unique because of their richness in natural resources and agricultural practices. These include Echuya central forest reserve, lakes Chahafi and Kayumbu in the Kisoro landscape, Kitanga wetland in Kabale landscape and R. Nile in the Kayunga landscape. These features double as habitats for biodiversity and some are homes for globally threatened species (Echuya central forest reserve and Kitanga wetland). Conservation efforts have been initiated in these landscapes, but still a lot needs to be done to protect the habitats and the biodiversity therein. The project indentified several wetland-based enterprises which include crafts making, capture of wild fish, fish farming and bee keeping in Rushebeya-Kanyabaha and ecotourism and fish farming in Echuya-Chahafi-Kayumbu landscape. These are major sources of food and incomes for the landscape dependant communities.

A number of environmental and human-induced threats were identified. They include degradation of landscape resources, landslides, soil erosion, siltation of water bodies, high population growth rates, poor institution arrangements and poor markets for agricultural products and services. For instance, increased population growth rates and therefore need for more food has exerted a lot of pressure on the natural habitats that have been converted to agriculture. This has seen more forested areas converted for agricultural production over the years, wetlands encroached on, all of which are threats to biodiversity conservation.

There are opportunities in implementing ecoagriculture practices in agricultural landscapes. These were identified in each landscape. In Rushebeya-Kanyabaha

landscape, opportunities include payments for environmental services, agroforestry, small livestock rearing, and intensifying wild fish capture, bee keeping, improving on production and marketing of crafts, and improving on soil and water conservation practices. Bamboo domestication and marketing, biodiversity conservation, access to forestry resources from Echuya central forest reserve and proper management and utilisation of resources from Lake Chahafi and Kayumbu were the major opportunities identified in the Kisoro landscape. The Kayunga landscape has opportunities for scaling up shade coffee growing and also growing pineapples on a larger scale to enjoy the economies of scale.

1.0 Background

This project is a follow up of the first ecoagriculture leadership course that was held in Naivasha, Kenya, November 2006. The project aimed at documenting activities that integrate increased agricultural productivity, biodiversity conservation and improvement of rural livelihoods in the selected landscapes in Kabale, Kayunga and Kisoro districts. In effect, the prject aimed at establishing the state of practice of ecoagriculture. The project lead Institution is Nature Harness Initiatives (NAHI) working in partnership with Uganda Agroforestry Development Network (UGADEN), Environmental Alert, Kabale District Local Government and Uganda National Farmers Federation (UNFFE).

This project was implemented alongside a similar one in Kenya, in order to initiate information generation and sharing within Uganda but also with Kenyan counterparts.

1.2 Rationale for the scoping study

Ecoagriculture is a rural development and conservation framework that seeks to simultaneously achieve improved livelihoods, conservation of biodiversity and sustainable agricultural production at a landscape scale. Landscapes therefore should be managed to ensure sustained supply of food, forest and wetland products to meet human needs while at the same time conserving biodiversity on which the productive functions depend.

Unfortunately production of food and other products for human well-being have been undertaken with less regard to biodiversity conservation. Similarly, biodiversity conservation efforts have been implemented without adequate recognition given to the linkages and interactions with the production of food for the growing human population. There is a strong assertion that wider adoption of ecoagriculture practices contributes to achievement of the millennium development goals on hunger, poverty alleviation and environmental sustainability.

It was recognized at the Nairobi ecoagriculture conference 2004 (Nairobi Declaration) that grass root communities and farmers all around the world have practiced ecoagriculture principles for millennia, with the potential for maintaining ecosystems and transforming vast areas of degraded lands and other habitats of high biodiversity value. These efforts have however not been documented and disseminated in ways that can be used to influence wider national and regional scaling up. Besides, the implementation of ecoagriculture practices has been by default rather than deliberate effort through organized multi-stakeholder initiatives at a landscape level.

With increasing population growth however, there is more pressure on natural resources which is already making the practicing of ecoagriculture increasingly difficult. The state of the environment report for Uganda 2004/2005 for example notes that land degradation, especially through soil erosion is the single largest contributor to the annual cost of environmental degradation, deforestation rates are high on customary and private lands as a result of conversion of forest areas into agricultural and pastoral lands. The report also notes that the decline in wildlife outside protected areas continues almost unabated as a result of increased off-take, the blocking of migratory routes and habitat conversion. Ecoagriculture practices are therefore at the cross roads requiring intervention to ensure

that there is deliberate, planned and coordinated effort to systematically design and implement good ecoagricultural practices that cater for biodiversity conservation in agricultural landscapes. The documented cases of good practices by this study provide the basis for better understanding, sharing of knowledge about landscape specific efforts to promote biodiversity conservation as well as improving agricultural productivity and people's livelihoods. There is need for a wider adoption and scaling up across the country.

1.3 Justification

This project aims at promoting innovative approaches of natural resource management for improved livelihoods and incomes. This is mainly through promotion of practices that enhance and sustain resource productivity while enabling rural communities to access markets for agricultural and natural resource products and services.

Efforts have been put in documentation of initiatives in the area of payments for ecosystem services especially on ongoing and potential carbon trade projects and potential watershed payments projects as the latter are still in the initial stages of development. Interested parties have highlighted the need to update this information to enable bringing payments for ecosystem services to scale.

Initiatives that integrate increased agricultural productivity, ecosystem conservation and improved rural livelihoods are important in ensuring that there is sustained resource productivity and income generation. The information generated is hoped to contribute to the promotion of understanding among interested stakeholders of current approached by communities to sustain agricultural productivity and biodiversity conservation for improved livelihoods.

The dissemination of project outcomes is ongoing. The outcomes have been and will be disseminated to target farmer leaders, agricultural/rural development workers and local government leaders to better understand the linkages between agriculture, biodiversity conservation and rural livelihood improvement. It is hoped that these will in turn better serve farming communities within selected productive landscapes both men and women for improved management of their productive landscapes. In addition, the government partners should be able to develop policies and programs that should address the three objectives of ecoagriculture and it is hopped that this will increase levels of resource investment to sustain the initiatives.

Information generated will further benefit ecoagriculture leaders/innovators, individuals involved in the implementation of agricultural and conservation programs and agencies such as the Plan for Modernisation of Agriculture (PMA) and the National Agricultural Advisory Services (NAADS), local government administrations and extension and conservation NGOs that all aim at promoting enhanced agricultural productivity while sustaining the natural resource base.

The benefits of the project have already been partly realized (as planned) as the results were used as a resource material during the second east Africa Ecoagriculture leadership

training that took place in Jinja, Uganda in April 2008. A case study on Rushebeya-Kanyabaha Wetland landscape, Kabale District was prepared and shared with the participants in the training course, which generated their understanding of landscape-specific ecoagriculture practices.

1.4 Project Description

The project undertook the documentation of ongoing initiatives that integrate improved biodiversity conservation, agricultural productivity and rural livelihoods in Uganda focusing on selected landscapes in the districts of Kisoro, Kabale and Kayunga. Information about the institutions behind the ecoagriculture initiatives, activities undertaken, biodiversity values, and impact of the activities on rural livelihoods, policy context was compiled.

1.5 Project Goal and Objectives

1.5.1 Goal: Establish the state of ecoagriculture practices in Uganda by undertaking a scooping study in selected districts.

1.5.2 Specific Objectives:

a) Develop inventory tools: Develop appropriate inventory tools for conducting ecoagriculture analysis at different scales.

b) Documentation of working ecoagriculture innovations and their contexts: This involved documenting working eco-agriculture practices in selected landscapes in the districts of Kayunga, Kabale and Kisoro, developing their profiles and conducting a critical analysis of the pre-conditions for the success of ecoagriculture. The institutional and policy context in which the initiatives operate were established as well.

c) Synthesis and lesson learning: Undertake a synthesis and lessons sharing in implementing ecoagriculture practices among ecoagriculture innovators in Uganda. This mainly involved organizing practitioners, community leaders and farmers meetings for information sharing at the landscape level.

d) Establish a community of Practice for Ecoagriculture innovators: Establish a community of practice for ecoagriculture leaders and innovators in Uganda that will link to other initiatives in the region including that of Kenya. A community of practice to involve: i) Organising experiences /information sharing events among ecoagriculture leaders and innovators in Uganda; iii) developing a web page under the ecoagriculture and participating institutions websites iii) contributing to an ecoagriculture newsletter; and iv) linking up with other processes and networks implementing ecoagriculture related work.

2.0. Methods

The project team took a step-wise approach to project implementation. The different steps undertaken are outlined in Box 1 below.

Box 1: Key steps in establishing state of ecoagriculture practices at the landscape level.

