

**Increasing the functionality of the Kyambura-Kasyoha Kitomi corridor
and Mpanga Falls area in the Greater Virunga Landscape:
management options and cost implications.**

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1.0 Introduction

In areas with high human population density and a community with reduced access to natural resources, increasing the extent of state-controlled protected areas is politically and financially difficult. The desire to improve rural people's standards of living through economic development and the need to conserve particular species, habitats and landscapes, and to ensure public access to them has led to increased conflicts (Feeney, 1993; Naughton, Rose and Treves, 1999; Cernea & Schmidt-Soltau, 2003). The positive side is that it has stimulated the demand for establishment of local trusts or the purchase of land by existing conservation trust organisations. Even with this strategy, the source of financing of these initiatives is primarily a challenge to the local trust organisations. The initial funds for purchasing land may be available but the resources to pay for on-going management and operational costs are lacking. Uganda Wildlife Authority (UWA) and National Forestry Authority (NFA) which are government agencies managing parks and wildlife reserves, and central forest reserves respectively, face the same challenges. As neighbouring communities continue to become estranged from the natural resource base, the pressure on forests outside protected areas also increases. The protected area edges have become more open leaving the protected areas as islands without buffers. More critical is the loss of wildlife corridors in the landscape. Wildlife populations have declined drastically and many populations are becoming non-viable due to the loss of connectivity.

With reducing connectivity in the Greater Virunga Landscape, international and local Non-Governmental Organisations (NGOs) are putting increasing emphasis on strengthening the remaining corridors. Over the past 15 years there has been an increasing demand to protect more land around the corridor areas. In order to address this problem, a number of management approaches (e.g. landscape, ecosystem) and conservation models are being tried. These approaches look at the larger 'landscape scale' which aims to maximise ecological sustainability while ensuring that stakeholders' needs are recognised. In high priority conservation areas secure land tenure and access rights have to be defined clearly to avoid conflict. Land purchase or leasing is one way of defining these rights. In places where land purchase or leasing is difficult, working with the communities that interact directly with the resources has been attempted. As such, there is increasing recognition by conservationists of the need to respect human rights and apply management approaches that allow local involvement in conservation and the development of their affairs (Barzetti, 1993; Emerton, 1998, Brockington, Igoe and Schmidt-Soltau, 2005). In order to effectively manage the protected areas, the involvement of the local communities in this process is not only considered a modern approach but is seen as indispensable. The dilemma that community conservation approaches have faced has been to effectively identify the actual rather than the perceived needs of the local people and to work with them to clearly define their roles and responsibilities.

Maintaining protected areas over the long-term and integrating them into the local socio-economic landscape is not merely a matter of obtaining public funding and paying park/forest guards. People living in and around protected areas need to be compensated for the limitations imposed on their use of natural resources, if they have been traditionally accessing these resources. The most often acknowledged issues that demand compensation include a) loss of land for agriculture, b) loss of access to resources for which people request provision of alternative livelihoods and c) losses arising from problem animals and vermin including loss of crops, livestock and sometimes even human life. In this particular area, human-wildlife conflict features prominently. However, it is known (Hoare, 1995) that habitat loss and local extirpation of big game has reduced the geographical range of human-wildlife contact (e.g. elephants) and intensified conflict. Land use changes, particularly the spread of agriculture into previously unoccupied wildlife habitats driven by human population growth, human resettlement, and/or a shift to farming by pastoralists, has intensified human-wildlife conflicts. Today, farmers and wildlife compete directly for scarce land.

This study builds upon previous work on the corridors around the Queen Elizabeth National Park (Nampindo & Plumptre, 2005). It aimed to specifically assess two of the corridor areas

identified in the previous work, looking at possibly increasing corridor functionality and options for managing land with local people adjacent to the protected areas to ensure this. Nampindo and Plumptre (2005) showed that the existing corridors are still used by wildlife but that they are so narrow at certain points that they increase conflict between the wildlife and the farmers. One of the options for management of the land adjacent to these corridors would be direct purchase but in order to compensate farmers fairly there is a need to assess what they have been deriving from this land and from their ability to access neighbouring protected area land. An economic valuation of people's livelihoods was made and the assessment estimated how many households would be affected by corridor expansion plans. Options for financing deals with local communities were assessed ranging from land purchase, leasing and supporting conservation easements or income generating activities that could encourage increased functionality of the corridors.

1.1 The Queen Elizabeth National Park Landscape corridors

As part of a process assessing the corridors that link Queen Elizabeth National park to adjacent protected areas in the Greater Virunga Landscape, the Wildlife Conservation Society (WCS) with financial support from Conservation International (CI) undertook a survey in 2004 of four key corridor areas: 1. Kyambura-Kasyoha-Kitomi; 2. Mpanga Falls; 3. Muhokya west of Lake George and 4. Kalinzu-Kasyoha-Kitomi (Figure 1). This assessment looked at several aspects of the corridor area particularly: which species moved through these areas, who was living around them and how they derive a living, problems with crop-raiding and proposed strategies to reduce crop-raiding (Nampindo and Plumptre 2005). For example, Mpanga Falls is an area of particular importance for Cycad conservation, conserving a species only known from this site, *Encephalartos whitelockii*, while the Kyambura-Kasyoha-Kitomi corridor has been used regularly by buffalos, elephants and chimpanzees according to local people living near the forest.

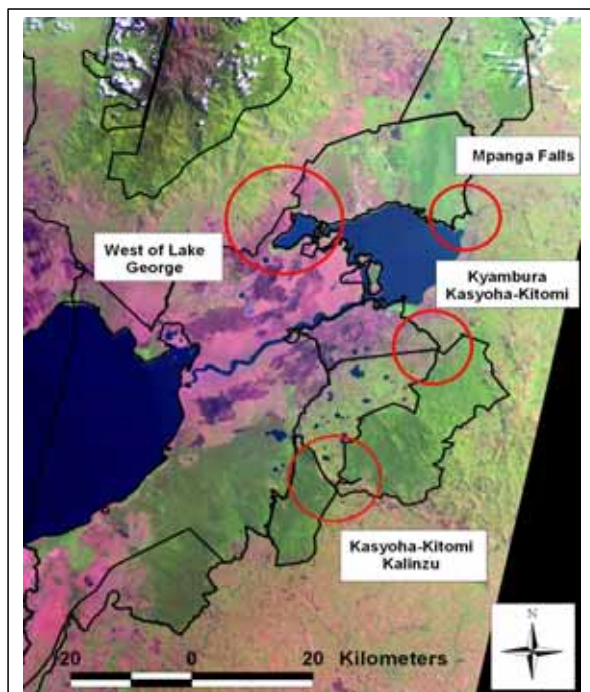


Figure 1 The four corridor areas assessed in 2004 around Queen Elizabeth National Park.

Following on from this short assessment a visit by CI staff members, Aaron Brunner and Eduard Niesten was made to assess the area and to discuss possible further support through the GCF (Global Conservation Fund) to expand the corridor areas. It was decided that two areas should initially be focussed on to assess the options for conservation land use and to look at the costs of these various options. It was decided that initially the Mpanga Falls area and the Kyambura-Kasyoha-Kitomi corridors would be surveyed further.

1.2 Objectives of the study

The main objective of the study was to assess the costs of widening the corridors around Kyambura-Kasyoha Kitomi and Mpanga Falls in the Greater Virunga Landscape. This would be undertaken by assessing the various options for the management of land outside the protected areas to widen the functional role of the corridors.

2.0 Methods

The study was conducted around the existing corridors between Kyambura Wildlife Reserve (KWR) and Kasyoha-Kitomi Forest Reserve (KKFR), and along the Mpanga river to Mpanga Falls in QENP (Figure 1). The narrowest point of the corridor at which Kyambura WR connects with Kasyoha-Kitomi FR is only 300 m wide and under pressure from agricultural expansion. Mpanga Falls experiences similar threats and requires widening the river protection zone to avoid wholesale drainage and loss of species that enjoy this type of habitat. Two main activities were undertaken to assess the widening of these corridors: mapping and household surveys of people living within the proposed expanded corridors. It was thought that it would make sense to try and widen the Kyambura-Kasyoha-Kitomi corridor to about 1 km wide (500 metres either side of the river) because this would lessen the risk of human-wildlife conflict (because the corridor is wide) and also allow free movement of animals through it.

Various options for land management were explored including land purchase, conservation easements, and possible crop selection that might allow animal movements through the corridors but at the same time benefit farmers. As such, it was necessary to assess the land ownership and tenure issues.

2.1 Mapping the corridor areas

Kasyoha-Kitomi - Kyambura

A field visit by staff of the National Forestry Authority (NFA) and Uganda Wildlife Authority (UWA) together with the local council chairpersons of the adjacent villages was undertaken to create broader understanding of the issues surrounding the corridor between Kasyoha-Kitomi and Kyambura and engage these leaders in a dialogue regarding options for its proper management. Using a Garmin II plus GPS unit, points were taken along the park/forest boundary and along the boundary of the areas suggested for expansion (Figure 2.1). Kyambura WR boundary is marked with pillars while River Rutondo on the southern side and Buhindagi on the northern side of the corridor act as boundaries for Kasyoha-Kitomi Forest Reserve, except in Munyonyi area where live markers were planted. It is important to note that the forest boundary around the corridor has not been re-opened by the NFA and because the flow of these two rivers is constantly interfered with by local people, it is difficult to say whether or not this is the original boundary. However, from the legal maps at the National Forestry Authority, it is clear that the cairns were placed along the forest boundary and the two rivers serve as live features for the boundary.

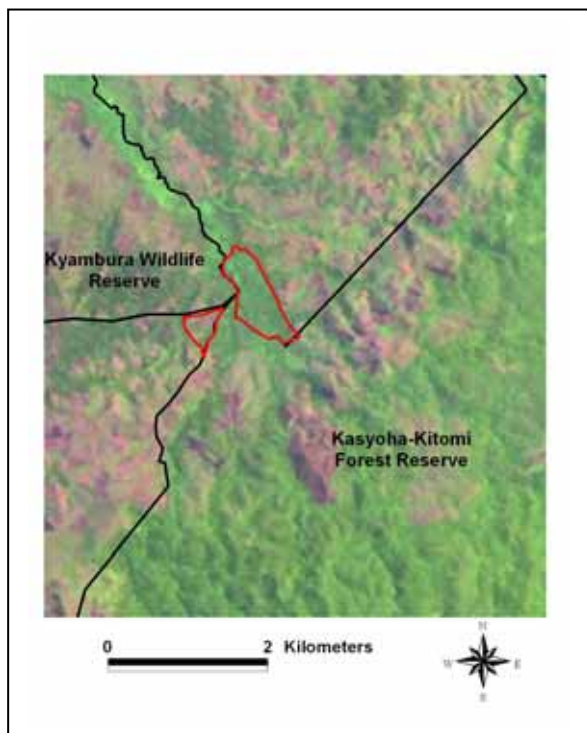


Figure 2.1 The planned wider corridor of Kyambura WR-Kasyoha-Kitomi FR. The marked parts in red indicate the area proposed for the widening of the existing corridor. The narrowest point is only 300 m wide. The smaller area marked with a red line is part of Kagarama village, Katerera Subcounty, Bushenyi and covers an area of 13.5 ha where as the larger area (52.4 ha) is located in Karuhisi village, Irimia Parish, Ibanda district.

Mpanga Falls

The same method was used to map the potential area for land acquisition around Mpanga Falls. The river acts as the park boundary on the southern side and concrete pillars mark the park boundary on the northern side of the gorge. GPS points were taken on both sides of the river to aid in generating a map (Figure 2.2) for the proposed expansion of the park to include the two falls, Mpanga and Kaburuguma, and increase protection to the cycads that occur on private land. The proposed area for expansion of the protection zone is marked in red, which covers 77.4 ha, i.e. 34.4 ha on the northern side and 43.0ha in the south.

