THE IMPACT OF COMMUNITIES ON CONSERVATION OF GISHWATI FOREST RESERVE, RWANDA

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A THESIS SUBMITTED TO THE SCHOOL OF POST GRADUATE STUDIES IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE IN ENVIRONMENTAL MANAGEMENT AND DEVELOPMENT OF KAMPALA INTERNATIONAL UNIVERSITY

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DECLARATION

I, Nyiratuza Madeleine hereby declare that the dissertation on "*The impact of communities on conservation of Gishwati Forest Reserve*" is entirely my own original work, except where acknowledged and that it has never been submitted to any other University or Institution of higher learning for award of a degree.

Signature.....

Date....18/10/2008

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APPROVAL

This is to certify that this dissertation has been submitted for examination with my approval as the University supervisor.

Signature..... Date 21/10/08

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Supervisor

DEDICATION

I dedicate this work to my husband Jean Bosco Harelimana, my parents Claver Kejo and Therese Nyiranduhije, for their support and encouragement and, to my special and loved baby Annie Shimo, without whose patience I could not have accomplished this work.

ACKNOWLEDGEMENTS

I am very grateful to Prof. Eric L. Edroma, for encouragement, understanding, guidance and intellectual support to complete this report. Sincere appreciation is also extended to Mr Stephen Wekoye for his encouragement.

Special thanks go to Karisoke Research Center/The Dian Fossey Gorilla Fund International for their generous support, with more appreciation to Mr Glenn Bush for his encouragement and intellectual assistance.

I would also like to express my deep appreciation to local governors of Rutsiro District especially the Mayor of the District, the Environmental Officer at the District Level and the Environmental Officers of Kigeyo, Ruhango and Nyabirasi Sectors for their support and encouragement and all people adjacent to Gishwati Forest Reserve who voluntarily accepted my interview. Also I would like to thank PAFOR agents working on conservation of Gishwati Forest Reserve to provide the necessary information for this study.

I can not forget to acknowledge my colleagues Felix Kavejuru, Fausta Mowo, Maximus Kwesige and Dan Mujuni for their integrity during my stay at Kampala International University.

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ACRONYMS

DGF: Development Global Fund

GBAD: African Development Bank Group

GDP: Gross Domestic Product

IUCN: International Union for Conservation of Nature and Natural Resources

MINAGRI: Ministry of Agriculture

MINALOC: Ministry of Local Governance

MINECOFIN: Ministry of Economics and Finance

OECD: Organisation for Economic Cooperation and Development

ONAPO: Office National de la Population

PAFOR: Projet d'Appui au Développement Forestier au Rwanda

ABSTRACT

This research has been conducted in communities adjacent to Gishwati Forest Reserve. It aimed at determining the impact of communities on conservation of this reserve. A sample of 120 respondents in 3 villages around the reserve was interviewed to find out the variation in the use of the forest by local people, the factors influencing their attitudes towards conservation and the measures which can be undertaken to reduce the impact of local people on conservation.

It was found that people enter the forest in search of firewood, building materials, handcraft materials, vegetables, medical plants, honey, animals for hunting, space for planting crops and rangeland for grazing animals. The tests of Qui-Square and Student were used to analyse the variation in the use of the forest by local communities. The results showed that there is no significant difference in the use of the forest by local people taking into consideration sex (χ^2=0.002, df =1, p=0.962 (p > 0.05), family size (χ^2=1.173, df =1, p=0.279). , membership in farmers association (χ^2=3.650, df =1, p=0.56) and source of income (F= 2.718, df =1, p= 0.213). However significant difference has been observed in the use of the forest considering age classes(χ^2=22.794, df =1, p=0.000), education (χ^2=35.227, df =1, p=0.000), occupation (F=82.237, df =1, p=0.000) , ownership of land (χ^2=71.020, df =1, p=0.000) and other assets (χ^2=58.131, df =1, p=0.000).

Among the respondents Batwa people were found to be the poorest and to use the forest more than other groups of people. In search of how to reduce the use of the forest by local people, the conservation program should put more effort on them and on households of non educated people, those who have no assets, young people, farmers and unemployed people and on people who own land less than 1ha. Taking into account sex, family size, membership in farmers association or source of income, the program should equally intervene to all local people as it has been found that there is no significant difference in the use of the forest by local people considering these characteristics.

The attitudes of local people toward conservation have been found to be negative. People who reported that the effect of conservation on their activities are crop raiding and lack of forest products have been considered as people who have negative attitudes towards

conservation and they represent 85.8% of all the respondents. Those (14.2 %) who reported that the effects of conservation are increased rainfall in the region, reduced erosion and increased safe breathing air have been considered to have positive attitudes towards conservation because they knew the importance of the forest.

The relationship between the attitudes of local people towards conservation and the factors: the big issues that face the households, knowledge of the conservation project, the work in conservation and the lack of benefit from buffer zone was tested . The tests of Qui-square, Student and Contingency Coefficient showed that there is no significant difference in attitudes of local people towards conservation if the factors: issues facing the households (C= 0.093. p= 0.901), knowledge of conservation project (χ^2 = 0.508, df =1, p=0.476), work in conservation (F= 1.908, df =1, p=0.201) and benefit from buffer zone (F= 0.001, df=1, p=1.000) are taken into consideration. This may be due to the fact that all households use the forest, and very few people have positive attitudes towards conservation.

Respondents gave some measures to reduce the conflicts with conservationists. These are: fencing the reserve to reduce crop raiding by monkeys, providing them with employment so that they can buy the alternatives of what they get from the forest, increasing their agricultural land to produce more and put the surplus to market, compensating them for the land taken by buffer zone and where possible allowing them to use the reserve.

This study revealed that people adjacent to Gishwati Forest Reserve live under poverty line. Serious measures should be undertaken to reduce the impact of their poverty on conservation by providing the alternatives of what they get from the reserve. Development projects should be multiplied in the region to improve the livelihoods of the people, family planning should be encouraged to reduce the populations, local people involvement should be counted for, education should be reinforced and conservation coordination enhanced.

CHAPTER 1: INTRODUCTION

1.1 Background to the study

Protected areas remain a major focus for biodiversity conservation globally, with a tenfold increase in the number in the world over the past 4 decades, and over 18.8 million square kilometres currently under protection (Southworth *et al*, 2007).

Recognition of the importance of biodiversity conservation and its linkage to global development issues has increased significantly since the 1972 Stockholm Conference on the Human Environment. At this time developing countries recognized that the increasing environmental degradation must be an important obstacle to their economic growth. From Stockholm Conference, Nations agreed that natural resources are essential assets on which economic growth must be based and that conservation and development are inseparable (Rao, 2006). This gave rise to the establishment of United Nations Environment Programme (UNEP) in 1972 with mission to develop and finance regional conservation programmes and the 1980 World Conservation Strategy (WCS) in which conservation community for the first time introduced the concept of sustainable development. This concept incorporated social and ecological considerations into economic development for long-term as well as short-term advantages. The two most widely used definitions of sustainable development are found in Our Common Future (1987) and in Caring for the Earth (1991). The former states that "sustainable development is development which meets the needs of the present generation without compromising the ability of the future generations to meet their own needs" while Caring for the Earth defines sustainable development as " improving the quality of human life while living within the carrying capacity of supporting ecosystems" (Trzyna, 1995). Those definitions clearly show the integration of biodiversity conservation with development. The goal of Caring for the Earth puts great emphasis on the human welfare. It is to help improve the living conditions of the people through development of sustainable society which involves local communities and integration of conservation and development.

The Convention on Biological Diversity adopted at the Rio de Janeiro Earth Summit (1992) also clearly links conservation with development, recognising that economic and social development and poverty eradication are the first and overriding priorities of developing countries. This Convention encourages *in situ* conservation and calls for systems of protected areas and various measures to conserve and sustainably use biological diversity as well as requiring countries to promote efforts to support environmentally sound and sustainable development in areas adjacent to protected areas, with a view to furthering protection of these areas (OECD, 2002). This provides a real justification for linking poverty issues to conservation and an acknowledgement that poverty can pose a threat to the survival of protected areas. To reduce the loss of biodiversity in developing countries poverty alleviation is a prerequisite as it is recommended by The Millennium Development Goals (2000) and to achieve sustainability a balance between economic, social and ecological objectives is required. According to Rao (2006) protected areas in developing countries will survive if they address human concerns. Therefore communities adjacent to protected areas should be supported to reduce their impact on wildlife. This may include local participation, education, revenue-sharing and development activities to reconcile the management of protected areas with the social and economic needs of local people.

The above scenario shows that the recognition that effective management of natural resources should be an important pillar of sustainable development and, improvement of the livelihoods of people adjacent to protected areas is a necessity for the survival of the latter is growing. However in developing countries sustainable conservation is not an easy task taking into consideration problems of high population pressures, poverty, political insecurity and civil strife, debts, illiteracy, political interference, prioritising economic activities more than conservation activities, insufficient financial support for conservation activities, and the conservation practices which historically excluded local communities. In these countries protected areas are surrounded by landscapes that, while still containing considerable biodiversity also have rapidly growing human populations. The domesticated portions of these landscapes are zones of dynamic change in demography, land use, and land cover. In the majority of these areas, agriculture is already or is rapidly becoming the main land use and then leading to encroachment of protected areas. Protected areas' landscapes are largely characterized by biological, social, economic and political dilemmas not found elsewhere.

Rwanda is not out of this situation. Families have many members compared to the size of the land they own and lack alternative activities which can generate income. The 1990-1994 war also caused displacement and resettlement of people in protected areas and the management activities have historically marginalised local communities. Researches conducted around Nyungwe Forest Reserve by Masozera (2002), Plumptre *et al.* (2004) & Wildlife Conservation Society (2007), and around Birunga National Park by Plumptre *et al.* (2004) & Wildlife Conservation Society (2007) showed that these protected areas are continuing to be destroyed by local people in search of firewood, timber, medical plants, grass for livestock, arable land and other household items. Since the livelihoods of people adjacent to these protected areas depend on them it is clear that their safety will also depend on the provision of alternatives to the goods people get from there. Rwandan protected areas are located in Albertine Rift, a region recently declared as a hotspot for biodiversity conservation; therefore, the rapid intervention is needed to address the conservation problems and to reduce the pressure on endemic biodiversity. This research has been conducted on one of Rwandan protected areas, Gishwati Forest Reserve which is known to be the most degraded (about 98%) of the country (Blondel, 2004).

1.2 The study area

1.2.1 Location and biodiversity

Gishwati Forest Reserve was situated in Western Province, in Ngororero, Nyabihu, Rutsiro and Rubavu Districts before its degradation. It used to cover large areas of highland range of the Congo-Nile Divide in the North-West of Rwanda. Although almost all the pre-1994 Gishwati Forest Reserve was degraded, a tiny part of about 7 km^2 in the South-West has not been cut and cultivated. Then it has been demarcated by PAFOR, a reforestation project funded by African Development Bank and it works to replant trees in this new reserve, located in Rutsiro District. Its maximum dimensions are 3.6 km (North-South) and 3.9 km (West-East). The Western edge follows the main road Kibuye-Gisenyi. The Western part is also the lowest one around 2100 m, in the valley of the river Pfunda. From there the land rises up to altitude of about 2550 m at the Eastern end (Blondel, 2004).This forest lies in the Albertine Rift, a landscape of high species endemism and diversity (Wildlife Conservation Society, 2004).

Gishwati region is characterized by a mountain climate which is cool and humid. Temperatures are relatively stable and precipitation is moderate throughout the year. The former Gishwati Forest Reserve had different plant species. All of the slopes were covered by luxuriant forest with rich flora. The species of big trees and high value were mainly *Podocarpus milanjianus, Newtonia buchananii, Pollysias fulva, Macaranga pavifolium, Chrysophyllum gorungozanum, Neoboutonia macrocalyx, Hagenia abyssinica, Symphonia globulifera, Carapa grandiflora* and *Entandrophragma excelsum.* There are other species which were poorly represented such as *Dracaena afromontana, Coton macrostachys, Macaranga milidibraedi (*Prioul & Sirven, 1984). At the bottom of hills there were some species of trees such as *Fagara sp, Lobelia giberosa, Croton macrostachys* and the Ortiz (natural grass) while on the top of the hills there were species such as *Polysias fulva* and some species of ferns.

Recently a biodiversity survey conducted in the new reserve by Blondel (2004) found 54 species of trees and shrubs. The best species for charcoal disappeared. The most abundant species are *Symphonia globulifera* (because it is said to be useless to produce charcoal) and *Myrianthus holstii.* Some species which used to be very common in the original forest such as *Carapa grandiflora* (the tree which gave its name to Gishwati forest), *Syzygium guineense, Ilex mitis, Chrysophylum gorungosanum, Strombosia scheffleri,* etc., are still present but in low densities. Three species represent most of the young seedlings and saplings in a way which depends on the topographic position. On the slopes of the hills, *Makaranga kilimandscharica* makes most of the regeneration and sometimes forms thickets of up to a hundred meters in diameter. On the dumper and more fertile soils at the bottom of the slopes, in valley bottoms and on gentle slopes, the seedlings and saplings of *Neoboutonia macrocalyx* and *Dombeya goetzenii* are very abundant and can also form thickets.

Before the forest destruction, different species of plants sheltered a large number of big herbivorous and small animals which lived under the ground. Gishwati Forest Reserve had different species of big and small animals. The varieties of species were not numerous but the existing species had a large population. Those species were for instance *Cephalophus nigrifons, Ceptailurus serval, Potamochaeurus porcus, syncerus caffer, Loxodonta africana, Viverra civetta, Inkanda and, inkima (*Prioul & Sirven, 1984). Apart from botanical composition, Blondel (2004) also surveyed animals remaining in Gishwati Forest Reserve.

They found four types of primates: Chimpanzees (*Pan troglodytes schweinfurthi)*, Mountain monkeys (*Cercopithecus l'hoesti),* Golden monkeys (Cercopithecus *mitis kandti),* and Blue monkeys (*Cercopithecus mitis doggetti).* They also observed a jackal but no signs of ungulates have been found. They also observed 84 species of birds.