- Development of ecoagriculture practices assessment tool (appendix I).
- Identify Ecoagriculture hotspots-Landscapes* (consult local government technical staff and local leadership)
- Identify local actors/service providers in the areas of biodiversity/ecosystems conservation, agriculture and livelihoods. These should act as local facilitators and provide the first line of contact with people living in the landscape.
- Delineate the landscape boundaries-describe the location and administrative units that comprise the landscape.
- In a selected landscape, villages were selected to get village level information (landscape analysis units based on a common resource/resource in common)
- Generate landscape level information from landscape key actors-land owners/users (establish ownership and user rights). These are key informants.

2.1 Development of eco-agriculture practices assessment tools

The development of the tool for assessing ecoagriculture practices was done in a consultative process involving participants from the project partner institutions. These include members from, in addition to Nature Harness Initiatives, Environmental Alert, Kabale District Local Government, and Uganda Agroforestry Development Network (UGADEN). Tools were tested in the field and agreed upon as valid and reliable for data collection.

2.2 Selection of the landscapes

The selection of the landscapes for this assessment largely depended on areas where agricultural production overlapped with biodiversity conservation. Also, the level of support to the livelihoods of people counted for selection. Based on these and with the help of area local leadership (Textbox 1), three agricultural landscapes were selected from 3 districts for this study. The landscapes include the Rushebeya-Kanyabaha wetland landscape from Kabale district, Echuya-Chahafi-Kayumbu landscape from Kisoro district and Nazigo-River Nile landscape from Kayunga district. They represent distinct areas ranging from mountainous to hilly (Kabala and Kisoro) and generally flat areas with undulating hills (Kayunga). Villages were selected from landscapes, which acted as the basic units for data collection.

2.3 Selection of respondents

Local leaders acted as the first line of contact and were used to identify key players in the selected landscapes. These included Service providers, resource users/beneficiaries, elders and other resource persons like the elders in the selected landscapes. Selection was purposively done because of need for respondents who were knowledgeable about the given landscapes. They helped in delineation of the landscape boundaries (landscape definition), identification of villages which have particular interests in various commodities, identification of resource users/beneficiaries and other players in the landscapes. With all the above in place, a scooping exercise was then undertaken to establish ecoagriculture practices in these landscapes.

2.4 Overview of the project-implementing districts.

2.4.1 Kabale District

Kabale district lies in the South West of the Republic of Uganda. It lies between 29^0 45' and 30^o 15' East longitude and 1^o 00' and 1^o 29' south of latitude. It borders with the Districts of Kisoro to the West, Rukungiri to the North, Ntungamo to the East and the Republic of Rwanda to the South. The district consists of Ndorwa, Rubanda and Rukiga as the three (3) rural counties and Kabale Municipality as the only urban area. The relief of Kabale ranges between 1,200m to 3000m above sea level, with the highest points being to the western and southern parts of the District. The district covers an area of Kabale, 1827 sq.km.

Kabala District has an estimated total population of 458,318 people, of which 214,552 are males and 243,766 females with the population density of 281.1 persons per sq. km. It has a population growth rate of 2.7%, quite lower than the national average of 3.5%. It is a rural district with 91% of the population staying in the rural areas.
The inhabitants are mainly Bakiga. However other ethnic groups are found in the district. These are mainly the Banyarwanda and Bafumbira. However there are no records available about where the tribes are settled and in what numbers. The population composition indicates a high dependency ratio of 50%.

Kabale has a montane climate with a bimodal rainfall pattern. It has two main rainy seasons of March to May as the heavy rains and September to November as light rains with intervals of some dry spells. June to August is the main dry season and December to February is the short dry period with little rain. The mean annual rainfall is 1,092 mm per annum and mean annual temperature is 180 C. The mean annual maximum temperature is 24.1^0 C and mean annual minimum is 11.6^0 C. Since 19994, the highest mean annual monthly temperature was 27.2oC in Sept 1997 and the mean annual monthly minimum temperature was 9.6^o C in July 1999. The relative humidity ranges between 90% and 100% in the mornings and decreases to between 42% and 75% in the afternoons throughout the year (Meteorological Dept, Kabale District 2005).

On land use, district has a total area of 1,827 square kilometres, out of which arable land area is 1,695 sq. km, water body is 48.5 sq. km, swamps/wetlands is 79.4 sq.km and marginal land is 41.1 sq km. About 75% of arable land is largely owned according to

customary laws. However, some land is held by freehold and leasehold of about 41.1 sq. km (2.4%) and 391.2 sq. km (22.6%) respectively. The average land area for agriculture is 2.06 ha or 5.08 acres per household. The per capita land holding is 0.3 ha/0.8acres (1995). Land is seriously fragmented and an average household has 6-7 plots of land on different hillsides. Each plot measures between 0.1 and 0.7 of an acre

2.4.2 Kayunga District

Kayunga District is located in the central region of Uganda, boardering with six districts ie Apac in the north, Mukono in the south, Luwero and Nakasongora in the west and Jinja and Kamuli in the east. The district comprises of two counties - Ntengeru and Bbaale. It has an annual average temperature of 19-25^{o}c with average rainfall of 1000mm-1200mm per year over two main rain seasons-March-May and August-November. The topography is generally flat with undulating hills and savannah vegetation cover.

Kayunga has a total population 297,081 people, of which 144,609 are males and 152,472 are females, with a population density of 213 persons per sq km. The majority of populations live in rural areas, with the urbanization level of only 6.7%. The original inhabitants of Kayunga District are the Baganda. However, Kayunga District has a diversity of ethnicity. There are other emigrants such as the Nubians of Sudanese origin, the Japadhola from Tororo, the Basoga, Ateso, Banyara, Bakayi, Luo, Bagisu, Rwandese and Asians who have become permanent residents in the area

Kayunga district has an average infrastructure development. It has both Tarmac and Murram roads. It has a total of 48km Tarmac road from Sezibwa bridge to Nyinze in Kangulumira sub-county on the boundary with Mukono and Jinja district again. The district has a sufficient supply of piped water from River Sezibwa and a reliable sub-power station located at Bukoloto on Kayunga –Mukono high way. Rural electrification extends to as far as Busaana and Bbaale where Diary farming is practiced. Kayunga district has a relatively low percentage of literacy, i.e. 46% literacy rate compared to 54% national average. The district has one government hospital at Kayunga, Four sub-district health centers each with a Maternity Theatre and a Resident Doctor, Eight Sub-county Health centers and 6 parish health units. (Nazigo Health center (III)

Over 90% of the population in Kayunga district depends on agriculture as a source of income. The climate, fertile soils, bimodal rainfall which peaks in March-May and October-November and vast lands make agriculture one of the best option for Kayunga's population. The district has a big potential for industrialization especially for agro-based industries. This is possible because of the variety of raw materials, which include food and cash crops, fruits and animal products. There is also fishing mainly on lake Kyoga, River Nile and R. Sezibwa. Kayunga District is endowed with potential sites for fish farming. The whole of Ntenjeru County, i.e. Kangulumira, Nazigo and Kayunga Sub counties are potential areas for this activity. The Sub counties contain wetlands, and swamps that are covered by water through out the year. These areas can be productively turned into fish farms to boost fish production and supplement capture fishery. Some local farmers are already engaged in this activity.

2.4.3 Kisoro District

Located on the South-western tip of Uganda, Kisoro district covers a total area of 729.7 square kilometres. It borders Kanungu districts to the north, Kabale to the east, The DRC to the west and the Republic of Rwanda to the south. It is a one county district (Bufumbira) with 13 sub-counties, one town council, 34 parishes, 2 town wards and 38 villages. It covers a total land area of 729.7km^2 of which 679.9km^2 is open land and 49.8 km^2 is covered by water and swamps (National Biomass study 1995).

According to UBOS (2002), the District has a total population of 219,427 people (males 99279 and females 120,148), with a sex ratio of 86 males to 100 females. The population density is 323 people per sq.km, with the fertility rate per woman of 8.5% and it has an average annual population growth rate of 3.53%. Over 96% of the district population lives in rural areas and 4% are urban dwellers. The crude population death rate is 16.5/ 1000.

The district is inhabited by people from different ethnic backgrounds. The percentage ethnic composition of the inhabitants is summarized in the table below.

Ethnic Group	**%age**
Bafumbira	68
Bakiga	16.1
Banyarwanda	15.4
Batwa /Pigmies	0.1
Banyankole	0.08
Others	0.32
Total	100

Source: Census Analytical Report 2002

The Bafumbira are the largest ethnic group in the district (68%) followed by the Bakiga (16.1%). The Pigmies were resettled from the forests of now Bwindi Impenetrable National Park to create room for conservation and also to give them the opportunity to be integrated with human communities and live a human life unlike the wilderness they were staying in.