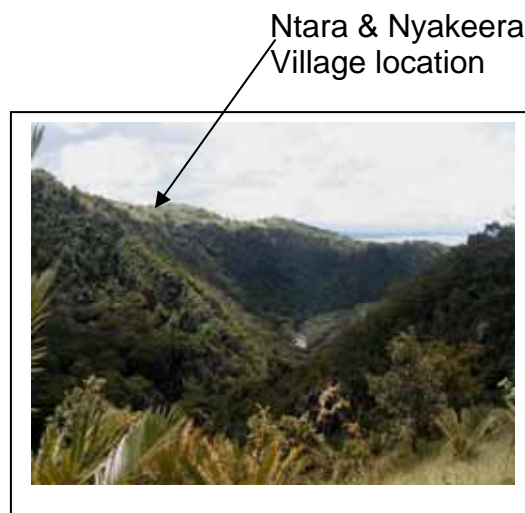
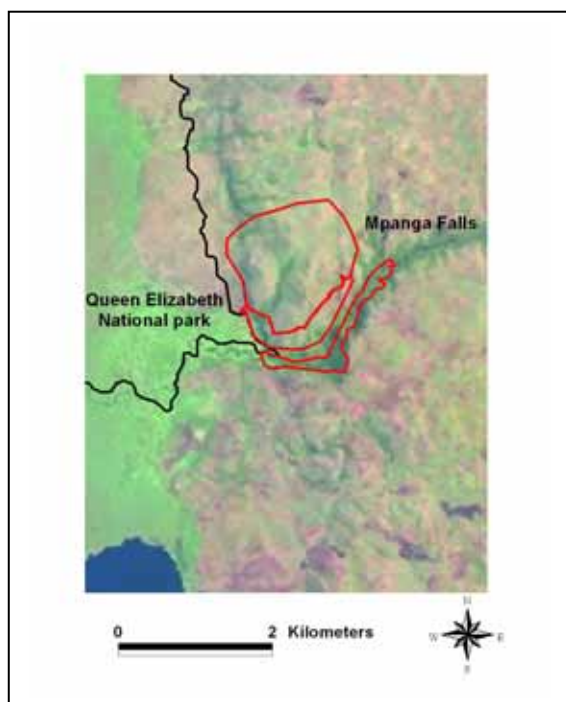


Figure 2.2 Proposed area for expansion to increase the river protection zone around Mpanga Falls and protect the endemic cycads mainly on private land.

On the northern side, the area mapped aimed to include most of the area where the endemic cycads were observed to occur and vulnerability of the river to possible human disturbances (e.g. livestock grazing and fires). On the southern side, the area mapped aimed to include the existing woody cover providing watershed protection, and vulnerability of the river to potential threats such as agricultural expansion and charcoal harvesting. It was also envisaged that by extending the area under legal protection away from the river, poacher's access to hippos that mainly dwell in the river would be reduced. In addition, it would help to protect the breeding zones for some fish species (e.g. Cat fish (*Bagrus docmak*) and mudfish (*Clarias gariepinus*). Households in Ntara and Nyakeera villages are involved in cotton growing and at the same time practice a form of slash and burn agriculture in the remaining natural habitat along the river, which may result in drying up of the river and possible water pollution due to heavy soil erosion deposits and sediments.

2.2 Household sampling

The selection of respondents targeted villages adjacent to the corridor and Mpanga Falls. Of these, two villages adjacent to the KWR-KKFR corridor and Mpanga River were selected. In order to come up with realistic costs of land acquisition, households that lie in a radius of 250 m from the corridor boundary were given first priority for interviews. A total of 44 household heads were selected for interviews. Of these, 30 households were drawn from Kagarama (Kyabakara parish) and Karuhisi (Irimia parish) villages adjacent to KWR-KKFR corridor, and 14 households from two adjacent villages (i.e. Ntara and Nyakeera) to Mpanga Falls (Table 2.1). Unlike the Mpanga falls area, the households in the selected villages around KWR-KK FR corridor interact directly with both protected area resources and only 21 households (13 in Kagarama and 8 in Karuhisi village) lay in the planned wider corridor. Nine households were selected outside the expanded corridor area to assess responses of people who would be unaffected and have a larger sample size to calculate average costs of land.

Household socio-economic attributes such as the amount of land owned, number of household members, livestock owned, income from agricultural and non-agricultural sources and direct benefits from the forest or park and the household consumption of all items accruing to the household over the last 12 months were recorded. The number and frequencies of sale of livestock and their products was recorded based on individuals recall of recent events. Although it was easy for the households to remember the quantities sold, those consumed (e.g. fruits, eggs) or given away as gifts were difficult to recall. As such, further probing was done by asking about the quantity of food prepared and number of meals taken per day (e.g. cassava, sweet potatoes). To arrive at the monetary value of the products consumed at home, a difference between the quantities produced and those sold (e.g. crop, livestock, and livestock products) was computed. It is important to note that the questionnaire administered relied more on the respondent's recall and own reported values regarding the quantity and use of various resources at the household level (Appendix 1) because time wasn't available to measure actual production.

Table 2.1 Households and individuals sampled.

Study Site	Village	Number of households	Number of respondents	Total number of people per village
KWR-KKFR corridor	Kagarama	130	22	420
	Karuhisi	60	8	256
Mpanga Falls Area	Ntara	72	6	432
	Nyakeera	76	8	480

2.3 Data analysis

The GPS points collected in form of latitudes and longitude were downloaded, entered in Ms-excel, converted to decimal degrees and exported to Geographical Information System (GIS) software ArcView ver 3.2 for map production and area calculation. The household survey data was entered in Ms-excel and further analysis was made in the Statistical Package for Social Scientists (SPSS) ver 10 to generate percentages, mean annual incomes from crops and forest products. Validation of the agricultural product prices was done by making cross-references to the Market Information Service (MIS) data from Foodnet/Institute of Tropical Agriculture who provide weekly retail prices for selected commodities in Uganda (<http://www.foodnet.cgiar.org/market/Uganda/uganda.htm#projects>).

3.0 Results

This section presents the responses to questions that were posed to households about their socio-economic status, the household structure, land owned and tenure systems and employment. It also presents the responses related to problem animals and the conflicts arising out of the people-park/forest interactions. It should be noted that the results regarding the crop incomes for households surveyed in Mpanga and KWR-KKFR corridor were calculated separately to reduce errors. Households in Mpanga area were involved mainly in cattle keeping or fishing and grew very few crops on their plots as opposed to those in KWR-KKFR corridor. Therefore, the calculated averages from the aggregated data would result in unrealistic values. In addition, the results for crop incomes were separated by those households that live in the potential wider corridor and the entire surveyed households near the corridor areas. This was to provide an estimate of the opportunity cost of leasing land for conservation purposes as opposed to agricultural land use accruing to the 21 households to be affected by this kind of management decision. Of the 21 land owners that lay in the potential wider corridor, four people did not have housing units on their land and were reported to be absentee landlords. As such, it was not possible to interview them during the survey.

3.1 Household characteristics

3.1.1 Household composition

In both KWR-KKFR corridor and Mpanga Falls area, the average household composition was 6.7 people per household with slightly more females (56.7%) to males (43.3%). The majority (93% n=44) of households surveyed were male headed. The total number of people in the 44 surveyed households was 308, which is 19% of the population (1,588) for the surveyed villages.

3.1.2 Household education level and employment

About half (51.2%) of the household members attained primary education and only 1.5% attended secondary school. The rest of the members had no formal education or were not yet of school age. It is important to note that 83% of the household heads were primary dropouts and 17% had no formal education. Of the 308 people represented by the 44 households surveyed, 29% had no regular employment, 39.7% were employed on-farm and 31.3% were school children.

3.1.3 Livestock

Ownership of livestock may be considered to be an indicator of wealth, although the significance and capacity of households to accumulate wealth through livestock may vary according to agroecological zones. On average, each household in Kyambura-Kasyoha-Kitomi corridor had 7.8 chickens, 3.9 goats and 2.0 sheep while in Mpanga the average number of cattle and goats were 15.5 and 10.2 respectively. It was reported that due to a lack of grazing land and the presence of diseases from the protected areas, households living adjacent to Kyambura-Kasyoha-Kitomi corridor failed to keep cattle. On average each household had 1.5 dogs. When asked about the possibility of using the dogs to hunt wild animals, those in possession of dogs reported not using them to hunt. However, from key informant sources, it was reported that some of the local people are involved in hunting though not necessarily within the corridor area.

3.1.4 Material possessions and housing structures

Other material possessions included possession of a radio and/or bicycle. A bicycle is the most common means of transport of both people and agricultural products to the market. However, only 40% of the surveyed households own bicycles. During auction days, people carry products for sale over the head or hire bicycles. At least 90% of the households surveyed possess a radio. The other material possessions owned by some (5.3%) of the households in Mpanga area included fishing nets and canoes. The majority (83.3%) of the housing units were constructed using poles and mud with an iron sheet roof, particularly the main house. It was

reported that because of the limited access to the protected areas to harvest grass, grass thatched houses were very expensive to construct. As such, only 16.7% of the respondents own grass thatched houses.

3.2 Land Tenure System and Ownership

3.2.1 Land tenure system

The land tenure system in both Mpanga and Kyambura-Kasyoha Kitomi corridor is customary. In this particular case, ownership of the land is vested in the household head, who holds exclusive rights of access, alienation, management and use. The household head, in most cases the father (e.g. in a male headed household), later passes it on to his sons. Ownership of land is therefore organized according to the families as opposed to tribes or clans. Although this system of land tenure is recognised in the 1995 Constitution of Uganda and the Land Act of 1998, landowners normally do not have any legal document to prove ownership. Of late, the government has been encouraging people to register their land and acquire land titles/certificates.

3.2.2 Land ownership

Land is one of the most important resources possessed by the households. As indicated earlier, almost all the households survive on agriculture either as farmers or as on-farm labourers. The majority (72.1%) of households adjacent to Kyambura-Kasyoha-Kitomi corridor, own between 0.4-2.8 ha of land (mean 2.7Ha) and 27.9% own land larger than 2.8 ha. In the Mpanga Falls area, on average each household owns 3.9 ha. However, there are individuals who own over 20 ha of land, particularly cattle keepers. Eighty five percent of the surveyed households farm on their own land. In KWR-KKFR corridor, 15% of the surveyed households rent/hire away from the corridor area in addition to their own land. Renting of land is mostly done in Irimia parish, where in some cases individuals have five tenants. Although the land owners claim to have bought the land from indigenous inhabitants (who either migrated to other areas or have died), key informant sources indicated that the land was merely grabbed or settled by displaced families, many of whom were evicted from Kyambura Wildlife Reserve. From field observations, it was noted that some agricultural fields were more recent (e.g. opened in the last 1-3 years). In the KWR-KKFR corridor area, 70% of the households have owned land for less than 10 years. The natural forest tree species still standing in people's fields provided additional evidence of recent forest clearing. Also the presence of a reasonable number of live palm trees in newly opened fields was evidence of a palm habitat under conversion. Going by the recognised reserve boundaries, the area outside the corridor was unprotected forested land under conversion extending into the protected areas.

In Mpanga some individuals have land titles, for example, on the northern side of the falls, one of the landowners has a land title issued by the Kabarole District Land Board. However, his land has not yet been surveyed because of conflicting interests that later cropped up between him and the District Land Board. He has sold some of his land to four other individuals who are mainly cattle keepers. On the southern Side of Mpanga River in Ntara and Nyakeera villages, the land is owned by individuals who are either subsistence farmers or pastoralists. Of these, 14 households share the boundary with the river protection zone.

3.3 Household Incomes

Agriculture provides the main source of income for the households, with most income derived from, crop sales, agricultural labour and agricultural related businesses such as beer production (e.g. waragi and banana beer), marketing of products and renting out land. Other sources of income derive from livestock and livestock product sales, and the sale of forest/park products such as charcoal, timber, crafts and poles. Besides watering the animals in Mpanga River, charcoal harvesting is a very important source of income for the households in this area. It was reported by the respondents that households produce an average of 40 sacs of charcoal per year (approx.10 households are involved in the business). However, they were quick to note

that all this charcoal is produced from privately owned woodlots. Most of it is transported by water using canoes and finds its way to the fishing villages such as Kasenyi, Kashaka and Kahendero.