1.2.2 Population around the forest

Rwandese population grew very rapidly with time. In 1934, the population was 1.5 million. It became 7.1 million in 1991, 8.7 millions in 2005 with growth rate of 2.5 (GBAD, 2005). The surrounding region of Gishwati Forest Reserve has been always densely populated. In 1982, the population was 360 000 and the density was between 250 and 400 inhabitants per km^2. With time, farms shrink in size because farmers continue to subdivide the already meagre holdings equally among their sons. As people have very small size of land they live in severe poverty pushing them to destroy the forest (MINAGRI & DGF, 1984). In the years following the war of 1994, thousands of immigrants, many of them repatriated from Democratic Republic of Congo, cleared the forest to settle, cultivate the land and create pasture land. This process went on until recently 2004. In the meantime, it turned out that the land deforested was not suitable for sustainable agriculture: after the first few crops, the yields dropped sharply. Moreover, the clearing of the forest started inducing serious erosion problems in the region, including land-slides and floods lower down. It was in 2004 that the Government decided to take protection measures: the settlers were partly moved out of the cleared area and resettled in a regrouped way in different villages located either at the periphery of the deforested area or in some cases in other provinces of Rwanda. But the new resettled and indigenous people adjacent to the forest continue to use the forest resources and destroy management activities.

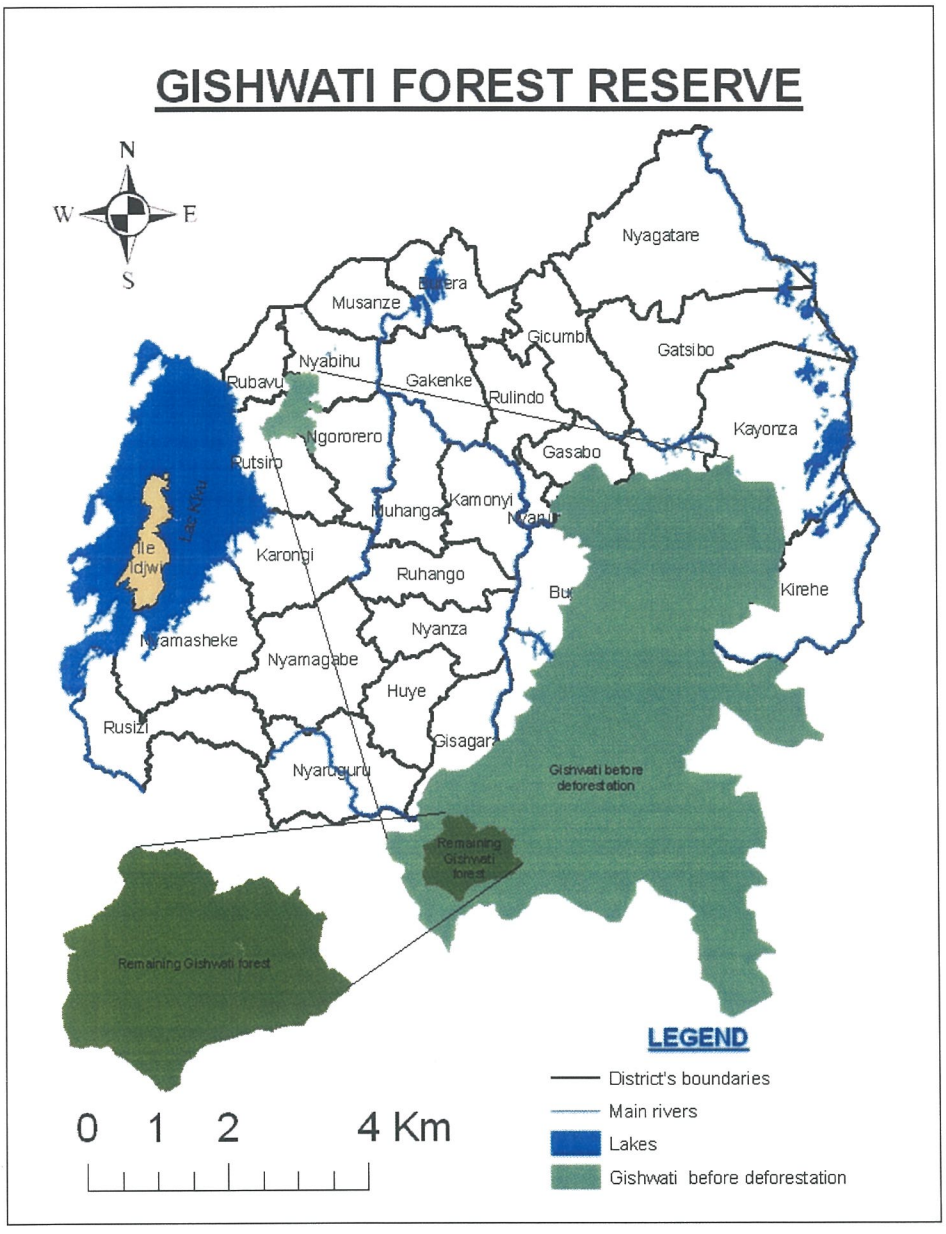


Figure 1: Location of the study area

1.3 Problem Statement

High population growth and poverty are two main challenges facing people around Gishwati Forest Reserve. This makes conservation of this forest very difficult since people depend on its resources to survive. Conservation strategies also failed to involve people in conservation activities.

There is a growing realization that conservation does not work in isolation from other national policies regarding development and environment. This means that as poverty alleviation is a central focus of Rwandan national development policy, importantly conservation activities should go together with rural development efforts. If not it is probable that these activities will be considered by local communities as factors inhibiting their survival which may be at the basis of conflicts reported between conservationists of Gishwati Forest Reserve and the local communities.

This research focused on studying the impact of communities on conservation of Gishwati Forest Reserve in order to elucidate the variation in the use of the forest by local people, what are the factors influencing their attitudes toward conservation and what can be done to mitigate the impact.

1.4 Objectives

1.4.1 Aim

The main objective of the study was to determine the impact of communities on conservation of Gishwati Forest Reserve.

1.4.2 Specific objectives

i) To determine the nature and extent of the forest use by the local people.
ii) To determine the factors influencing people's attitudes towards conservation.
iii) To identify mechanisms to reduce people's impact on Gishwati Forest Reserve.

1.5 Hypotheses

Two hypotheses were formulated to provide more information to the conservationists when it will be necessary to design a conservation program of Gishwati Forest Reserve.

i) There is a variation in the use of Gishwati Forest Reserve by local communities.

ii) The issues and benefits of local people resulting from conservation have an influence on their attitudes toward conservation.

1.6 Significance of the study

i) The results of this research will give useful information that may contribute to finding solutions to the conflicts between the people adjacent to Gishwati Forest Reserve and management of the reserve.

ii) This research will promote awareness for carrying out a comprehensive research on various parameters of relationships between local communities and protected areas.

iii) The study will also provide to policy makers, local governments and other stakeholders with recommendations which can be used to improve livelihoods of people while conserving the environment in the country.

1.7 Scope of the study

The work aimed to study the impact of communities on conservation of Gishwati Forest Reserve located in Rutsiro District in Rwanda. This reserve measures about 10 km^2. The study took 3 months and the focus was laid on the variation of the use of the forest by communities and the factors influencing the attitudes of people towards conservation of this forest.

1. 8 Conceptual framework of the study

This framework shows the relationship between five main components: household's socio-demographic and socio-economic characteristics, use of the forest, attitudes toward conservation, conservation strategies and sustainable conservation. Household's socio-demographic and socio-economic status determines the nature and to what extent its members will use forest products to survive. The amount and type of forest products to be harvested will depend on the revenue and the number of people to feed. Household's socio-demographic and socioeconomic characteristics and the role played by the forest in their livelihoods have an influence on people's attitudes toward conservation. People can not conserve the forest when they have no other source of energy, food, construction materials, medicine, timber or other needs from the forest. This leads to negative attitudes of people

toward conservation. However if conservationists involve people in conservation projects, and try to improve their livelihoods, the latter will support conservation strategies, and therefore achievement of sustainable conservation.

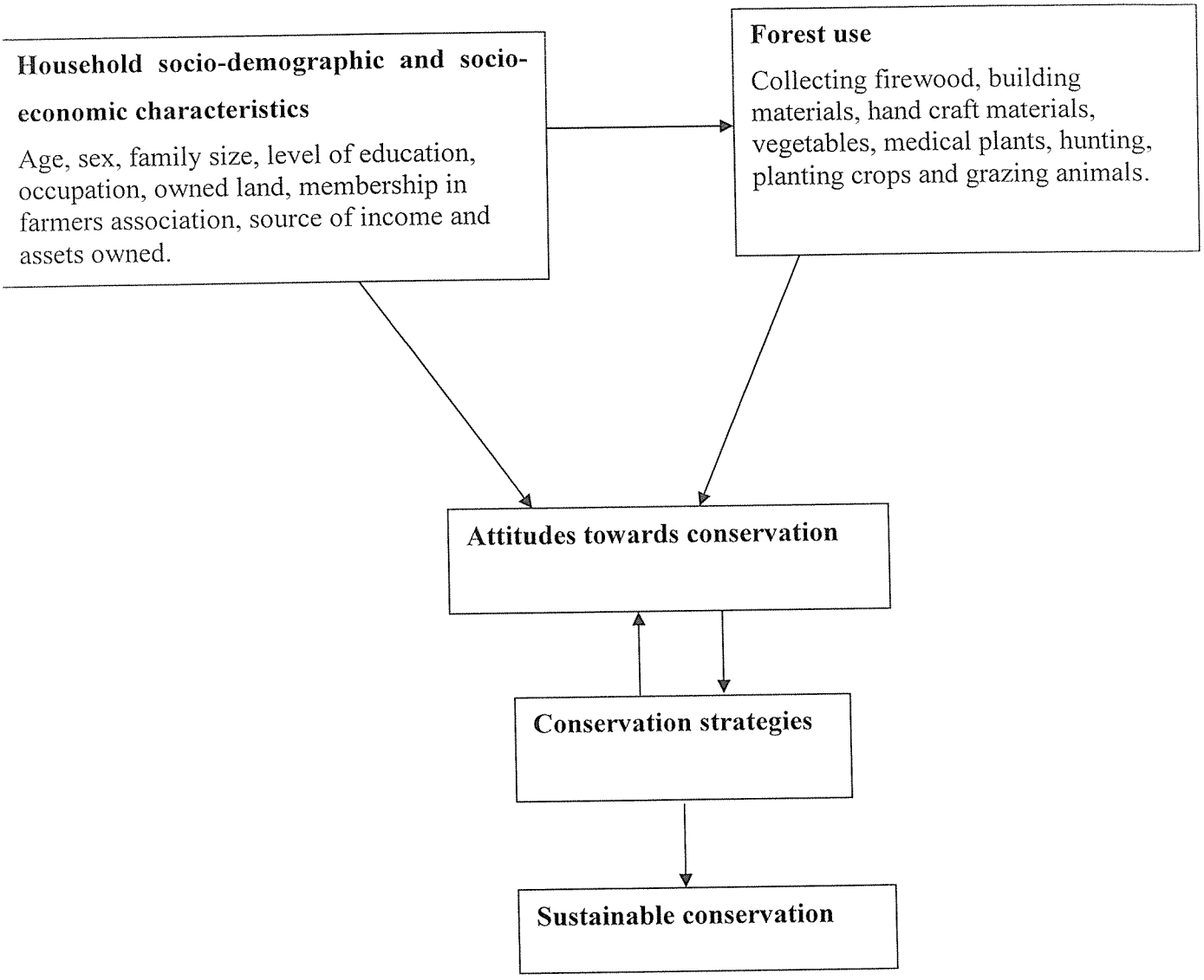


Figure 2: Conceptual framework.

CHAPTER 2: LITTERATURE REVIEW

2.1 The variation in the use of the forest by local people

People adjacent to protected areas use them differently and the use varies according to socio-demographic and socio-economic status of their households (Newmark, 2001; Masozera, 2002; Plumptre *et al.*, 2004 & Scherl *et al.*, 2004). In this study it has been found necessary to also review the literature on socio-demography and socio-economics of people adjacent to protected areas in general and those of Rwandese people in particular to more explain the variation of the use of Gishwati Forest Reserve by local people.

2.1.1 Socio-demography and socio-economics of communities adjacent to protected areas

People living around protected areas in developing countries are often poor and marginalised. This is mainly caused by the fact that protected areas are often sited in the less agriculturally productive areas or in remote rural regions with little access to markets or in areas to which socially marginal people have been dominated by other communities. These rural communities are often the last to be provided with development opportunities or social services and be effectively involved in decision-making processes that affect natural resources (Scherl *et al.*, 2004). A study conducted by Wilson & Wilson (2004) showed that in sub-Saharan Africa the top threats to World Heritage Sites are poverty related, with unsustainable resource extraction (illegal hunting, fishing, firewood collection, etc.) affecting 71% of Sites, and encroachment for agriculture or livestock use affects 38% of World Heritage Sites. In Asia and Pacific region unsustainable resource use affects 36% of World Heritage Sites. This shows that the socio-demographic and socio-economic status of people surrounding those World Heritage Sites is not good. Poor households have limited economic alternatives, and therefore more depend on the protected areas for their subsistence, or as an income source where they may be used by richer people to exploit protected areas. Also their access to local channels of livelihoods improvement is limited. The credits are likely to be given according to owned wealth and level of education. The poor are then excluded since in many cases they can't fulfil the required conditions. They are also less likely to benefit from interventions by NGOs if not well targeted.

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The results of a study conducted by Plumptre *et al* (2004) explained the socio-economic status of communities adjacent to six protected areas (Bwindi, Echuya and Mgahinga in Uganda; Birunga National Park and Nyungwe Forest Reserve in Rwanda; and Virunga National park in Republic Democratic of Congo) in the central Albertine Rift Region of Africa. These results showed that people around these protected areas have poor livelihoods leading to encroachments and conflicts with conservationists. Poverty in this region is determined by high population growth, undefined land tenure system, limited agricultural land, low ability to send children to school and the quality of the schools attended, low level of farm production (whether one produces enough for their household and can sell off the surplus for income), poor quality of housing, low ownership of transport means, etc.

These poor livelihoods in Albertine Rift lead to increase in mortality rate due to poor accessibility to quality health services and malnutrition. Some members of households also migrate to towns in search of jobs or to become involved in trade since they have limited economic opportunities. This migration and high mortality rate have serious implications for natural resource management. With fewer men in the age category of 21-55, the labour force needed for natural resource management activities is greatly reduced. Women from poorer household actually have to sell their labour (in digging) to earn income for household needs. Moreover, the income that migrant men earn is rarely ploughed back into agriculture, or even household maintenance. As such, little effort is put into conservation activities, including soil management, tree planting and management. Migration of men in the community may therefore limit the adoption rates of new conservation and land management technologies if not taken into consideration by Government and NGOs implementing programmes in the region. The Batwa (pygmies) communities have been found to be affected in the same way, however mortality among them was higher than among other communities, because most of them do not seek medical services even where they are available, but depend on local herbs even for illness that need modern medicine. This is because they have been historically marginalised by other community members, including workers in public facilities. The demographic structure in this Rift has been found to be typical of people living below the poverty line. The structure of people's houses, their ownership of bicycles, land, livestock and other indicators of wealth all showed clearly that these people are very poor.

