



**ASSESSMENT OF SOCIO-CULTURAL, ECONOMIC
CHARACTERISTICS AND LIVELIHOOD OF RIPARIAN
POPULATION OF THE KIBIRA NATIONAL PARK
(*Rukoma-Mutana locality*)**

by

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ABBREVIATIONS

ABO	: Burundian Association for the Protection of Birds
ACF	: Action Against Hunger
CC	: communal Council
CCDC	: Communal Committee of Development Community
CFP	: Centers of Vocational training
FAO	: Food and Alimentation Organization
GEF	: Global Environment Facility
IGEBU	: Geographic Institute of Burundi
MINATTE	: Ministry of Land Management, Tourism and Environment
NIENC	: National Institute for Environment and Nature Conservation
OTB	: Office of the Tea of Burundi
PA	: Protected Area
PDAE	: Provincial Direction of Agriculture and Breeding
UNDP	: United Nations of Development Program
UNOPS	: United Nations Office for Project Services
WFP	: World Food Program

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EXECUTIVE SUMMARY

This Socio-economical study of the Rukoma-Mutana locality of the riparian area of the Kibira National Park respectively of the Communes of Matongo and Muruta of the Kayanza Province falls under a program of the Project of Enhancing local Capacities for Sustainable Biodiversity Action in Africa.

The approach of the study followed is to understand, from the riparian population of the Kibira National Park, especially from the Rukoma-Mutana locality, about its livelihood and its aspirations, its own comprehension of the interrelationship between the conservation of the Kibira National Park and its poverty and the way of attenuating it and working towards improved and more sustainable ways of life.

I. PARK PRESENTATION AND DESCRIPTION

The Kibira National Park is located in the North-West of Burundi on the Congo-Nile peak. It covers almost a surface of 40.000 ha, i.e 1,4% of the surface of the country. The Kibira National Park's relief is marked by sharp slopes on both sides of the Congo-Nile Peak, very marked on the Western slope. Its altitude is distributed between 1.600 m and 2.666 m

The Kibira National Park's climate is tropical with a moderate temperated tendency marked by its mountain character. The Kibira National Park is considered as the castle of waters of Burundi. Many important rivers take their sources in this forest mass. The geological formations met in Burundi are all very old and it is not astonishing that many grounds have been strongly metamorphosed. The degree of metamorphism is all the more marked that the series is older (Ruzizien) and it increases also as quickly as the granitic intrusions. The Eastern slope cover has been completely degraded and the pédogenèse is no longer characterizing a forest.

The Kibira National Park's flora is characteristic of the ombrophilous afro-montane forest. Its inferior limit is around 1600 m of altitude. In this flora, three horizons can be distinguished (Lewalle, 1972) according to the physiognomic and floristic characteristics, and from altitude.

As a whole, more than 644 flora species are found within the mountain forest and especially in the valleys. This endemism relates to typical species of the country and those that can be found in the surrounding areas. A list of 60 endemic species of the Kibira forest are known on a total of 70 species at the national level (see table 1, appendix 1).

The Kibira National park is as rich in animal species as in flora species. The great characteristic is probably in the invertebrates and especially in the insects. For the case of mammals, the Park counts approximately 98 mammals species. The insectivorous ones with 20 species comprise endemic elements. The avifauna is very diversified with approximately 200 species.

The riparian population of the Kibira National Park is important and is unequally distributed. The communes riparian the forest have a relatively high density as table 2 shows it. With a density of 312 Inhabitants per km² the commune of Muruta is the second after the commune of Matongo among the communes riparian the Kibira National Park recording a strong density of the population.

Being a true roof on the watershed between the Congo and the Nile basins, the ombrophilous montane forests play a fundamental role in the regulation of water and the protection of the basin slopes with strong inclination against erosion. Moreover they maintain essential climatic conditions for agriculture while making possible the production of electricity and irrigation. Indeed, a great number of rivers take their source in the montane forests. The Kibira National Park is contiguous with great plantations of tea and coffee, being the two main exportation cultures in Burundi.

The demographic pressure on the proximity of the park are reflected on the latter through the following actions: Cutting of converted timber, firewood cutting, servicewood cutting, bamboos cutting, lianas, flowers and cords haversting, cutting of shrubs, overpasturage of cattle, agriculture by clearing forest, gold washing at Mabayi.

The main causes of all these constraints are primarily related to the coercive methods used to intervene since the creation of this Park and which were at the origin of the continuous conflicts with the riparian population. One would quote the following:

- Insufficiency of the Kibira National Park guarding;
- Not accessibility of the local communities to the natural resources of the Kibira National Park ;
- Non involvement of the riparian populations in the activities of the Kibira Park protection ;
- limited knowledge on the exploitable resources;
- Insufficiency in the sensitizing and the environmental education of the population for the safeguarding of the Kibira;
- Lack of a management plan of the Kibira National Park.

II. SOCIO-ECONOMICAL ANALYSIS IN RIPARIAN AREA OF THE KIBIRA NATIONAL PARK

II.1. RIPARIAN POPULATION IN MURUTA AND MATONGO COMMUNES

The communes of Muruta and Matongo are among the nine communes of the province of Kayanza. They are on the eastern slope of the Congo-Nile peak, and they are riparian the Kibira National Park. The number of households of the commune of Muruta according to the 1990 census was 9805 and the average size of a household was of 5 people; and the Matongo commune counted 11880 of households. The Mutana hill counts 2017 people comprising 430 households whereas the Rukoma hill counts 1742 of them distributed in 356 households. Among the 430 households, Batwa add up 132 households on the only hill of Mutana, whereas that of Rukoma does not count any of it. The commune of Muruta is very rich historically and keeps some symbols of the kingship in Burundi. In all the riparian communes of the Kibira, the riparian population is estimated to 99040 inhabitants.

II.2. EXPLOITATION METHODS OF THE NATURAL RESOURCES OF THE PARK IN MURUTA AND MATONGO COMMUNES

The Kibira National Park is regarded as a supermarket taking into account the biological resources which it contains. The edible products take part in the food of the population especially in famine period. Some traded species help the population to have incomes. The Batwa who is people without agricultural land, benefit from these foodstuffs from forest.

More than 100 different medicinal plants are exploited in the only commune of Muruta. The Batwa are the users of the medicinal plants because they seldom attend the health centers. Some traditional users earn their incomes by the treatment of people with medicinal plants of which the most considered are collected from Kibira National Park. It also should be stressed that the medicinal plants are marketed in the local market places and are even sent in Bujumbura town.

The bamboo (*Arundinaria alpina*) is the most exploited resource and, by its participation in varied uses, allows the survival of a many people. It is die bamboo which naturally constituted through several social groups in particular Batwa, haversters and salesmen, the craftsmen braiders, carpenters, masons, etc. and the tradesmen of the artisanal products.

Several households thus live on bamboo whose exploitation became a sector of unchoking from the agriculture which occupies 90% of the population in the area characterized by increased soil exiguity.

The use and the trade of the adhesive with *Symphonia globulifera* constitute important activities for the population survival notably the Batwa. However, the exploitation in particular by hulling does not leave in good condition this species which are becoming rare.

The use and the sociocultural aspects of the plaits with *Cyperus latifolius* confer on this species a distinguished importance. By holding account of various uses, this species is irreplaceable for all the rural population whose annual income is very low. They could never plan to use modern mattresses which are enormously expensive.

As a whole, it is advisable to highlight the importance of the biological resources of the Kibira National Park but also a very distinguished native knowledge. Suitable measurements for the perrenity of this usable biodiversity are very important because these resources should be sustainably exploited.

As a whole, the activities of biological resources exploitation are undertaken in clandestine and illegal way in the Kibira National Park and are considered to be infringements. These activities are generally the sawing of the high value trees, carbonization, the firewood cutting, gathering of the medicinal plants, the bamboos overcutting, etc.

II.3. MAIN SYSTEMS OF PRODUCTION

The populations of the communes of Muruta and Matongo live primarily of agriculture and breeding. It is a crossroads of two natural areas, Buyenzi and Mugamba. The locality of Rukoma-Mutana is entirely localised in the natural area of Mugamba. The wars disturbed some agricultural activities and accentuated the lack of organic manure and the seeds.

Generally, the farming systems were highly struck by the crisis since 1993. The average size of a family exploitation ranged between 0.6 and 0.8 ha. Overpopulation constitutes the main cause of degradation. The grounds are overexploited; the system of setting in fallow does not exist because the same fields carry each year two successive harvests. The use of chemical fertilisers often non suitable on land or the cultures by the local communities, with an aim of raising the productivity takes part in land degradation.

The exiguity of the arable lands and the weak fertility of the hills and the disappearance of the pastures impose agriculture promotion combined with breeding adapted to the current situation.

II.4. WELLBEING OF POPULATION

The living conditions of the population of Rukoma-Muruta do not permit a sustainable safeguarding of the Kibira National Park. From the educational point of view, it was noted that many children do not have access to studies. The Batwa children registered at the school end up by giving up and joining their parents in trade where they remain poor. That results in believing in a possible increase of misery orchestrated by the increasing non educated population who consider only agriculture as the only activity in precarious situation.

The lack of health center worsens an already worrying situation of a population suffering from malnutrition. On the level of the hills of Mutana and Rukoma, the scarceness of wood especially for Batwa and the layers lack of clay constitute one major handicap for a decent housing.

With the crisis of 1993, poverty worsened and the very poor communal receipts cannot come any more to supplement the population. The lack of associative movements show that the population is not

highly assisted and is not sensitized for common actions of self-development and do not permit the external supports.