Beans and cooked bananas (matooke) are the most grown and produced crops: all surveyed households produced beans and matooke. Millet and Coffee are the second most popular crops produced by 90 percent of 30 surveyed households. The other most common crops include Irish potatoes, maize, sweet potatoes, rice, sorghum, groundnuts, tobacco and cassava produced by 63 percent (n=30). The average land size under bananas and beans for the households that grow these crops was 0.49 and 0.23 hectares respectively. However, because intercropping is a common practice, especially between beans and maize/bananas, overestimation of the land devoted to a single crop was possible. Thus, some areas devoted to beans are probably double counted. The main crops grown and their contribution to household income are shown in Table 3.1. Because it was very difficult to allocate intercropped areas into a single crop, income calculations were based on the total quantities harvested rather than the production per unit area.

Table 3.1 The total income and mean annual income/crop/Household (HH) separated into what was sold and consumed in KWR-KKFR corridor (n =30).

Crop	HH	Unit of measure	Mean Units Sold	Mean Units consumed/ Household	Average Unit price	Mean income from crop sales (US\$)	Mean Income consumed/crop (US\$)	Total income/crop (US\$)
Coffee	25	Sack	4.0	0.0	32,560	129,882	0	3,247,046
Tobacco	5	Bundle	286.4	62.0	1,200	343,680	74,400	2,090,400
Sugar cane	8	Bundle	50.5	77.1	1,588	80,194	122,475	1,621,348
Beans	30	Sack	1.7	2.6	42,267	71,149	108,661	5,394,326
Cassava	22	Sack	6.1	9.1	26,136	159,192	238,432	8,748,590
Potatoes	22	Sack	2.0	14.1	18,182	35,538	256,755	6,430,367
Irish potatoes	23	Sack	4.4	1.8	24,609	108,387	45,259	3,533,852
Maize	20	Sack	1.7	1.1	30,400	51,680	31,991	1,713,040
Cauliflower	1	Bundle	30.0	50.0	200	6,000	10,000	16,000
Egg plant	1	Sack	5.0	3.0	18,000	90,000	54,000	144,000
Cabbages	8	Head	303.8	102.5	450	136,710	46,125	1,462,500
Tomatoes	7	Sack	2.6	0.4	25,571	66,302	9,315	528,467
Dodo	7	Bundle	0.0	1431.4	129	0	184,654	1,292,580
Nakati	1	Bundle	0.0	364.0	300	0	109,200	109,200
Solanum	6	Basket	2.4	3.1	2,500	6,042	7,708	82,500
Pawpaw	9	Head	100.0	342.2	267	26,700	91,373	1,062,660
Jackfruit	19	Head	113.7	189.5	874	99,360	165,600	5,034,240
Mangoes	21	Sack	1.1	4.6	15,857	16,990	73,622	1,902,840
Onions	11	Sack	1.6	0.5	29,273	45,506	15,701	673,279
Matooke	30	Bunch	284.7	698.0	2,653	755,221	1,851,882	78,213,093
Sorghum	16	Sack	4.4	1.5	26,625	116,651	40,770	2,516,063
Passion fruit	4	Sack	1.1	0.3	29,000	30,813	10,005	163,367
Cow peas	1	Sack	1.0	1.0	40,000	40,000	40,000	80,000
Oranges	6	Sack	2.6	0.6	24,000	62,000	14,520	459,200
Millet	27	Sack	4.0	1.6	48,370	195,773	75,780	7,331,925
Pine apple	2	Head	70.0	90.0	300	21,000	27,000	96,000
Guava	4	Basket	0.8	1.8	2,250	1,688	3,938	22,500
Lemons	1	Tin	5.0	1.0	6,000	30,000	6,000	36,000
Yams	1	Sack	8.0	0.0	25,000	200,000	0	200,000
Musa	2	Bunch	350.0	0.0	800	280,000	0	560,000
Avocado	11	Sack	0.3	0.2	17,636	4,810	3,207	88,180
G/nuts	12	Sack	3.7	0.6	47,500	174,958	29,292	2,449,417
Rice	19	Sack	11.5	1.6	46,842	537,450	76,426	11,663,658
Soya beans	3	Sack	4.0	2.8	60,000	240,000	168,000	1,140,000

Different crop combinations ranging from 7-20 are grown by individual households, of which the majority of crops are produced as intercrops, particularly vegetables and fruits.

The total annual income from crops for all surveyed households in KWR-KKFR recorded was 142,511,800. On average each household earnings were USh 4,750,393 (US\$ 2,639; exchange rate of USh 1800 per dollar) per year (Std. Deviation of \pm 2,344,312 USh). Of this income, 56% is consumed at home. Apart from matooke and beans not all surveyed households grew all the listed crops (Table 3.1), that is, different crop combinations were grown by each household. The total income per crop was the sum of revenue generated from both sales and consumption by all households that grew that crop. In terms of revenue generation, the highest income earning crops were bananas generating Uganda Shillings (USh) 2,607,103, rice (USh.613,877) and cassava (USh 397,663) per annum per household. Coffee and tobacco were the important traditional cash crops grown in the area. The majority of households (83.3%) have coffee fields but only nine percent grew tobacco. Given the objective of the study, the crop earnings for the households that lay in the planned wider corridor were presented alone to estimate the value of agriculture as a land use in these proposed corridor areas. Table 3.2 provides the total annual income earned by all households that grew each crop. The mean annual income from crops per household was USh 4,695,262.

Table 3.2 The mean annual harvest per crop/household and total income earned from each crop by the Households that lay within the planned wider corridor of KWR-KKFR (n=17).

Crop	Unit of measure	No. of Households	Average units produced per Household (HH)	Unit price (USh)	Total income (USh)
Avocado	Sack	8	2.4	17,500	336,000
Beans	Sack	17	3.6	40,765	2,494,800
Cabbages	Head	4	475.0	450	855,000
Cassava	Sack	13	16.2	23,308	4,908,600
Cauliflower	bundle	1	80	200	16,000
Coffee	Sack	17	2.5	30,647	1,302,500
Dodo	bundle	5	1411.2	140	987,840
Egg plant	Sack	1	8	18,000	144,000
G/nuts	Sack	5	5.0	48,000	1,200,000
Guava	basket	3	1.7	2,667	13,600
Irish potatoes	Sack	13	4.6	24,538	1,467,400
Jackfruit	Head	13	224.6	869	2,537,978
Lemons	Tin	1	6	6,000	36,000
Maize	Sack	13	3.4	28,846	1,275,000
Mangoes	Sack	12	4.8	15,583	897,600
Matooke	Bunch	17	954.6	2,647	42,957,019
Millet	Sack	14	4.4	51,071	3,146,000
Musa	Bunch	1	350.0	1,000	350,000
Nakati	bundle	1	364	300	109,200
Onions	Sack	5	1.4	30,800	215,600
Oranges	Sack	2	2.4	20,000	96,000
Passion fruit	Sack	2	1.3	29,000	75,400
Pawpaws	Head	4	325.0	275	357,500
Pine apple	Head	1	160.0	300	48,000
Potatoes	Sack	12	13.5	17,667	2,862,001
Rice	Sack	10	12.4	49,000	6,076,000
Solanum	basket	3	4.3	2,000	25,800
Sorghum	Sack	9	11.2	29,111	2,934,400
Soya beans	Sack	1	6.3	60,000	380,000
Sugar cane	bundle	4	22.3	2,800	249,760
Tobacco	bundle	1	348.4	4,000	1,393,600
Tomatoes	Sack	1	3.0	24,000	70,857

In Mpanga area, surveyed households grew very few crops (Table 3.3) and in this particular case, none of the households grew coffee. Although grown on a relatively small scale, matooke raises the most income (US\$ 3,307,500) earned from agricultural crops. The total annual income from crops accruing to the 14 households surveyed in Mpanga area was US\$8,146,500, which implied that each household earned on average US\$ 581,893. The standard deviation of the crop income for the households was $\pm 230,885$

Table 3.3 The mean annual income per household (HH) from crops divided into what was sold and consumed in Mpanga Falls area (n =14).

Crop	HH	Unit	Units sold	Unit consumed	Unit price	Mean sold per HH	Mean consumed/HH	Totals/crop
Cotton	8	Kg	40		480	19,200	0	153,600
Tobacco	7	Bundle	100	60	1,000	100,000	60,000	560,000
Sugar cane	6	Bundle	15	15	1,500	22,500	22,500	270,000
Beans	13	Sack	0.2	0.4	40,000	8,000	16,000	312,000
Cassava	14	Sack	2	4	18,000	36,000	72,000	1,512,000
Potatoes	8	Sack	3	6	10,000	30,000	60,000	720,000
Maize	13	Sack	1	2	28,000	28,000	56,000	1,092,000
Dodo	10	Bundle	0	968.4	100	0	96,840	968,400
Jackfruit	7	Head	60.0	200.0	600	36,000	120,000	1,092,000
Mangoes	6	Sack	0	2.6	8,000	0	20,800	124,800
Matooke	7	Bunch	50.0	265.0	1500	75,000	397,500	3,307,500

An attempt was made to compute the incomes that accrued to households engaged in different economic activities in KWR-KKFR (Table 3.4) and Mpanga Falls area (Table 3.5). In KWR-KKFR corridor, all households surveyed earned an income from agricultural products. Agriculture contributed 51.3% towards the household incomes and small-scale enterprises contributed 14.5%. Similarly, agriculture was the main source of income (36.7%) for the households of Mpanga area. However, unlike in KWR-KKFR corridor, fishing occurs in the Mpanga area and was the second highest income earning activity contributing 25.7% to the household income. Forest/park products contributed 13.1% and 8.6% to household incomes of KWR-KKFR and Mpanga local residents respectively. Eighty percent of the households in KWR-KKFR depend on the forest/park for their livelihood while in Mpanga 53% depended on the park resources. This difference could be explained by the high level of policing by Uganda Wildlife Authority (UWA) as opposed to National Forestry Authority (NFA) where people are allowed to access resources from the forest reserves. Of the park/forest products, 3% reported harvesting craft materials, firewood (32.8%), charcoal (1.5%), timber (4.5%), wild coffee seedlings (1.5%), thatching grass (23.9%), medicinal plants (10.4%), poles (19.4%), ropes and fibres (1.5%) and other (mushrooms, honey, fruits) (1.5%). About half (55%) of the forest/park products are consumed by the households. Of the products sold, poles and charcoal dominate the forest product market. On-farm tree products included poles, charcoal, coffee seedlings and firewood.

Table 3.4 Mean annual income from different economic activities separated into what was sold and consumed (n =30) for KWR-KKFR corridor households.

Sources of income	Crops	On-farm tree products	Livestock	Small-scale enterprises	Wages	Gifts cash & non-cash	Forest /park products
Mean income from sold goods	2,149,814	40,333	345,204	1,274,847	1,014,240	0	640,607
Mean income consumed	2,855,363	261,977	255,373	0		142,262	777,296
Mean totals	5,003,555	302,310	600,557	1,274,847	1,014,240	142,262	1,417,903
Households (%)	100	47	87	63.3	37	83.3	80

The income calculated is a gross value which does not include the paid-out costs (e.g. costs of seeds, labour, transport, drugs for livestock, taxes).

Table 3.5 Mean annual income from different economic activities separated into what was sold and consumed (n =14) for Mpanga area households.

Sources of income	Agriculture	Fishing	Livestock	Small-scale enterprises	Wages	Forest /park products
Mean income from sold goods	922,353	300,000	443,040	390,000	50,000	115,000
Mean income consumed	1,124,706	1,133,333	327,730	400,000	0	366,667
Mean totals	2,047,059	1,433,333	770,745	790,000	50,000	481,667
Households (%)	100	69	94	41	36	53

The income calculated was a gross value which did not include the paid-out costs (e.g. costs of seeds, labour, transport, drugs for livestock, taxes).