Kisoro enjoys a mountain type of climate with maximum temperature of 23-25^{o}c and minimum of 10-12^{0}c. The mean annual maximum temperature recorded is 26^{o}c and the mean annual minimum temperature is 14.5^{o}c. The maximum temperatures are recorded in the months of January to March and July to September, which correspond to dry spells. The district receives two rainfall seasons with a mean annual rainfall of 1500 mm especially during the months March-May /June. It has relative humidity of 80-90% and this falls to 40% during the dry season.

Kisoro district covers a mountainous area, which lies approximately 1981 meters above sea level. It covers an area with two types of terrain, namely the low land upland mountain landscapes. The highest point is in the volcanic ranges of Mgahinga with 3475 meters, Muhavura with 1427 meters and Sabyino with 436 meters above sea level. The

volcanic ranges are interspersed by wide saddles with drainage valleys occupied by extensive swamps in Nyakagyezi, Kabiranyuma, and Kazibakye.

The district has a radial drainage pattern with several rivers and numerous streams descending the mountains in all directions. The volcanic mountains of Virunga ranges, Bwindi and Echuya highlands provide the most important drainage systems in Kisoro district. These are sources of gravity flow schemes to supply rural population in Nyarusinza, Chahi and Muramba sub counties. The district has both surface and underground water sources. Open water bodies cover an area of 28.3km^2 and swamps 98.8km^2 of the district total area. There are crater lakes of Mutanda, Murehe, Chahafi and Kayumba. There is a network of permanent swamps, many of which have been put under cultivation. Important swamps are Rugezi, Kaburanyuma and Nyakagezi, which are located in saddles between volcanoes of Muhavura, Sabyino and Mgahinga.

The major land use is agriculture and it employs 93.4% of the people in the district. The district land use figures show that this activity is on 543.9 sq.km of the total area, while the rest is covered by the tropical high forests-fully stocked (102.9 sq.km), tropical high forests-degraded (11.4 sq.km), open water bodies (28.3 sq.km), papyrus swamps, grassland/bushland plantations and built up areas (National Biomas Study, 1995).

Kisoro district has different soil types and this can be explained in terms of both geological and geomorphologic processes, which have a lot of significance on soil formation. The soils in Kisoro are mainly volcanic and they are among the most productive in Kigezi region. The volcanic ash soils are mainly found in the southern part of the district in the sub counties of Busanza, Muramba, Chahi, and Nyarusinza around Mufumbira mountain ranges. Environmental geology and geomorphology are important factors influencing the district's high soil fertility levels, with a high productivity potential which has been enhanced by reliable rainfall and moderate evapotranspiration rate.

3.0 Results

This section presents the results of the scooping study of ecoagriculture in the selected landscapes of Uganda. The section begins with the profile of the districts in which the agricultural landscapes were selected to give the readers a better understanding of their location and other attributes.

3.1 Description of the agricultural/study landscapes

This section describes the landscape sites that were selected for this project in the three districts of Kabale, Kisoro and Kayunga.

3.1.1 Rushebeya-Kanyabaha wetland Landscape (Kabale Landscape)

The Kanyabaha-Rushebeya landscape lies in Kabale district in the Kigezi highlands, South-western Uganda. Kigezi highlands are one of the most densely populated areas in Uganda facing severe environmental problems that reflect on people's livelihoods. The Rushebeya-Kanyabaha landscape is shared between the three sub-counties of Bukinda, Rwamucucu and Kashambya all in Rukiga County, Kabale district. This landscape is described by the Rushebeya-Kanyabaha wetland (gazetted as a protected wetland under the National Wetland Policy in 2002) and its associated catchment area. The wetland in particular is a resource of common interest to the people living in the landscape. It is delineated by the boundaries of seven parishes that share border with the wetland. The parishes are: Kangondo and Kyerero in Bukinda sub-county; Rushebeya-Kanyabaha wetland and Kitunga in Kashambya sub-county and Burime, Nyakagabagaba, Kitojo in Rwamucucu sub-county.

Part of the Rushebeya-Kanyabaha wetland landscape

The Rushebeya-Kanyabaha landscape is quite rich, involving an interaction of major natural resources. Its primary assets include; the long-stretching wetland, water resources, vast low-lying land and a wide range of hills. People have also planted trees for fuelwood and timber. The trees are mainly planted as woodlots, along farm boundaries and in a few cases scattered on the fields. The common tree species planted or regenerating naturally

are eucalyptus and black wattle. Rainfall in the landscape is bimodal. The long heavy rains are from March to May while the short rains are from October to November. June, July and August are generally the driest months of the year. The mean annual rainfall varies from 800-1000mm. Mean annual minimum and maximum temperatures are 10.9º C and 24.4º C respectively (NEMA, 2001). There has been a rise in average minimum temperatures of 0.7º C since 1995 in Kabale district. This is higher than the world average rise and has resulted in many changes in microclimates of the valleys and hills (Kabale district council 2000).

3.1.2 Echuya-Chahafi-Kayumbu landscape (Kisoro Landscape)

Echuya-Chahafi-Kayumbu landscape is described by a host of natural resources that are of great importance not only to Kisoro district alone but also to the national and global environment. The landscape name is derived from the two lakes-L. Chahafi (1.0 sq. km) and L. Kayumbu (2.1 sq km) which are separated by an all-weather road that joins the two villages across; and Echuya forest, a biodiversity conservation and catchment area for the two lakes. Surrounding the lakes are degraded hills planted with mainly eucalyptus trees with loose soils due to poor water retention capacity. This has accelerated soil erosion and siltation of the lakes is a possible outcome.

In the middle ground is L. Chahafi

Echuya Forest Reserve in the background

The photographs above provide a general overview of the landscape. The formation and nature of Lake Kayumbu is similar to that of Chahafi in the picture and both lakes are separated just by an all-weather road. The lakes are a major source of water to the surrounding communities. The second picture shows the interaction of the lake (in the middle ground) and Echuya Forest Reserve (in the background). To the right of the middle ground is one of the many hills in the landscape with scattered eucalyptus on loose brown eroding soils. This is where one elder in the area described as “having petrol underneath”. These natural features provide a major source of livelihood to the surrounding communities.

3.1.3 Nazigo-River Nile (Kayunga) Landscape

This landscape is part of a larger section of Kayunga District that is generally flat with gentle slopes. It rolls gently and touches River Nile and there therefore, a major catchment area for the river. There is a lot of farming activity going on for the soils are relatively fertile. As such, the area is a hub for pineapple production in the district. Coffee, matooke, sugarcane vegetables like cabbages are among other crops grown.

3.2 Livelihoods of people living in the landscape.

The central premise of the ecoagriculture approach is that conservation and production goal, to a great extent, can be jointly achieved at the landscape scale while at the same time enhancing household and community welfare. Many of these livelihood benefits stem from products harvested from natural areas in the landscape, or from the ecosystem services produced jointly by natural and agricultural areas (Scherr and McNeely (2007). This part examines how production systems are a contributor to livelihoods in agriculture landscapes.

3.2.1 Rushebeya-Kanyabaha Wetland Landscape.

Rushebeya-Kanyabaha landscape has a big population, mainly composed of one tribe, the Bakiga who are predominantly subsistence cultivators. The landscape population, estimated at 67,406 people, is one of the highest in Uganda (UBOS, 2002). The high population densities in the area constitute a high pressure on the resources particularly agricultural land. Almost all available land has been cleared for agriculture leaving the wetland as the next option source of land for cultivation. The settlement pattern is characteristic of the Kigezi highlands where settlements are mainly located in the lowlands and concentrated in a few places.

Table 1: Human Population in Rushebeya-Kanyabaha landscape

Sub-county	Area (km^2)	Male	Households	Female	Total	Av. HH Size
Bukinda	57.83	9,467	3,863	9,844	19,412	4.9
Kashambya	130.04	11,381	5,006	12,646	23,670	4.7
Rwamucucu	110.55	3,724	4,989	12,806	24,324	4.9
Total	**298.42**	**24,572**	**13,858**	**35,296**	**67,406**	**4.8**

Source: Uganda Population and Housing Census (2002)

The main economic activity in Rushebeya-Kanyabaha landscape is agriculture. This is practiced for both subsistence and commercial purposes. The wetland provides livelihood for the densely populated local communities in form of farming, grazing, fishing, raw materials for building and handcraft, water for domestic purposes as well as hunting and bee keeping. Harvesting of craft materials is one of the major activities of the communities surrounding this wetland and according to WID (2001), about 162 specialized craft makers are reported to be involved in the harvesting of materials from the wetland for crafts. Fishing, fish farming and wild animal hunting are among major activities in the wetland. There are an estimated 45 specialized Sitatunga hunters from

surrounding areas. The hunters kill the animals and also destroy the wetland that harbors the animals through bush burning.