II.5. SOCIAL GROUPS IN THE RIPARIAN AREA OF THE KIBIRA NATIONAL PARK

This study made it possible to highlight the close connections between the human pressures and the social groups (example: bamboos and Batwa, pastures and stockbreeders, haversting of some resources and women, etc.) These relations evolve and this evolution can be orientated in a precise direction, a better conservation of the Kibira firstly, an improvement of the local conditions then. According to the population of Rukoma-Mutana area, the daily activities make it possible to arrange him in three groups. Indeed, 75 % of the population are occupied of agriculture, while the remainder i.e. 24,8 % and 0,2% are respectively in the craft industry dominated by Batwa and the work paid for the OTB. If one holds some with poverty, the available data, for the riparian people of the Kinyovu sector of the Kibira in Matongo commune, show four categories: the vulnerable, Poor wretches, average poor rich persons. The average poor and poor wretches constitute the group who must exploit the Kibira resources and Batwa are among the poor wretches.

II.6. ADMINISTRATIVE STRUCTURE AND LEVEL OF DECENTRALISATION IN THE RIPARIAN AREA OF THE KIBIRA

Since last year, Burundi obtained a new administrative structure founded on decentralization. This decentralization aims at the responsabilisation of the communes in the development activities. It is autonomy of management granted to the commune. Thus, at the communal level, the new structures are built as follows: The communal Council, Communal Administrator, Communal Committee of Development Community (CCDC).

II.7. TOURISM

The touristic frequentation in the Kibira National Park was favoured by its panoramic assets, its exceptional installation of touristic paths, camp-site and the installation of beaconing and interpretation system for the visitors. On the level of the locality of Rukoma-Mutana, the tourist attractions are tiny, but the tracks to reach the area are not practicable. It is thus obvious that touristic promotion can be based on the sale of artisanal products. That requires a well awaited an organization of the craftsmen especially Batwa of Mutana on the manufacture of several bamboos products. One could consider the creation of bamboos industry towards the touristic centers of the Bujumbura town.

III. ORIENTATIONS OF THE POPULATION ON THE CONSERVATION OF THE PARK AND SOCIO-ECONOMICAL DEVELOPMENT IN THE RUKOMA-MUTANA AREA

With an aim of supplementing our information of the areas of study, a participative diagnosis was carried out on Mutana and Rukoma hills. The members of the local communities carried out the regrouping and the hierarchisation of the major constraints:

1. Batwa Poverty at the origin of the bamboos exploitation in Kibira,
2. Lack of livestock,
3. Degradation and exiguity of land,
4. Insecurity due to the presence of the armed groups in Kibira,
5. Insufficiency of service wood and firewood,
6. Non access to the natural resources of Kibira,
7. Lack of pasture,
8. Bush fires in Kibira

At the end of this constraints inventory in the riparian area of Rukoma and Mutana hills, it is noted that all the population encounters the same constraints, except that Batwa live only the hill of Mutana. It is clear moreover that the Batwa strongly need this forest for their survival before activities of substitution. The consulted population proposed of an action plan to protect Kibira and to improve their livelihood.

IV. STRATEGIC PLAN FOR THE NATIONAL PARK OF THE KIBIRA CONSERVATION AND THE DEVELOPMENT OF THE POPULATION FROM RUKOMA AND MUTANA HILLS

The strategic plan suggested here is conceived like an action plan for a safeguarding of Park but also for a development of the riparian population. It is a plan which seeks to establish a harmony between the population and the Kibira National Park. It is built on the recommendations made throughout this study and also holds account orientations provided by the population itself.

This strategic plan is based on five strategic axes formulated as follow:

- Rational exploitation of the biological resources of the Kibira National Park;
- Improvement of the productivity of the arable land in the riparian area of the Park;
- Promotion of a sustainable and ecologically rational development in the area surrounding the Park in order to improve its protection and to attenuate the conflicts resulting from the resources use;
- Involvement of all the stakeholders in the conservation of Kibira;
- Reinforcement of the administrative system's capacities of the Kibira National Park for an effective protection of the Park.

The present study is a step to reinforce the protection of the Kibira National Park by the attenuation of the conflicts with the riparian population. It is an ecosystemic approach aiming at improving the riparian human environments of Kibira and involving the riparian populations in the conservation activities. Thus, 4 principal complementary strategic orientations are followed to make this objective be a success:

- Elaboration of integrating policy and a program of sensitizing and environmental education;
- Follow-up of the guideline for a controlled exploitation of the biological resources;
- Involvement of the population in the activities of Kibira National Park protection through a Program "Peripheral Zone";
- Participative approach in the farming production improvement.

The monitoring and evaluation indicators have been elaborated.

INTRODUCTION

Context

This Socio-economic study of Rukoma-Mutana locality of the riparian area of the Kibira National Park respectively in the Matongo and Muruta communes of the Kayanza Province falls under a program of the Project of Enhancing Local Capacities for Sustainable Biodiversity Action in Africa.

This project aims at satisfying the need to strengthen capacities within civil society groups and Protected Areas (PA) authorities to engage in constructive partnerships to improve management effectiveness in Protected Areas, with a concentration on small sites which are often overlooked, though vital to ensure conservation of localized, often endemic species, communities and bio-geographical representation.

UNOPS has been accountable to UNDP for the delivery of agreed outputs and has contracted BirdLife International as an implementing partner to assume direct responsibility for the delivery of the project outputs as well as other service vendors. At the national level, BirdLife International has sub-contracted Burundian Association for the Protection of Birds (ABO) to implement the project. The ABO works in close collaboration with National Institute for Environment and Natural Conservation to ensure project requirements.

Mandate

The study should be axed on the following activities:

- Provide data and information on sociocultural and economical features of population of Rukoma and Mutana hills riparian the Kibira National Park;
- Examine governance structures and levels of decentralization in the projetct areas;
- Describe the degree and the level of right access of the communities and social groups (particularly vulnerable women, young people and other groups) to access productive resources, information, education and training;
- Collate data and information (disaggregated according to the gender) on income, the poverty and livelihood sources that are currently available to PA-Fringing communities, particulary women and the youth as well as other vulnerable groups;
- Assess the potential of the selected protected area system for nature-based tourism and tourism-related local (village-level) enterprises to support tourism;
- Make recommendations on the kind and form of alternative livelihood and income generating options and choices that may be needed to keep the population frm the Pas and reduce the levels of exploitation of biological resources therein;
- Develop a set up of indicators that would be used to measure the impact of the projetct on the livelihood and development of the local population and the improvement in Biodiversity conservation.

Approach and methodology

Approach

Before a project of livelihood improvement of the riparian population of the Kibira National Park is considered, the analysis of the current situation should be done. In order to understand the assets of Rukoma-Mutana locality, a socio-economical evaluation is thus necessary.

The approach of the study thus followed is to understand, from the riparian population of the Kibira National Park, precisely for Rukoma-Mutana locality, about his livelihood and its aspirations, his own comprehension of the interrelationship between the conservation of the Kibira National Park and his poverty and the way it and work towards improved and more sustainable ways of life.

Methods and constraints

During this socio-economical study in Mutana and Rukoma hills, two important phases of data-collection were followed:

- Phase of secondary data-collection,
- Phase of primary data-collection.

Secondary data-collection

The purpose of this first step was to collect the first information available on the geographical entity, demography, the socio-economic situation of the riparian population of the Kibira National Park and the interrelationship between them, etc, in Muruta and Matongo communes, starting from the already undertaken studies. Communal reports were also consulted particularly retrieval data on demography, the communal taxes, the operation of the communes in the development activities.

Primary data-collection

It was the step of the Participatory appraisal on Mutana and Rukoma hills. In this level, the invited populations (30 persons by hill) should identify the problems which are at the origin of the degradation of the Kibira National Park, but also of the poverty of the population. The establishment of the relations of the causes for purposes should allow the comprehension of the problems origin, their reduction and to seize truths problems well. That made it possible to raise the main problems and to treat them on a hierarchical matrix. It is starting from these hierarchical problems that one carried out the identification of causes for each problem. The alternative solutions and the actions to be carried out were also identified.

Individual meetings and common meetings with the various actors of development in the two communes were carried out. All these data were supplemented by observation of various sites of Mutana and Rukoma hills. Indeed, with the agents of the Kibira National Park and the chiefs of the hills concerned, the visits allowed noting the assets and the constraints on the field. The farmers and the vulnerable groups' habitats were visited.

During our entertainments with the local population, the latter was brought to speak about historical profile related to their way of life for a long time ago. Data on seasonal productions were identified. The relations between the population and the INECN, institution in charge of the Kibira National Park management were also diagnosed.

However, for lack of time, these methods did not permit to make investigation with more details on livelihood on the level of households.

I. PARK PRESENTATION AND DESCRIPTION

I.1. PHYSICAL ASPECTS

I.1.1. Geographical localization

The Kibira National Park is located in the North-West of Burundi on the Congo-Nile peak. It almost covers a surface of 40.000 ha, i.e 1,4% of the country surface (Fig. 1). The Kibira National Park extends on four provinces from South to North: Muramvya, Bubanza, Kayanza and Cibitoke. Using the orientation NNO-SSE, its length is of approximately 80 km between Bugarama and the Rwandan border where it is prolonged in the forest of Nyungwe, in Rwanda. It extends between 2°36' and 3°17' Southern latitude and the meridian lines 29°12' and 29°35' longitude. Its width can reach 8 km, but it normally increases by 1 to 6 km at the same time as that of the peak of the South in the North (Arbonnier, 1996). The Kibira National Park which extends between 1 600m and approximately 2 800 m, consists of three great complexes of afro-mountain forest which is still partially primary.

The Kibira National Park is subdivided in four sectors which are:

- Teza Sector: 5.794 ha (Muramvya)
- Musigati Sector: 15.424 ha (Bubanza)
- Rwegura Sector: 12.423 ha (Kayanza)
- Mabayi Sector: 359 ha (Cibitoke)

The Mutana et Rukoma Hills concerned by our study are located respectively in the Rwegura and Teza sectors, in Muruta and Matongo Communes (Fig. 2).