The most common off-farm activity was business, particularly shop vending and marketing of agricultural produce (middle persons). Twenty percent of the surveyed households are involved in small-scale enterprises, which include trading in goods (shop vending, marketing agricultural produce), brewing and renting out goods (e.g. land, bicycles, commercial buildings). Women were quite active in agricultural trade, crafts (e.g. mats and baskets) and food restaurants. Only men were engaged in trading livestock, carpentry, brick making, construction and the timber business (pitsawing, transportation and marketing). It was found that high income households had a large (26%) share of income coming from off-farm activities compared to low income households (4%). Among the small-scale enterprises, brewing of local beer was the most lucrative business. Waragi (local spirit) and banana wine (popularly known as tonto) are brewed from the uncooked banana, locally referred to as *Musa* and *Mbiire*. The bananas for making alcohol could also be sold in raw form directly to brewers. Of the earned income from small-scale enterprises, US\$ 803,154 was generated from brewing. Unlike in some other parts of western Uganda, this activity was dominated by men because it was the main economic activity for households with large banana plantations. In addition, it was found to be a source of employment for casual workers who were mostly men.

In all surveyed households, none of the members earned a regular income. Regular income was used to refer to someone who earned a constant monthly wage throughout the year. A majority (98%) of the households were dependent on seasonal activities for wages such as farm labour, timber cutting, carpentry and construction work. The income earned as cash and non-cash gifts was mainly received from relatives and friends. Such donations included food, livestock, transport assistance (bicycle) and contributions to cultural and religious ceremonies (e.g. introduction, give away and wedding).

3.4 Crop raiding

Crop raiding by both problem animals and vermin was a major challenge to both the protected area managers, conservationists and the local community. The wild animals reported to raid the crops include mainly the vermin, that is, the baboon (54.9%), Vervet monkey (21.6%) and wild pigs (5.9%). The problem animals reported were the elephant (15.7%) and Hippopotamus (2%). Of the crop raiding animals reported, 97% of the households regard the baboons as the most problematic animal. Although food loss and income from crop products were the obvious impacts of crop damage, other indirect costs occur to the communities around Kyambura WR and Kasyoha-kitomi FR corridor. In particular, four households abandoned the cultivation of drought resistant crops such as cassava, millet and sorghum due to baboons. In addition, households complained of children dropping out of school to guard crops.

3.5 Threats to Kyambura-Kasyoha Kitomi Corridor and Mpanga and areas

The major threats to the achievement of an effective wildlife corridor between the protected areas (KWR and KKFR) include problem animal incursions, habitat loss due to illegal cutting of forest/park products and agricultural encroachment, road construction and wildlife poaching. In the Mpanga Falls area, the major threats to the area included woody cover loss due to charcoal burning, agricultural land expansion (mainly cotton, tobacco), livestock grazing in the park, over-fishing and destruction of fish breeding zones, fires, poaching and harvesting of the endemic cycad plants.

3.6 Local community needs

During the household survey and the village meetings, community needs were documented. These included: the need for the government and development oriented organisations to service the area with social amenities, particularly primary schools, dispensary (health centre) and community centre. Most of these services are far from the village. A primary school and dispensary are located in the nearest trading centre, Irimia, a distance ranging from 5-10 km (Katerere and Mahyoro trading centres). However, to access the school and dispensary in Irimia, people have to move through the corridor. It is not surprising that there were three footpaths connecting Kagarama village to Irimia parish. Public roads leading to the service centres (markets, health units, communication facilities) were poor and one had to go round on foot to access the services. One of the female village members, said “we have been going to Irimia through the forest in five minutes now the park authorities want us to spend the whole day to reach the same place by using the Kyendangala-Mahyoro road, is that fair?, it means that for some of us who go to cultivate across the other side we would have to shift residence”. The community is pushing for the road that has been constructed up to Kyambura Wildlife Reserve boundary to continue to Irimia through the reserve. Another controversial project involves a road under construction that will pass through Kasyoha-Kitomi Forest Reserve to Buhweju,

In Kagarama village, there is a sub-grade primary school called Nyakarambi with classes from primary one to six, which was recently taken up as a government-aided school. It has a population of 230 pupils with only six teachers including a headmaster. It lacks a primary leaving examination centre and a number its buildings are made of mud and wattle with tin roofs. Improving the school is a community priority. The school is housed on one acre of land but the Local Chairperson indicated that nearby land was available for school expansion at a cost of US\$ 400,000/acre. They also expressed the need for assistance from the National Forestry Authority to provide poles for classroom construction and timber for making desks and benches for the school for the youths.

The community members raised the issue of inadequate markets (low prices) for their agricultural products and lamented the lack of alternative income sources. They blamed the illegal access to forest/park resources by some community members for the lack of alternative sources of income and voiced frustration about low crop returns. They suggested that at least NFA and UWA should recruit some of the local residents as rangers and vermin guards to provide employment.

The other concern was about the problem animals and vermin. They feel the government has not done enough to help them reduce crop losses due to animal damage. In addition, the revenue from the park was too low and subjected to heavy taxes. The Subcounty chief and the Local council III chairperson noted that the money they receive becomes inadequate after subjecting it to the tendering process (this is a legal requirement if it exceeds one million; Local Government Act, 1997). In addition, the process takes a lot of time to mature, costly to manage and the bidder has to deduct 18% Value Added Tax (VAT) and 6% withholding tax, on top of his profit, which results in less value for money. The Subcounty chief was quoted saying that “UWA gives with one hand and takes back with another”. For example, if UWA issues a cheque

of two million, only 1,520,000 will be left after tax deductions, we continue to lose money in administration costs such as allowances are given to the tender board members at every sitting. As such, they cannot implement their projects on time because they have to wait for the next disbursement to raise more money. Accumulation of bids helps to reduce the administration costs in the long-run. They proposed that such compensation funds should not be subjected to taxes by the government and that the money should be deposited directly to the subcounty account to avoid all the above problems. They expressed the need for the construction of a trench along the wildlife reserve boundary to continue because it was perceived as a working option. However, this should be interpreted with caution as local people were paid to dig the trench, which could be seen as an immediate benefit rather than the actual intended purpose.

Related to the above was the concern of losing local fiscal revenue and increasing poverty when people are displaced or relocated. During the village meeting, local residents listed a number of impoverishment risks that they faced during earlier displacement or resettlement process from Kyambura Wildlife Reserve namely: the risks of landlessness, joblessness, homelessness, marginalization, increased morbidity/mortality, food insecurity, loss of access to common property resources and social disarticulation. The Local Council Chairpersons proposed that if government was to expand the protected area to make the corridor wider, it should be able to demonstrate in practical terms the extra sources of fiscal revenue to the local government to execute its programmes. It should be able to provide better compensation packages for the displaced or resettled families not to roll back into absolute poverty. This is because they would have lost taxes and a reduction in the amount of grants received from the central government. According to the local government Act, 1997, one of the criteria for awarding conditional and equalisation grants depend on the population of the district and its inability to raise local revenues due to inadequate resource endowment.

The community members expressed the need to establish tree nurseries but lacked seeds, hence demanded support from NFA to enable them plant trees on-farm. In addition, they need credits to start up small-scale businesses and also meet household needs (especially school fees and medical care). They also echoed the need for environment and conservation education delivered in form of community meetings, wildlife awareness films and video shows and regular trips to Mweya to enable them appreciate the value of wildlife conservation.

They also need access to the protected area resources, particularly firewood, thatching grass, water and poles. They need more protected springs and if possible construct boreholes near public utilities (e.g. school, church). This approach might help to improve relations between the local people and protected area (UWA and NFA) managers in the long run. Local people claimed that they were harassed and beaten whenever found in the park/forest reserve. Unfortunately, when the wild animals raid their crops, UWA and NFA staff does not offer any assistance.

Lastly, the community expressed the need to access land, in particular the degraded patches of Kasyoha-Kitomi forest to plant trees. They reported that the National Forestry Authority promised to grant them permission to plant trees in the degraded areas of the forest reserve and some form of process was initiated but until now nothing further has happened. This is yet another opportunity for collaborative forest management to be nurtured.

3.7 Stakeholders relevant to corridor management

As indicated in the previous sections, a number of interest groups committed to conserving wildlife and the entire Queen Elizabeth Landscape do exist. They are broadly categorised as governmental and non government organisations. The government agencies include National Forestry Authority in charge of central forest reserves and some plantations, Uganda Wildlife Authority managing parks and wildlife reserves, Wetlands Inspection Division (for wetlands and

watersheds), National Environment Management Authority (National environmental secretariat). Other key government institutions include the Local Government (from Local Council I-V) implementing all government programmes at the grassroots, of which the most cited programmes that interface with the target areas were the National Agricultural Advisory Services (NAADS) and Area-Based Agricultural Modernisation Programme (AAMP) under the Plan to Modernise Agriculture (PMA). Among the conservation and development organisations are Nature Uganda, CARE-Uganda, Wildlife Conservation Society, International Centre for Agroforestry/World Agroforestry Centre (ICRAF) and Productive Resources Investment for Managing the Environment in Western Uganda (PRIME West). There were also a number of Community Based Organisations (CBOs) such as Byabagambi Tours Association, Kabarole Tours Association, Beach Management Units, Kasese Wood Users Association, Kagarama Twebisheho Association and Nkusibo Association, and the local community.

3.8 Challenges

The laws regarding watershed management are already in place but lack implementation. For example, the enforcement of a river protection zone of hundred metres from the highest water mark of the river specified in the Sixth Schedule, thirty metres for those rivers not specified in this sixth schedule, and the two hundred metres for lakes specified in the Seventh Schedule of the National Environment (Wetlands, Rivers banks and lake shores) Management Regulations, 2000. There has been a general debate by the Wetlands Inspection Division, National Environment Management Authority (NEMA) and the local government as to how people facing a problem of small landholdings could implement this law. The issues raised include loss of land for agriculture hence, exposing such households to food insecurity, loss of incomes from aggregated land units left as protection zones at the district or national level, which constrains government efforts to reduce poverty through the Plan to Modernise Agriculture (PMA) strategy, and increased access to resources by vulnerable groups, which is a pillar in the Poverty Eradication Action Plan (PEAP).

Inadequate human resources working for the institutions mandated to implement the environmental laws (e.g. NFA, UWA, NEMA, and Wetlands Inspection Division) at the district level. In the case of Kasyoha-Kitomi FR, the field officers were very thin on the ground and poorly facilitated. As such, illegal use of the forest reserve for activities that are inconsistent with conservation of wildlife has continued. Such activities include encroachment on the reserve (e.g. agriculture) charcoal burning, where trees are cut from the reserve and brought to the private land for kiln construction and timber harvesting. The inadequate human and financial capacity make it difficult for protected area managers to have effective law enforcement.

Farming of private land outside the corridor attracts wildlife often leading to crop and livestock damage. This has continued to generate a lot of concern for the local community which does not realise any tangible benefits particularly at the household level from wildlife and in turn, wildlife is detested and considered a nuisance by the community. Planting of buffer crops (e.g. coffee, vanilla) has been perceived as a wise idea but communities were concerned about trees encouraging vermin species to reside near their farms, particularly the monkeys.

In addition, farming on steep slopes presents a major challenge for poor subsistence farmers. The steep slopes coupled with poor farming techniques exposes the soils to erosion in the area. There is need to promote preventive agronomic and agroforestry practices that are effective for soil conservation such as zero tillage, mulching, contour farming, use of natural vegetative strips, good crop selection and intercropping according to slope and land use potential than curative approaches. Households that are unable to plant trees due to land constraints should be encouraged to plant carefully selected perennial crops such as coffee, fruit trees, pigeon peas which are more likely to protect the soils on hillsides. In addition, they will help to reduce sedimentation and reduce water pollution.

Inadequate formal community associations. Community groups need to be formed to facilitate the planning process, management and crafting of bye-laws needed for regulation and enforcement of resource use agreements, and to provide a quick forum for information flow. The other challenge concerns the creation of effective and recognisable partnerships between the local people and the conservation agencies. The local people are always very suspicious of the conservation agencies because their participation stops at the consultation level and are never fully involved in the decision-making processes. It is therefore prudent that processes adopted ensure that the community has a decisive voice in formulating regulatory mechanisms about the resource use and demand for accountability from the state or conservation agencies.