2. 1. 2 A brief review of socio- demographic and socio-economic status in Rwanda

Historically, Rwanda has always had a high population density relative to neighbouring countries and this pressure persists to the present day. Rwanda's population has been on a very high increase, growing from 1,595,400 inhabitants in 1934 to 7,155,391 in 1991 and to 9,446,559 million in 2005. The population growth rate is 2.5, among the highest in the world (ONAPO, 2001).This high increase is the combined effect of the decline of mortality, the high birth and fertility rates.

Year	Population	Physical Density (2.336 km2)	Physiological Density (18.740 km2)
1934	1,595,400	61	85
1940	1,913,322	73	102
1948	1,806,371	69	96
1950	1,954,870	77	104
1960	2,694,990	102	144
1970	3,756,607	143	200
1978	4,831,522	188	263
1991	7,155,391	272	382
1996	6,167,000	234	329
2000	8,109,754	308	433
2005	9,446,559	359	504

Table1: Population growth and density from 1934 to 2005

Source: ONAPO (2001). *Population Growth in Rwanda and Framework for its solution.*

The consequence of the continuous increase of the population is increased density and the reduction of arable land per capita. In fact, the physiological density increased from 85 inhabitants /km2 in 1934 to 433 in the year 2000 and it is likely to increase further (GBAD, 2005). This drastic population growth will require (whatever the innovations in terms of human settlement and land organization) a two-fold increase of agricultural production, double the quantity of water for domestic use, double the sources of energy, etc. Natural resources are on high demand. For instance the resulting land scarcity from population expansion has compelled farmers to cultivate fragile, steep-slope holdings leading to land slides and flooding in different regions of the country. The relentless pressure on land has led to a dramatic decrease in Rwanda's protected areas as mentioned above.

Rwanda is a very low-income country ranked among the 10 least developed countries of the world. According to MINECOFIN (1999), the Gross National Product per capita was 251 US dollars/year in 1998. The primary sector dominated by agriculture, employed 91.1% of the working population in 1996. Agriculture contributes up to 45% of GDP and accounts for 93% of export earnings through coffee and tea at 49% and 44% respectively.

Rapid population growth and declining agricultural productivity affect the livelihoods and survival of thousands of households in Rwanda, where over 90 percent of the people live in rural areas and where virtually all rural households are engaged in agriculture (Poverty Observatory, 2002). Farm production in Rwanda is oriented toward subsistence; farms average less than one hectare of land. Beans and sorghum, supplemented by sweet potatoes, cassava and peas, are the principal food staples. Coffee and tea are important cash crops for some farmers and important sources of foreign exchange for the nation. Rwanda's agricultural system is labour intensive; hoes and machetes are the basic farm implements. Livestock comprise an integral part of the farming system in Rwanda. It is widespread in the country and practised at the family level. In the country, reared animals are cattle, sheep, goats, pigs, poultry and bees. But there is a progressive conversion of pasture into cropland which causes a reduction in average household livestock production, and a parallel decline in the amount of manure available for improving soil fertility (Rwamasirabo *et al,* 1991). Fisheries are practised in lakes and often very little in rivers. It is a small-scale activity whose contribution to the economy is low and its productivity is limited.

Forests have a big commercial value deriving from the use of different forest products. Wood is the principal source of energy in Rwanda. The increase in population has led to increased demand of firewood and wood products as the majority of people (90%) depend on firewood as main source of energy. Wood fuel consumption in Rwanda has increased nearly 8.2 million cubic meters per year in 2006. More than 60% of the urban population use charcoal as a source of energy (News Articles on Rainforests, 2006). Wood is also very much used in construction.

Tourism in Rwanda generates significant revenue. Each year, the country receives a large number of tourists visiting national parks and forest reserves. Secondary and tertiary sectors are not much developed. They employ 1.7 and 6.5% respectively of the working population

(Ministry of Lands, Resettlement and Environment, 2003). The informal sector (crafts, family unit processing, trade, etc) contribute significantly to the national economy and employment creation, even though the flows of this sector are not recorded in the national economy.

Sector of Activity	**Years**				
	1994	1995	1996	1997	1998
Food crops	95 605	123 806	146 541	152 776	171 049
Cash crops:	1 347	8 456	6 266	6 176	6 104
Coffee	1 140	8 214	5 719	5 554	5 339
Stockbreeding	13 283	11 040	18 183	19 095	20 432
Fisheries	762	838	1 090	1 144	1 179
Sylviculture	4 355	4 815	6 792	5 929	6 521
Agriculture	115 351	148 956	178 871	185 120	205 285
Industry	36 655	55 719	68 646	84 258	93 814
Services	97 162	135 195	141 240	167 333	178 307
Gross Domestic Product	250 939	337 200	390 639	440 714	483 003

Table 2: Gross Domestic Product per sector of activity (millions Frw) from 1994 to 1998
Source: MINECOFIN (1999).*Development Indicators for Rwanda*. Kigali. Rwanda

As the above table shows, the share of agriculture to the Gross Domestic Product has been increasing since 1994. The predominance of the primary sector in the structure of the national economy and lack of alternatives cause high pressures on the biological resources currently available. The lack of well defined land tenure system combined with existing market failures have also undermined conservation of natural resources in Rwanda. The Ministry of Finance (2002) indicates that the percentage of the households owning some land in the lowest quintile (poorest households) is on average around 85%. 40.5% of them have less than 0.2 ha compared to only 14.9% in the top quintiles. Farms of this size are inadequate to support a household, especially where the land is of poor quality.

The practices of land renting, share-cropping and lending are also frequent in Rwanda. According to the Wildlife Conservation Society (2004), on average 10.7% of farmland is rented in form of cash or kind. This means that people can not make long-term investments where land is being rented and the land law must address this problem. Security of land

tenure is a very important factor to increase agricultural productivity and improve people's livelihoods.

Few poor households sell any of their agricultural products in Rwanda. On average, in the lowest quintile, more households sell none of their output as compared to the top quintile (wealthiest) where the majority of the households sell at least some output. The crops most likely to be sold are coffee, tea, tomatoes and *ikakama/inkashi* (banana to make beer). Among staple food crops *inyamunyo* (cooking banana), Irish potatoes and sorghum are the crops most likely to be sold dependently on their cultivation regions. Reliance on cash crops such as coffee and tea make already poor farmers increasingly vulnerable to impoverishment as the prices are fixed by foreign markets. Of the 18 major crops among the households in Rwanda, the one most stored by the households is dry-beans (with 39.2% of producing households storing beans), followed by sorghum (26.7%) and maize (14.4%). More storage of crops is encountered among the higher quintiles, compared to low quintiles. This indicates that there is a serious food security problem in poorer households. Poverty for many households in Rwanda is associated with having too much labour compared to activities to be done (for instance small land, capital or demand). This is shown by underemployment or unemployment of members of these households. For other households poverty may be associated with too little labour, with members working long hours, typically at low returns. Poverty is concentrated among households whose primary livelihoods are agricultural activities where by nearly 97% of active members work on their household farm and the remaining through agricultural wage labour (Ministry of Economics and Finance, 2002).

2.1. 3 The forest use by the local people

Forests provide many benefits to humans. The forest is a resource base from which a variety of goods and services may be obtained. The range of goods and services vary from place to place depending on the type of forest and its socio-demographic and socio-economic setting. The table below summarises the global uses of the forest resource according to Mather & Chapman (1999).

Traditional use	Industrial use	Services
- Fodder, grazing, shifting cultivation - Food: Fruits, seeds, nuts, honey, game - Medicines - Fibres, - Gums, dyes, oils, waxes and resins, - Building materials - Wood for domestic utensils and furnishing - Firewood	Sawlogs Pulpwood and other industrial wood Firewood and charcoal Cork and turpentine	Soil conservation Water conservation and watershed protection Nature conservation and biodiversity Amenity Recreation and tourism

Table 3: The global uses of the forest resource

Traditionally forest is used in a great variety of different ways. It is the setting for shifting cultivation, and provide directly or indirectly most of the materials for home. It yields medicinal products and alcoholic beverages, as well as fruits, nuts, honey and game. In the Gogol Valley of Papua New Guinea, for example, 69 of the 250 species of wildlife are used by local people (Mather & Chapman, 1999). The traditional use of forest remains in developing countries while in developed world it has been replaced by industrial use focusing on commercial production of timber.

In developing countries population depends on forests for agricultural, energy, nutritional, medicinal, and income needs (Wildlife Conservation Society, 2007). According to Newmark (2001) residents around forests of Eastern Arc Mountains in Tanzania use many native plant and animal species for medicines, food, building materials and household items. In this region wild plants are the primary if not the only source of medicine for many people. In most villages the individuals most knowledgeable about the medicinal value of wild plants are traditional healers. It is estimated that Tanzania has 30,000 to 40,000 traditional healers compared to 600 Western-trained doctors, who practice primarily in the cities. Wild plants and mushrooms comprise an integral and significant proportion of the diets of many people living in Eastern Arc Mountains.

A survey conducted in Western Usambura found that people in that region accompany a staple food of cassava and maize with green leafy plants (called *michicha* in Swahili) harvested from the forests. Wild green leafy plants are also economically important for households in that region as people mainly unmarried women, elderly widows and divorcees sell them to earn money to buy other food and household items. People also collect highly nutritious mushrooms and gather wild fruits from those forests. Some of those fruits are directly eaten and others provide cooking fats. The most used species for fat extraction are *Allanblackia stuhlmannii* (Guttiferae) and *Trichilia roka* (Meliaceae). The forests of Eastern Arc Mountains have been identified to host many species of plants which are important sources of nectar and pollen for bees, therefore beehives are frequent in those forests and honey is an important portion of the diet of many people in this region.

It is also used as medicine for burns and coughs. Bushmeat is also an important source of protein for many villagers adjacent to the forests of Eastern Arc Mountains. Intensive hunting pressures have caused scarcity of many species. Those people also highly depend upon natural forests for building materials. The more vulnerable tree species are those resistant to termites and decay (or example *Cyathea spp.* (Cyatheaceae). Most of the common household items they use are constructed from plant materials collected from the adjacent forests. Those are for example: stools, chairs, baskets, bed frames, sugarcane presses, mortars, and pestles, pipe stems, wooden spoons, beehives, baskets, bows and arrows, twine, rope, etc. Long-burning species of trees are more searched by people for firewood. In the Eastern Usambura Mountains 29 species are known to be actively collected because of this property. In East Africa especially in the Eastern Arc Mountains, people frequently use dyes for body paints and for colouring houses, household items, cloth and fibres. Dyes are normally obtained by boiling the bark, roots or fruits of a plant in water and are fixed using lemon juice and salt. In eastern Usambura, over 20 species have been identified as sources for dyes (Newmark, 2001).

In Rwanda people living in close proximity to forests use them as part of the local resource base available to them in order to secure their livelihoods. Despite regulations prohibiting the use of areas with a protected status, failure to enforce the regulations means that local people have been able to access these areas (Nyungwe Forest Reserve, Birunga National Park, Akagera National Park and Gishwati Forest Reserve) to exploit the resources. The forests are used by local people for firewood collection, farming, livestock rearing, timber harvesting, bushmeat, honey, mining, medical collection, etc. For instance, people around Nyungwe

Forest put much pressure on its resources because of the need for more agricultural land or alternative sources of income. Large mammals have been always a pray of hunters which has resulted in reduced densities and the extinction of the park's last elephants in 1999. Hunters now target smaller mammals, such as giant rats and squirrels, because they cannot find larger ones. People rear bees inside the forest. When those people want to smoke bees from wild hives sometimes fires spread, devastating large parts of the forest. For example during El Niño years, when the climate was particularly dry, many hills lost their vegetation cover and up to now they have few or no trees as a result. At times, mining of gold and, more recently, Colombo-tantalite has led to the creation of large mining camps inside the forests (some containing more than 3,000 men). The high birth rates of the local population and the lack of land outside the forest have also contributed to the threat of encroachment (Wildlife Conservation Society, 2007).

A socio-economic study of Masozera (2002) around Nyungwe Forest Reserve showed that where agricultural income, market access and/or household average age are low or poor, household use of the forest is higher and the large households use the forest more than small households. This suggests that poorer households may more use forests to secure their basic livelihood, through harvesting wild food, bush meat for consumption, goods collection such as timber, firewood, and charcoal to sell on local markets, where many poorer households have fewer other livelihood options.

People living in isolated areas with limited access to external markets and infrastructure facilities are likely to remain poor and will continue to use surrounding forest resources to survive. On the other hand, communities closer to town may have a wide range of opportunities such as employment in tea plantations and small businesses. For example, communities who live closer to tea plantations showed less dependency on Nyungwe forest resources because they are employed by the tea company. In addition, returns to labour and agriculture may be high in villages closer to the market than those of isolated villages. Younger households are more dependent on forest resources. This may be due to the fact that forest dependent activities in the NFR are illegal and it is risky to undertake them. Youth generally take greater risks relative to older people in the community. Furthermore, with limited off farm economic opportunities, younger households rely on resources to meet their basic needs. The author stresses that the use of the forest by local people plays a significant role in livelihoods security.

He argues that during the period of hungry gap (a period when reserves of home produce and cash are low or exhausted prior to the collection of the next harvest), the forest is very important to people as it provides alternative options such as wild food to cover this hungry gap. He adds that the forest use is influenced by household size, agricultural income, off-farm employment opportunities, incorporation to outside market and education.

The forest resource use can have important environment and socio-economic implications. This can happen at local, regional and global levels. For instance, shifting cultivation, overgrazing and logging have been often associated with strong environmental impacts such as soil erosion and loss of biodiversity. Erosion of exposed ground leads to impoverishment of the soil within the affected area and silting downstream. This leads to low productivity and therefore poverty. Those activities also destroy some species of the forest and this affects the whole forest ecosystem. The places occupied by more valuable plant species may be taken by other less valuable species and leads to extinction of some animal species starting from some herbivores which were dependant on these plant species.