3.2.2 Nazigo-River Nile (Kayunga) Landscape

Despite the diversity of ethnicity in Kayunga mainly due to immigration, the population in this landscape mainly comprises of the original inhabitants-the Baganda. Majority of these people live in the rural area as the urbanization level at only 6.7%. They therefore largely depend on agriculture for their livelihood. Whereas the majority of the farmers are still engaged in subsistence cultivation, some have graduated to medium-scale farming, mainly producing for sale. These are mainly engaged in pineapple, coffee and vegetable (mainly cabbages) growing. Because of this, trade is booming in the area as traders from Kampala and Kayunga town frequent the area for the products. This however is being enjoyed by a handful of successful farmers and the rest are still lining under miserable conditions.

Efforts have been put in place to add value to their raw materials. A processing plant was put in place to produce wine from pineapples and after production for some time, it broke down and no attempts have been put in place to bring it back to function. A certain women's group is also engaged in drying vegetables so that they can be preserved over seasons. This is mainly for food security purposes, and also for sale. The challenge has been that the production is still at a very low scale and training has not rolled over to a larger community, first in the landscape and then to district at large.

3.2.3 Echuya-Chahafi-Kayumbu (Kisoro) Landscape

The landscape is mainly inhabited by the Bafumbira and Banyarwanda ethnic groups, mainly depending on potatoes, sorghum, and beans as their major foodstuffs. Since the majority of the inhabitants in the landscape are peasant farmers who practice subsistence farming, they depend on the sale of their food surpluses and casual labour to earn a living. With the help of credits and saving groups which have instilled among the people a saving culture, most of the households have been able to graduate from grass-thatched houses to at least those with iron sheets. They have copied the slogan of Rwanda ' Rwanya Nyakansi' meaning fight grass-thatched houses in our community.

In this area, there has been shortage of food due to early sunshine that led to the Aphids epidemic. This affected most of their crops since April 2007. This was made worse by expensive spray chemicals that would have helped in control of the aphids. In each village you find 2-4 spraying pumps serving a total of 100-150 households. This has caused terrible food shortages to the extent that most households do not entertain visitors in their homes because there is no food to serve them. In the affected households, parents force their children to go to sleep because there is no food for supper. In the local language it is referred to as '*Ukwa ten*,' meaning famine period. Famine is aggravated by the fact that only women do the cultivation while men spend most of their time in bars drinking. During the period of food shortage households reduce on meal volume and number of times to eat implying that they eat once a day or some times go without food for a whole day. Some resort to gathering green vegetables like *dodo shusha* and other wild vegetables.

In terms of water and sanitation, most households use lake water which is not suitable/ safe for human consumption. A survey carried out in all lakes of Kisoro by Compassion International proved that the water sources were contaminated and not safe for human consumption.

This landscape has the highest rate of illiteracy where over 30% of the population are illiterate. They narrated how women groups almost fail to get a Secretary for their groups as they could not easily get women who knew how to read and write

3.3 Agricultural practices

Agriculture is the major economic activity in all the three landscape sites and the entire districts at large, like it is for the entire national economy.

3.3.1 Rushebeya-Kanyabaha Wetland Landscape

Crop production

In this landscape, agricultural practices especially for potatoes and cabbages have slightly shifted towards commercial from subsistence farming. Most of these are grown mainly for sale. A list of major crops grown and their respective markets beyond the landscape was compiled and presented as below.

Table 2: Major crops grown and their markets

Crops	Markets	Means of transport	Challenges
Irish Potatoes	Kampala, Rwanda, Kabale, Rukungiri, Mbarara	Vehicles, Bicycles	• Marketing and selling coordinated by middlemen, • low prices to farmers, • Individual farmer marketing (low bargaining power)
Bananas	Kabale, Rukungiri	Vehicles, Bicycles	
Sorghum	Kabale, Kampala, Mbarara, Rukungiri	Vehicles, Bicycles	
Cabbages	Kampala, Kabale	Mainly vehicles	

Irish potatoes, sorghum and vegetables (mainly cabbages) are the major crops grown in the landscape. Other crops include sweet potatoes, maize, beans, peas, millet, egg plants, tomatoes, groundnuts, rice and yams. Producers are in two categories-individual farmers and farmer groups. Whereas individual farmers produce for both home consumption and for sale, farmer groups mainly produce for sale. Sorghum is mainly grown and sold for making local brew (*Omuramba*). Farmers usually add value by fermenting the sorghum for it to fetch a higher market value. On average a kilogram of sorghum costs 300 Uganda shillings, while a fermented one costs 500. Unfortunately, this is only where value (local) is added to the products. All others are just sold in their raw form. Improved crop varieties especially of beans and Irish potatoes have been introduced and adopted by the farmer and this has been recommended for high yields in the area. It should be noted also that the common means of transport used locally for transportation of farm produce are bicycles. Vehicles are used on long marketing routes like to Kabale town, Rukungiri, Kampala and across the boarder to Rwanda.

Fish farming

This is practiced under the umbrella of Kitanga Wetland Fish Farmers Association, a county-based and registered organization. The association is responsible for improved fish farming as well as extending advisory services to the local people in the area. Fish farming is done in ponds which are locally constructed and maintained.

Agroforestry

Farmers have integrated trees on farm to enhance farm productivity. Fruit trees especially avocados, passion fruits and apples dominate the agroforestry plantings. Eucalyptus species generally dominate the landscape, mainly planted for fuelwood and timber since access to these products from the protected areas was denied to them.

3.3.2 Nazigo-River Nile (Kayunga) Landscape

Kayunga district is generally known for being a hub for pineapple production. Much of this is done in the Nazigo-R. Nile landscape mainly in Kangulumira and Nazigo sub-counties. It is the major economic activity of most of the households in this landscape. Because pineapples are produced in big quantities and are of good quality-very tasty in all sizes, Kayunga ranks number one supplier of Kampala city, and of late, they have started exporting them to outside countries, mainly Southern Sudan. Vegetables, especially cabbages are also grown on a large scale and mainly sold in Kampala. Pineapples and vegetables form the major commercial crops from the district and in particular, Nazigo-R. Nile landscape. Other crops grown include matooke, potatoes, yams, maize, rice, vanilla, pumpkins, sugarcanes, beans and coffee.

Shade coffee growing is becoming popular in Kayunga District. Farmers integrate mainly ficus species in coffee plantations for shade. A cross-section of farms visited demonstrated good performance of the innovation on farm and farmers generally showed great interest in expanding their plantations.

3.3.3 Echuya-Chahafi-Kayumbu (Kisoro) Landscape

Like in other landscapes, most of the people in Echuya-chahafi-Kayumbu landscape depend on agriculture for their livelihoods. Irish potatoes, beans, wheat, and vegetables (tomatoes and onions) are the major food crops grown. Livestock farming is practiced by farmers who also grow crops. Livestock normally kept are cattle, goats, local chicken, and pigs. These are their sources of cash income in addition to earning from trade, and small scale industries (carpentry, brick laying, pit sawing and crafts making).

Besides the agricultural crops grown and marketed, this landscape is conducive for Bamboo growing. It grows naturally in Echuya forest reserve, but also, there have been efforts to domesticate it though with little success. There is a potential market for exporting Bamboo chips and plans are underway for planting more of it to sustain the market (some experts are already raising Bamboo nurseries for this purpose). This will give an opportunity to communities in this landscape to increase their cash income through the sale of this product.

3.4 Ecosystems and biodiversity management practices

3.4.1 Rushebeya-Kanyabaha wetland landscape

Biodiversity

The landscape/wetland has a mosaic of natural vegetation, crops and open water patches. The dominant vegetation is *cladium* spp and cyperus papyrus species and these are scattered with *Miscanthidium violaceum*. The swamp is rich in birds with globally threatened species such as Papyrus Yellow warbler (*Chloropeto graciliroshtris*), Papyrus gonolek and others. Besides, the swamp is home for the IUCN red data listed Congo clawless otter (*Aonyx congica*) and Grey- crowned crane. The intact wetland is embedded in a long broad valley surrounded by steep hills. It is a permanent swamp but is seasonally flooded in some places. The wetland receives water from rivers Bufureka and Kabigodi and drains North East into Lake Edward. At its heart is a small lake believed to be very deep. The wetland is also rich in fish such as *Clarias* and *Protopterus* species. This is a major source of proteins and income for the local people.

This wetland is also home to the Sitatunga (*Tragelaphus spekii*), commonly known as the water antelope. This semi-aquatic species is so specialized that it is found only in swamps and permanent marshes or wetlands dominated by bulrushes, reeds, and sedges where it frequents the deepest parts of swamps (Estes, 1991; Owen, 1970).