Inadequate markets for agricultural products. The unpredictable and always falling prices for agricultural products present a major challenge to influencing a shift from one agricultural enterprise to another. The guiding questions to answer may be does the product have a financially accessible market? What are the means of transport?, can the technology, labour and capital requirements be affordable and accessible? Does the product have an attractive and stable cash income potential? Related to markets is the comparative advantage of existing economic activities (e.g. livestock grazing, fishing) to the proposed alternatives. For example, livestock offers many products such as milk, meat, manure and services (e.g. draft power, cultural and religious values) which may not have ready substitutes. Other indirect values include the provision of community coherence and insurance (e.g. livestock serve as household banks to save money for future use) based on the premise that the community identifies with a common land use system and share experiences. PRIME West's strategy of competitiveness will be suitable if extended to this area.

Lastly, the timing of actions, particularly purchase of land should be planned carefully to avoid the sensitive periods of local and national politics on-going in the country. It is possible to meet resistance if the work plan coincided with the parliamentary and presidential elections due in March. On the other hand, incompatible developments are taking place in the proposed project areas, in turn the demand for immediate action is highly needed. For example, in Kyambura-Kasyoha Kitomi corridor, a new road has been constructed up to Kyambura WR boundary and the local people are pushing the local leaders to move it through Kyambura Wildlife Reserve to connect Bushenyi (Kagarama village) to Ibanda (Irimia). To make matters worse, a new district was recently created out of Ibanda sub district, formerly part of Mbarara. The demand for services and the desire to raise fiscal revenue for the district local government will increase pressure on the land resources and the subsequent conversion of forested land around the protected areas. Apparently, the farmers have intensified the cutting down of the forested islands around Kasyoha-Kitomi Forest to plant mainly rice and bananas. As such, the corridor is likely to become narrow and ineffective.

Mpanga Falls area is no different; the river is under increased threat from charcoal production, poaching of hippos in the river and sedimentation from poor agricultural practices (e.g. slash and burn, soil erosion, expansion of gardens close to the river banks). One of the landowners around Mpanga Falls, who is also the proprietor for Byabagambi Tours Association (a private company) has erected a gate and is constructing bandas to start charging entry fees to the falls. This is a positive development which benefits conservation unfortunately, he also claims to own the falls and is contesting the location of the park boundary. In addition, the proposed lime mining in Dura sector by Larfarge International who owns Hima Cement Factory will have negative impacts on the wildlife, fish and the water bodies if it is approved after EIAs have been finalised.

4.0 Discussion

4.1 Sources of Income to the households

The survey has shown that households depend more on agriculture as a source of income, matooke, cassava and rice being the highest income earning crops. According to Yamano *et al.*, 2004, who made an analysis of the agricultural contribution to poverty reduction and the environment from a household survey of 940 households in Uganda, matooke provides the largest income, that is, the production value net minus the paid-out costs, was on average US\$ 360,789 (US\$190; exchange rate of US\$ 1899/dollar). Maize provided about US\$ 115,000 (US\$66) and beans US\$ 70,263 (US\$37), to its producers (Yamano *et al.*, 2004). Coffee, cotton and tobacco were the important traditional cash crops grown in the study areas. Coffee should be encouraged as a buffer crop around the protected areas. Although small-scale enterprises were the third largest source of income, much of it accrued from brewing (US\$ 803,154). This income from brewing compared fairly well with Yamano *et al.* (2004) who reported an average income of US\$ 605,781 (US\$319).

Both on-farm and off-farm forest products were noted to be economically important to the households. However, much of the forest products were derived from the park or forest. The direct value of the forest/park to the households could not be effectively measured as some of it accrues to them illegally and were unwilling to disclose the quantities harvested. For example, households living adjacent to the forest reserve where regulated access is allowed were likely to derive more economic benefits than those adjacent to parks (e.g. Mpanga area).

Forest/park products contributed 13.1% for KWR-KKFR households, which compares well with estimates of Bugoma forest contribution to the adjacent local people (Bush *et al.*, 2004). Agricultural crops, which were the largest income source, contribute over 50 percent to the households. It was not possible to derive the net production values of the different income sources due to limited information on the paid-out costs during the production by the households. What is available was limited to agricultural crops (Table 3.6) of which, few crops are considered (Yamano *et al.*, 2004).

Other reports have shown that the gross returns to crops in Bushenyi district are US\$ 495,215/ha/yr (NEMA 1998a,b) and livestock is US\$ 100,051/TLU/yr (Mbuza *et al.* 1998). Considering the total land (212.5 ha) owned by the 30 surveyed households from KWR-KKFR corridor (excluding land rented far from the corridor area), and at an annual gross return of US\$ 495,251/ha/yr on agricultural crops, the total annual gross return for such an area would amount to US\$ 105,240,838 (\$58,467). This gross value was lower than the calculated annual income of US\$ 150,106,638 (US\$82,607) from the survey. The difference could be explained by the change in the market value of agricultural products, technology and yields over time. Unfortunately, it was hard to tell whether or not the increase in land size under production and change in production technologies are also possible factors. The obvious factor was that some crops (e.g. sorghum, rice, matooke and groundnuts) have gained market value and their production increased, particularly the land cover rather than the yield. The income from agriculture provides an estimate of what it might cost if households accept to lease or rent their land for conservation of wildlife.

Table 3.6 Crop Production–Value Production at the Household Level.

	Percentage of producer households (A)	Area devoted		Production Value		Production value per acre (F)
		All (B)	Producers only (C)	All (D)	Producers only (E)	
	%	acres	acres	US\$	US\$	US\$/acre
Beans	75.8	3.34	4.33	28.3	36.7	8.5
Maize	74.9	2.99	3.90	50.3	65.5	16.8
Matooke	67.3	8.25	11.8	132.5	189.8	16.1
Sweat potato	51.7	0.62	1.14	29.9	55.3	48.5
Cassava	48.4	1.64	3.06	30.5	56.9	18.6
Coffee	31.0	2.66	7.64	19.7	56.2	7.4
Groundnuts	26.4	0.48	1.77	9.9	36.3	20.5
Millet	19.9	0.27	1.29	5.7	27.5	21.3
Sorghum	15.2	0.24	1.55	4.6	29.1	18.8
Peas	13.2	0.23	1.68	3.6	26.4	15.7
Irish potato	12.3	0.16	1.30	5.8	46.4	35.7
Fruits	9.6	n.a.	n.a.	7.6	79.0	n.a.
Industrial crops	8.4	0.44	4.19	10.1	96.5	23.0
Other vegetables	7.6	0.20	2.45	6.0	70.9	28.9
Rice	3.2	0.07	2.05	4.7	145.3	70.9
Wheat	1.3	0.01	0.68	0.2	12.8	18.8

Percentages of households producing each crop (column A), the average area devoted to each crop among all households (column B) and among producers (column C), the average production value of each crop among all households (column D) and among producers (column E), and the average return to one acre of land (column F). Source: Yamano *et al.*, 2004.

4.2 Crop raiding

The survey revealed that the most problematic crop raiding animal was the baboon, which is regarded as vermin. The results are consistent with studies conducted around Kibale National Park (Naughton-Treves, 1998) Mgahinga National Park (Andama, 2000) and Budongo Forest Reserve (Hill, 1998; Tweheyo, Hill and Obua, 2005) who reported that baboons were the most notorious vermin. According to the Local Government Act, 1997, management of vermin is a preserve of the local government. Unfortunately, the local government lacks the financial capacity to recruit vermin guards. The major challenge is to effectively measure the cost of problem animal impacts to communities because there are various dimensions to problem animals such as children dropping out of school to guard crops, loss of sleep by men guarding crops in the night and food insecurity due abandonment of growing some crops (e.g. cassava, millet and potatoes). None the less, efforts have been made to study the damage to crops by vermin and problem animals in Uganda. For example, studies were conducted around Kibale National Park (Naughton-Treves, 1998), Lake Mburo National Park (Kagoro-Rugunda, 2004) and Budongo Forest Reserve (Tweheyo, Hill and Obua, 2004) and elsewhere in Africa (Naughton *et al.*, 1999).

The crop damage losses have been estimated and a value attached to it. For example, the estimates of crop damage by elephants along Kibale National Park boundary was reported to be equivalent to US\$6 per farmer or US\$100 per km of border (Naughton-Treves, 1998). At the crop level, Naughton-Treves (1998) reported that maize recorded the highest damage of 38.4%, sorghum (21.4%) and banana (28.6%) around Kibale National Park. The affected households are located at a distance less than 200 m from the forest edge, a zone noted to be of highest risk for crop raiding (Naughton-Treves, 1998). It is interesting to note that none of the households interviewed reported abandoning the fields because of crop raiding. In addition, no respondent accepted the idea of relocating because of the problem animals. Apparently, the benefits enjoyed from the protected areas (e.g. firewood, water, medicinal plants, poles) seem

to outweigh the problem animal damage. However, because of the low annual incomes and the demand for compensation, households suffering crop loss to elephants are expected to detest wild animals.

4.3 Management options for the areas

Several options are potentially available for the management of the two proposed widened corridor areas. These include

- 1) Sustainable Land management outside the corridors
- 2) Alternative income generating activities
- 3) Purchasing of land
- 4) Renting or leasing of land
- 5) Conservation easements

4.3.1 Kyambura WR-Kasyoha Kitomi Corridor area

i) Sustainable land management outside the corridor areas

Sustainable land management involves successful utilisation of land resources to satisfy the changing human needs while maintaining or enhancing the quality of the environment and conserving the natural resources therein. Land outside the corridor areas could be managed to allow biodiversity co-existence. The most fundamental principles of sustainable land management include the recognition of ecological interaction, economic viability, social satisfaction, respect for all forms of life and adaptable practices. The process should allow the use of low cost inputs, optimal use of the resources, minimise resource degradation and promote participatory (people) technology development. In this context, the land management package may include but not limited to the following:

Agro-biodiversity – promotion of private land management for biodiversity conservation, which interventions may include agroforestry (e.g. tree planting, fruit trees, pastures) and woodlot establishment for carbon trade. The demand for firewood is high and on average each household uses five bundles of firewood worth US\$7000 a week. Most of the firewood is harvested from either the wildlife or forest reserves. Some particular tree species could be targeted for planting along the forest/park boundary to allow animals to pass through. The prime objective is to increase on-farm biodiversity and generate household income.

Soil and water conservation – This may involve the construction of trenches, bunds, planting cover crops, organic farming, tree cover restoration to address soil degradation and fertility decline. On average each household uses four 20 litre jerrycans of water per day, which majority households (93%) reported to be coming from the forest. The local community around these protected areas depend on the water from the forest for domestic use, including watering of livestock. They also rely on rain-fed agriculture irrespective of the abundant water from the river. The International Centre for Agroforestry (ICRAF) and the Environmental Conservation Trust of Uganda (ECOTRUST) could play a leading role in this area given their experience.

ii) Provision of alternative income generating activities

Another option is to provide alternative sources of livelihoods both on-farm and off-farm with a major emphasis of raising household incomes. Eco-development could be an appropriate strategy to help resolve the local sustainable development issues. Eco-development is a multi-disciplinary and multi-stakeholder led collaborative strategy initiated by the United Nations under the Conservation Development Fund, currently being adopted to link the conservation values of wildlife protected areas with livelihood and development aspirations of the local communities (Singh, 1997). Eco-development strategy will help to address the dual goals of improving ecological conditions and the sustainability of natural resource management, and improving local socio-economic conditions. It aims to do so by catalysing participatory process

of resource management with local communities and building partnerships with governmental and non governmental structures. Fortunately, Productive Resources Investment for Managing the Environment in Western Uganda (PRIME West) has already started implementing this strategy, which provides an opportunity for all stakeholders to promote and support conservation.