2.2 Factors influencing attitudes of local people toward conservation

Poor livelihoods lead to negative attitudes towards conservation (Scherl *et al.*, 2004 and Plumptre *et al.*, 2004). Poor people living in or adjacent to protected areas have no alternative sources of materials they get from the forest. When they are restricted from forest resources without providing alternatives to them they see the conservation activities as a burden. Masozera (2002) stresses that the restrictions on grazing, collection of fuelwood, small landholding size and low income led to negative attitudes toward conservation around Nyungwe Forest Reserve. Furthermore there is growing evidence that local people's support for protected areas depends on the perceived costs and benefits of conservation. For instance around Sirena National Park on Madrigal Peninsula in Talamanca, Central America people have negative attitudes toward conservation and continue the illegal hunting activities inside the park because they do not benefit from tourism (Rao, 2006).

Where animals in protected areas destroy crops of local people, the latter have negative attitudes toward conservation. Crop damage by wildlife has been found to enhance the negative attitudes of people around Nyungwe Forest Reserve and Birunga National Park in Rwanda.

It is actually one of the reasons why park-edge households do not plant trees, because they believe trees create a habitat for problem animals. The creation of buffer zones can also lead to negative attitudes toward conservation when the government and conservationists do not integrate local communities. Around Nyungwe Forest Reserve there is a buffer zone area consisting mainly of mature pine plantation. The establishment of this buffer zone has affected communities differently. People who live near the plantations are able to collect fallen dead wood for fuel. However land had been expropriated from local people by the government during the formation of the buffer zone and in such cases with people not earning any direct benefits, they consider the buffer zone primarily as a limitation for the expansion of their agriculture into the reserve. Buffer zone management schemes should clearly establish the equity and solve the capital issues in local communities around it (Masozera, 2002).

Positive attitudes toward conservation have been observed where government and conservationists involve local communities in conservation projects and attempt to improve their livelihoods. Benefits from the protected area and a better education resulted in more positive attitudes around Bwindi Impenetrable and Mgahinga Gorilla National Park which had experienced conflict and resistance of local people from their establishment in 1991 (Wildlife Conservation Society, 2004; Scherl *et al.,* 2004 and Rao, 2006). Also people living around a part of Nyungwe Forest Reserve where there are large tea plantations have positive attitudes because they have off-farm economic opportunities. The buffer zone tea plantations provide them with seasonal income through employment (Wildlife Conservation Society, 2004).

2.3 Measures to reduce the impact of poor livelihoods on conservation

It is now widely recognized that the long-term survival of protected areas in developing countries will not be achieved if needs, aspirations, and attitudes of local peoples are not accounted for (Masozera, 2002). This suggests that understanding the influence of socio-economic status on forest use and attitudes to conservation are of great importance to formulate new or modify existing conservation strategies. In this concern Scherl *et al.,* (2004) argue that to achieve sustainable conservation, poverty must be alleviated in communities adjacent to protected areas.

All parties involved in conservation should adopt approaches such as Integrated Conservation and Development Projects (ICDPs), inclusive management approaches, and creating opportunities for biodiversity conservation within the wide rural landscape in the form of community conservation areas.

According to Plumptre *et al* (2004), to achieve sustainable conservation in Albertine Rift there should be continuation of supporting income-generating activities, supply of alternative resources such as water to communities adjacent to protected areas, promotion of family-planning in the region, improvement of access to markets and adding market value, improvement of access to micro-credit on the basis of social capital, providing support to the Batwa and other marginalised groups adjacent to the protected areas, implementing Integrated Conservation and Development Projects (ICDPs) with law enforcement, .improving relationships between park guards and local communities and ameliorating the coordination between conservation and development projects.

These authors show that for sustainable conservation of protected areas, strong cooperative relationships between conservationists and local communities are necessary. The results from researches conducted by Southworth *et al* (2007) around different protected areas showed that in order to ensure greater cooperation between state authorities and local communities, there is a need to provide local inhabitants with incentives for conservation, and to seek economic alternatives for farmers adjacent to the protected areas. They found that tourism provides one promising source of income in many locations, but this money often does not filter back to the local communities. They propose that to reduce the impact of local people on conserved areas, this money should be used in improvement of socio-economic conditions of these people.

Other researches conducted in many developing countries showed that the implementation of community-based conservation (CBC) programs changes the attitudes of people towards conservation. The recent experiences in Annapurna and Makalu-Barun Conservation Areas in Nepal in 1996 and 1997 showed that the adoption of a community-based conservation approach in policy formulation, planning, and management to manage the country's protected areas, mainly in response to poor park-people relations, allowed the government to arrive at positive achievements.

This has been done through creation of new "people-oriented" conservation areas, formation and devolvement of legal authority to grassroots-level institutions to manage local resources, fostering of infrastructure development, promotion of tourism, and provision of income-generating trainings to local people. The results indicate that the majority of local people hold favourable attitudes toward these conservation areas. Participation in training, benefit from tourism, wildlife depredation issue, ethnicity, gender, and education level are found to be the significant predictors of local attitudes in one or the other conservation area (Southworth *et al*, 2007).

The results of a research conducted by Wildlife Conservation Society (2004) around Bwindi and Mgahinga national parks in Uganda showed that to achieve community-based conservation the attitudes of park staff towards communities should change from viewing them as poachers towards viewing them as useful partners, in accordance to the changes in protected areas management policy. The policy changes and increased dialogue between managers of protected areas and local communities has led to positive change. Communities around Bwindi and Mgahinga have been given the opportunity to voice their concerns about the park and now they feel that by conserving they may receive more benefits in future.
This research also showed that a success to link community benefits with protected areas led to positive attitudes towards conservation around Bwindi and Mgahinga in the last decade. The cooperation with park authorities among the communities increased.

In Rwanda, although the government is trying to enforce forests conservation laws, the success is very limited because of lack of empowerment of local communities living around them. A consistent desire to have access to the forests and harvest forest products was expressed by all people but in particular by the Batwa communities around Nyungwe forest in a research conducted by Wildlife Conservation Society (2004). This means that a need to improve the livelihoods of local people to reduce the conflicts between them and conservationists is necessary. It can be done through clearly defining land tenure system, grouping people in associations, providing credits to promote rural development, integrating the community conservation priorities into local development priorities and increase land productivity (Clay, 1996). All these approaches to be successful must involve local communities. When people are involved in decision making it is easy to raise their awareness, to reduce the illegal activities and to enforce rules.

CHAPTER 3: METHODS

3.1 Research design

This study adopted descriptive research design which used both qualitative and quantitative methods.

3.2 Sample and sampling procedures

This study has been conducted around Gishwati Forest Reserve which is located in Rutsiro District. This district has 14 sectors but only 3 of them are adjacent to the forest. Those are Kigeyo, Ruhango and Nyabirasi. People who destroy the forest are mainly from these 3 Sectors. Three villages were randomly selected for the survey. This means that one village from 5 in total was randomly selected in each Sector.

Each village is inhabited by about 400 households among which 40 households were randomly selected to represent all inhabitants of this village. In total 120 households among 1200 were randomly selected from villages around Gishwati and this sample helped to make projections about all communities around Gishwati Forest Reserve. In case the household head was not available during the visit, the next person in the household was interviewed.

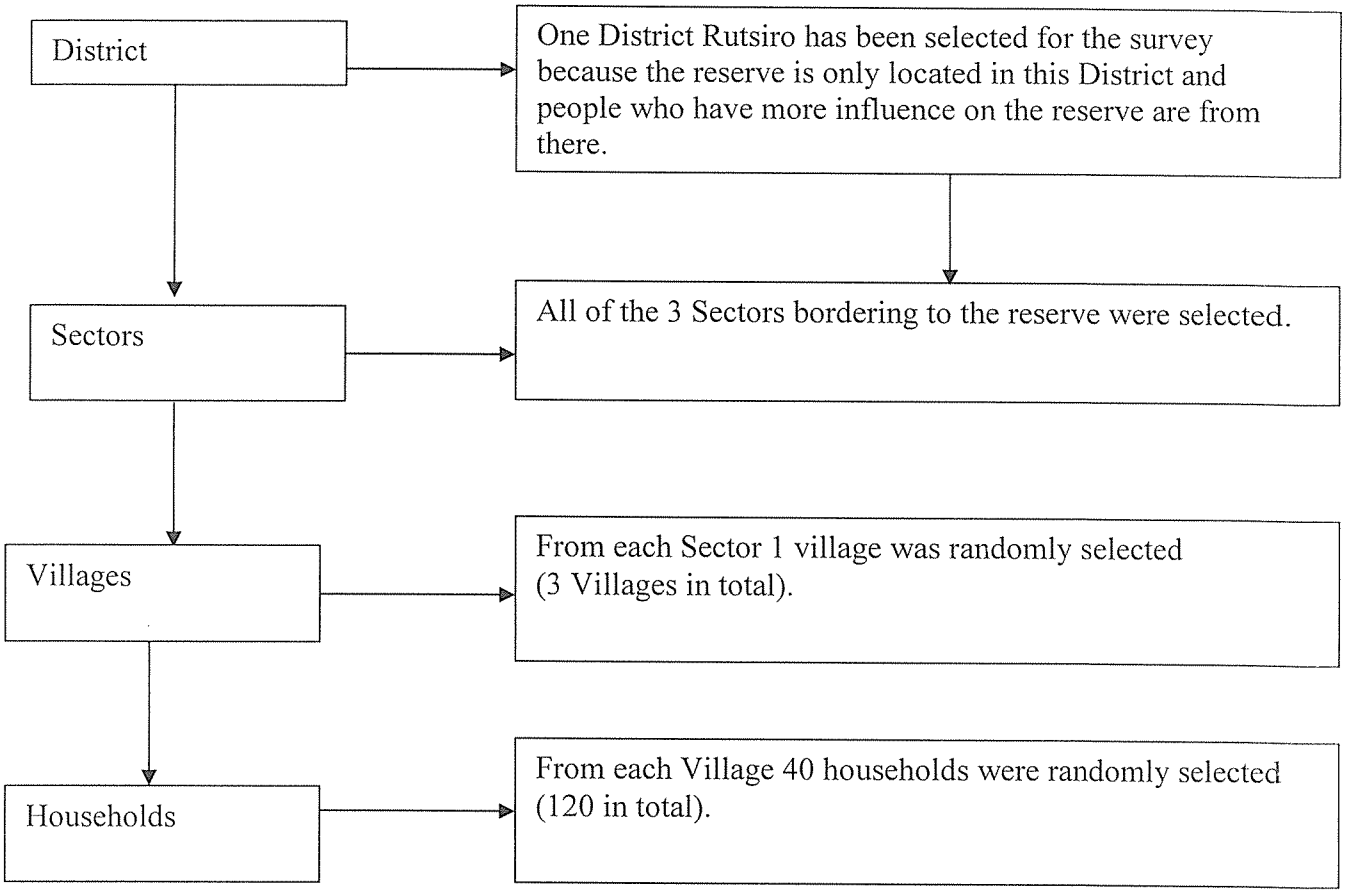


Figure 3: Sample frame

3.4 Data collection instruments

3.4.1 Interview

Interview guided by a questionnaire was used to collect information from respondents. Questionnaires contained both close-ended and open-ended questions and were divided into three main sections:

3.4.2 Observation

This instrument was used to collect some information about the socio-economic situation of households and the way they use the forest. Some photographs were taken to reinforce the findings.

3.5 Survey procedure

Questionnaires were translated into Kinyarwanda and administrated in this language orally. In each village a guide helped in the administration of the interview. The field work took 2 weeks.

3.6 Data analysis

Primary data were collected from the respondents in sampled households and secondary data were obtained from literature review. Data were organized in a more meaningful and interpretive way to answer to the study objectives. After the collection from the field, data were entered into a computer to allow easy interpretation and analysis. The table for data entry was developed in an Excel file format. Qualitative data were treated in the computer using simple packages like Microsoft word for text and Microsoft excel to organize data in form of tables and figures from where conclusions were drawn and quantitative data were analysed using SPSS for Windows to test the two hypotheses.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Results

4.1.1 The variation in the use of Gishwati Forest Reserve by local communities

Socio-demographic characteristics

In this research 120 people were interviewed. The socio-demographic characteristics measured in this research are age, sex, family size and level of education. Female respondents were 54.2% while males were 45.8 %(Table3). The percentage of women was higher than the percentage of men. This can be due to fact that men are usually very mobile in search of money to feed their families. Some migrate to towns in search of jobs, others can be working in tea factory or elsewhere and get home late in evening. This difference can also be a consequence of the war and genocide which killed and imprisoned more men than women.

The age of respondents varied from 18 to 78. People in age classes of 18-40 were 45.8% and people in age class of 41-78 were 54.2% (Table3). This shows that the sample was mainly composed by elders.

On the question of how many members do your family has, people gave numbers from 3 to 13. Families with members in class of 3-7 represented 67.5% while those in class 7-13 represented 32.5 %. The families of all Batwa (pygmies) interviewed were in class 3-7 and represented 28.3% of all respondents (Table3). This can be due to the high infant mortality rate caused by poor conditions of living

Sectors	Males N=45.8	Females N=54.2	18-40 age class	41-78 age class	3-7 family members	8-13 family members
Kigeyo	11.6	10.8	10	12.5	12.5	12
Kigeyo(Batwa)	4.1	6.6	7.5	3.3	10.8	-
Ruhango	11.6	14.1	10.8	14.9	13.3	15
Ruhango(Batwa)	3.3	4.16	4.1	3.3	7.5	-
Nyabirasi	10	13.3	8.3	14.9	13.3	12
Nyabirasi(Batwa)	5	5	5	5	10	-

Table 4: Percentages of respondents by Sectors considering sex, age classes and family members

The level of education of people adjacent to Gishwati Forest Reserve is very low. Among respondents 56.7% had no formal education, 36.7% completed primary education, 5.8 % finished secondary education, and 0.8% had tertiary education. The high number of illiterate people may be due to the poverty of families which do not afford school fees and materials required for the education of their children.

Among 36.6% of people who completed primary education only 5.8% were Batwa (Figure5). This shows that many of Batwa children do not go to school. In Kigeyo sector, many Batwa reported that they do not send their children to school because of lack of school materials. Only one Batwa family had a child in secondary school in the whole village.