I.1.2. Relief

The Kibira National Park's relief is marked by sharp slopes on both sides of the Congo-Nile Peak, very marked on the Western slope (NIENC, 1992). Its altitude is distributed between 1.600 m and 2.666 m (Arbonnier, 1996). The climaxes of the South towards the North are Teza (2.666 m), Musumba (2.661 m), Dusasa (2.621 m) and Twinyoni (2.559 m).

I.1.3. Climate

The Kibira National Park's climate is tropical with a moderate temperated tendency marked by its mountain character (KRUG, 1993). The average temperatures are the lowest of the country, variable between 14°C and 20°C of altitude. The annual amplitude is lower than 2°C but the diurnal amplitude can exceed 25°C. The monthly average temperature recorded at the weather station of Rwegura during the last fifteen years (1990-2005) is 15,4°C. It is in July during the dry season that one records the lowest temperatures and it is in September during the hottest season of the year that there is an average of 17,3°C along the last eleven years.

It is on the Congo-Nile Peak that one records the most important annual pluviometries of Burundi; more than 2.000 mm with Ndora and Mabayi, more than 1.800 mm on the remainder of the Park. These rains are distributed over a great period of the year (from September to May) with a "small dry season" little marked in January-February, respectively 150 and 179,3 mm. The dampness ranges between 60% and 90% all along the year but generally remains near the average of 75%. The Western side is hotter and wetter than the Eastern slope because it is favoured by draughts coming from the East (Atlantic Monsoon).

The insolation is the weakest of the country. The average duration of insolation quantified over the 1986, 1987 and 1988 years is 2040 hours per year. Fogs are frequent in altitude, especially in the valleys (IGEBU, 2001). The average speed of the wind calculated over the 1990, 1991, 1992 and 1993 years varies from 1,22 m/s to 2 m/s from the ground (IGEBU, 2001). The data for 2002-2005 are not available.

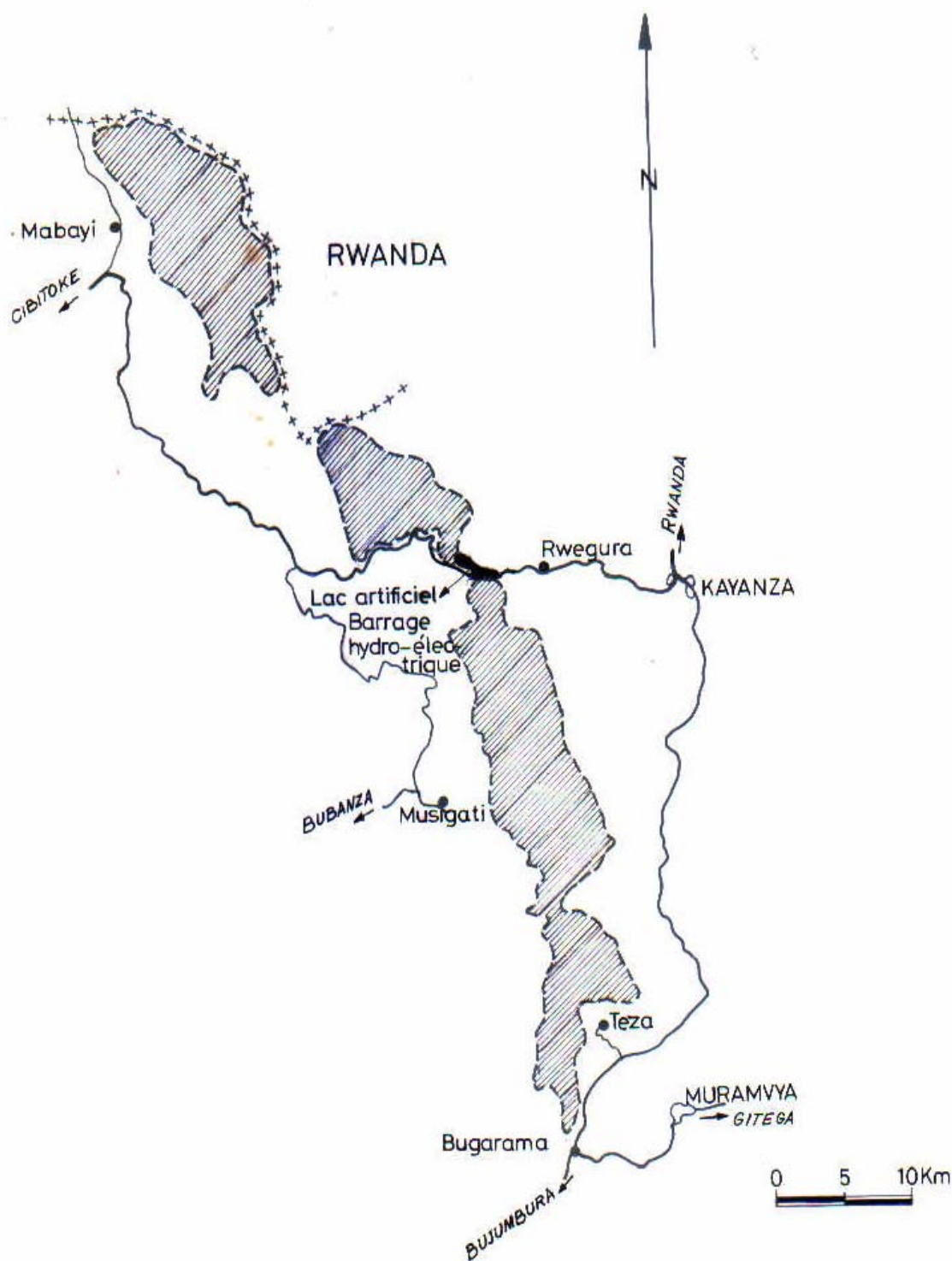
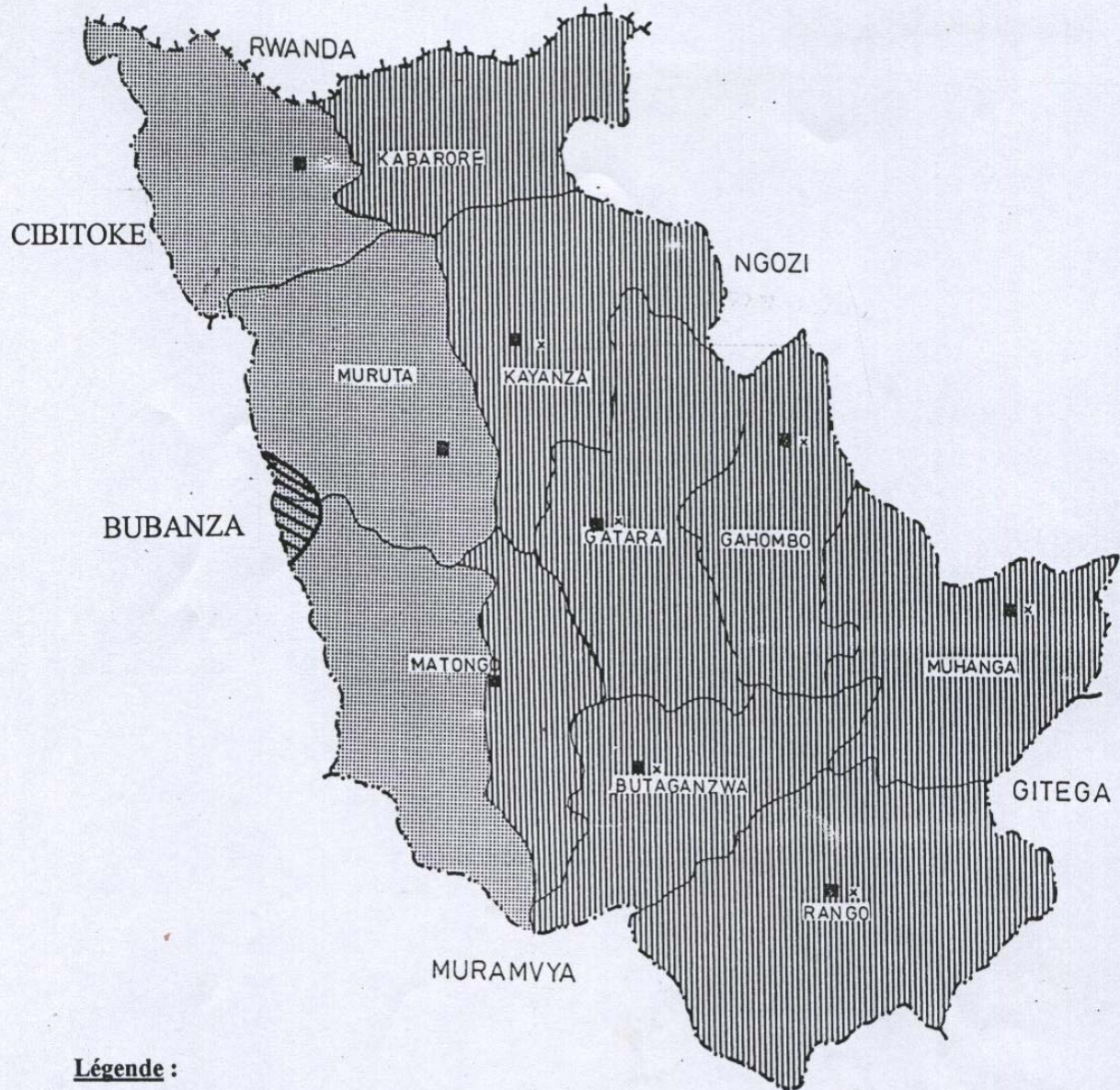


Fig. 1: Map of Kibira National Park

CARTE DE LA PROVINCE DE KAYANZA



Légende :

- Région Naturelle de Mugamba sous influence de la Forêt de montagne de la Kibira :



- Région Naturelle de Buyenzi :



- Rukoma et Mutana Hills :



Echelle : 1/250000

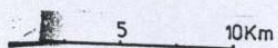


Fig. 2: Map of Kayanza Province and the riparian communes of Kibira National Park

I.1.4. Hydrology

The Kibira National Park is considered as the Burundi castle of waters. Many important rivers take their sources in this forest mass. The watershed divides two basins i.e the Nile Basin in the East and the Congo Basin in the West. The brooks and rivers located in the West of this peak run towards Imbo, flowing in Rusizi river. From South to the North, the main affluents are: Ruhora, Mpanda, Gitenge, Nasumo, Kaburantwa. The brooks and rivers located at the East side of the peak flow towards the central plate-land (Ruvubu) and Bugesera (Kanyaru) and, from the South of Teza towards the North of Rwegura, the main ones are: Nyabihondo, Nkokoma, Nyakabindi, Ruvubu, Kayave, Buyumpu. The whole of both of these brooks and rivers forms a very dense hydrographic network which cuts out finally the mass.