The strategies under this intervention may include fish farming and restocking of crater lakes, planting of high value crops (e.g. vanilla, coffee) in the buffer areas, domestication of medicinal plants with a major emphasis on commercially valuable native species (e.g. *Prunus africana*). Seventy percent of the households depend on herbal medicine for treatment of health-related ailments. Provision of alternative sources of income could be one way of promoting rural development while securing support for conservation of wildlife. Other income generating opportunities could include piggeries and fruit trees to raise household incomes and reduce food insecurity. The latter options need further research to examine the potential and availability of markets for the products.

The proposed interventions should have a clear link between the economic incentives offered and conservation so that they are seen as trade-offs or replacements for loss of access to protected area resources. Whenever, the objectives for offering an economic incentive to engage in a conservation driven activity are not well understood by the community, the good intentions are normally abused when funding comes to an end. In packaging of the interventions, consideration should be made about the repercussions of investments in the periphery of a protected area that create a middle-class of consumers who by becoming participants in the market economy pose a greater rather than a lesser threat to the protected area. For example, individuals who develop skills and accumulate capital and begin to respond to the available markets and engage in commercial harvesting of protected area resources will increase the threats rather than reduce them.

iii) Purchase of land

Land purchase to widen the corridor and the river protection zone is the most effective way of increasing the effectiveness and enhance the functionality of the corridors. The corridor between KWR and KKFR has become too narrow (300 m) for species such as elephants and chimpanzees to move through. At the landscape scale, a wildlife corridor can only be effective if it is between 1-10kms wide (Bennett, 2003). It would therefore make sense if the corridor was made 1.5km wide to allow sustainable movement of wildlife. In turn, it will facilitate genetic material exchange and increase variability of species in the QENP landscape. Land was considered under two different categories, that is, land with and without crops. The local market price of land without crops (e.g. under fallow) was US\$1,389 per Ha (exchange rate of US\$1.800 per dollar) while land under crops and housing structures was valued at an average price of US\$2,167 per Ha. From the survey, the area of land under the planned wider corridor that would need to be purchased was 65.9 Ha (Figure 2.1). Because all the land under consideration is cultivated, land purchase would cost US\$ 142,805. The cost price did not include administration and legal fees. It is worth noting that the price of land with crops varied among the respondent because it was not a common practice on the local market for people to sell land with crops. As such, there was a disparity in the value attached to a piece of land with perennial crops such as bananas and coffee compared to annual crops. Irrespective of the high market value for crops namely rice, beans, millet and groundnuts, local people regard land under coffee and/or banana as more valuable. This was because such land provides security to the land. The two crops provide security of tenure and land rights. In addition, it provides social values because of their use during cultural ceremonies (e.g. use of dry banana leaves in burial ceremonies, roasted coffee during cultural festivities).

iv) Renting or leasing of land

Leasing land is one other option for streamlining the management of land outside the corridor areas to make it compatible with wildlife conservation. When asked whether or not they knew what leasing of land meant, only two people reported having heard about it but did not know what it involved exactly. It was therefore a new concept to the local communities. It was noted that people were familiar with renting of land. As such, they were asked whether or not they would be willing to rent their land to government for wildlife conservation. Ten households accepted to rent land and 20 did not accept the idea but were willing to sell the land and move to other places. Furthermore, an attempt was made to establish how much the 30 households would require as compensation for the lost property and land if willingly accept to relocate to other places. The total cost was US\$ 459,837 far greater than what it would cost to buy the land as a purely market transaction. Considering only the 21 households that lay in the planned wider corridor, the total compensation cost would be US\$323,333 (US\$582 million). The cost of paying off people to relocate was high because the households considered a number of issues such as loss of property, land, access to protected area resources and the maintenance costs during the time of resettlement. The households that accepted to rent land for wildlife conservation rated each hectare at a monthly fee of US\$ 129 (US\$ 231,529). Interestingly, one hectare of land was rented at US\$100,000 per ha (40000/acre) per year for agricultural purposes. Important as it may be, leasing or renting land for conservation demands sustainable and long-term financing. Therefore, intensive negotiations have to be made to make it affordable and enforceable.

v) Establishment of a barrier around the corridor

It is increasingly clear that to further coexistence in wildlife habitats where local people live and use natural resources, there is a need not only to estimate and offset economic costs but to make wildlife conservation beneficial to people (Prins *et al.*, 2000; Mishra *et al.*, 2003). Because wildlife damage to household property leads to financial losses in already poor communities, they provoke retaliatory persecution of problem animals such as elephants. Hunting becomes inevitable which leads to a decline in wildlife populations. As such, hunting remains one of the most widespread and the direct threats to wildlife (Mishra *et al.*, 2003). In order to limit human expansion into the corridor area, a barrier in form of an electric fence, trench or live fence could be erected. For example, the construction of an electric fence will not only limit human access (e.g. encroachment, foot paths) to the corridor but will also lead to a decrease in crop damage, thereby reducing human-wildlife conflict, reduce poaching and provide employment for the local people to maintain the fence. In addition, erecting the barrier can co-exist with sustainable land management. Support to local government to recruit vermin guards to ensure protection of crops against wild animal damage will be appreciated.

The majority of the respondents (77.4%) are willing to slash or maintain the barrier (e.g. slashing fire lines, re-open trenches) and 65% are willing to guard the crops against problem animals and vermin if paid to do so. The cost for construction and maintenance of an electric fence are known (Sam, 1998; de Boer and Ntumi, 2001). For example, the construction and maintenance cost of the 38-km electric fence around the Maputo Elephant Reserve in Mozambique to protect farmers from elephant raids was estimated at US\$ 41,100 per year (de Boer and Ntumi, 2001). In this case, the cost of fencing a 2 km Kyambura-Kasyoha corridor on both sides (4 km) would cost US\$ 4,326 (\$1082/km). This is lower than the computed cost of US\$ 10,490 from Sam (1998)'s estimates (Nampindo and Plumptre, 2005 p.43). The cost of erecting other types of problem animal deterrents have been discussed and presented in the previous report (Nampindo and Plumptre, 2005 p.20).

4.3.2 Mpanga Falls area

The management interventions for Mpanga Falls area are not so much different from those being proposed for Kyambura-Kasyoha Kitomi corridor. These may include

i) Support private tourism development

Enhancing the ability of communities to directly generate income or livelihood benefits from wildlife may be a more cost-effective and economically efficient way to implement benefit sharing arrangements. Given the presence of two falls (Mpanga and Kaburuguma) and the biodiversity that occurs in the area (e.g. hippos, elephants, fish, plants -cycads, buffaloes), tourism can be a viable development option. The hippos have been reported to occasionally feed around and water from the river, in addition to the fish species that exist in the area. The idea of setting up a jetty boat from Mweya to the falls along Mpanga River provides an addition value to the tourist attractions in Queen Elizabeth National park. Apparently, one of the landowners around the falls has started developing the area for tourism. He has put up a gate, a rest house and has plans to construct a banda, hill climbing (similar to mountain climbing) near the falls, and habituate birds in the area for tourist viewing. He operates a tour company called Byabagambi Tours Association. The other landowners are pastoralists which land use conflicts with wildlife and tourism management. Therefore, some form of joint land management can be encouraged so that the property owners are assisted to develop joint land management plans that are compatible with wildlife and ecosystem management such as tourism.

The Land Act, 1998 provides for landowners to consolidate their land and jointly manage it (joint land coupling). This might require some incentive in form of conservation easements to help them offset the costs of managing land with the prime objective of conserving biodiversity. An important element of this approach is that it will enhance local community efforts to capture wildlife benefits as real cash values or support to livelihood, in order to directly offset the tangible costs incurred by wildlife and enhance the ability of wildlife based activities to compete with other land uses and livelihood elements.

ii) Purchase of land around the falls to increase its protection

The other potential option is to negotiate with the landowners so that the mapped out area (Figure 2.2) can be purchased and added to Queen Elizabeth National Park. The proposed area for purchase is 77.4 Ha (i.e. 34.4 Ha on the northern side and 43.0 Ha on the southern side). The advantage is that the proposed area for expansion is too steep for both livestock grazing and cultivation, which makes it less attractive to pastoralists and cultivators. However, it is very vulnerable to degradation in form of fires, charcoal production and harvesting of the cycads. The actual landowners are absentee landlords hence the area is prone to open access due to indiscriminate use of resources by the local people. The estimated cost of purchasing land at the prevailing local market prices is US\$ 700 per ha (at exchange rate of US\$1800 per US\$) amounting to a total cost of US\$ 54,180. The cost price is likely to go up due to the site developments on-going and increased access in the near future (the local government of Kamwenge district received funding channelled through the Local Government Development Fund to construct a road linking Kamwenge to Kasese district passing 5 km from the falls).

*iii) Domestication of cycads (*Encephalartos whitelockii*)*

The presence of a single community of endemic cycad plants that occurs nowhere else in Uganda, makes Mpanga Falls area a critical site for conservation. Unfortunately, large proportions of these plants occur on private land and are under threat from human activities (e.g. uprooting, fire, conversion of habitat to farms). Efforts should be made to domesticate using enhanced propagation mechanisms to promote regeneration. ICRAF is a very suitable candidate to do the job and perform on-site trials. Local people can be supported to plant the cycads on-farm if the experiments are successful.

iv) Economic incentives for strengthening and protecting environmental services

The last strategy which applies to both areas was the use of economic incentives extended to those who own land adjacent to the corridor areas. Several meanings of the term incentives as applied to environment and natural resource use exist (Simpson and Sedjo, 1996; Emerton,

1998; Knowler, 1999; Ferraro and Simpson, 2001). However, in this context, it is used to mean an inducement to action or inaction. In economic terms, incentives are the external factors that determine production or consumption decisions, whether the economic unit is an individual, household, community or some other entity. Broadly, incentives are a major component of the economic decision-making framework yielding both positive and negative changes in outcomes as a result of particular actions taken within a set of rules. The incentives proposed will target the encouragement (under privately owned land) or provision of appropriate land tenure regimes over government land, credit, information, education and appropriate (e.g. cost effective, quickly adaptable, gender sensitive) farming technologies that promote biodiversity and resource conservation.

The marketing mechanisms for these ecosystem or environmental services could be through the following ways:

a) Conservation easements. One incentive that might work in both Mpanga and Kyambura-Kasyoha corridor areas is the innovation of Tradeable Development Rights for Environmental Services (conservation easements). A conservation easement (restriction) is a legal agreement between a landowner and a land trust or government agency that permanently limits uses of the land to protect conservation values. This might be the best option for Kyambura-Kasyoha Kitomi corridor as it allows the landowner to continue to own and use their land and to sell it or pass it on to the heir. However, when the property owner accepts to donate or sell a conservation easement to a land trust, they give up some of the rights associated with the land such as the right to erect more structures while retaining the right to grow crops. It is helpful in the sense that the property owner is bound by the easement terms and also provides the land trust the responsibility to enforce the easement terms. By removing the land's development potential, it is assumed that the easement lowers its market value, which in turn make land alienation valueless rather possible for passing on to the next generation.

Private developers engaged in tourism development in Mpanga could be supported, where specific land use rights that govern the development of the property on land, which provide environmental services are well negotiated. It may involve selling the property to the conservation buyers, or signing a memorandum of understanding thereby limiting the extent to which the current or subsequent owner can curtail the provision of environmental services. Since the legal, framework, monitoring and enforcement capacity are available, Tradeable Development Rights for Environmental Services are an alternative to outright purchase of land (Conservation easements approach). Local people interested in afforestation on private land and degraded areas in forest estates re-forestation could be supported from a conservation trust fund.