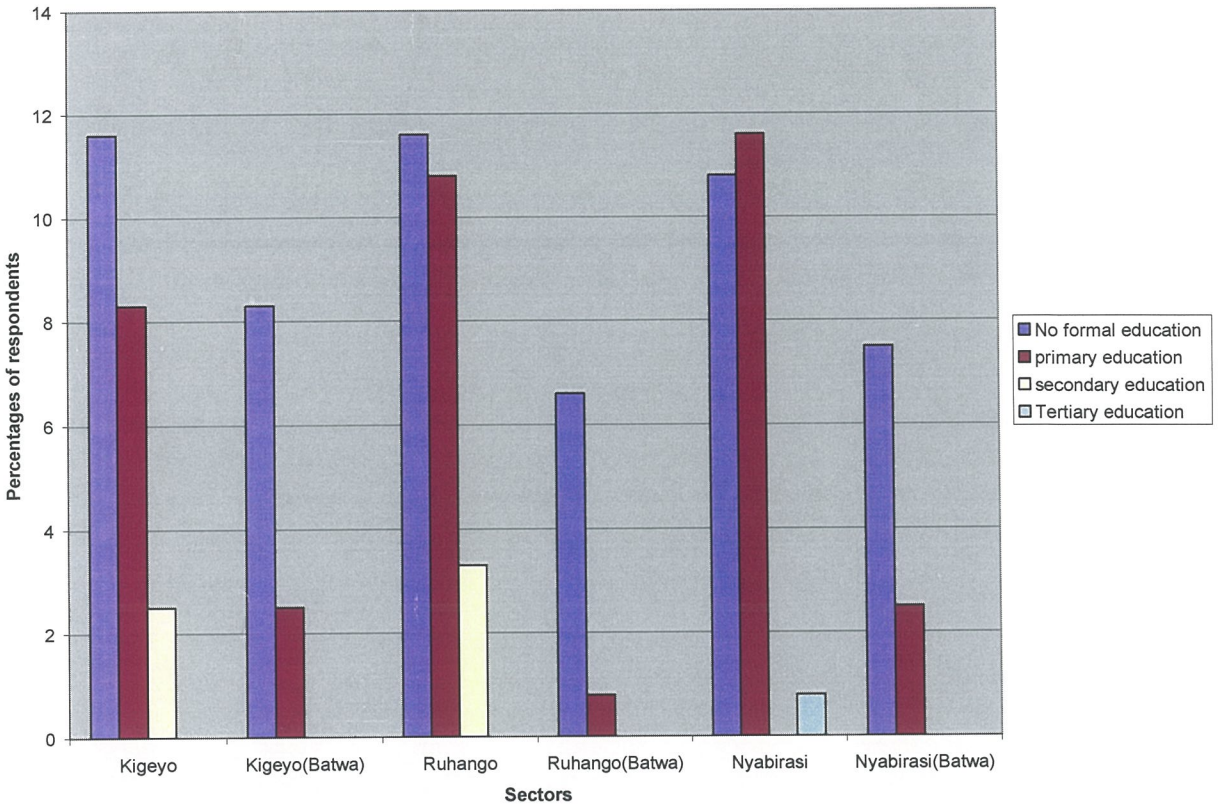


Figure 4: Percentages of respondents by Sectors considering the level of education

Socio-economic characteristics

The socio-economic characteristics measured in this study were occupation of respondents, land ownership, membership in agricultural association, source of income and ownership of assets. On the question of occupation of respondents, more of respondents (79.1%) reported that they were farmers, unemployed respondents were 15.9%, respondents who had employment were 2.5% whiles students were also 2.5% (Table 4). The factors to justify this are: Gishwati Forest Reserve is found in high mountain region where accessibility is very difficult. There are no roads, no secondary schools, no health centres, no markets and no electricity; therefore it is the region where only people depending on agriculture can live because there are no opportunities for other occupations. People who reported to be employed are teachers at primary school and the students of secondary school who were interviewed were at home because they were chased from school because of lack of school fees. Unemployed people were all pygmies. This is a group of people who have been historically marginalized and in their habits they live by hunting and collecting wild vegetables and fruits

or by pottery. Since 2004 they illegally entered the reserve because the Ministry of Land decided to protect the reserve.

That is why in interview they responded that their occupation is pottery but when asked from which place and materials they use in this they reported that they are able to make different household's materials in clay but they lack investment to start.
Pygmies do not cultivate, they prefer to rent or sell their land to gain money to buy food. This must be the underlying factor of their miserable life.

On the question of whether the people are members of farmers associations, 35.8% of them answered positively while 64.2% responded negatively (table 4). This shows that it must be difficult to support development projects of local people because it is recognized that the good way of assisting people in development is grouping them in associations and cooperatives to facilitate awareness and their involvement in project planning, implementation and monitoring.

Sectors	Farmer	Unemployed	Employed	Student	Member of farmers' association	Not member of farmers' association
Kigeyo	20.8	-	0.8	0.8	12.5	10
Kigeyo(Batwa)	2.5	8.3	-	-	-	10.8
Ruhango	23.3	-	0.8	1.6	13.3	12.5
Ruhango(Batwa)	3.3	4.1	-	-		
					-	7.5
Nyabirasi	23.3	-	-	-	10	13.3
Nyabirasi(Batwa)	5.8	4.1	-	-		
					-	10

Table 5: Percentages of respondents by occupation and membership in farmers' association

People who own the land less than 1 ha were 72.5%, those who have land between 1.1 ha and 2.5ha were 20.8% while only 8% owned the land between 2.6 and 5 ha (Figure6). These percentages show that people have small plots of land compared to the people they feed. The

harvest was also very small compared to the owned land. This is due to soil erosion and soil impoverishment recognized in the region that has made the people to become increasingly very poor. Moreover, the land owned by local people seems to be large compared to other regions of the country, simply because the land distribution around Gishwati Forest Reserve has been done recently in 2004 giving every household of new resettled 1000 m of length by 600 m of width. But these holdings will not be maintained for a long period of time simply because of high birth rate pushing parents to share the small land they own with their sons and the poverty which is already pushing some people especially Batwa to sell their land to buy food. The Figure 6 shows that all Batwa had less than one ha of land except 2 in Nyabirisi who owned land between 1.1 ha and 2.5 ha.

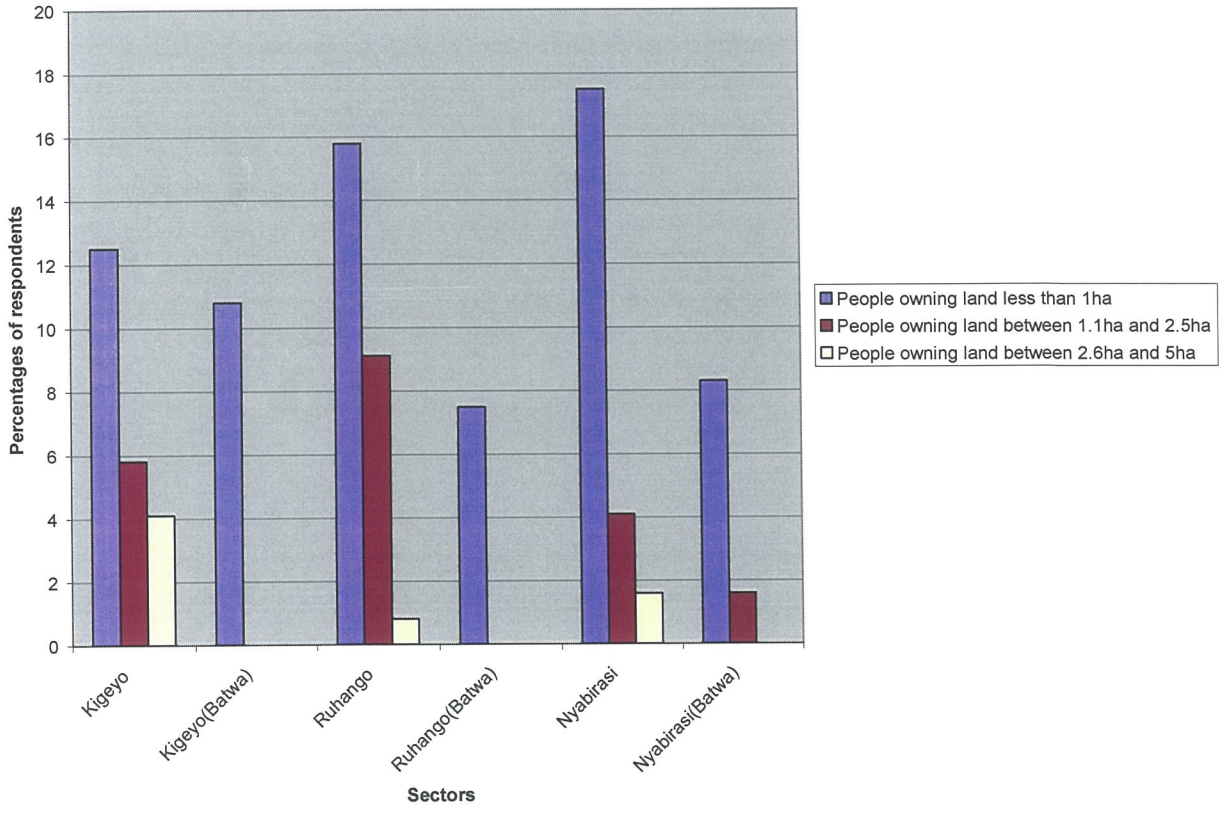


Figure 5: Percentages of respondents per Sectors considering owned land classes

People who reported to sell something and those to be employed were very few. To gain money to buy salt and other basic necessities to survive is very difficult. If the source of income is considered, 35% of the respondents reported to get money from selling crops, 10% from selling animals, 14.1% (found only in Kigeyo Sector) from selling tea, 9.1 %

(principally Batwa) from selling forest resources, 10.8% (also mainly Batwa) from renting land, 12.5% from selling household labour in agriculture, 3.3% from petty trade while 1.6% from employment(Figure7). Even if all people reported to have a source of income the money they get is in a very small amount for survival. For example a person who reported to sell crops got only 2000 kg of Irish potatoes per year which gave him an income of 254 $ per year. He is the richest of respondents. This means that people around Gishwati Forest Reserve live under poverty line. There is a big problem for Batwa who live by selling forest products, renting their land and by selling household labour in agriculture. Since the reserve is protected their freedom to collect the resources is reduced.

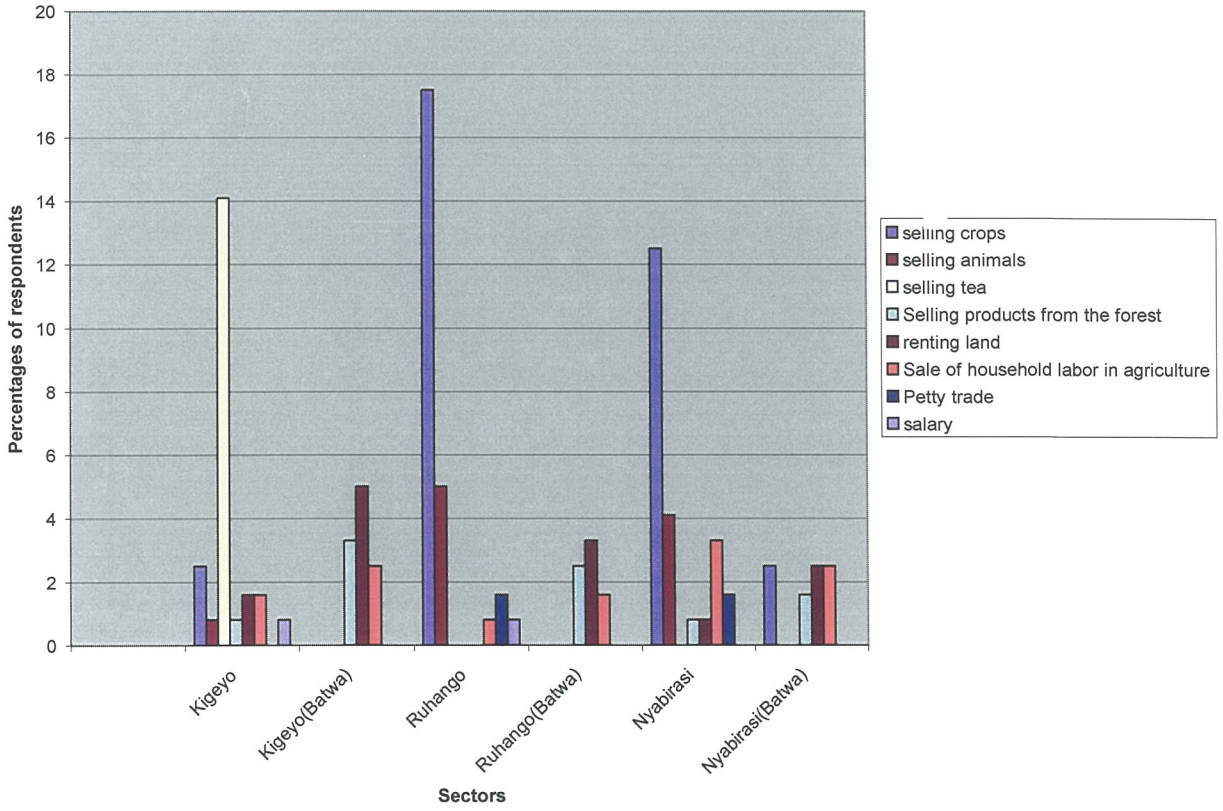


Figure 6: Percentages of respondents per Sectors considering their source of income

The ownership of assets also shows that these people live in poverty. No one owns a bicycle or a motorcycle. This is due to the lack of enough money to buy them and also the lack of access to roads. Some12.5% of the respondents own radios in their households, 9.1% have chickens, 0.8% have pigs, 9.1% own goats, 4.1% have sheep, 13.3% cows, 17.5 % own small fields of trees while 3 1.6% own nothing (Table5). This is a large number of people meaning that for somebody who has nothing at home it is very difficult for him to get money.