Soil and water conservation

The mountainous nature of this landscape makes soil and water conservation the biggest challenge as people endeavour to secure better livelihoods. Farming is mainly done on steep slopes and because of limited land for expansion, land is ploughed over and over again to ensure continuous supply of foodstuffs. Contour plouging is practiced to control soil and water run-off downstream.

A number of interest groups were recorded in this wetland. There are over 45 specialized hunters who are mainly interested in Sitatunga for meat. They also hunt in order to reduce the animal populations thereby reducing their threat of attacking their gardens. However, this practice has been checked by conservationists and has since reduced. The local people estimate higher populations than before due to this intervention. The wetland is also the provider of thatching materials as most of the communities around are very low income earners and therefore can only afford local materials for thatching their houses both for humans and domestic animals.

Wetland based enterprises

i) Bee keeping

There is active beekeeping with over 700 bee hives in the wetland, with over three quarters colonized. The wetland is therefore one of the major producers of bee products like honey and wax in the area. Market for honey is available locally as it is a major ingredient for the production of local brew (Enturire). It is also sold in the sourrounding markets and towns.

ii) Crafts industry

Crafts making is an important activity in the area, with the wetland as the main source of raw materials. Popular crafts made out of these materials include mats, ropes, and baskets. Women have particularly benefited from this activity as it is their major source of income. This is done both at individual and group level. A total of 3 groups was reported engaged in large scale crafts making. Markets for their products are available locally, but need outside exposure for bigger markets.

iii) Wildfish capture
Wild fish exists naturally in the wetland. They are a good source of food to the local people, but also a major source of income for the local communities in the landscape. Wild fish is marketed both locally and countrywide. Locally, it is smoked and sold for food in local markets and surrounding towns as it is said to be very tasty and nutritious. It can also be sold when fresh. Beyond the landscape, wild fish is used as bait for fishing Nile perch in L. Victoria. This is the major market and businessmen come all the way to look for it from the local fishermen. Its high demand for use as bait and therefore higher prices offered by businessmen tend to tempt local fishermen sell all their catch for money. This sometimes deprives the local people of their traditional diet.

3.4.2 Echuya-Chahafi-Kayumbu landscape

Biodiversity

The Echuya-Chahafi-Kayumbu is another landscape of great importance. To begin with is Echuya Forest Reserve which encloses a permanent high altitude swamp (Muchuya) at 2,300 m, about 7 km long by up to 750 m wide, in a narrow valley surrounded by steep forested hillsides. The swamp vegetation is dominated by sedges (Carex species) and includes tussock vegetation and giant lobelias. The swamp drains northwest into the Murindi River. Currently, there are no conservation measures for the swamp but the surrounding forests are protected in the 3400 ha Echuya Forest Reserve, which completely surrounds Muchuya Swamp. Echuya is dominated by *Hagenia-Rapanea* moist montane forest and *Arundinaria montane bamboo* (Davenport et al 1996d). Echuya may not be as diverse as other Ugandan forests (using an index of species per unit area, as recorded by the Forest Department biodiversity inventory). However, in terms of conservation value of the species represented (based on the world-wide distributions and occurrence in Uganda forests), Echuya is ranked among the top 10% of sites visited by the Forest Biodiversity Inventory Team (Forestry Department, 2000).

Besides the wetland in Echuya, L. Chahafi and Kayumbu are surrounded by a vast swamp which serves as their immediate catchment. The wetland has attracted the attention of the local leadership because of its biological and economic importance to the population. Due to this, efforts were made to put in place a wetland management plan. However, attempts to implement it were frustrated by limited funds. In one of the attempts to implement this plan, the wetland program helped in establishment of the Buffer zone around the two lakes. The District Environment office provided sugar cane seed to plant in the buffer zone without consulting the landlords and these communities did not look at them as for their own benefit and they ended up eating the sugar cane seed. Now that they have realized that they are the losers, they again requested for seed from the District but they had not got any response by the time of this project.

Wetland-based enterprises

i) Ecotourism.

There is a growing ecotourism industry with a campsite located near Lake Kayumbu. This is the centre for tourism in the area. Though not yet well developed to quality tourism standards, there is potential for growth due to the influx of visitors who come to see these natural features in the area. People mainly come to see the unique lakes-Chahafi and Kayumbu which are merely separated by an all-weather murram road.

ii) Fishing

Fishing is done in Chahafi and Kayumbu lakes. Clarias and ----------are the major fish species found in the two lakes. There were efforts by Ecotrust to restock the lakes in order to increase the fish catch, but the fish species introduced were reportedly not tasty to the local communities and were therefore rejected by killing them. Their response frustrated the conservation effort and since then the fish catch has been minimal.

3.4.3 Nazigo-R. Nile Landscape

This landscape has less biodiversity and not much has been recorded. The area is largely for agricultural production with a few parts of the landscape left under fallow for fertility rejuvenation. The landscape has a lot of vegetation cover, though part of it has been cleared mainly for charcoal burning and also pineapple growing. People are opening up more land for pineapple growing due to increasing demand in the district.

3.5 Mapping of stakeholders within the agricultural landscapes

3.5.1 Rushebeya-Kanyabaha Landscape

In this landscape, the Government works through Kabale District local government to implement agricultural and biodiversity conservation programs. This comes against the backdrop that implementation of agricultural and conservation of wetlands and agricultural biodiversity is a decentralized function. A list of government agencies operating in the landscape is provided in table 3.

Table 3: Government Agencies/Programmes

Agency	Nature	Focus
National Environmental Management Authority (NEMA)	A national agency mandated to co-ordinate, monitor and supervise environmental management in the country	Monitoring and regulation of environmental practices and standards
Kabale District Local Government	National Agricultural Advisory Services (NAADS), Area-Based Agricultural Modernsation Programme (AAMP)	Agricultural advisory services, livelihood improvement, Bee keeping, piggery, fruit farming Road works
Wetland Inspection Division (WID)	A National Programme for the inspection of wetland resources	Constructed a foot path in the wetland, advisory on wetland management

Non-Governmental Organisations (NGOs)

Several NGOs operate in this landscape. They work on different activities and no coordination between their activities is registered. The description in Table 4 details the nature and activities of the organizations in question. Their activities range from promotion of good farming practices by providing with them good seed and farming techniques for crops and livestock, biodiversity conservation to livelihoods improvement through savings and credit schemes, building of schools and health centres. These activities together constitute the core values of ecoagriculture.

Table 4: NGOs operating in the landscape and their activities

Name	**Nature of Organisation**	**Activities**
Africa 2000 network	An agricultural-based NGO	Provision of seed, good farming practices in cassava, Bananas, passion fruits, Apples, livestock and poultry, fish farming.
CARE International in Uganda	International development organization	Savings and credits
Nature Uganda	National Conservation Organization	Biodiversity conservation and fish Farming
World Vision	International development organization	Building schools and health centres, agricultural services

In addition to the above, communities in the landscape have formed local working associations/groups that help them collectively conserve the agricultural landscapes. In total, 35 associations were recorded specific to this landscape (*see Appendix 1 for the list and their respective activities in the landscape).*

3.5.2 Echuya-Chahafi-Kayumbu Landscape

Like many other degraded landscapes in Kisoro district, Chahafi-Kayumbu-Echuya landscape has benefited from the services of government programmes as well as a number of conservation and agricultural-based NGOs. The National Agricultural Advisory Services (NAADS) is an example of such government programmes. These have improved on the livelihoods of the communities in the landscape. However, despite such interventions, limited /no impact is observed on the ground.

Table 5 Key NGOs that operate in the landscape

Organisation	**Nature of the organization**	**Activities**
Nature Uganda	A biodiversity conservation NGO	Soil and water conservation and other conservation enterprises around Echuya Forest Reserve.
Africa 2000 Network (A2N)	A conservation and agricultural based NGO	Gave seeds, Hoes, Cows, tree planting

Africare	A conservation and agricultural based NGO	Production, post-harvest handling and marketing of agriculture products, community nutrition, watershed management, etc
ECOTRUST	The Environmental Conservation Trust of Uganda	Fish restocking in both Chahafi and Kayumbu Lakes
Kisoro Beekeepers Association	A local CBO	Production and marketing of bee products e.g honey and propolis.
ADRA	Conservation	Tree planting
Muhabura diocese	Religious-based organization	Provision of quality water to the communities
Uplift the poor	A local CBO for improving the livelihoods of the poor.	Bamboo planting/ domestication and marketing of products.
PRIME/west	A conservation organization	Bamboo domestication

In addition to the above, a total of 16 local associations were identified operating in Echuya-Chahafi-Kayumbu landscape. These were formed out of local initiatives to ensure that communities better manage the environment. Among their activities include wetland management, planting of elephant grass for fodder and planting of calliandra for soil and water conservation.