As such, some form of guidelines for private conservation and tourism development needs to be formulated (i.e. if they do not exist). Such guidelines could provide direction to priority ecosystem conservation possibly not well represented in the protected areas or endemic species in the area (e.g. cycads). In addition, if the incentives are to be effective, they should be carefully designed not to benefit only the wealthy individuals at the cost of local communities. They should also provide clear linkages with conservation and protection of wildlife resources. The incentive design should aim to offset the costs of conservation to local people, to make conservation beneficial to them, and to extend their limits of tolerance towards wildlife.

b) Transfer payments. Support to households that will carry out better land management practices (e.g. soil and water conservation, soil fertility management, watershed management) to reduce the demand for land and/or reduce pressure on protected areas should be rewarded. This could be packaged in form of transfer payments, where financial incentives are made to land-owners to maintain and enhance environmental services. These payments can be made and transferred through an intermediary (e.g. a trust organisation) as a partnership between the public sector, private organisations and civil society organisations, which make it necessary to

set up a trust fund. The environmental Conservation Trust of Uganda (ECOTRUST) with the experience of carbon trade initiatives under Payment for Environmental Services (PES) can be very useful in capturing local prospects in the private sector to build synergies between conservation and income creation.

c) **New product development.**

Creating new economic opportunities based on sustainable management of natural resources can provide an important incentive for resource conservation in this area. Market assessments will be required to determine which products are likely to yield desired income and benefits. Certified forest products offer some potential as do speciality natural and fair trade products. The National Forestry Authority and ECOTRUST could help create linkages with private businesses and to emerging markets for these products. Investment in feasibility and market studies will be required, as will capital investments to launch feasible enterprises.

4.4 Sustainable Financing

Long-term management of land and sustainable use of natural resources requires a source of long-term financing. Without such a commitment, the conservation effects of investment in land acquisition and community-based enterprise development may be short-lived. Establishment of a conservation trust fund will allow for sustainable land management in critical corridors around target protected areas.

4.4.1 Trust Fund Options

Basically two options exist for establishment of a trust fund to manage corridors around Mpanga Falls and Kasyoha-Kitomi Forest Reserve: establish a new conservation fund, or work through an established Ugandan conservation fund. Creating a new institution would require a significant investment of time and resources. Legal establishment of a trust fund could take up to three years and would require a significant investment funds to cover legal fees and design costs. Additional funds would then be required to establish the new institution and get it operational. Taking this route would be normal if a fund did not already exist. However, a fund already exists and its land management mandate (conservation easements, land purchase for conservation, etc.) meshes with the goals of this corridor conservation project.

The Environmental Conservation Trust of Uganda (EcoTrust) was created in 1999 with a national mandate to protect biodiversity on both public and private land. Its deed of trust permits land acquisition for conservation management and fosters innovative approaches to conservation. EcoTrust does not manage an endowment at this time and has operated as a sinking fund, re-granting money from donors to specific projects. Although it has no endowment, its deed establishes the mechanism for managing an endowment to ensure its sustainability.

Although it does not have a long-term source of sustainable financing, programs focused on the future are already part of its portfolio. In Bushenyi District EcoTrust manages small-scale carbon sequestration projects, brokering long-term payments from carbon buyers to smallholders in rural Uganda. As a broker EcoTrust will receive annual payments over a period of 20 years that are passed on to farmers after charging of a management fee. EcoTrust hopes to expand this program in western Uganda.

Land management is also a key component of its program. EcoTrust currently owns land at the entrance of Rwenzori Mountains National Park, and holds title to Ngamba Island, in trust, for the Ngamba Island board. It also provides grants for conservation and sustainable development projects in Uganda. EcoTrust is in negotiations with a private sector operator to build an ecotourism lodge at the entrance to Rwenzori National Park. The deal will be operated as a concession, with EcoTrust receiving a percentage of income from the operation.

Establishing an endowment through EcoTrust provides a low start-up cost option to put in place a trust fund mechanism in western Uganda to manage biodiversity on private land. The approach builds on an existing legal structure and land management experience. And it allows EcoTrust to play a more significant role in Albertine Rift conservation. The strengthening of both the technical and financial capacity of EcoTrust in the region, opens the potential for other donors to support capitalization of its programs. Even if donors will not contribute to its endowment, capitalization of a land acquisition and management fund (including conservation easements) and a program for payments for ecosystems services will be attractive to other donors.

4.4.2 Funding Options

Analyses indicate that funding for land management and projects will require approximately \$150,000 per year, necessitating an endowment of \$3,500,000. Of the \$175,000 generated, 20%, or \$35,000, would cover EcoTrust administrative costs. The remaining would cover lease and other payments, land acquisition costs and any project disbursements. Projects that EcoTrust would support in this area include: sustainable land management, conservation education, capacity building, conflict management and enterprise development based on conservation and the principle of sustainable resource management (e.g. ecotourism, conservation agriculture, etc. Moreover, funds can be invested to develop projects promoting payments for ecosystems services that provide financial benefits to both communities and to land managers, including EcoTrust itself.

Calculations assume an average net return (after paying investment fees) of 5% per year. The board of EcoTrust will develop a spending rule allowing it to spend up to the amount represented by the 5% return. Any additional returns will be reinvested in the capital of the Trust to increase potential future cash flows, unless, for some reason, additional funds are urgently acquired (e.g. last minute land purchase), and the board votes to utilise those additional funds. Reinvestment of additional capital into the fund is seen as an important hedge strategy for those years when returns may fall below 5%.

All funds that constitute the endowment will be invested in an off-shore account and managed by a competent investment advisor to ensure prudent investment decisions that will guarantee the future value of the fund and satisfy conservation funding needs over a long time horizon.

WCS will work with the EcoTrust board to ensure that the board has an adequate investment strategy and that systems are in place to ensure wise investment of financial resources.

4.4.3 Funding Plan

Launching the fund will require capitalization of the fund as well as some initial capital to launch activities, including the purchase of approximately 200 has of land that is now available. A total allocation of \$ 4 million is required as follows:

Table 3.7. Requirements to establish a trust fund for the corridor areas

Budget Item	Funding Total (US\$)
1. Capitalization of the trust fund	3,500,000
2. Land Purchase	200,000
3, Project Fund (2 years project funding to allow additional capitalization of Fund)	150,000
4. Technical assistance and training	80,000
5. Administration (2 years)	70,000
Total	4,000,000

The budget assumes that the endowment capital would be received sometime in year one and be invested with the asset manager. All gains will be reinvested from the time of the original investment through year two, allowing the capital to grow beyond the original \$3.5 million, assuming positive market returns. In year three, EcoTrust would begin program implementation from the income earned on investments.

5.0 Conclusion and recommendations

Based on the study results a number of conclusions can be drawn and recommendation made. These are presented separately for each study site.

5.1 Conclusions

a) Kyambura WR-Kasyoha-Kitomi FR corridor

1) In Kyambura-Kasyoha Kitomi corridor, land purchase may be possible but not in the short run. It will be necessary to try and manage the land outside the corridor sustainably with a major emphasis on biodiversity conservation. Sustainable land management will help build strong relationships between the local people and the conservation agencies and encourage local people to willingly sell the land. Given the presidents policy pronouncements such as putting a stop to the eviction of forest and wetland encroachers, an attempt to engage the local people to sell land is likely to be rejected.

2) Since agriculture is the main source of income to the local people, the idea of providing alternative income generating activities can be pursued where crops such as Arabica coffee can be promoted as a buffer crop and try to promote eco-labelling so that farmers earn more money and reduce poverty. Other activities such as, fish farming and woodlot establishment and re-forestation of the degraded forest reserve areas is a possible strategy for the area.

3) The use of economic incentives such as conservation easements, payment for ecosystem services (e.g. carbon trade) will be necessary. The conservation trust fund of not less than US\$ 3.5 million will be needed and is likely to generate cost-effective conservation benefits. This will help to provide cash-flows in the local economy and stimulate innovations for enterprise development. It is hoped that illegal activities will be reduced as people earn incomes outside protected areas.

b) Mpanga Falls area

1) In Mpanga falls area, it can be concluded that land purchase is possible and negotiations with the land owners can be initiated using local property agents. The proposed land for purchase is at the moment less suitable for agriculture because of the terrain. Purchase of the 77.4 Ha can constitute the first year plan in the proposal and later extended to KWR-KKFR corridor after two years.

2) Support community tourism using the conservation trust funds. Already there are interested people in wildlife tourism.

3) Domestication of the cycads is one possible intervention where farmers can be encouraged to plant after experimental trials have been done by ICRAF.

A total sum of US\$ 196,985 will be required to purchase the proposed area of 143.3Ha in both KWR-KKFR corridor and Mpanga falls. In KWR-KKFR and Mpanga Falls area, 21 and 14 households will be directly affected by land purchase respectively. In addition people are more willing to sell their land rather than rent or lease it for wildlife management.

5.2 Recommendations

1) Participation of all stakeholders in resource planning. It is important to embrace the principle of the need for the community, resource users and land use planners to identify and agree upon simple criteria by which they can determine resource use and allocation available to

them. As we influence the household land resources utilisation, it would be necessary to consider the community constraints to fully harness the resources. Given the small landholdings, it is necessary to encourage intensive use of a land unit than to adopt one land use system and teach it to the community. As such, micro-scale land use capacity assessment using maps collaboratively drawn and probably with the help of Geographical Information System (GIS) tools needs to be done. This will help to identify the local resource interaction, practices and uses (e.g. how cropland and forests are used, privately or communally managed land use categories). The objective is to promote practices that are compatible with the social values and land use potential. The technological packages to be marketed should be tailored to the community's capacity to afford them (e.g. household financial resources, limited labour, economic returns, consumption patterns).

2) Environmental and conservation education. To effectively promote the above interventions, environment and wildlife conservation education will be desirable. This is intended to make the community appreciate the value of wildlife conservation and environmental management. It can be done through workshops, community meetings, use of brochures and use of simple geographical maps to disseminate important environmental information, and encourage community visits to the protected areas for purposes of attitude change. The other long-term strategy would be to incorporate environment and wildlife conservation education in the school curriculum. Increasing public awareness of conservation easements and providing a source of funds to cover endowments would help promote the use of the proposed conservation incentives.

3) Institutional capacity building and training. It will necessitate the collaborating government institutions and Non Governmental Organisation to take up the role of building capacity of the local communities and land owners in preparation for community wildlife management and collaborative forest management. It is believed that the provision of alternatives income sources will only supplement the subsistence needs that are being met from the protected area. As such the Joint/Collaborative Forest Management (JFM/CFM) and Community conservation agreements need to be formalised and strengthened. It will help to increase participation of local people when these legal frameworks are implemented. However, the process will involve the formation or require strengthening of the existing community groups to enhance their negotiation skills and formulate rules and sanctions, participate in land use planning, conflict and information management between the intermediary agency and the resource user groups. This task is technical and requires technical assistance to help property owners develop land management plans. In addition, demand more flexibility on the side of property owners to permit innovative management of agricultural systems in which commercial use will be promoted. ICRAF and PRIME West could take a leading role in developing, training and implementing the education programs, while the Wetlands Inspection Division under the Ministry of Water, Lands and Environment and The World Conservation Union (IUCN) could assist in watershed analyses and planning for restoration of degraded wetlands.