Sectors	Bicycle	Motorcycle	Radio	Chickens	Pigs	Goats	Sheep	Cows	Field of trees	Nothing
Kigeyo	-	-	3.3	0.8	0.8	3.3	2.5	3.3	5	3.3
Kigeyo(Batwa)	-	-	-	0.8	-	0.8	-	-	0.8	8.3
Ruhango	-	-	4.1	4.1	-	4.1	-	6.6	4.1	2.5
Ruhango(Batwa)	-	-	0.8	0.8	-	-	-	-	-	5.8
Nyabirasi	-	-	3.3	2.5	-	0.8	0.8	3.3	5.8	5
Nyabirasi(Batwa)	-	-	0.8	-	-	-	0.8	-	1.6	6.6

Table 6: Percentages of respondents by Sectors according to assets owned

The use of the forest

People adjacent to Gishwati Forest Reserve use the forest in different ways for different purposes. Some 29.1% go to forest to collect firewood, 11.6% in search of building materials, 14.1% to collect hand craft materials, 5.8% in search of honey, 2.5% in search of bushmeat which has considerably reduced with deforestation thus discouraging many of hunters from going there and 5.8% in search of medicinal plants. These are used by traditional healers and other people to treat some diseases. The traditional medicine is frequent there mainly because there is no hospital in the region and the health centres are far (the nearest is 10 km). Some 5% of respondents went to harvest natural vegetables from the reserve, 11.6% to graze animals inside the reserve, 8.3% to plant crops inside, and 7% of the respondents (all from Ruhango Sector) reported to collect water from the reserve (Table6). As said above these activities conducted in the forest are illegal since 2004 when the Ministry of Lands, Resettlement and Environment decided to protect this reserve. But the fact that they put in the whole District only 3 guards who stay at the Sectors office, people freely enter the forest. At first they refused to report that they go there but when examples of people who were seen

from there were given, they then reported their activities inside the reserve. All the people accepted to use the forest; none reported that their household does not go there. No Batwa reported to graze or plant crops in the forest; their activity is mainly for collecting forest resources.

Sectors	Firewoo	Building material	Hand craft	Honey	Hunting	Medical plants	vegetabl	Grazing	Planting and	Water
Kigeyo	7.5	2.5	1.6	1.6	0	1.6	2.5	3.3	1.6	-
Kigeyo(Batwa)	1.66	0.8	2.5	1.6	1.6	0.8	1.6	-	-	-
Ruhango	5	2.5	2.5	-	-	0.8	-	4.1	5	5.8
Ruhango(Batwa)	0.8	1.6	1..6	2.5	-	0.8	-	-	-	-
Nyabirasi	10.8	2.5	3.3	-	-	0.8	-	4.1	1.6	-
Nyabirasi(Batwa)	3.3	1.6	2.5	-	0.8	0.8	0.8	-	-	-

Table 7: Percentages of respondents per Sectors considering the way they use of the forest

Test of hypothesis

To test the first hypothesis whether there is a variation in the use of the forest by local people; the use of the forest has been used as the dependant variable with activities grouped into 2 categories: harvesting forest products and conducting the agricultural activities in the reserve. The socio-demographic and socio-economic characteristics have been used as explanatory variables. The following results of SPSS tests have been found:

The difference in the use of the forest by both sexes is not significant (χ^2 =0.002, df =1, p=0.962 (p > 0.05). All females and males use the forest in almost the same way. The lack of sufficient guards to protect the forest must be the reason because anybody enters the forest without fear.

		forest use 3		Total
		harvesting forest products	conducting agricultural activities	
respondent sex	Male	44	10	54
	female	54	12	66
Total		98	22	120
P=0.962;		**χ^2=0.002;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 8: Distribution of forest use frequencies according to respondent sex

When considering the age classes, it has been found that the difference in the use of the forest by different age classes is highly significant (χ^2=22.794, df =1, p=0.000). People in age class 1-40 must use the forest more than people in age class 41-78 because they are in active age. People in the second class are old and the main activities conducted in the forest are collecting firewood, building materials, handcraft materials and grazing animals which are normally done by young people.

		forest use		Total
		harvesting forest products	conducting agricultural activities	
age classes	low class	55	0	55
	high class	43	22	65
Total		98	22	120
P=0.000;		**χ^2=22.795;**		**df =1**
Ic=95%;		**Decision: H.S.**		

Table 9: Distribution of the forest use frequencies according to age classes

The size of the family does not have any influence on the use of the forest. There is no significant difference in the use of the forest by large families (3-7 members) and very large families (8-13 members): (χ^2=1.173, df =1, p=0.279). This is supported by the fact that all of the families adjacent to Gishwati Forest Reserve use the forest. It seems all of them get firewood and construction materials from the forest because when observing the types of trees used to make fire were species from the reserve and brooms used to clean the ground were all made in bamboo branches. The other reasons are that very few of the respondents reported to have a field of trees and also some families reported to sell forest products such as materials for hand craft, firewood, construction materials and honey. Therefore a family can be small and use the forest more than the large family depending on the fate of the activities conducted in the forest.

		forest use		Total
		harvesting forest products	conducting agricultural activities	
family size	large family	64	17	81
	very large family	34	5	39
Total		98	22	120
P=0.279;		**χ^2=1.173;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 10: Distribution of the forest use frequencies according to the family size

The education has a highly significant influence on the use of the forest by local people (χ^2=35.227, df =1, p=0.000). Un-educated people use the forest more than the educated people because the latter easily understand the importance of conservation and reduce their activities from the forest. Also some of the educated people have off-farm occupation which can not allow them to have enough time to enter the forest.

		forest use		
		harvesting forest products	conducting agricultural activities	Total
education	non educated	68	0	68
	educated	30	22	52
Total		98	22	120
p=0.000;		**χ^2=35.227;**		**df =1**
Ic=95%;		**Decision: H.S.**		

Table 11: Distribution of the forest use frequencies according to the level of education

The difference in the use of the forest by local people considering the type of occupation is very significant (F=82.237, df =1, p=0.000). This means that people who have on-farm occupation seem to use the forest more than people with off-farm occupation. Farmers who work in fields are the ones who graze animals in the reserve, plant and harvest crops from the reserve and collect forest products such as firewood, construction and hand craft materials. Pygmies who reported to work for other communities in agriculture and others to sell forest products to gain money are in this category of people having on-farm occupation even if they said they were unemployed or their occupation was pottery. People who have off-farm occupation are employed or students. Employed people get enough money to buy alternatives of what they would otherwise get from the forest. Some additionally buy products others harvest from the forest. Students do not have enough time to go to the forest because they attend to schools. In this survey people who have off-farm occupation are only 6 among the 120 respondents.

		forest use		
		harvesting forest products	conducting agricultural activities	Total
occupation	on-farm	98	6	104
	off-farm	0	16	16
Total		98	22	120
P=0.000;		**F=82.237;**		**df =1**
Ic=95%;		**Decision: H.S.**		

Table 12: Distribution of the forest use frequencies according to the occupation

A significant difference in the use of the forest by people owning different size of land was also observed (χ^2 =71.020, df =1, p=0.000). People owning less than 1 ha of land use the forest more than the people owning 1.1 ha to 5 ha of land because the latter satisfy their agricultural needs. They are the people in this category who also reported to have plantations of trees; therefore they can somehow get firewood and construction materials from their own fields thus reducing their negative impact on the reserve. People who own small size of land harvest the reserve products, graze their animals or plant crops inside the reserve because they have no alternatives. Batwa for instance rent their land and the money they get is not enough to buy food for the whole season. In order to survive they resort to cutting trees from the forest, collecting honey and firewood for sale, collecting vegetables and hunting animals for beef. Those who sold their land now totally depend on the forest to survive. For example somebody who own 0.1ha or 0.2 ha does not really own land. It is a very small plot enough for erecting a small house.

		forest use		
		harvesting forest products	conducting agricultural activities	Total
owned land classes	less than 1ha	87	0	87
	From 1.1 ha to 5 ha	11	22	33
Total		98	22	120
p=0.000;		**χ^2=71.020;**		**df =1**
Ic=95%;		**Decision: H.S.**		

Table 13: Distribution of the forest use frequencies according to the owned land classes

No significant difference was observed between people who were members of farmers associations and people who were not (χ^2=3.650, df =1, p=0.56). This may be due to the fact that many people do not benefit from these associations and the level of living is almost the same. This means that people used the forest almost in the same way whether or not they were members of the Farmers Association.

		forest use		
		harvesting forest products	conducting agricultural activities	Total
membership in farmers association	yes	39	4	43
	no	59	18	77
Total		98	22	120
p=0.56;		**χ^2=3.65;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 14: Distribution of the forest use frequencies according to the membership in farmers association

There was also no significant difference in the use of the forest by people of different sources of income (F= 2.718, df =1, p= 0.213). People who got money from selling forest products used the forest at almost the same level with other people who got money from other sources such as selling crops, selling animals, selling tea, working in farms of other people to gain money, renting land, petty trade or salary. This resemblance may be due to the small number of people whose source of income is selling forest products. In this category there were only 9.1% of all respondents.

		forest use		
		harvesting forest products	conducting agricultural activities	Total
source of income	selling products from the forest	11	0	11
	gaining money not from forest products	87	22	109
Total		98	22	120
p= 0.213;		**F= 2.718;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 15: Distribution of the forest use frequencies according to the source of income

There was a significant difference in the use of the forest according to the ownership of assets (χ^2=58.131, df =1, p=0.000). People who owned assets normally had higher standard of living compared to people who owned nothing and could have alternatives of what they searched from the forest. This means that the latter group used the forest more than the former.

		forest use 3		
		harvesting forest products	conducting agricultural activities	Total
ownership of assets	owning asset	82	0	82
	not owning	16	22	38
Total		98	22	120
p=0.000;		**χ^2=58.131;**		**df =1,**
Ic=95%;		**Decision: N.S.**		

Table 16: Distribution of the forest use frequencies according to the ownership of assets

4.1.2 Factors influencing attitudes of local people towards conservation

Considering the people's attitudes to conservation, knowledge of the conservation project, involvement in the conservation of Gishwati Forest Reserve, benefit from the buffer zone, the most issue facing their households and the effect of conservation on their activities, a wide range of responses were received.

On the knowledge of the conservation project, 34.1% of the respondents answered positively while 65.9 % answered negatively (Table16). Many people do not know the conservation project (PAFOR). This can be because the project does not involve local people. It is obvious that people who do not know the project for the conservation of the reserve have little chance to have positive attitudes towards conservation. This means that nothing has been done to explain to local people the importance of the forest near them. And reforestation is done by different associations and cooperatives which are interested in money paid by PAFOR for the number of planted seedlings. They are not concerned with the sustainability of their activities as does PAFOR because the protection of planted trees is in attributions of Ministry of lands, resettlement and Environment.

People who work in conservation were received from only 4.1 % of the respondents. They are those who know PAFOR. Other 30% who also reported to know it see the agent working or passing, but they did not hold any meeting with them (Table16). Some people reported that the project gives work to people from far in other Sectors and Districts. This can be one factor leading to negative attitudes of these people towards conservation because it is recognized that where the conservation project involves local people and employ them their attitudes change.

People benefiting from the buffer zone were stated by 29.1% of the respondents. This means that other 70.9% reported no benefit from the buffer zone (Table16). This makes it obvious that their attitudes towards conservation must be negative because they consider the buffer zone as area that they could use for agriculture and now it became a habitat of monkeys which destroy their crops. Only one Mutwa works in conservation and he is also the one who benefits from the buffer zone. This study showed that Batwa are the most vulnerable taking into consideration the local indicators of improved life and openness.

Sector	know	not know	work	no work	benefit	no benefit
Kigeyo	8.3	14.1	1.6	20.8	5.8	16.6
Kigeyo(Batwa)	0.8	10	0	10.8	0	10.8
Ruhango	10	15.8	0	25.8	8.3	17.5
Ruhango(Batwa)	0.8	6.6	0	7.5	0	7.5
Nyabirasi	9.1	14.1	2.5	20.8	14.1	9.1
Nyabirasi(Batwa)	5	5	0.8	9.1	0.8	9.1

Table 17: Percentages of respondents in each sector considering knowledge of conservation project work in conservation and benefit from buffer zone

To know the attitudes of local people towards conservation, the question: What are the effects of conservation of Gishwati Forest Reserve on your activities was asked. Respondents answered differently. People who reported to have problem of crop raiding were 40.0 %, those who said that the conservation caused lack of forest products were 45.8 %, those who responded that the conservation increased rainfall in the region were 5.0 %, those who reported that conservation activities reduced soil erosion were 4.1% and those who said that the conservation gave them safe breathing air were 5.0 % (Figure 8).

Except three Batwa in Nyabirasi Sector who said that they have a problem of crop raiding, all other Batwa interviewed reported that the effect of conservation on their activities is the lack of forest products. In Kigeyo Sector all the respondents including Batwa had no crop raiding problem by monkeys and chimpanzees. This can be because there is a road separating the forest and the fields of people and animals must fear to cross the road to enter the fields of crops. People houses are also near the forest. People who reported that the effects of conservation on their activities are crop raiding and lack of forest products were considered as people who have negative attitudes towards conservation and they represent 85.8% of all the respondents. Those (14.2 %) who reported that the effects of conservation are increased rainfall in the region, reduced erosion and increased safe breathing air were considered to have positive attitudes towards conservation because they knew the importance of the forest (Figure 8).

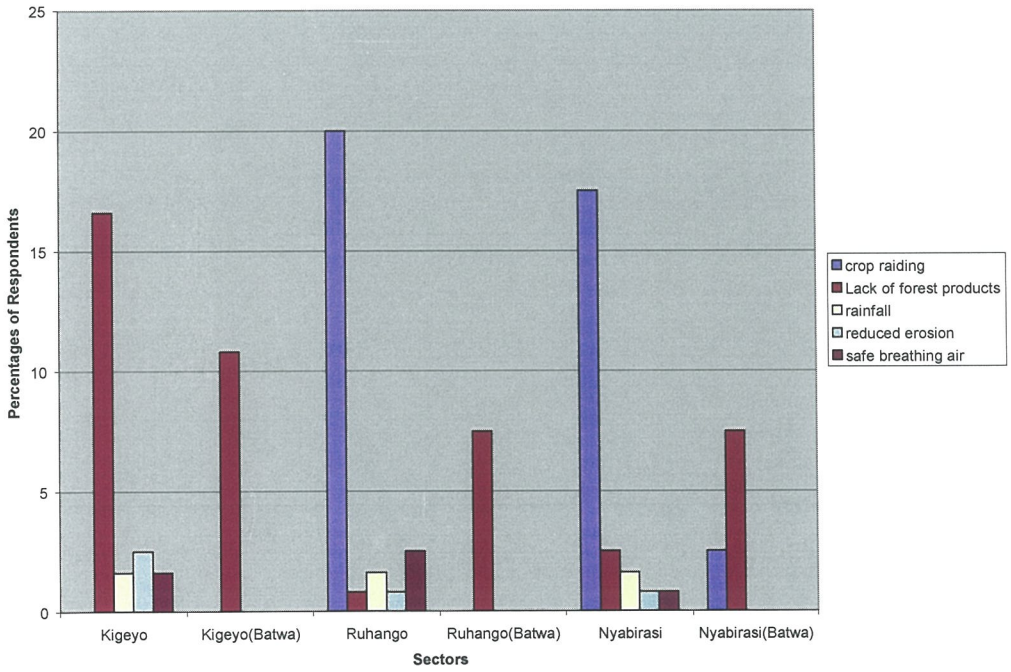


Figure 7: Percentages of respondents by Sectors considering the effects of conservation on activities on local people

To the question what is the most issue facing your household the respondents who reported the limited land for crops were 32.9%, limited land for cattle grazing were 10%, limited food 46%, lack of firewood 5.2 % and lack of fertilizers 5.9% (Figure 9). This means that since people do not have enough land for agriculture and the small they have is impoverished, it is obvious that they also lack food and firewood. The large percentage of respondents said that

the most issue facing their household is lack of food. This shows that people around Gishwati Forest Reserve are poor and this may be one of the reasons that their attitudes towards conservation are negative because they are obliged to use the forest to survive. All of Batwa except two in Nyabirasi reported to lack food rather than other issues. This was supported by the fact that normally Batwa do not like to work in agriculture. For them they want donors to give them food and if possible help them to start pottery.