I.1.5. Geology, Geomorphology and soils

The geological formations met in Burundi are all very old and it is not astonishing that many grounds have been strongly metamorphosed. The degree of metamorphism is all the more marked that the series is older (Ruzizien) and it increases also as quickly as the granitic intrusions (NIENC, 1988). According to Cazenave-Piarrot (in Krug, 1993), it is necessary to distinguish the 2 different slopes as two different geosystems. In the West, the forest clay soils, slightly ferralitic, were exposed only recently and remain very humus-bearing.

On the Eastern slope cover has been completely degraded and the pedological genese is no longer characterizing a forest. Two zones of ground are identified in the Kibira: the North of Teza consists of lithosoils not differentiated from bad quality; in the area of Teza there, one finds wealthy endosoils. The fragile grounds undergo an irreversible draught when they are badly cultivated and are very likely to undergo erosion (Lewalle, 1972). In the Kibira, two essential factors determine the typology of the grounds: the nature of the mother rock and the mountain climate (NIENC, 1998).

a. Role of the mother-rock

One can gather the multiple lithological facies in four main sets:

- **quartzitic Peaks:** these peaks are made up of various hard rocks in which the quartzites dominate; they are generally hanging. The low speed of deterioration of these rocks associated with erosion due to the strong slopes (30 to 60%) explains why one finds there primarily lithosoils and regosoils. At most can one observe a light deepening of the grounds by colluvial deposition in the small thalwegs or possible projecting ledges.
- **Granites and granito-gneiss:** The granites and granito-gneisses are acid rocks which deteriorate by giving rise to a quantity of clay weaker than the basic rocks. The quartzose fraction, practically inalterable, releases from inert sands which will remain in place. The feldspths, however, will deteriorate, as quickly as they will be poor in silica, and will transform itself into clay minerals which will be able to migrate vertically and laterally. The grounds on granites and granito-gneiss are of coarse texture and chemically poor.
- **Complex schisto-metarmorphic:** Leaned with the quartzitic peaks or granito-gneiss, it is made of structural projections with less strong slopes evolving locally in round top hill. Although irregular, the deterioration is generally important on the micaschistic formations and grounds there are deep.

The contents of clay, about 50% are rather regular in the profile and show a clear predominance of haolonite. The muddy fractions are made up of phyllosilicates (Kaolonite, muscovite) and of quartz. Quartz and muscovite are the only elements of the sandy fraction.

- **Alluvia:** They are only present in the Kibira where a rock threshold bars a valley with weak gradient. They are essentially in the high valleys of Gitenge and Mpanda.

b. Role of the afro-montane climate

The pedological development of the grounds of the Kibira is characterized by the presence of a humus-bearing horizon related to the presence of the ombrophilous forest. This horizon which is sometimes very deep, has characteristics very related to the mountain climate. It is constituted by litter (2 to 4 cm thickness) covering a black horizon humus-bearing (from 20 cm up to 1 meter if it is on a filtering mother-rock), highly saturated with cations and its structure being finely friable. Under the meadow of altitude, if the ground is not reduced in a lithosoil, the characteristics are comparable, the superior horizon is humus-bearing, but the absorbing complex is strongly saturated and its structure is more massive. Everywhere and to a variable depth, the humus-bearing horizon passes without transition to a massive horizon with very low apparent density.

I.2. BIOTIC ASPECTS

I.2.1. Flora

The Kibira National Park's flora is characteristic of the ombrophilous mountain forest. Its inferior limit is around 1600 m of altitude (fig. 3). In this flora, three horizons can be distinguished according to the physiognomic and floristic characteristics, and from altitude (Lewalle, 1972). Indeed, the lower horizon ranging between 1600 m and 1900 m of altitude is characterized by an ombrophilous mountain forest of transition, represented better in the Western part of the dorsal while in the Eastern part, it is reduced by human occupation.

The average horizon between 1900 and 2250 m of altitude: the ecological conditions are definitely mountain. The ombrophilous mountain forest of this horizon presents large trees reaching 40 m height. On the level of the higher horizon (2250-2450 m) of altitude, the climatic conditions become more rigorous, the annual average temperatures fall until 12°C. It develops a forest distinct from the two preceding types with trees height generally stopping to 15 m. Beyond 2500 m, the flora formations of the afro-subalpine type consist of sclerophyllous fruticea where the Ericaceae family is represented in the shrubby layer.

These horizons are well marked when the forest is continuous from 1600 m but other types of flora formations meet in the afro-montane area, such as the bambousaie and the flora of the peat bogs in the hollows.

The various types of flora that one observes there are (Nzigidahera, 2000):

- ***Vegetation with Entandrophragma excelsum and Parinari excelsa var. holstii***: This type of very dense primary forest corresponds to the ombrophilous mountain forest of the average horizon (1900-2250 m). As a whole, this forest is well represented in all the North-western part (valley of Ruvyirame to the Rwandan border) and would cover on the whole the solid mass of the Kibira, an area of approximately 2330 ha.

- ***Vegetation with Parinari excelsa var. holstii and Polyscias fulva***: This type of forest corresponds to the preceding type in which the majority of the value species of the higher arborescent layer were exploited, arborescent layers average and lower remaining still rich. One finds it until altitudes exceeding 2300 m, it would thus overflow on the higher horizon (2250-2450 m). The flora is structured according to the taking away intensity of large trees, which, in addition, induces some variation in the floristic composition.

One finds there species of primary forest which were initially neglected by the exploitation, in particular *Parinari excelsa* that the strong content of its silica wood makes it very difficult to saw. The area covered by this ombrophilous degraded forest, on the whole of the mass, can be estimated to 3 400 ha.

- **Vegetation with *Polyscias fulva* and *Macaranga neomilbrediana* and *Syzygium parvifolium*:** This type is more complex than the two preceding, it can cover the vegetation of structure and variable composition resulting sometimes from the combination of several phenomena (degradation, recolonisation of "clear cutting zone", altitude influence). It is primarily characterized by the frequent and abundant presence of one or the other species of secondary forest, *Polyscias fulva* and *Macaranga neomilbrediana* or of *Syzygium parvifolium* general-purpose species, and by the very clear poverty in species of primary forest. The area covered, on the whole of the Park, can be estimated to 7070 ha.

- **Secondary forest with *Hagenia abyssinica* and *Faurea saligna*:** In this flora, it is necessary to reveal here two tendencies, according to whether it appears or not a "Peak effect"; these tendencies are the following:

- *Correspondent with a less advanced phase of recolonisation of the area:* This type of forest was observed between 2200 and 2400 m of altitude. It is characterized by a floristic composition largely dominated by the secondary species of forest *Hagenia abyssinica*.

- *Correspondent for a purpose of Peak:* One generally observes this tendency above 2400 m. "the effect Peak" primarily seems due to a little depth of the grounds, being able to go until their complete disappearance by places. This symptom appears by the appearance of species such as *Philippia benguellensis* and *Agauria salicifolia*. All that would represent, on the whole of the Park, a surface of 5 900 ha.

- *Formation of altitude in *Philippia benguellensis* and *Protea madiensis*:* One generally meets this type of vegetation on a peak, in areas where the thickness of the ground is reduced. It is the "fruticea Ericaceae of the afro-subalpine stage". The strong insolation combined with low temperatures and a hygrosopy always higher than 30% stands a xerophilous vegetation in this area.

- **Formations with *Arundinaria alpina*:** Two facies are known with in particular the pure bambousaie which are a practically pure formation with *Arundinaria alpina* and the mixed bambousaie made up of the trees dispersed in a mass of bamboos. The total surface of this formation is approximately 2 005 ha.

- **basic Formation of talweg:** One finds this type of vegetation in valleys presenting a particularly soft longitudinal profile and in which an aggradation occurred. They were considerably subjected to human influence: clearing by the gold washers, and pasture (degradations in the valleys located inside the mass), which explains why one systematically finds species of recolonisation like *Hagenia abyssinica*, *Lobelia giberroa* or *Hypericum revolutum*. The covered area is approximately 500 hectares.

- **Formation of recolonisation of the cultivated and grazed areas:** Outside the forest mass itself, this recolonisation vegetation covers the abandoned areas. The vegetation is structured in one or two layers, the shrubby layer, when it exists, not exceeding normally 3 m height. The floristic composition is generally dominated by *Ipomea grantii* and *Pteridium aquilinum*, *Hagenia abyssinica*. The areas of recolonisation at more advanced stages consist in large trees of *Faura saligna*, of resistant species to fire and which would have survived grubbing, but also *Syzygium parvifolium*, *Parinari excelsa*, *Prunus africana* etc... The covered area is approximately 2350 ha.

As a whole, more than 644 flora species are found within the mountain forest and especially in the valleys. This endemicity relates to typical species of the country and those that can be found in the surrounding areas. A list of 60 endemic species of the Kibira forest are known on a total of 70 species at the national level (see table 1, appendix 1) (MINATTE, 2000).