Most of these associations/groups meet regularly-at least once a month to review their activities and membership compliances. Most of them have introduced credits and savings, whereby "*they keep on subscribing money and they lend it to members. After a year, they share and leave some money in the associations",* one of the group members elaborated. Other activities that cut across these local associations include taking care of the wetland and grass materials, soil and water conservation, planting of elephant grass for fodder (Cameroon straw), soil and water conservation especially Calliandra.

3.5.3 Nazigo-River Nile Landscape

Both government and local organisations combine efforts to help the communities in Kayunga improve their livelihoods through improved agriculture and environmental conservation. These are described in table 6.

Table 6. Institutional framework in Nazigo-River Nile landscape.

Organisation	**Nature of the organization**	**Activities**
Karitas	A Charitable Organisation	Energy saving devices e.g. cooking stoves
Kayunga District local government	• National agricultural Advisory services (NAADS). • National Livestock	Advisory Services on pineapples, coffee, etc

Organisation	Nature of the organization	Activities
	productivity improvement	Farmer capacity building, water sources
NARO	Research	Banana and Clonal coffee research
Centre for Integrated Development Initiatives (CIDI)	Local NGO	Promote improved agricultural productivity practices
Self-Help Development International	Local CBO	Awareness raising (programmes on radio)
Integrated Environmental Defence (INED)	Local NGO	Sustainable agriculture, energy saving and environmental awareness
Bugema University	Research	Documentation of farming practices
Centre for integrated development	Local CBO	Promote tree planting, provision of seeds,

Ten (10) local associations, in addition to the above were registered in this landscape (part of Appendix 1). They are mainly in group farming crafts making, environmental conservation and credits and savings activities.

3.6 Threats and current approaches to address them

3.6.1 Rushebeya-Kanyabaha landscape

Threats to the Rushebeya-Kanyabaha landscape are diverse and take different dimensions. The landscape soils are under intensive continuous cultivation with a net loss of fresh organic materials especially from the annual hillside cropping systems (Briggs and Twomlow, 1998). Mounting demographic pressure has forced farmers to abandon shifting cultivation, the indigenous soil replenishment method, for continuous cultivation. This is coupled with the terrace scouring phenomenon, caused by down slope cultivation and soil erosion (Siriri, 1997). Consequently, harvest from the upper third of terraces usually does not exceed 12% of the entire field though farmers manage the entire plot uniformly. Some areas with Eucalyptus trees have no undergrowth leading to dry soils and water runoff. This has resulted into increased lake silting and floods. Farmers occasionally use animal manures and crop residues for soil fertility replenishment. However, the amount of these organic resources, and their quality are often insufficient to meet crop nutrient demands. Alternative organic resources are agroforestry trees and shrubs (Siriri & Raussen, 2001). Yield gradients over the narrow terrace benches (typically 5 - 15 m wide) results in negative net benefits and low returns to labour, and have serious food security implications on this low input farming system.

Being the main wild game in the landscape, the Sitatunga (*Tragelaphus spekii*) is hunted for meat and as a control of crop raiding. It is listed by IUCN as a lower risk near-threatened species (IUCN, 2006). The wetland was in the past, and in present times, partly encroached, reclaimed and silted due to unsustainable land management practices in the hillside catchment area (MWLE and Kabale district local government, 2001).

Originally, the wetland was estimated to be 859 ha (National Biomass Study, 1995) but approximately 363 ha (43%) has already been converted to farmland.

The other big threat to lowland farming is use of pesticides and more so very close to streams. This is practiced by most farmers especially those engaged in Irish potato growing. Pesticides used include Ambush and Diathene. These pesticides, in addition to being hazardous to small soil organisms, they also pollute the waters which in most cases are used for domestic purposes. The practice is in all Irish potato growing areas, including the Kisoro landscape.

A farmer spraying Irish potatoes and cabbage gardens.

In addition to the above, other threats can generally be grouped as:

i) ***Degradation of landscape resources***

- Wetland drainage
- Degradation of streams
- Severe run-off and sedimentation of valley bottoms.
- Hunting of wild animals
- Soils fertility loss resulting into stunted crops, especially bananas
- Soil erosion leading to degraded hill sides
- Overgrazing and farming on steep slopes
- Overgrazing

ii) ***Institutional arrangements***

- Limited coordination among actors in the landscape
- Limited capacity of local institutions
- Inadequate implementation of policies and laws
- Poor management practices
- Limited financing

iii) Others

- High population growth
- Land degradation/depleted soils.
- Erosion due to downhill cultivation.
- Food and nutritional deficits
- Lack of wood (for fuel, poles, stakes, timber)
- Fragmented farms
- Poor markets for agricultural products

In a bid to safeguard the ecological importance of the wetland, efforts were made to put in place a management plan. This saw the Kanyabaha-Rushebeya Community Wetland Management Plan (2001- 2005) developed in a consultative process that involved staff of the National Wetlands Programme, the Kabale District Administration and the neighbouring villages of this extensive wetland complex. The Kanyabaha-Rushebeya Community Wetlands Management Plan was launched by the Minister of Water, Lands and Environment. A key aspect of the plan is the promotion of multiple -use wetland management systems, which enhance wetland benefits for local communities, while at the same time safeguarding their vital functions for off-site users. At the heart of this approach is a process of community consultations, resulting in a resource users plan, wetland user zones, a monitoring plan and a wetland investment plan. A unique feature of the management plan is the establishment of a Sitatunga sanctuary. The Sitatunga is a rare wetland antelope, which is hunted by the local population for its meat, and because of the damage it does to local farms. Inside the sanctuary, which is situated in the main breeding ground of the antelope, hunting is not allowed. Other features of the plan are a range of investments in the wetland area to increase community benefits from wetland products or to reduce the negative impacts of the wetland on community livelihoods. For example, two footbridges were constructed to ease crossing of the wetland, apiary activities were to be promoted and professionalized, and a canoe was bought for boosting the local fisheries. The required investments for the implementation of the Kanyabaha-Rushebeya Community Wetland Management Plan are about US$ 50,000. About one third of this is paid by the Government of Uganda through the Poverty Action Fund. The remaining investments are financed by the UNDP/GEF Small Grants Fund. Upon completion of the plan, the NWP contracted a number of NGOs to do the actual fieldwork, and analyse the process. The district was eventually supposed to take over the responsibility for the process.

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NGOs to do the actual fieldwork, and analyse the process. The district was eventually supposed to take over the responsibility for the process. It is however important to note that there have been minimal additional investments if any beyond what were provided by the government and UNDP/GEF Small Grants Fund.

3.6.2 Echuya-Chahafi-Kayumbu Landscape

The threats identified in Kanyabaha-Rushebeya in the groups of '*degradation of landscape resources,' 'institutional arrangements'* and *'others*' also apply to this landscape because they share similar topographic features. But in addition, unique to Echuya-Chahafi-Kayumbu landscape are seasonal occurrences of landslides due to heavy rains, seasonal floods, famine, and seasonal heavy drought. Excessive drought made one of the key informants-one Mzee. Erasto Buchana lament that "*I suspect there is petrol underneath that is making the grass to dry up".* This comment came out of the fact that the conditions were unbelievable and the situation was getting out of control. The study team further observed that settlements are too close to the wetlands and this conflicts with good wetland management practices.

A degraded hill planted with eucalyptus. Lake siltation is a possible outcome due to massive erosion

3.6.3 Nazigo-River Nile Landscape

Threats observed in this landscape are mainly agricultural based. Poor river bank management practices were evident along part of R. Nile that flows through the landscape. For instance, crop growing was seen practiced close to the river (a distance of up to one (1) metre to the river) and this was sometimes accompanied by spraying, which chemicals drain into the river. By the time of this study, maize crop was the one being grown in such circumstances. Other landscape threats include soil erosion during heavy rains as no control measures are in place, and food and nutrition deficits.

3.7 Policy issues and options

There are policies and legislations that regulate agricultural production in fragile ecosystems. For instance, the National Environmental Management Policy (1994) emphasises that the drainage basin should be the basic planning and development unit,

and that priority should be given to watershed management to control, conserve and regulate the water balance in the catchment regions and water sources. These policies however have not been successfully localised or rather there is laxity in implementing them due to population pressure in such landscapes. Thus, it is the recognition of this study that such resources cannot be protected or conserved without finding acceptable means of livelihood for the people who use them. This is particularly true in fragile, rainfed areas where poverty is a major force during the degradation of many resources. Sustainable and poverty-reducing agricultural intensification could be the key to solve resource degradation problems particularly because solutions involving economic diversification into non-farm activities are limited.