Also the small number of the people who had positive attitudes must be due to the small percentage of people who knew the conservation project with the consequence of lack of awareness, few local people who are employed in conservation, few number of people who reported to benefit from buffer zone and issues of lack of agricultural land, food, firewood and fertilizers.

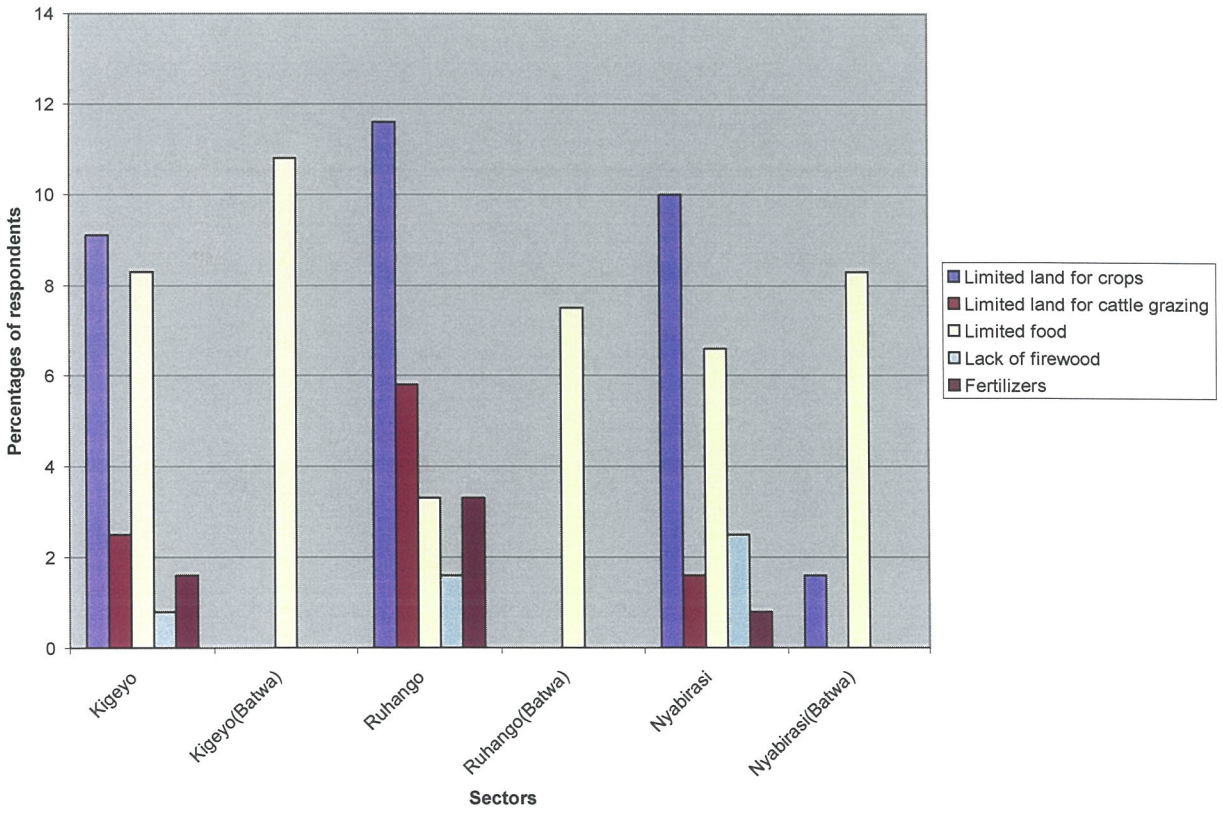


Figure 8: Percentages of respondents by Sectors taking into account most issues facing the households

Test of Hypothesis

A SPSS analysis was carried out to assess whether there was a significant difference in the attitudes of local people towards conservation in concern with the knowledge of conservation project, work in conservation, benefit from buffer zone and the most issues facing their households.

There was no significant difference found in the attitudes of people adjacent to Gishwati Forest Reserve if the knowledge of conservation project was considered ($\chi^2 = 0.508$, df =1, p=0.476). The idea to support this is the small number of people who know the conservation project (34.1%) and by the fact that the project does not involve local people.

		attitudes towards conservation		Total
		positive	negative	
knowledge of conservation projects	PAFOR	7	33	40
	none	10	69	79
Total		17	102	119
p=0.476;		**χ^2= 0.508;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 18: Distribution of the attitudes' frequencies according to the knowledge of conservation project

The Fisher's Test also shows that there was no significant difference in the attitudes of people if the work in conservation was taken into account (F= 1.908, df =1, p=0.201). This is due to the fact that local people who work in conservation were very few (5%) and people who had positive attitudes were also very few (14.2%).

		attitudes towards conservation		Total
		positive	negative	
work in conservation	yes	2	4	6
	no	15	99	114
Total		17	103	120
p=0.201;		**F= 1.908;**		**df =1**
Ic=95%;		**Decision: N.S.**		

Table 19: Distribution of the attitudes' frequencies according to the work in conservation

There was also no significant difference in the attitudes of people adjacent to Gishwati Forest Reserve if the benefit from buffer zone or not was considered (F= 0.001, df=1, p=1.000). This must be due to the fact that the buffer zone is recently created (2004) and it seems that people do not use it. People who reported to benefit said that the buffer zone showed them the limit of the forest. This so called benefit can not change their attitudes because it adds nothing on their life.

		attitudes towards conservation		Total
		positive	negative	
benefit	yes			
	no	12	73	85
Total		17	103	120
p=1.000;		**F= 0.001;**		**df=1**
Ic=95%;		**Decision: N.S.**		

Table 20: Distribution of the attitudes' frequencies according to the benefit from buffer zone

The contingency coefficient shows that there is no significant difference in the attitudes of people towards conservation if most issues facing the households are considered (C= 0.093. p= 0.901). This may be due to the fact that all issues reported by people are said to be

reinforced by the closure of the forest and the creation of buffer zone and a large number of respondents have negative attitudes.

		attitudes towards conservation		
		positive	negative	Total
most issue facing facing your household	limited land for crops	6	33	39
	limited land for cattle grazing	2	12	14
	limited food	8	46	54
	lack of firewood	0	6	6
	lack of fertilisers	1	6	7
Total		17	103	120
p= 0.901 **Ic=95%;**		C= 0.093. **Decision : N.S.**		

Table 21: Distribution of the attitudes' frequencies according to the most issue facing the household

4.1.3 Measures to reduce the impact of poor livelihoods on conservation

The question: how do you wish the conservation activities should be undertaken to reduce their impact on your activities, was asked to respondents in order to determine what can be done to achieve sustainable conservation. People who responded fencing the reserve were 30.8%, creating employment were 23.3%, increase agricultural land were 15%, allowing people to enter the forest were 26.6% and compensation were 4.1%.

All Batwa answered allowing people to enter the forest except one in Nyabirasi who said fencing the reserve (Table 20). It seems the living conditions of Batwa in Nyabirasi Sector are a bit higher than others elsewhere around the reserve. Some of them cultivate their land instead of selling or renting, have more assets and two of them showed positive attitudes towards conservation.

Sectors	Fencing the reserve	Employment	Increase agricultural land	Allowing people to enter the forest	Compensation
Kigeyo	0	6.6	11.6	4.1	0
Kigeyo(Batwa)	0	2.5	0	8.3	0
Ruhango	17.5	3.3	1.6	0.8	2.5
Ruhango(Batwa)	0	0.8	0	6.6	0
Nyabirasi	12.5	6.6	1.6	0.8	1.6
Nyabirasi(Batwa)	0.8	3.3	0	5.8	0

Table 22: Percentages of respondents by Sector according to suggestions of people on how the conservation activities should be undertaken to reduce the impact on their activities

4.2 Discussion

4.2.1 The variation in the use of Gishwati Forest Reserve by local communities

In this research the socio-demographic and socio-economic status of households was analysed to find out how this factor might have different influence on the reserve. The Figures 5, 6 and 7 showed how people around Gishwati Forest Reserve are poor and use the forest differently.

This study agrees with the findings of the Ministry of Finance (2002) which indicate that few poor households sell any of their agricultural products in Rwanda. Only 35.0% reported to gain money from selling crops whereas farmers represent 79.1% of all respondents. This means that more households sell none of their agricultural products indicating that there is a serious food security problem around Gishwati Forest Reserve. The problem of unproperly defined land tenure system also discourages people from agricultural activities. In Ruhango

problems because they are poorer than other communities who have the same and even smaller size of land compared to theirs. Pygmies need more attention compared to other communities. Plate 1 shows the type of houses they use in Nyarusuku village.



Plate 1: Type of houses of Batwa community around Gishwati Forest Reserve

When asked why they preferred to rent their land instead of cultivating it, they answered that this was not in their habits. They prefer hunting and pottery work. Some donors such as KORWA, an association to improve the livelihoods of Batwa in Rwanda gave them hoes and crops which they sold. The education program to change their mind from depending on the forest to other activities which can generate income is required to be combined with economic support. The environment officer at District level promised that there is a project of constructing better houses for them this year.

This study also agrees with the findings of Mather & Chapman (1999) about the use of the forest by local communities. They stress that the range of goods and services vary from place to place depending on the type of forest and its socio-economic setting. They found that global traditional use of the forest resource is for grazing, shifting cultivation, fruits, seeds, nuts, honey, game, medicines, fibres, gums, dyes, oils, waxes and resins, building materials, wood for domestic utensils and furnishing and firewood. It also agrees with the findings of Wildlife Conservation Society (2007) which argues that in developing countries population

depends on forests for agricultural, energy, nutritional, medical, and income needs and that in Rwanda the forests are used by local people for firewood collection, farming, livestock rearing, timber harvesting, bushmeat and honey collection, mining, medicinal collection, etc. Respondents around Gishwati Forest Reserve confirmed that they go to forest in search of firewood, construction materials, materials for handcraft, vegetables, medical plants, water, honey, planting crops, grazing animals and hunting. There are no mining activities inside the forest. The Colombo tantalite deposits are outside the Reserve.

The more harvested tree species for construction is *Cyathea maniana* (i*gishigishigi)* because it is resistant to termites and decay. People remove the bark of some tree species for handcraft such as mats, baskets, plaints, ropes for animals, etc. Plate 2 shows the barks of *Urera cameronensis* (*imise),* a tree species used to make plaints that an old lady was carrying from the forest. She sells them to gain money.



Plate 2: Barks of *Urera cameronensis* tree (*imise*), used to make plaints

Most of the other common household items used in the region are also constructed from plant materials collected from the reserve. These are for example: brooms made in bamboo branches, stools, chairs, bed frames, mortars, wooden spoons, beehives, etc. The more harvested species are *Urera cameronensis* (*imise*), *Dombeya goetzenii (imikore)*. People use them at household level and others mostly pygmies sell them to generate money.

The people who hunt animals are pygmies. The most hunted animals are *Cephalophus nigrifons, Ceptailurus ferval, Potamochaeurus porcus,* etc. But they said that the prey is reduced, they no longer find many animals because of deforestation which pushed animals to migrate to Volcanoes National Park. The frequent animals today are monkeys that they do not normally eat. The vegetables that they harvest are *Amaranthus hybridus (imbwija), Solanum nigrum (isogo).* The wild honey which is made by bees in the roots of trees has been reported to be very abundant.

The results of SPSS tests showed that there is no significant difference in the use of the forest by local people taking into consideration the sex, family size, membership in Farmers Associations and source of income. However significant difference has been observed in the use of the forest considering age classes, education, occupation, ownership of land and ownership of assets. Data of this research agree with the findings of Masozera (2002) who stressed that when age is low household use of the forest is higher and that education and off-farm employment opportunities reduce the forest dependence. But it does not agree with him where he says that the large households use the forest more than small households. This can be due to the fact that the conservation of Nyungwe Forest Reserve where he conducted his research is more reinforced than that of Gishwati Forest Reserve and people who enter the Nyungwe Forest Reserve are only those who can not find other alternatives. But this is very different around Gishwati Forest Reserve where everybody freely enters the reserve.

In search of how to reduce the use of the forest by local people, the conservation program should put more effort on Batwa communities and on households of non educated people, those who have no assets, young people, farmers and unemployed people and on people who own land less than one hector. When taking into account sex, family size, membership in Farmers Associations or source of income, the conservation program should put all people in the same category because it has been found that there is no significant difference in the use of the forest by local people considering these characteristics.

4.2.2 Factors influencing attitudes of local people towards conservation

According to Wildlife Conservation Society (2004), Scherl *et al* (2004) & Rao (2006), positive attitudes toward conservation were observed where government and conservationists involve local communities in conservation projects and attempt to improve their livelihoods.

Masozera (2002), Scherl *et al* (2004), Plumptre *et al* (2004) and Rao (2006) also stress that poor livelihoods lead to negative attitudes towards conservation. The findings of this research agree with them. Very few people around Gishwati Forest Reserve have positive attitudes towards conservation (14.2%). Those are some of the people who are educated and those who work in conservation. The large number of people adjacent to Gishwati Forest Reserve have negative attitudes towards conservation. People who reported that the effect of conservation on their activities are crop raiding and lack of forest products have been considered as people who have negative attitudes towards conservation and they represent 85.8% of all of the respondents. Those (14.2 %) who reported that the effects of conservation are increased rainfall in the region, reduced erosion and increased safe breathing air have been considered to have positive attitudes towards conservation because they knew the importance of the forest. Monkeys and chimpanzees devastate crops of local people. These animals are said to eat stems of maize and grains of beans. Even if PAFOR reported to have created tree nurseries in the region and people have been given seedlings to plant in their farms, very few trees are seen in the fields boarding to the reserve. People said that trees hide the monkeys which destroy their crops. The simple observation of their farms also shows that nothing is done to conserve soils.