Fig. 3: Picture of the physionomy of Kibira afro-montain forest

I.2.2. Fauna

The Kibira National park is as rich in animal species as in flora species. The great characteristic is probably in the invertebrates and especially in the insects. For the case of the mammals, the Park counts approximately 98 mammals species. The insectivorous ones with 20 species comprise endemic elements like *Myosorex blarina*, *Crocidura lasona*, *Crocidura niobe*, etc. Eight species of Chiropteres were identified. Ten species of Primates of which most frequently met is *Cercopithecus mitis dogetti*. One also meets *Pan troglodytes* in the area. The primates get a greater interest with the forest, as well as scientific and touristic. The baboons (*Papio anubis*) are very prolific and sometimes developed in important colonies (30 to 35 individuals).

Whereas Serval (*Leptailurus serval*), African chive (*Civettictis civetta*), *Nandinia bonitata*, the genets (*Genetta* sp.), *Canis adustus*, the leopard (*Panthera pardus*) and the hyenas (*Crocuta crocuta*) still exist in the Kibira forest, from 1980 to 1984, *Cercopithecus l'hoesti* disappeared practically and is rarely seen. It is the same case for *Cercopithecus ascanius* since 1990, of *Colobus ruwenzorii* (Ndikumako, 2000).

The avifauna is very diversified with approximately 200 species of which most noticeable are *Lophaethus occipitalis*, *Corythaecola cristata* and *Bycanistes subcylindricus*. The reptiles of the Park are badly known but the Ophidiens often observed are notably *Atheris nitchei* and *Bitis gabonica*. For the other groups (Amphibians and fish) the studies will have to be done.

I.3. DEMOGRAPHIC ASPECTS

I.3.1. Background of the human settlement on the border of the Kibira

The question of Burundi populating still poses problems nowadays. Controversies are observed among specialists of the Burundi history. No unanimity neither on the date of the first occupations, nor on the first populations to occupy our forests and our savannas, neither on the various steps of the settlement. Indeed, André Ndikuriyo says in his article "Mobility and migration in traditional Burundi": that " we know very badly the history of the settlement and the migrations within the different regions of the country until the 18th century. The historical traditions remain quiet on this subject... " (Chretien, 1977).

What is sure for the moment, is confirmed by archaeological research: the country's occupation, the agro-pastoral and handcraft techniques are the result of a long history of more than two millenia. But the stages and the way the occupation occurred have not yet been elucidated.

Concerning the period that precedes the 18th century, one is rather informed about the progressive cristallization and consolidation of the old State of Burundi and not about the large hearths of human concentrations (density) and the populating of different social groups without proper identity. The internal distribution of these groups as well as the clans, are characterized by a geographical dispersion. As Emile Mworoha says it "not only their members are scattered inside a kingdom, but also they overflow even on other kingdoms" (Mworoha, 1977). Here he speaks of Rwanda, Bushi, Buha, etc... And he still adds about the clans: "When one carries out an investigation at the local level, this dispersion appears in all its width as the survey carried out near Kayanza in 1971 shows it (near the Kibira). On only one hill we could count 11 clans belonging to the one or the other of the three categories of Bahutu, Batwa and Batutsi; each one of these clans whose variety appears so important on the level of the hill has then members in all the country, but without any relationship on the national level".

In the current state of researches, it would be thus very difficult to seek the origin and the demographic trends of the populations riparian the Kibira. The three social groups (Hutu, Tutsi, Twa) as well as many clans among them scattered here and there on the Burundian territory are found there. One would be bold also if he counts the clans which are in this area. They are as many as they are on the whole territory of Burundi; traditions reveal a great mobility of people in old Burundi (Ndikuriyo,). The question is thus to know if the Kibira would be considered as the first hearth of the human settlement from which, there have been dispersions of people towards the rest of the country. As said above:" it is hazardous to seek to determine with precision the demographic trends of this area before the period of the effective censuses.

Even for the colonial period during which one could already count on, the reliability of statistical data is doubtful. A report however: the interior of the forest is not inhabited, that it is a fact. But its littoral, especially the eastern slope of the peak is densely populated since surely a long time before the formation of Burundian monarchy (except the northern part of very high altitude where it is very cold).

In fact, even if it is not very convincing, some elements lead us to this assumption:

1. It is not free that one of the two old political hearths of Burundi - the hearth of North - was formed in the surroundings of the Kibira. In our opinion, an important humanization (the territory occupation) is among the required conditions to the emergence of a political hearth in a given area. This hearth of the North is located between Kanyaru and Nkokoma, including Banga which is very close to the Kibira (Mworoha, 1987).

2. The localization of the royal capitals is also a very revealing element. If it is true that the "kings" created their capitals in any area of the country, a preponderance is noticed in the area of Muramvya where many of those political capitals are found.

Kings, says Mworoha (1977), chose to be established on the two wealthiest areas of the country, namely Mugamba (rich in pastures and cultures) and the Kirimiro very rich from the agricultural point of view. The appreciation of these qualities could not be the prerogative of the only monarchs. They also attracted "Mister everyone".

3. The rain abundance and fertile land. Generally, the Kibira forest represents the most important vestige of natural forest playing a fundamental role of hydrological regulation. The pedological development of the grounds of the mass is marked by the omnipresence of a humus-bearing horizon favorable to the existence of the ombrophilous forest, often very deep.

4. The localization in altitude is on its side a non neglectable factor. It is said that the climate of the areas of altitude is unfavorable to the development of many diseases. Safety is an important factor in demography.

5. Even nowadays, the riparian communes of the forest have a relatively high density (provisional Results of the census of August 1990 in Burundi).

This situation is the same in all the area of Mumirwa where the afro-montain vegetation type yielded remarkably the place to the population.

All these anthropic occupations around the Kibira forest were undoubtedly accompanied by the exploitation of this forest. But the width of destruction had never been worrying during the royal period.

Some facts provide us invaluable information on the beliefs and institutions conceived as the foundation of the authority, social structures and the religious practices preached the perennality of the Kibira.

Even sites of cultural interests appear inside the Kibira, let us quote the example of the royal necropolises the caves like Inangorore, the cascades which one observes from Kaburantwa (in North) to Mpongora (towards Teza), without forgetting thermal springs in the North of Rwegura. The Mpotso forest encloses a historical site which accommodates the late queen-mothers since the beginning of monarchy.

In Burundi, the marshes were feared. One could seldom build and live there owing to the fact that they were supposed being inhabited by spirits, dangerous monsters (Bahenduzi and Quillet, 1985). The marshes were also associated to the festival of sowing (Umuganuro).

The marshes in which were held ritual hunting are: Kibenga (close to Bukeye), Nyabibondo (valley of Nkokoma close to Bukeye), Kaniga (close to Fota), Rubongo, Mumvumvu (close to Banga), Rukiga, Valley of Ruvubu, Kaniga (behind Saga, area of Mbuye), Kanindi (valley being in Kibira). They constituted a reserve of ritual antelopes (*Tragelaphus spekei*).

Mugamba region (the zone of Kibira included), pastoral area by excellence, had developed better than in the other areas the odes with the cow, with churning as well as the handling of the flute. Another characteristic of this area is the abundance of the bamboo baskets, produced more with a utility aim than an artistic one. Even today, this area remains the great producer of this type of basket.

All these investigations show definitely that the zones of high altitudes (Congo-Nile Peak and central plates) are the first zones of great populating of Burundi. It would be very difficult to talk about how the migrations towards the other areas took place. What is sure, is that at this moved back period of the history of Burundi, several areas remained densely covered by advanced forests and Savannas.

It is starting from all these migrations due mainly to the demographic rise, origin of the reduction and the scarceness of the fertile lands, that the natural zones (forests and marsh) were destroyed.

I.3.2. Human Occupation on the borders of the Kibira National Park borders

The riparian population of the Kibira National Park is important and is unequally distributed. The riparian communes of the forest have a relatively high density as table 2 shows it. With a density of 312 Inhabitants per km² the commune of Muruta is the second after the commune of Matongo among the riparian communes of the Kibira National Park recording a strong density of the population.

Table 2: Permanent population of the riparian communes of the Kibira

Commune	Number of households	Total	Male	Female	Density (Hab./km²)
Bukeye	11.789	53.511	25.700	27.811	291
Bukinanyana	10.220	49.044	24.072	24.972	148
Kabarore	8.521	43.251	20.808	22.443	217
Mabayi	8.056	40.078	19.873	20.205	116
Matongo	11.880	53.252	25.678	27.574	318
Muramvya	12.021	57.300	27.456	29.844	297
Muruta	9.805	45.788	23.756	22.032	312
Musigati	11.637	58.303	28.612	29.691	199
Rugazi	8.708	41.360	20.582	20.778	263

Source : Population Departement (1990).

I.4. INFLUENCES OF THE KIBIRA ON THE ECONOMICAL LIFE OF THE COUNTRY

Being a true roof on the watershed between the Congo and the Nile basins, the mountain ombrophilous forests play a fundamental role in the regulation of water and the protection of the basin slopes with strong inclination against erosion. Moreover they maintain essential climatic conditions for agriculture while making possible the production of electricity and irrigation. Indeed, a great number of rivers take their source in the mountain forests: Kibira is source of Luhwa, Kaburantwa, Gitenge, Ruvubu, Mpanda and Nyabihondo.

To protect the catchment area, the Kibira forest functions like a giant sponge, and thus slow down erosion. Rishirumuhirwa (1994) showed that this vegetation reduced erosion below the tolerance level, but as soon as it disappears, the phenomenon becomes increasingly serious as the slope increases. He then noted that this forest reduces the erosion of 1 000 times, a savanna of 100 times, and that the main food crops are much less effective (reduction of one to five times).

These functions allow the water supply of a great part of the arable lands, the conservation of the grounds and especially the regulation of the rivers, in order to increase the irrigated surfaces in the Imbo plain. They avoid then river overslting and therefore, the pollution of the lake Tanganyika.

The Kibira National Park is contiguous with great plantations of tea and coffee, being the two main exportation cultures in Burundi (Fig. 4).