Policy interventions that seek to overcome environmental problems in agriculture need to be based on proper understanding of why farmers degrade natural resources eg why they think farmers overuse pesticides and deplete soil nutrients yet these actions cause health problems and reduce future incomes for themselves, their children and the community in which they live. According to Lutz (1994), the answer lies with incentives including discount rates. Farmers are not rational. To the contrary, they maximise income and minimise risks in a dynamic context and often under harsh conditions and serious constraints. For example they degrade resources when there are good economic and social reasons for doing so (when benefits they gain exceed the perceived costs that they as individuals must bar). If the management of natural resources is to be improved, these economic and social incentives will need to be changed in appropriate ways

A key issue for policy is determining the relative weight to be given to resource poor areas in allocating public investments among rural areas. Resource poor areas have been sadly neglected yet the prevalence of poverty and environmental degradation in those areas implies that increasing the social and environmental benefits of public investments may help to offset their lower efficient returns.

4.0 Challenges

Overall, there is general acceptance that agricultural practices have been instrumental in reducing the amount of high-quality habitat for wild diversity. Increased population growth rates and therefore need for more food has exerted a lot of pressure on the natural habitats. This has seen more trees cut for individual gain, expansion into steep hillsides causing soil erosion and lowland flooding, wetlands encroached on, degradation of watershed protection areas, increased pressure on common property resources with breakdown of indigenous institutions that regulate and manage these resources leading to open access regimes and resource depletion. These are responsible for general declining resilience in ecosystems which reduces the ability to rebound from stress factors such as drought.

Political interference has also been blamed for increased encroachment and cultivation in the wetland in like in Rushebeya-Kanyabaha landscape. The need for a political will/support forced one of the Ministers in the ruling government to encourage the farmers intensify the growing of Irish potatoes in the wetland which curtailed the efforts

of the local government to reprimand the culprits. People plant close to water streams and do a lot of spraying to boost the crop growth against pests.

4.1 Opportunities for implementing eco-agriculture in agriculture landscapes.

There are opportunities for implementing ecoagriculture in agriculture landscapes. Such opportunities begin with the recognition that the situation of the poor will not necessarily be improved by producing more food at a higher cost because the necessary technology requires more capital investment. The current situation is that subsistence agricultural practices where farmers use rudimentary tools and farms are rain fed. Land has been ploughed over and over. Fallowing no longer exists since there is no land to shift to. Ecoagriculture then is the answer for sustainable production systems. Opportunities were identified in each landscape as listed below.

4.1.1 Rushebeya-Kanyabaha Landscape

Payment for watershed services (PES)

The Rushebeya-Kanyabaha wetland provides a source of livelihood to communities beyond the landscape in many forms. It is the catchment for the water stream on which the Kisizi hydro electric power station is built. This is the source of power for the entire Kisizi hospital, a missionary referral hospital in the area. It is the major health provider for the Kigezi highlands. The landscape provides a potential for PES to the surrounding communities so as to promote its conservation.

Agroforestry

The practice of tree planting seems to have considered mainly eucalyptus for it has a shorter rotation period and can coppice many times making it possible for one to have multiple harvests from one stamp. The target for quicker benefits from eucalyptus overshadows the need to conserve soil and water in the landscape. There is need to shift the target to planting indigenous species and more of fruit trees so that they can enhance water retention and soil conservation in the landscape.

There are also opportunities in investing in small livestock rearing, intensifying wetland-based enterprises like fish farming, wild fish capture, crafts industry, beekeeping, and also, improve on soil and water conservation practices.

4.1.2 Nazigo-River Nile Landscape

This landscape is mainly popular for pineapple and vegetables production. Shade coffee has been introduced and doing very well though still on a small scale. There is an opportunity for shade coffee growing in this area. Increasing shade within pineapple gardens is also good and therefore an opportunity for farmers to improve their farm productivity.

4.1.3 Echuya-Kayumbu-Chahafi landscape

Bamboo growing and marketing of products.

Bamboo *(Arundinaria montane bamboo)* grows naturally in Echuya central reserve. It is highly demanded for making crafts and other products. There is controlled access to

bamboo products from the reserve and this limits local users from utilizing the resource. There have been efforts to domesticate bamboo and little achievement has been made. Besides, there is a potential market for exporting Bamboo chips and plans are underway for planting more of it to sustain the market (some experts are already raising Bamboo nurseries for this purpose as earlier noted). In addition, a market chain analysis for Bamboo has been commissioned to assess its production, past initiatives, products, services and markets. Domestication and development of bamboo based markets for both products and services is therefore a big opportunity for communities to tap into these initiatives.

Biodiversity conservation

Like the Rushebeya-Kanyabaha wetland, the wetland surrounding Lake Chahafi and Kayumbu is home to many bird species. Among the notable ones is the Grey- crowned crane which has established for decades of years. In a mere one round tour, one cannot fail to see either their breeding ground or a family of them perching in the farmlands. Conservation of such birds, which are only found in the few left wetlands in Uganda, is crucial to the tourism industry in the area.

Grey- crowned cranes perching from a harvested garden

Access of forest resources from Echuya Forest reserve

There is an opportunity for conservation of Echuya forest reserve with a view of benefiting local communities. Local communities being the absorbers of all the shocks and threats from the forest reserve, they should be given an opportunity for regulated access to resources like bamboo from the reserve. This can harmonise the relationship between the communities and the forest reserve management.

Management and utilisation of lakes Kayumbu and Chahafi resources

Lake Chahafi and Kayumbu are the major sources of fish for both protein and cash for the people in Kisoro district. The current management practices are so demanding that life for the few fish remaining in the lakes is threatened. The adjacent hills for example are not well managed. People do their farming to the last edge of the lake on one side, the eucalyptus planted on the other side has deprived the soils of vegetation cover leaving it susceptible to massive erosion. These practices expose the lakes to siltation, making the

conditions for fish to survive very harsh. There is need to introduce better management practices for both the lakes and their catchments.

4.2 Conclusions and general recommendations

Despite the fact that a number of efforts have been put in place by different stakeholders, the landscapes still face both environmental and socio-economic challenges which threaten the sustainability of the ecosystems. Farmers, especially in Kabale and Kisoro landscapes have continued with their farming practices which negatively impact the environment. They do this targeting short term economic and social benefits thereby neglecting their future consequences. It was noted that farmers respond rationally to economic and social incentives but sometimes, they may be poorly informed about the consequences of their actions, like on long term consequences of soil degradation of particular farming practices, effect of removing trees on soil erosion on neighbouring farms or the effect of siltation problems downstream. There is therefore need for knowledge and communication systems in place to help educate these farmers on specific degradation consequences and landscape specific actions to correct such activities.

National agricultural extension and advisory systems need to integrate environmental concerns successfully into their agenda. This is because too little attention is given to the sustainability of recommended technologies to broader aspects of natural resource management and to the technology and management problems of more fragile areas where resource consideration is considerable.

Alleviating poverty is fundamental to redressing environmental problems of most resource poor areas. Appropriate strategies therefore need to include targeted assistance programmes for the poor, economic diversification strategies for rural areas assistance programmes for small farms and public investment in rural infrastructure like health facilities, water and schools to improve livelihoods in the communities.

There is need for opportunities to help farmers to access better markets so that they can get good prices for their commodities. Appropriate prices act as incentives for increased production. Elimination of middlemen who give low prices for farmers' commodities can be the starting point. Farmers need to be assisted to form marketing groups which can increase their bargaining power for their products and services.

Policy recommendations

There is need to reduce problems incurred by individuals but borne the whole community (externality problems) by seeking help from organisations, local and central governments to provide environmental guidelines contributing to resource monitoring systems and protecting designated conservation areas. Effective actions require the joint involvement of people who misuse resources and of people who are affected most immediately by that misuse. Empowering local action groups is important and this can sometimes be reinforced by appropriate changes in property rights. For instance ownership rights over a watershed protection area and waterways can be bestowed on communities and local organisations rather than on individuals or the public sector.