It is also necessary to stress that since 2004 the Ministry of Lands, Resettlement and Environment even if there is no enforcement, prevents local people from entering the forest when it is where they get firewood, construction materials, bushmeat, vegetables, medical plants, honey, cultivate crops, graze animals and get other household items. And no alternatives of these products have been reported to have been given to people. This may be the reason why all of the respondents reported to use the forest. From this it is obvious that many of them must have negative attitudes towards conservation. The closure of the free grazing inside the reserve left many people with insufficient land that can be used for both crops and animals' grazing, therefore, many people sold their cows. Those who cultivated crops inside the forest also reported that the owned land is very small to satisfy their food needs. That is why people reported the issues of limited agricultural land, limited food, and lack of products harvested from the forest, etc. Batwa communities were very angry against conservationists.

They said that the forest belongs to them and no body has right to evade them from it. Many of them refused to engage themselves in agriculture and rent out their land to other ethnic groups at low price. The fact that little number of people knows the conservation project, very little work in conservation and few people benefit from buffer zone shows that nothing has been done to change the attitudes of the people. When the project comes in the area and start working without hearing the wishes and advices of people it has no chance to succeed. People adjacent to Gishwati Forest Reserve need to be socially and economically supported and work in collaboration with the local governments and conservationists to change their attitudes for sustainable conservation.

In this study it has been found that there is no significant difference in attitudes of people towards conservation taking into consideration the knowledge of conservation project, working in conservation, benefiting from the buffer zone and different issues facing the households. This means that when it will be necessary to design the conservation program of Gishwati Forest Reserve to change the attitudes of local people, all of them should be considered equally taking into account the above factors.

4.2.3 Measures to reduce the impact of poor livelihoods on conservation

The results of this research agree with the findings of Masozera (2002) that the long-term survival of protected areas in developing countries will not be achieved if needs, aspirations, and attitudes of local peoples are not accounted for. It also agrees with Scherl *et al.* (2004) that to achieve sustainable conservation, poverty must be alleviated in communities adjacent to protected areas, and with Plumptre *et al.* (2004) that to achieve sustainable conservation in Albertine Rift there should be continuation of supporting income-generating activities, supply of alternative resources such as water to communities adjacent to protected areas, promotion of family-planning in the region, improvement of access to markets and adding market value, improvement of access to micro-credit on the basis of social capital, providing support to the Batwa and other marginalised groups adjacent to the protected areas, implementing Integrated Conservation and Development Projects (ICDPs) with law enforcement, improving relationships between park guards and local communities and ameliorating the coordination between conservation and development projects.

People adjacent to Gishwati Forest Reserve suggest that the reserve should be fenced to reduce crop raiding, provide employment to local people to improve their livelihoods, increase their agricultural land to increase their productivity, allow people to enter the forest to harvest the forest products, and conduct agricultural activities and compensate those whose land has been taken for buffer zone gazettement.

Where possible the suggestions of people should be taken into account to change their attitudes. But on the idea of allowing people to enter the forest, conservationists should conduct research on what can be done between conserving the reserve allowing some activities to be undertaken inside the reserve and to find the alternatives of what people get from there since poor livelihoods push people to overexploit the forest because they have no alternative means to survive.

If their livelihoods should be improved, their impact on conservation activities will automatically be reduced. For instance many people do not own any tree plantation. There is no other option to cook their food with except to enter the forest to look for firewood. Others do not have enough land for animal grazing; it is obvious that they will graze inside the forest. If no measures are taken to provide the minimum of what people get from the forest, their attitudes toward conservation will remain negative and they will continue to destroy the forest.

CHAPTER 5: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Summary

The study on the impact of communities on conservation of Gishwati Forest Reserve was conducted around Gishwati Forest Reserve. This research tried to find out the nature and extent of the forest use by the local people, the factors influencing people's attitudes towards conservation and mechanisms to reduce the impact of local people on the Forest Reserve.

The methods used in this research were interviews, observation and library research. In this study 120 respondents from 3 villages of Rutsiro District (where the reserve is found) were interviewed. After the collection from the field, data were entered into a computer in an Excel file format to allow easy interpretation and analysis. Qualitative data have been treated using Microsoft Word for text and Microsoft excel for tables. Quantitative data were analysed using SPSS (Statistical Packages for Social Sciences).

The findings revealed that people entered the forest in search of firewood, construction materials, handcraft materials, vegetables, medicinal plants, honey, water, hunting, planting crops and grazing animals. The large number of people reported to use the forest in search of firewood (29.1%). To understand the variation in the use of the forest by the local people, the tests of Qui-Square and Student were used. The use of the forest was found to be varied if taking into account the age classes, education, occupation, ownership of land and ownership of assets. Young people are likely to use the forest more than old people, un-educated people also use the forest more than the educated, and people who have off farm occupation seem to use the forest less than those with on-farm occupation. Also people who own less than one ha of land use the forest more than people owning land between 1.1 hectors and 5.0 hectors when people who own assets are likely to use the forest less than people who own nothing. The tests also showed that there is no significant difference in the use of the forest by local people taking into consideration sex, family size, membership in farmers association and source of income.

This study also showed that attitudes of local people towards conservation were negative. The attitudes of local people toward conservation were found to be negative. People who reported that the effect of conservation on their activities are crop raiding and lack of forest products have been considered as people who have negative attitudes towards conservation and they

represent 85.8% of all the respondents. Those (14.2 %) who reported that the effects of conservation are increased rainfall in the region, reduced erosion and increased safe breathing air have been considered to have positive attitudes towards conservation because they knew the importance of the forest. The tests of Qui-square, Student and Contingency Coefficient revealed that there was no significant difference in attitudes of local people towards conservation when the factors: issues facing the households, knowledge of conservation, work in conservation and benefit from buffer zone were taken into account. This was due to the fact that all households used the forest, and very few people had positive attitudes towards conservation.

Some measures to reduce the conflicts with the reserve management were suggested by respondents. These were: fencing the reserve to reduce crop raiding by monkeys, providing local people with employment so that they can buy the alternatives of what they get from the forest, increasing their agricultural land, compensating them for the land taken by the buffer zone and where possible allowing them to use the forest.

This study pointed out the following as necessary to be addressed to achieve an effective conservation of Gishwati Forest Reserve:

- Provide the alternatives of what people get from the forest.
- Support development projects in the region around Gishwati Forest Reserve.
- Involve local people in conservation
- Increase the number of school enrolment of local people
- Reinforce conservation coordination.

5.2 Conclusion

The description of the socio-demographic and socio-economic status of people adjacent to Gishwati Forest Reserve made clear that these people are poor and live under the poverty line. This led to the overuse of the forest resources where every respondent accepted to use the forest.

Even if all communities needed support to improve the livelihoods, for sustainable conservation to be possible, Batwa group needs more attention socially and economically because it is clear that they are marginalised and the poorest of all respondents. It is also this group which was found to more depend on the reserve to survive.

People were found to use the forest differently. When the relationship between the use of the forest and factors of sex, family size, membership in farmers association and source of income have been tested, no significant difference was found. Therefore, the conservation programs should consider all households in the same angle when it will be necessary to solve the conservation problems related to these factors. However, it should put more effort on Batwa communities and on households of un-educated people, those who have no and few assets, young people, farmers and unemployed people and on people who own land less than one hector.

People around Gishwati Forest Reserve were found to have negative attitudes towards conservation. The test of the second hypothesis showed that there was no significant difference in attitudes of local people towards conservation in relation to most issues facing their households, knowing conservation project, working in conservation, benefiting from buffer zone or not. The conservation programs should consider all people adjacent to Gishwati Forest Reserve in the same category when it will be necessary to change their attitudes towards conservation.

In order to reinforce conservation, the following suggestions of local people should be considered: Reduce the destruction of their crops by monkeys and chimpanzees, providing employment to them, increasing the owned agricultural land, compensating for the land occupied by the buffer zone and allowing them to enter the reserve to collect forest resources. These measures should be deeply studied by the conservationists of Gishwati Forest Reserve to solve the conflicts between them and local people.

5.3 Recommendations

To achieve sustainable conservation of Gishwati Forest Reserve, the following should be done:

1) Reduce the forest use by local people

This will be achieved by:

-Provide alternatives of what people get from the forest. This research clearly showed that people adjacent to Gishwati Forest Reserve live under poverty line. Therefore this reserve will continue to be destroyed as long as the local people will have no other alternatives to survive on. Batwa are the most users of the forest and they failed to engage in agriculture. The conservationists and Local Authorities should put more attention on them without forgetting to raise the living conditions of all people adjacent to Gishwati Forest Reserve. This can be done by:

- Grouping people in Farming Associations. Around the Reserve few people are in Farming Associations and many members do not benefit from them. This means that the existing associations are not supported to improve the livelihoods of the communities. NGOs and CBOs should help the Farming Associations to invest in income generating activities, improving agricultural practices for increased productions and providing small credits to them or to individuals to improve their livelihoods. This will have a positive effect on conservation since people will have other sources of money, and their forest dependency will reduce.
- Intervening in agriculture. The soils in Gishwati region have been impoverished and the harvests seriously declined. The local governments, NGOs, CBOs and the Ministry of Agriculture should provide a special program for these people in agroforestry, soil conservation, manure composting and modern animal rearing to generate natural fertilizers.
- Supplying water to local people. Local Authorities, NGOs and CBOs should find how to supply water to people adjacent to Gishwati Forest Reserve because some fetch water from the reserve. This has an impact on conservation since people who go to fetch water are attracted by other forest resources that they immediately harvest or come later to harvest.

- Promoting education. The large number of un-educated people is an indicator of underdevelopment. Some 56.6% of the respondents had no formal education. It is recommended that projects should be developed to support the education and increase the number of schools in this region. This will help in increasing awareness to change from the people's attitudes and in improvement of livelihoods.

2) Change attitudes of local people

This will be achieved by:

- Involving local people in conservation activities. The conservation project did not involve local people in conservation activities. A big number of respondents said that they do not know the conservation project and very few local people work in conservation. The Ministry of Natural Resources (former Ministry of Lands, Resettlement and Environment) and Local Authorities should involve local communities to change their attitudes towards conservation. The meetings to explain to people why it is necessary to conserve the reserve should be increased and an environmental education programs put in place.

- Enhancing the coordination in conservation. The coordination of conservation of Gishwati Forest Reserve should also be improved. The number of guards should be increased and they should be stationed at the edges of the reserve to reduce the number of people who freely enter the forest. The improved coordination will reinforce the relationships between all stakeholders involved in conservation and therefore better achievements of their objectives.

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APPENDICES

Appendix 1: Household survey questionnaire

Introduction

In order to help in problems solving between people around Gishwati Forest Reserve and conservationists I ventured to conduct a research on the impact of poor livelihoods on conservation of Gishwati Forest Reserve. The study is part of the requirements for the award of a degree of Master of Science in Environmental Management and Development of Kampala International University.

In this survey, I am going to conduct face-to-face interviews with households around the Forest. The households are randomly selected, in order to get representative data from various communities around the Forest. You have been randomly selected from this community to be a respondent. Privacy is a key principle of this survey. There are no wrong or right answers, and honest answers are the most useful. If you have any questions about this survey, please feel free to contact either of the following offices: The Rwanda Reforestation Project (PAFOR) or the Rwandan National Park Services (ORTPN).

Background information

Village: .....

Date and time: .....

Sex: Male ☐

☐ Female

Age:

a)	15-29	
b)	30-44	
c)	45-59	
d)	60-74	

Occupation (List all): .....
Last year of education.....

Section I. Socio-economic Questions

1. Can you tell us about the members, their age, gender, educational level and occupation of your family?

Names	Relation to Household head	Age	Sex	Education Level	Occupation
	Household head				

2. How much is the agricultural land owned by your household (ha)?
3. Where is this located?
4. Of the land that you own, how much is rented out?
5. Does your household own any pasture?
6. If yes, where is it located?
7. What is the size of this pasture and how many cows are there?
8. Are any of the mentioned holdings (land and pasture) outside of the village?
9. If yes what size?
10. Where are these located?
1. Are you a member of any association of farmers?
12. When has that association been formed?
13. How has that association been formed?
a) Local initiative b) Initiative from NGO c) Initiative from forest managers d) initiative from the government e) other, specify
14. What is required to be a member of that association?
15. What do you gain from the association?
16. What main crops do you grow and what was the average production (kg) last season?

Crop	Bananas	Coffee	Tea	Potatoes	Beans	Wheat	Cassava	Others
Amount (kg)								

17. For each crop, find out the amount of produced for the market or for the household consumption? If for the market, what quantity of the production is sold?

Crop	Household consumption	Market (quantity)
1. Banana		
2. Potatoes		
3. Beans		
4. Wheat		
5. Cassava		
6. Others		

18. What are the main sources of cash income for your household?
a) Sale of farm produce (specify which crops or animal products)
b) Sale of household labor (specify where sold, and if male or female)
c) Remittances from - a daughter/ son / relative-specify
d) Petty trade (specify type of trade and who in the household does it)
Others (specify)

19. Please indicate ownership of the following assets and number owned:

Items	Number
Bicycle	
Motorcycle	
Radio	
Chickens	
Pigs	
Goats	
Cows	

10. Are the forest products collected for the market or household consumption? If for the market, what quantity of the product is sold?
11. How many hours do you walk to reach the market?
12. Are you currently gainfully working for this forest? Yes / No (if No go to # 12)
If yes what is your wage rate? (Monthly, daily, piece-meal)
13. Does your family benefit from the buffer zone plantations? __ Yes, __ No

Section III. Attitude Question

1. Please tell us what kind of impact do the conservation activities have on you? Is it an improvement or a detriment?

Section IV. Questions on factors influencing attitudes of people

1. For how many years have you lived in this area?
2. For how many years have you owned a property in this area?
3. Rank the following issues or problems currently facing your community in order of 5 (most important) to 1 (least important).

Problems	Most important (5)	More Important (4)	Important (3)	Somewhat important (2)	Least important (1)
Limited land for crops					
Limited land for cattle grazing					
Limited food					
Lack of firewood					
Other					

Section V. Question on suggestions of people

1. How do you wish the conservation activities should be undertaken to reduce their impact on your activities?

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