The production of electricity and consequently the economic development are strongly related to the mountain forests which feed and maintain the flow of the stoppings. Hydroelectric dam of Rwegura on Gitenge river currently covers 50% of the needs of the country in electricity. The dam set up on the Nyabihondo river, feeds the tea factory of Teza in energy (Fig. 5).



Fig. 4: A great plantation of tea near the Kibira National Park



Fig. 5: Artificial Lake for hydroelectric dam of Rwegura in Kibira National Park

I.5. DEGRADATION OF THE KIBIRA NATIONAL PARK

Even if the Kibira is protected since 1932, different exploitations of its natural resources were observed and have contributed to its degradation a long time ago. The degradation of this forest is primarily related to demography and is very increased in the overpopulated communes. The impact of this population on the Park resources appears under several angles:

- the high number of households increases the need of firewood that is taken in the Kibira often described as inexhaustible. The efforts to be deployed out of forestry matter are thus reduced and the park will suffer from it more by a continuous reduction of its natural richnesses.
- the need of service wood (construction) increases correlatively with the population increase and, the equipment in furniture of box is a factor even more destructive (case of the sawlog) being able to relate to great extents.
- the highest densities induce the scarceness of the arable land and therefore the resort to clearing of the forest after the impoverishment of the soil following overloads.
- the exploitation of the forest by the permanent population presents risks of accidents such as the bushfires caused by: Camp-sites, Stockbreeders, Delinquents, Bee-keepers... such risks increase during the dry season.

In all cases, the demographic pressure on the proximity of the park will be reflected on the latter through the following actions (Nzigidahera, 2000):

1. Cutting of converted timber
2. firewood cutting
3. Servicewood cutting
4. Bamboos cutting
5. Lianas, flowers and cords haversting
6. Cutting of shrubs
7. Overpasturage of cattle
8. Agriculture by clearing forest
9. Gold washing at Mabayi

Of all these harmful anthropic actions, it should be stressed the gravity of degradation due to the sawing which touches in majority the plants of the dominant layer of the forest.

By consulting the monthly reports of the NIENC, it was noted that 882 cases of sawings were recorded during 1994 and 1995 years. This situation is worrying as it relates to large trees of the forest that nature could forge during more than 3 centuries: *Entandrophragma excelsum*, *globulifera Symphonia*, *Podocarpus milanjanus*, *Podocarpus usambarensis*, *Prunus africana*, etc which start to be rare in this forest mass and on all the national territory.

The degradator role of the cutting of bamboos, *Arundinaria alpina*, deserves to be highlighted. Indeed, being used for several uses (construction of the houses, heating, basket making), this species constitutes an important source of income for the Batwa who live mainly of this resource. That enables to foresee its eminent disappearance owing to the fact that it is not as abundant as it was, being more represented only by small drowned and scattered tufts inside the Kibira.

In 1995, at Teza, many *Entandrophragma excelsum* were barked by annulation, which caused the death of a number of old trees from approximately 1 to 1,5 m in diameter and more than 20 m height. In Rusha, around fifty of *Agavea salicifolia* died of the continuations of the frequent and

repeated annular hulling. In Mabayi, on Gasebeyi hill, all *Zanthoxylum gillettii* are gradually and systematically killed by barking. This case appears to be most critical, owing to the fact that this species do not still exist on this hill because it was not found elsewhere (Arbonnier, 1996).

Agriculture in the vicinity of the Park constitutes a danger which threatens some species of monkeys: Chimpanzees (*Side troglodytes*), Baboons (*Papio anubis*), Colobes (*Colobus pennanti*). To that the intensive poaching by place (Arbonnier, 1996) is added.

The main causes of all these constraints are primarily related to the coercive methods used to intervene since the creation of this Park and which were at the origin of the continuous conflicts with the riparian population. One would quote the following:

- Non efficient guarding of the Kibira National Park

The guarding of the Kibira National Park is done with the control system by foresters' rangers. They have as the main activities the survey any anthropic action inside protected areas. The NIENC appoints one forester ranger to supervise more than 8.000 hectares, whereas one forester ranger would be appropriate for supervising 750 hectares in a protected area. It means that a manager and a technician supervise 1500 hectares.

- Lack of access of the local communities to the natural resources of the Kibira National Park

Generally, the Burundian law prohibits the access to the resources instead of regulating it. This is due to the fact that it was elaborated within the framework of a policy worried by the preservation of the biological resources without taking into account the needs of the population (authoritative approach instead of a participatory appraisal). Also, some incompatible practices with a sustainable use of the resources such as the uncontrolled exploitation of the medicinal plants, the illicit cutting of the bamboos, etc. are not regulated by law. Native knowledge on the biological resources is not recognised by law.

- Non involvement of the riparian populations in the activities of the Kibira Park protection

For a long time, the local communities never took part in the decision-making for the natural resources management of the Park. It is risen from not taking into account the problems of the riparian region in the management of the Park. It is currently observed an insufficiency of training of the woman aiming at the controlled use of the natural resources and that has an effect on the degradation of the Park. In fact, rural women occupy a significant position in the use of the resources especially in the use of the firewood, in farming activities, in basket making, etc. Moreover, the women encounter difficulties in organizing themselves in associations. As regards environment, only one female association exists among the 32 environmental associations approved by the government. Very few female associations are involved in the exploitation of the wild biological resources. Associations which exist aim only at collecting and marketing the forest products without being concerned by conservation and sustainable use. Female associations which occupying the agricultural sector primarily remain few and not supported and show a low capacity of mobilization of funds.

- limited Knowledge on the exploitable resources

In the Kibira National Park, like elsewhere in Burundi, there are no thorough studies made on a mode of exploitation of these resources to make it possible to know the resources available to a given date and to adopt the needs with the instantaneous potentialities in order to specify the methods of sustainable use. The non destroying techniques of exploitation of the biological resources remain ignored.

- Non efficient sensitizing and environmental education of the population for the safeguarding of Kibira

The Kibira biodiversity continues to regress because of the ignorance of the populations and the lack of sensitizing. Many people are unaware of the ecological importance of the forest and the wildlife it contains. The staff of the Park is not trained on the various participative approaches and methods of rural education.

- Non availability of a management plan of the Kibira National Park

The management plan is an undeniable tool when undertaking all the activities of management of a protected area. Several attempts of development of a management plan for this protected area were made. However, the currently available plan for the Kibira remains incomplete, unsuited, not applied and does not leave a place to the involvement of the local communities. That is partly the result of a management which privileged police and coercive methods making barrier to the participation of the riparian populations.

Indeed, the strategy used in the development of this management plan had not taken profit of an optimum consensus of all the stakeholders in particular the populations and the local administration in management of the park. It is in the final analysis that should be added this uncomplete plan written in a foreign language not understood by the population.

II. SOCIO-ECONOMICAL ANALYSIS IN RIPARIAN AREA OF THE KIBIRA NATIONAL PARK

II.1. RIPARIAN POPULATION IN THE COMMUNES OF MURUTA AND MATONGO

The communes of Muruta and Matongo are among the nine communes of the province of Kayanza. They are on the eastern slope of the Congo-Nile peak, and they are riparian the Kibira National Park.

The commune of Muruta encloses three zones, six sectors and twenty five hills. Only two zones are riparian to the Kibira notably Nkonge and Rwegura with 12 hills. The Matongo commune counts four zones including 35 collines which are Mudehe, Rutarure, Bihunge of the Banga zone, Rukoma and Kinyovu of the Kabuye zone, Bandaga, Ngoro, Gasare, Nteko, Nyarumanga, Muganza, Kivumu of the Ruganza zone are riparian to the Kibira (table 3).

The number of households of the commune of Muruta according to the 1990 census was 9805 and the average size of a household was of 5 people; and the Matongo commune counted 11880 of households. According to the monthly census of marital status, the recording report of July 2006 in Matongo commune gives 10367 men, 13366 women, 19809 boys and 21774 girls thus a total of 65316 people. The same type of report of July 2006 in Muruta commune gives 10714 men, 13730 women, 16007 boys, 18450 girls, adding up 58901 people together. This current situation changes the densities of these two communes which become 351 inhab/km² for the Matongo commune and 444 inhab./km² for the Muruta commune. One thus concluded from it that the commune of Muruta is overpopulated.

The Mutana hill counts 2017 people comprising 430 households whereas the Rukoma hill counts 1742 of them distributed in 356 households. Among the 430 households, Batwa add up 132 households on the only hill of Mutana, whereas that of Rukoma does not count any of it.

The commune of Muruta is very rich historically and keeps some symbols of the kingship in Burundi. The population of this commune revealed us that it is a zone of royal tombs. Three kings of Burundi were buried in this commune namely NTARE RUGAMBA on the Muganza hill, MUTAGA MBIKIJE on the Mutana hill and MWEZI GISABO on the Remera hill. KIRIMA who had rebelled against the King MWEZI GISABO was buried in this same commune on the Ruvumu hill. In all the riparian communes of the Kibira, population is estimated to 99040 inhabitants (Table 4).

Table 3: Administrative subdivisions of the commune of Muruta

Communes	Zones	Hills
Muruta	Muruta	Muruta, Nyamiyogoro, Karunyinya, Myugariro, Yanza, Busambo, Remera Buziraguhindwa, Campazi
	Nkonge	Nkonge , Mutana, Mikuba, Ruvumu, Nyabibari, Gishubi
	Rwegura	Muciro, Rwegura, Ruharo, Mpfunda, Rwangongwe, Kavoga, Kibakwe, Manini, Muganza, Kajerege
Matongo	Banga	Banga, Munini, Murambi, Mudehe, Rutarure, Bihunge
	Kabuye	Munyinya, Musonge, Camizi, Kabuye, Gitwe, Rukoma et Kinyovu
	Ruganza	Ruganza, Kibavu, Bwayi, Burengo, Mvumvu, Bandaga, Ngoro, Gasare, Nteko, Nyarumanga, Muganza, Kivumu
	Burarana	Burarana, Rutuhurana, Bwisange, Ruvumu, Nyarurambi, Kijuri, Mikamba

Zones and Hills (in bold) touch directly on Kibira Park National.