References:

- Andama, E., 2000. Assessment of wildlife crop damage around Mgahinga Gorilla National park: A particular emphasis on crop depredation by the Porcupine (*Hystrix africaeaustralis*). Institute of Tropical Forest Conservation, Kabale Uganda. 49pp.
- Barzetti, V. (Ed.), 1993. Parks and Progress, IUCN and Inter American Development Bank, Washington D.C.
- Bennett, A.F., 2003. *Linkages in the Landscape. The role of corridors and connectivity in Wildlife Conservation*. IUCN, Gland, Switzerland and Cambridge, UK. Xiv + 254pp.
- Bush, G., Nampindo, S., Aguti, C. and Plumptre, A.J. 2004. The Value of Uganda's Forests: A livelihoods and ecosystems approach. A Report submitted by WCS to European Union Forest Resources Management and Conservation Program, National Forest Authority. May 2004. Kampala, Uganda pp.100.
- Brockington, D., Igoe, J. and Schmidt-Soltau, K., 2005. *Conservation, Human Rights and Poverty Reduction: A progress report of an ongoing debate. Conservation Biology* **19**(4).
- Cernea, M.M and Schmidt-Soltau, K., 2003. National parks and poverty risks: Is population resettlement the solution? Paper presented at the World Park Congress (Durban, September 2003). An abbreviated version was published as: The end of forced resettlements for conservation: Conservation must not impoverish people, *Policy Matters* **12**: 42-51.
- de Boer, W.F. and Ntumi, C.P., 2001. Elephant crop damage and electric fence construction in the Maputo Elephant Reserve, Mozambique. *Pachyderm* **30**: 57-64.
- Emerton, L., 1998. Community conservation research in Africa: Principles and Comparative Practice Paper No. 5. The Nature of Benefits and the Benefits of Nature: Why Wildlife Conservation Has Not Economically Benefited Communities in Africa. Institute for Development Policy and Management, University of Manchester. Oxford, UK.
- Feeney, T. 1993. The impact of a European Community project on peasant families in Uganda. *Oxfam Briefing*, 6 (July 1993): 1-7.
- Ferraro, P.J., and Simpson, R.D., 2001. *The Cost-Effectiveness of Conservation Payments. Resources for the Future*. Discussion Paper No.00-31. Washington, D.C: Resources for the Future.
- Hill, C. 1998. Conflicting attitudes towards elephants around the Budongo Forest Reserve, Uganda. *Environmental Conservation* **25**(3): 244-250.
- Hoare, R. 1995. Options for the control of elephants in conflict with people. *Pachyderm*, **19**: 54-63.
- Mbuza, F., Apuuli, M., Ngarukiye, A. and Kajura, S., 1998, *Comparative Analysis of Milk Production Costs Under Different Cattle Management Systems in the Different Agroecological Zones of Uganda*, Department of Animal Production and Marketing, Ministry of Agriculture, Animal Industry and Fisheries, Entebbe
- Mishra, C., Allen, P., McCarthy, T., Madhusudan, M.D., Bayarjargal, A. and Prins, H.H.T., 2003. The role of incentive programs in conserving the snow leopard. *Conservation Biology* **17**(6): 1512-1520.
- Nampindo, S. and Plumptre, A., 2005. A socio-economic assessment of community livelihoods in the areas adjacent to corridors linking Queen Elizabeth National Park to other protected areas in Western Uganda. Report prepared for Conservation International. 69pp.
- Naughton-Treves, 1998: Predicting patterns of crop damage by wildlife around Kibale National Park, Uganda. *Conservation Biology* **12**: 156-168.
- Naughton, L., Rose, R. and Treves, A., 1999. The social dimensions of human-elephant conflict in Africa: A literature review and case studies from Uganda and Cameroon. A report to the African Elephant Specialist, Human-Elephant Conflict Task Force of IUCN, Glands, Switzerland.
- NEMA, 1998a, *District Environmental Profiles*, National Environment Management Authority, Kampala

- NEMA, 1998b, *District State of the Environment Reports*, National Environment Management Authority, Kampala
- Kagoro-Rugunda, G., 2004. Crop raiding around Lake Mburo National Park, Uganda. *African Journal of Ecology* **42**: 32-41.
- Knowler, D., 1999. *Incentive Systems for Natural Resource Management: The Role of Indirect Incentives*. Environmental Report Series No. 2. Rome: FAO.
- Prins, H.H.T., Grootenhuys, J.G. and Dolan, T.T. (eds.), 2000. *Wildlife conservation by sustainable use*. Kluwer Academic Publishers, Boston.
- Sam, M.K., 1998. An assessment of crop raiding by elephants in the Red Volta Area of Ghana. MSc. Thesis, University of Kent at Canterbury, UK.
- Singh, S., 1997. Biodiversity Conservation through ecodevelopment planning and implementing lessons from India. Working Paper No.21. UNESCO (ed.). South-South Cooperation Programme on Environmentally Sound Socio-economic development in the humid tropics.
- Simpson, D.R., and Sedjo, R.A., 1996. "Paying for the Conservation of Endangered Ecosystems: A Comparison of Direct and Indirect Approaches." *Environment and Development Economics* **1** (2): 241-257.
- Takashi Yamano, Dick Sserunkuuma, Keijiro Otsuka, George Omiat, John Herbert Ainembabazi, and Yasuharu Shimamura, 2004. The research on poverty, environment, and agricultural technologies (REPEAT) Survey in Uganda: Results. Foundation for Advanced Studies on International Development. Unpublished report. 82pp.
- Tweheyo, M., Hill, C. and Obua, J., 2004. Patterns of crop raiding by primates around the Budongo Forest Reserve, Uganda. *Wildlife Biology*. **11**:237-247.

Appendix 1 Queen Elizabeth Landscape corridor areas Household Survey Questionnaire.
Environmental Economic Value of Forests to Local Livelihoods

Interviewer:	Date:	Time:
Checked by:	Check Date:	
Village (LC1):		
Parish (LC2):	Respondent Age:	
Sub-county	Respondent Sex:	
Forest:	Distance from corridor:	

1. Household Composition

How many people are in the household?

Status	Description	Age	Sex	Education level	Occupation
Head of Household					
Spouse					
Member 1					
Member 2					
Member 3					
Member 4					
Member 5					
Member 6					
Member 7					
Member 8					
Member 9					
Member 10					

Description – 1)husband, 2)Wife, 3)Child 4)Relative 5)Orphan 6) Visiting worker 7)Dependent 8) Female head

Education Level – 0) no formal education, 2) Primary, 3) Secondary 4) College/University education

Occupation – 0) no work 1) Farming-including subsistence 2)student 3)Own business 4) wage labour 6)Salaried employee 7)Infant 8) Other – specify

How many years has your family been in this village/location?.....

1)Less than 1 year 2) 1-5 years 3)5-10years 4)10years or more

2. Assets

House Materials for Main Dwelling (try to make discreet observations on approach)

Walls

1)Timber/poles 2)Brick 3)Mud 4)Iron 5)Plastic Sheeting

Door/Window Frame

1)Timber/poles 2)Brick 3)Other-specify

Floor

1)Timber/poles 2)Mud 3)Cement 4)Tiles/bricks

Roof

1)Thatch 2)Tiles 3)Iron Sheets 4)Plastic Sheeting

Do you own a Bicycle? How many? How about any of the other things below?

1)Radio 2)Television
3)Bicycle 4)Motorcycle 5)Pickup truck or car 6)None

Livestock Assets

Do you have any animals amongst your household assets?

Livestock Item	Number
Goats/	
Sheep	
Pigs	
Chickens /ducks/ pigeons	
Rabbits	
Cows	
Dogs	

3. Land Resources - How much land do you have? What do you use it for?

Land Type	Area (Local Unit)	Land ownership

Land Type – 1)Natural forest/woodland, 2)Woodlot, 3)Arable, 4)Wetland, 5) Grassland Pasture 6)Woodland/forest pasture 7)Cash crop plantation

Land ownership 1) – Own 2) Rent/Hire 3) Do not own land

4. Do you own a woodlot? If woodlot is owned:

Species of tree	Area (Ha)	Purpose

5. Do people use the forest?

6. How far is it to the forest in Km

7. How long does it take to walk there?

8. Which months of the year do you use the forest most?

Month	Reason

9. Which months is food scarce or expensive?

Month	Reason

10. Which fuels do you use each week and how much?

Source	Use	Volume (unit)
Wood		
Charcoal		
Paraffin		
Gas		
Electricity		
Other?		

Use- 1)Cooking 2)Lighting 3)Heating

11.What trends have you noticed regarding the following resources from your local forests or market in the last year?

Charcoal		Fuel wood		Timber	
Supply		Supply		Supply	
Quality		Quality		Quality	
Price		Price		Price	

0) Decrease, 1)Increase 2) No change 3) Don't know

12. How far on average do you travel each day to collect firewood? Is it from the forest reserve?

12. How has this changed in the last 5 years? 1) No change 2) travel further 3)travel shorter

13. What is the reason for the change (if any)?

14. Where do you get your water?

Bore hole/well	
Stream/river	
Spring Protected	
Spring Unprotected	
Pond/Dam	
Lake	
Other Specify	

15 Does your water come from the forest? Yes/No

16. How far is it from your home (one way) to the water source?

17. Who collects water in the household? (If hired labour skip to 19)

18. How many 20l jerry cans do you use each day?

19. What type of treatment do you use to purify water for drinking?

Nothing	
Boiling	
Boiling and Filtering	
Chemicals	

20. What is the quality of your drinking water?

1.Excellent

2.Good

3.Fair

4.Poor

21. Do you collect medicinal plants from the forest? 1) Yes 2)No

22. What is the main reason you collect medicinal plants?

- 1) Own Consumption 2) Sale

The following questions on household income and consumption should concentrate on recalling events from the past 12 months.

23. Household Income/Consumption (Non forest based)

Item			Annual income from own produce/labour	Weekly consumption of own produce	
	Local Unit	Total annual harvest	Units Sold/received	Units Consumed	Average Price per unit
Crop Income					
Coffee	Tin				
Tea	Kg				
Cocoa	kg				
Tobacco					
Processing Cane	tonne				
Beans (dry)	kg				
Staple Food (starches, maize matooke etc):					
1					
2					
3					
4					
Vegetables:					
1					
2					
3					
4					
5					
6					
7					
Fruits:					
1					
2					
3					
4					
5					
6					
Tree Crop Income					
Woodlot Timber:					
1					
2					
3					
4					
Woodlot poles:					
1					
2					
3					
4					

Charcoal	Sac				
Moringa	Kg				
Neem	Kg				
Seedlings	Piece				
Livestock					
Large animal					
Small animal					
Animal products					
Renting out of livestock					
Wage Labour					
Unskilled Agricultural/seasonal labour					
Other employment					
Skilled/regular employment					
Crafts and small scale enterprise					
Beer	Jerry can				
Waragi	litre				
Sale of crafts	item				
Trading goods					
Renting out goods					
Miscellaneous cash income					
Total Cash Income (excluding environmental cash income)					
Private Cash gifts/donations received					
Private non cash gifts received					
Total gifts received					

24. Household Income/Consumption (Natural Forest based goods)

Do you have any problems with crop raiding animals from the forest? 1)Yes 2)No

Which Species?

1)Elephant 2)Antelopes 3) Chimpanzee 4)Monkeys 5)Baboons 6)Porcupines 7)Wild pigs

8)Other (Specify).....

Which species is most problematic?

Do you ever trap some of these problem animals?

Do you eat them? 1)Yes 2)No

Do you harvest or sell anything from the forest?

Item	Local Unit	Own harvested units Sold Annually	Own Harvested Units Consumed Weekly	Price Per unit
Sale of forest goods				
Yams	Heap			
Bamboo shoot	Bundle			
Mushrooms	Basket			
Wild honey	Litre			
Afromamum	Heap			
Passion fruit	Heap			
Guava	Heap			
Mango	Heap			
Jackfruit	Head			
Pawpaw	Head			
Palm nut (oil)	Basket			
Wild Coffee	Kg			
Tamarind	Bundle			
Small wild animals:				
Rats	Piece			
Rabbits	Piece			
Duiker	Piece			
Primates	Piece			
Snakes	Piece			
Porcupine	Piece			
Guinea fowl	Piece			
Francolin	Piece			
other				
Large wild animals:				
Big Antelope	Piece			
Hippo	Piece			
Buffalo	Piece			
Other products:				
Building Poles from forest	Piece			
Timber from forest				
Grass for thatching	Bundle			
Rattan	Bundle			
Bamboo	Bundle			
Sand	Heap			
Clay	Heap			
Stones	Heap			
Other				
Large carpentry items	Item			
Small carpentry items	item			
Medicinal plants	Kg			
Mats/woven goods	Item			
Handicrafts	Item			
Firewood	Bundle			
Charcoal	Sac			

25. Would you be willing to rent your land to the government of Uganda so that the wildlife is left to use and during this time, you are not allowed to cultivate or do anything on this land for three months? 0) no 1)Yes

a) If yes how much money would you ask from the government as rent?.....UGSh.

b) if you were to sell land, how much would you sell a hectare.....UGS/ha

c) Would you be willing to work as a vermin guard in order to protect the crops against animal damage? 1) no 2) yes

d) Would you be willing to slash the forest/park boundaries (fire lines) and earn some income? 1) no 2) yes

End

Thank You Sir/madam for your time