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Annex 1: Landscape group profiles

Rushebeya-Kanyabaha Landscape -Kabale district

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
1. Noozi Farmers' Group.	Noozi	Bataringaya Baker	2005	45:60	Yes	Yes	Poverty eradication	Digging, Crafts making moulding	Banana plantation
2. Kakirare Bakyara Tutungukye Group	Ntaraga market	Mrs Aisha Juma	2004	0:20	Yes	Yes	Improving HH income	Crafts making, knowledge sharing	-
3. Kakirare Bee keeping & farmers Association	Kitanga Paris	Bikorwomuhangi A.	2006	11:4	Yes	Yes	Improving HH Income	Bee keeping, goat and sheep	-
4. Kitanga Fish farmers association	Kitanga catholic Church	Kamugyeregyere Dez	1994	14:8	Yes	Yes	Improving HH Income	Train members in Agric enterprises, mainly fish farming, apiary & Soil conservation	Bee hives
5. Nyarutuntu Bakyara Twimuky	Nyarutuntu	Kett Magezi	-	-	Yes	Yes	Uplifting their standards of living	Goat rearing	

	Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
	e									
6.	Kabira Bakyara Twimukye	Kabira	Bampabura Seforoza	2002		Yes	Yes	Uplifting their standards of living	Goat rearing	
7.	Nyakagabagaba Bakyara Twimukye	Rubirizi	Mrs Margaret Kururagire	1995	Only females	Yes	Yes	Improve standards of living	Market assessment, Goats rearing, growing Irish potatoes	Goats Irish potato gardens
8.	Kitunga Orphans Care & Needy Family Support	Rwengongo	Mbareba Saduresi	2002	8:152	Yes	Yes	Caring for orphans	Farming, crafts making, adult literacy	
9.	Mumuremere Women's group	Mumuremere	Tusiime Betty	2002	2:18	Yes	Yes		Irish Potato growing	
10.	Kitunga CC Nursery bed and Crafts	Kitunga Catholic Church	Mrs. Komujuni Joram	2006	20:40	Yes	Yes	Increasing HH income	Crafts making, farming, Bee keeping	
11.	Kamuhur	Kamuhuruza	Tibubabwomwe	2002	Males	Yes	Yes	To improve	Fruit growing	Fruit

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
uza Fruits Growers		Samuel		only			standards of living		gardens
12. 13. Karubanda Farmers group	Karubanda village	Bangirana Gilion	2003	6:10	Yes	Yes	Fighting poverty and disease	Growing Irish potato, beans, marketing of produce	
14. Ngoma Kwetungura Group	Ngoma primary school	Komukoryo Benon	2003	5:10	Yes	Yes	Fighting poverty and food security	Tree planting, Fruits growing and irish potato growing	
15. Kahama farmers' group	Ngoma primary school	Nyangozi	2001	16:10	Yes	Yes	Fighting poverty and food security	Bee keeping, tree planting, Irish Potato growing	
16. Kahumuruza Bakyara Kwetungura	Kahumuruza	Dinah Tibubabwomwe	2002	Females only	Yes	Yes	To improve standards of living	Building rain water harvesting tanks, Growing Irish potatoes.	
17. Kakiri Kataka Tukore	Kakiri LC1	Betunguza Selestino	2001	10:13	Yes	Yes	Eradicating poverty and food security	Good farming practices, marketing of agricultural produce, ensuring quality seeds	
18. Rwongor	Rwongora Lc1	Mawanda John	1980	75:47	Yes	Yes	Fighting	Tree growing,	

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
a Timber Society							poverty	saving and credits	
19. Bugarama Tukwatanise	Kitojo	Bajurizi Herbert	2003	6:8	Yes	Yes	Improving HH incomes	Irish potato growing, passion fruits, rearing goats, pigs, cattle, Crafts making	
20. Bugarama Modern Farmers	Bugarama	Mayanja David	2002	7:20	Yes	Yes	Food security	Irish potato growing, group marketing, money lending	Spray pump
21. Kabimbiri Kwebisaho	Kabimbiri	Bonne Buhumuriro	2002	26:6	Yes	Yes	Poverty eradication and food security	Irish potato growing, credit and saving	Built Irish Potato store
22. Kirimbe new farmers' Group	Kirimbe	Turyasingura Richard	2002	2:18	Yes	Yes	HH food security& poverty eradication	Credits and savings, Irish potato store	Built Irish Potato store
23. Kyerero Faul Class	Kabimbiri	Kesanyu Scolla	2000	9:40	Yes	Yes	Uplifting HH livelihoods	Adult literacy, modern farming practices, Piggery	
24. Burime Bakyara Tukwatanise	Kirera Burime	Busingye Fausta	2002	3:7	Yes	Yes	Improved health, livelihoods increased HH	Conservation of soils, savings and credits, HIV/AIDS control, tree	Farming and conservation bi-

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
							income	planting, Irish potato growing	laws in place
25. Burime Farmers Association	Behangana Deus	Kirera-Burime	2002	15:26	Yes	Yes	Improved health, livelihoods increased HH income	Irish potato growing, group marketing, Savings and credits, HIV/ AIDS control	Market centre, Saving box
26. Burime Twetase	Burime Nyakafura	Katororo Flugence	2000	14:14	Yes	Yes	Improving HH incomes and standards of living	Credits and savings, Irish potato growing, goats rearing	
27. Nyakarambi Tukorenamani	Kitojo	Aggry Bakahabwa	1998	10:12	Yes	Yes	Poverty eradication	Crop growing& livestock farming	
28. Rugarama Tutunguukye	Rugarama	Mrs. Alice Kabuuti	1997	18 females	Yes	Yes	Eradicating poverty	Crop growing& livestock farming	
29. Rugarama Twimukye	Rugarama	Peace Kakuhikire	1990	23 Females	Yes	Yes	HH Self-sustenance	Credits and savings, farmer training in modern farming practices	
30. Kitunga Fish Farmers	Kitunga Muruganda	Beinenama Richard		12:8	Yes	No	Improve HH Income	Fish farming, Apiary	

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal	Activities	Assets
Association									
31. Kabimbiri vegetable growers	Kabimbiri Kyerero Bukinda	Kesanyu Scolla	2001	2:23	Yes	No	Poverty eradication	Credits and savings, vegetable and Irish potato growing, group marketing	
32. Nyangorogoro Bataka Kweteran a	Kitojo	Beyendera Alex	1994	10:7	Yes	Yes	Poverty eradication,	Irish potato growing, improved seed	
33. Mumuremere Bataka Kweteran a	Hamuremere Kitunga	Byarugaba Seperiano	1990	30:35	Yes	Yes	Fighting poverty	Tree growing, Irish Potatoes, bee keeping, credits and saving	
34. Kashambya Youth Association	Kashambya	Musinguzi Medard	2003	30:20	Yes	Yes	Fighting poverty	Irish potato growing, credits and savings	House/ office building
35. Kitunga Youth Group	Kitunga Parish	Twijukye Victor	2003	20:10	Yes	Yes	Fighting poverty	Irish potato growing, fish farming, Bee keeping	
Nazigo-River Nile Landscape-Kayunga District									

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal		Activities	Assets
36. Katikanyonyi Kyosimba	Katikanyonyi, Nazigo	Nabwire Opio	2002	10:20	Yes		Yes	Poverty eradication	Farming, Credits and savings	Rice farm
37. Obumu Gemanyi	Nakatoke, Nazigo	Wandera S.	2001	15:10	Yes		No	Poverty eradication	Farming	Farming land
38. Fakumudara gwo	Nakatooke	Nabwiire William	2006	7:23	Yes		Yes	Poverty eradication	Farming, credits and savings	
39. Kyosimba onanya Farmers Association	Kotwe D, Nsiima	Agatha Lutalo	2002	1:24	Yes		Yes	Food security	Credits and savings, farming	
40. Tulolebukozi Farmers Association	Katikanyonyi		2004	20:7	Yes		Yes	Poverty eradication	Farming-Tomatoes, rice,	Land
41. Twekole Twezimbe Group	Kotwe, Nazigo	Mrs Lukiya Kakooza	2003	3:20	Yes		Yes	Social and economic development	Farming-Pineapples, Maize etc, credits and savings	
42. Namirembe farmers	Bukamba Parish	Semaku Ndugwa Fred	2004	31:33	Yes		Yes	Eradicating poverty	Farming-coffee, maize, potatoes, rice	Rice drying machine

Group name	Location/ Address	Contact person	Date of formation	Membership Males: females	Registered	Have a constit-ution	Goal		Activities	Assets
Group										
43. Nazigo Community Foundation for Health and Development	Nazigo village	Kizito John Masiiri	2005	12:3	Yes		Yes	Improved HH livelihoods	Fighting HIV/AIDS, improved health and sanitation,	Office equipment, goat farm etc
44. Agali Awamu Farming Group	Nsiima Parish	Fred Sempateba	2005	8:9	Yes		Yes	Eradicating poverty	Farming-Maize, poultry keeping	
45. Katikanyonyi PWDS Farmers Group	Katikanyonyi, Nazigo	Aisa Ogutu	2004	15:10	Yes		Yes	Eradicating poverty	Farming, Poultry, sugarcane	
46. Basooka Kwavura Group	Nakakonge, Nazigo	Namusisi Olivia	2000	12:29	Yes		Yes	Poverty eradication	Crafts, farming-Cassava, rice, etc, credits & savings	