Table 4: The population density of the different communes of Kayanza province

Communes	Area (ha)	Population	Population density Hab./km ²
1. Butaganzwa	1038	39472	382
2. Gahombo	8064	29434	366
3. Gatara	10396	46891	452
4. Kabarore*	20012	43251	217
5. Kayanza	12236	64361	526
6. Matongo*	16780	53252	318
7. Muhanga	12890	53673	417
8. Muruta*	14708	45788	312
9. Rango	17900	67555	378
Total	123324	443677	360

* The riparian communes of Kibira

Source: Population Department (1990)

II.2. EXPLOITATION METHODS OF THE NATURAL RESOURCES OF THE PARK IN THE COMMUNES OF MURUTA AND MATONGO

For the inhabitants of the communes of Muruta and Matongo especially the Batwa, the Kibira remains a center of provisioning of the forest products like bamboo, vegetables, boards, firewood, grasses of braiding of the plaits, the medicinal plants, etc. Several points of sale of bamboo, plaits from *Cyperus latifolius* and baskets from bamboo are created as well as several shoprooms of joinery in Kayanza. The samplings are done secretly.

II.2.1. Edible plants found in the Kibira National Park

- Vegetables

The Kibira National Park contains a number of vegetables that feed the riparian populations. Others badly known are especially exploited by some groups of people, namely the Batwa, often in precarious economical situation. Some species are also met outside the forest with or without possibility of being cultivated.

Nevertheless, the fact that they are consumed justifies their aptitude for trade. The limiting factors are quality on the one hand and the quantity on the other hand. Barter is practised more than the cash sale. Table 5 is a synthesis of information provided by our advisors and shows 5 species of plants which are consumed like vegetables by the riparian population of the Kibira National Park, Rwegura sector. That does not mean at all that they are the only ones to serve to such ends. We are conscious that there exist many others whose consumption is not generalized.

Of the 9 quoted species, some of them are of abundant quantity and can enjoy an interesting trade. It is the case of *Solanum nigrum* and *Basella alba*. The period of abundance of vegetables always corresponds to the rain season, but some like *Basella alba* and *Erythrococca bongensis* stand the dry season though their yield decreases.

Solanum nigrum is a vegetable known and consumed by all. It constitutes a great part in the feed ration for the riparian populations of the park. Women generally will collect it whereas men do it occasionally.

Harvest consists in cutting the young part of the trunk and the stock rejects. The second harvest on the same stock gives a vegetable of darker color than the first. The period of abundance corresponds to the rain season. In dry season, the vegetable decreases considerably and small quantities are found in the edge of the wetlands.

Solanum nigrum is a vegetable sold more on the local markets, more particularly in Mumirwa (Ndora). There, some salesmen come sometimes by far, i.e. hills of the commune of Muruta. At the market of Rwegura, some women make such a trade. The sold quantities enable them to have an additional income which they consider sufficient (1000 FBU per day on average). Marketing can also be done in the form of barter. In this case, one exchanges this vegetable with other food: corn, bean, corn... This kind of trade is especially practised by old men. They do that on days when the market is not held.

In the Kibira forest, this vegetable is more abundant than *Solanum nigrum*, but level of appreciation by the consumers is almost the same one. It is also known and consumed by all. The period of abundance corresponds to the rainy season. Although the quantities decrease in dry season, they remain considerable.

The trade of *Basella alba* is done normally every season but in small quantities. Moreover, it dries quickly and the purchasers are not involved. The incomes obtained are low although the vegetable remains appreciated.

The appreciation of quality is a completely relative concept of which variability depends on the consumer. We adopt here the system of relative majority.

Indeed, people with precarious economical situation do not have time to discuss qualities. The important thing for them is to have what to “put under the tooth”. However, they also need variation in their ration and, as the majority of them do not even practise agriculture, they adopt barter which consists in exchanging the products of the forest against those of agriculture.

We see here that the majority of forest vegetables are not appreciated, which can somewhat handicap their trade. It is in particular: *Urtica massaica*, *Erythrococca bongensis*, *Impatiens burtonii*... A well carried out exploitation does not consist in a threat to the disappearance of these vegetables because the totality of them regenerate after exploitation. In addition, the great majority of them can be domesticated.

Let us note that the majority of these vegetables require a specific preparation to improve their taste. It is generally steeping in hot water followed by dehydration with the hands for the species of *Alchornea hirtella glabrata*, *Basella alba*. The association of vegetables to beans, the small fishes (ndagala) or meat seems to be a practice for Barundi. Some vegetables must be collected carefully according to the tradition (*Impatiens burtonii*).

The effort required in all that remains lower than that which one would deploy to cultivate them. This is why almost everyone counts on the forest.

- Tubers

In the Kibira National Park, there is a number of tubers that are exploited for feeding ends. Compared with vegetables, they are very few. Even those which are available are not abundant (Table 5). 60% of them reach exploitable quantities only in the Imbo part. The maturity of the tubers of the Kibira occurs during the dry season and their harvest often corresponds to the death of the plant. For the majority of them, regeneration is even done by means of the tuber. It is especially the case of *Dioscorea astericum*. That attests their possibility to be farmed which calls upon the bulblet at *Dioscorea bulbifera*. *Eriosema lebrunii* was never tested in culture. These tubers are well appreciated by the consumers.

- Fruits

The list of the fruits given here is non exhaustive. These fruits do not contribute much in the nutrition of the populations living in the surroundings of the Kibira. The trees of *Myrianthus holstii* are found on all the surface of the forest. They are however more productive in the valleys. *Ensete ventricosum* is also found in such places but the number of feet is decreasing if one considers the extent of the forest.

Like the tubers, the fruits reach their maturity during the dry season except *Ensete ventricosum* which behaves like the banana tree i.e. that can mature during any season. That does not mean that there are no fruits which mature during the rainy season. Let us say that they are less productive.

The level of consumption of the fruits originating from the Kibira is generally low (Table 5). That is due to the fact that these fruits are themselves not very abundant and their harvest requires hardwork. One will also note the tendency to hold them to children.

Though little cultivated, 57% of them can be farmed. Apart from the forest, *Ensete ventricosum* is cultivated like decorative plants especially in the towns. This plant can also be cultivated for a medicinal use. Trade of the forest fruits is still moderate and only 28% of them can be sold with poor incomes.

- Mushrooms

Six mushroom species are consumed by the inhabitants in that region. The mushrooms found in termites' areas are generally very appreciated. They are notably *Termitomyces robustus*, *T. microcarpus* and *T. titanicus*. Their level of consumption is satisfactory. In addition, the majority of them are sold with average incomes. No species until now is tested in agriculture. People is waiting for the results of a scientific research.

Table 5 : Edible resources originating from the Kibira

Familles	Species	Estimated Abundance	relative abundance Periods	Quality appreciation	Regeneration after exploitation	Cultived or cultivable	Marketing
Vegetables							
Solanaceae	<i>Solanum nigrum</i>	3	SP	TB	+	+	+
Basellaceae	<i>Basella alba</i>	4	SP	TB	+	+	+
Solanaceae	<i>Solanum capsicoides</i>	2	SP	B	+	+	-
Euphorbiaceae	<i>Alchornea hirtella glabrata</i>	1	SP	B	+	-	-
Amaranthaceae	<i>Amaranthus lividus</i>	1	SP	TB	+	+	+
Urticaceae	<i>Urtica massaica</i>	3	SP	AB à M	+	-	-
Euphorbiaceae	<i>Erythrococca bongensis</i>	2	TS	AB	+	-	-
Balsaminaceae	<i>Impatiens burtonii</i>	4	SP	AB	+	+	-
Brassicaceae	<i>Cardamine obligua</i>	2	SP	B	+	+	-
Tubercules							
Fabaceae	<i>Eriosema lebrunii</i>	2	SS	B	-	-	-
Asteraceae	<i>Helianthus tuberosum</i>	1	SS	B	+	+	-
Dioscoreaceae	<i>Dioscorea astericum.</i>	1	SS	B	+	+	-
Dioscoreaceae	<i>Dioscorea bulbifera</i>	1	SS	B	+	+	-
Fruits							
Moraceae	<i>Myrianthus holstii</i>	4	SS	TE	TB	+	+
Solanaceae	<i>Physalis angulata</i>	3	SS	E	TB	+	+
Rosaceae	<i>Rubus punnatus</i>	2	SS	M*	TB	+	-
Musaceae	<i>Ensete ventricosum</i>	3	TS	TB*	AB à M	+	-
Hyppocrateacea	<i>Salacia erecta</i>	2	SS	B*	TB	-	-
Sapoaceae	<i>Aningeria adolphi-frederici</i>	2	SS	B*	TB	-	-
Myrsinacea	<i>Ardisia kivuensis</i>	1	SS	B*	TB	-	-

Legend

Estimated abundance: 4 : very abundant
3 : Abundant
2 : average abundant
1 : not abundant (rare)

relative abundance periods:
SP : Rainy season
SS : Dry season
TS : All seasons

Quality appreciation: TB : very good
B : good
AB : Moderate
M : Poor

Regeneration :
+ : Regenerate
- : Doesn't regenerate

Marketing : + : Traded
- : Non traded

Cultivated or cultivable :
+ : Cultivated or cultivable

II.2.2. Medicinal plants

Introduction

The Kibira forest encloses a great number of vegetable species enjoying medicamentous properties. They are used to cure human and animal diseases and/or anomaly. They can be also used to treat other plants, on fields. The medicinal power of the plants of the Kibira is recognized at the national level. Indeed, they are sold on other remote market places like those of Gitega and Jabe (Bujumbura).

Around the Kibira National park, in the Rwegura Sector, the most common parts of plants used by tradi-experts are the leaves, the barks and the roots. The barks can be sampled from the trunk or the roots according to the specificity of the plants and the diseases to be cured.

They are obtained by using axes, billhooks, machetes and when they are the roots, they are excavated by using small hoes or pieces of wood.

Concerning leaves, they are collected by hand, put in baskets and carried at home. The sampling of the medicinal plants is done generally in the fall of night or very early in the morning in order to escape from the sight of passengers. Moreover, it is an opportune moment for photosynthesis not to occur because there is no sunlight. The speculations can also depend upon the time of preparation. In our area of study and more particularly in the commune of Muruta, some tradi-experts were inquired. They use about 100 species of plants to cure diseases or anomalies. Some of these plants are exclusively found in the forest. Those which are found outside the forest either are cultivated or retained in the fields or remain wild in bush as timberings protected from the pasture. The medicinal plants from the Kibira National park are important if we consider the incomes they degenerate. Some tradi-experts earn their living by curing people using drugs prepared with plants of which the most considered are found in the Kibira. Nowadays, some of them are becoming scarce (*Ocotea michelsonii*).

III.2.3.1. Medicinal plants prepared with barks

In the chapter of the edible plants, we noted that some of them can be met outside the forest. Such is not the case for the medicinal plants prepared with barks made up of trees which can be met only in the forest. For some, the analysis of their names reveals the medical use that one expects from them. It is the case, of *Ocotea michelsonii* (Umuganza), *Apodytes dimidiata* (Umusivya), *Bersama abyssinica* (Umurerabana), *Pittospora macrocalyx* (Umunyereza), etc.

The behavior of a wounded tree varies according to species'. 44% of these species overlap with a new bark whatever their barking whereas 20% find their bark if the wound does not relate to the entire surface. 32% of them dry obligatorily after being wounded (Table 6).

III.2.3.2. Medicinal plants prepared from leaves

The plants whose leaves have medicamentous properties are many in the Kibira National park like everywhere else. One could not venture to enumerate them. In addition, we can undoubtedly affirm that all the plants have those properties towards one or another disease or anomaly, that can affect man, domestic or wild animals and even plants. Few has been done in terms of research as regards such plants. This is why we will limit ourselves to the experiments, tests and essays already done, sometimes gropingly, sometimes after training by their parents. We will also limit ourselves to the species most usually used in our area of study without repeating those previously described.

We give here 14 species of plants whose leaves are used to cure 11 diseases or anomalies affecting men (Table 6). 57% of them call upon associations which are sometimes outside the vegetable kingdom: Lichen + honey, *Solanum anguivi* + cooking salt.

The adopted method of preparation resembles those observed for the barks. It is the same for the posology. *Cassia occidentalis* (Umuhurika) does not take part in the cure, but rather to cause diseases.

Table 6: Synthesis of the medicinal plants prepared from leaves

Kirundi Name	Species	Preparation	Administration	Association	Disease treated or anomaly	Behavior of the tree
Umuremera	<i>Prunus africana</i>	Decoction	Anale	-	- Loss of appetite - Kidneys	R
Umushwati	<i>Carapa glandiflora</i>	juice extraction	Oral	-	intestinal worms	R
Umunazi	<i>Parinari holstii</i>	juice extraction - Powder	Oral	Beer's banana	Madness thoracic	R
Umuganza	<i>Ocotea michelsonii</i>	Fumigation	Intradermal	-	Folie	S+
Igihungere	<i>Protea suffruticosa</i>	Decoction	Oral	<i>Phillipia benguellensis</i>	Constipation	?
Umdwedwe	<i>Tabernaemontana johnstonii</i>	Juice extraction	Oral	-	Lack of milk	R
Umukaragata	<i>Faurea saligna</i>	Juice extraction	Oral	-	- intestinal worms - Swelling	R
Umusebeyi	<i>Albizia gummifera</i>	Poudre	Oral	-	Bad fate	R
Umuhotora	<i>Xymalos monospora</i>	Juice extraction	Oral	-	intestinal worms	R
Umugoti	<i>Syzygium guineense</i>	Juice extraction	Oral	-	infantile Diarrhoea	R
Umuhanga-hanga	<i>Maesa lanceolata</i>	Juice extraction	Oral	-	Abortion	S
Umurerabana	<i>Bersama abyssinica</i>	Decoction	Oral	<i>Rhus vulgaris</i>	Poison	R
Umwungo	<i>Polyscias fulva</i>	Juice extraction	Oral	<i>Mangifera indica</i>	bacillar dysentery	S+
Umusivya	<i>Apodytes dimidiata</i>	Fumigation	Intradermal	-	Bad fate	S
Ntareyirungu	<i>Erythrina orophila</i>	Fumigation	Intradermal	-	Bad fate	R
Umukungu	<i>Crotalaria ochroleuca</i>	Juice extraction	Oral	-	- Lumbago - Swelling of the feet	S
Umugimbu	<i>Bridelia micrantha</i>	Decoction	Oral ou anal	-	bacillar dysentery	S
Umukerekwa	<i>Newtonia buchananii</i>	Powder	Nasal	<i>Albizia gummifera</i>	Bad fate	S
Umujegeshe	<i>Ficalhoa laurifolia</i>	Juice extraction	Oral	-	Boutonnement dû à une termitière	S+
Umunyereza	<i>Pittospora macrocalyx</i>	Juice extraction	Oral	<i>Veronica abyssinica</i>	Placenta tardif	S+
Umuhumba	<i>Ficus sp.</i>	Decoction	Oral	<i>Maesa lanceolata</i>	intestinal worms	S
Ibamba	<i>Rauwolfia obscura</i>	Juice extraction	Oral	-	intestinal worms	S

Legend: Behavior of the tree after the bark removal

R: Does the tree overlap with a new bark? : Not confirmed information.

S: The tree dries; S+: The tree dries when its bark is removed on all its surface

II.2.3. Plants of undeniable economic interest

1. Bamboo exploitation (*Arundinaria alpina*)

The bamboo of the Kibira National Park (*Arundinaria alpina*) is undoubtedly one of the most solicited vegetable resources (fig. 6 and 7). It has many uses of which we quote here the most current: timbers, and artisanal use of trees. It is cut either in a fresh state, or in the dry state depending upon the use.

The bamboo sampled from the Kibira is cultivated since 1967. This domestication was rapid but its production was moderate. It is in particular the reduction in the flow of the cuts in the illegal owners. Like any other culture, *Arundinaria alpina* is productive on fertile lands like valleys, drained or not, where it is seen even at distance. The bamboo of the forest is preferred by craftsmen thanks to its properties. It is in particular great diametrical dimension, its softness, the space between knots which is relatively long, etc.. The cultivated bamboos (Umusuna, Umusakaronge) are especially used in building industry. During the rainy season, young bamboo shoots become a preferred food for chimpanzees.



Fig. 6: The bamboo (*Arundinaria alpina*) in the Kibira National Park



Fig 7: Bamboo cutting in the Kibira National Park

- **Bamboo in building industries**

Today, the bamboo has completely replaced the reed in building at least in the riparian areas of the Kibira National Park (Fig. 8). There are two reasons for that: the area is favorable to the growth of bamboo, *Pennisetum* is more competitor towards the other cultures whereas its yield is poor. The facilities of supply from the forest is another asset.

The bamboo used in building is collected when it is dry. Currently, it is almost exclusively used as roof of mud bricks walls in rural area and cooked bricks walls in urban area. Today, only fences are great consumers. In the young state, the bamboo is called "Umwerakare". It is at this time that it provides a rope of good quality that is used in building. The bamboos of the Kibira (*Arundinaria alpina*) are considered as imputrescible whereas the cultivated bamboos (Umusuna, Umusakaronge) resist less and are not adapted to a handcraft use (basket making). The cultivated bamboos provide additional income to the owners thanks to their important demand during the dry season.



Fig. 8: Bamboo in building near the Kibira National Park

- **Incomes from the trade of the dry bamboo**

The dry bamboo intended to building is traded by only the Batwa who can transport it on the head and to a distance of more than 14 km. As they live in small villages, they leave in group a day before the market day, about 8 o'clock in the morning, armed with billhooks or well sharpened machetes. It is difficult for the foresters to fight against these men whose strong reputation is to never miss their target with a sagaie.

If trade does not occur at the market place, it is done at home for those who ordered the goods. At the market place of Kayanza town, a well-known place seems to be reserved for the exposure of the dry bamboos. Curiously, one meets there more than 20 salesmen, all men, aged of between between 17 and 39 years, with less than 20 stems exposed on sale for one and the other length. These stems remain there and are yielded only in last position. When a "customer" arrives, one negotiates the price and the delivery is done outside the market place in hidden places because foresters and some authorities as well as militaries and civilmen can seize the exposed stems.

Except some little differences, the incomes got from the trade are almost the same ones (Table 7). The 4 m length is preferred especially during the dry season when many houses are built. On the other hand, the 2 m length is often adopted for low-size subjects having little diametrical dimensions.

The market place where we carried out our investigation holds 3 times per week. This is why the daily income was multiplied by 3 to obtain the "weekly" income at the market place whereas it is multiplied by 7 for the case of the households. Moreover, it is not always festival! Any stem exposed on sale is not obligatorily bought. Sometimes, the seller is obliged to reduce the prices when it is becoming late in the evening.

Table 7: Comparison of the incomes of the dry bamboo marketing at the Kayanza market of and in the households which are near the Kibira National park (Konge)

Places	Uses	Transport Capacity (units)	Number of walk/day	Unitary price (FBU)	Daily income (FBU)	Weekly income (FBU)
Market place	Enclosures construction	30	1	60	1.800	5.400
	Houses construction	15	1	100	1.500	4.500
Nkonge Households	Enclosures construction	30	1	20	600	4.200
	Houses construction	15	1	40	600	4.200

- **Bamboo in the craft industry**

Before the development of tea culture, the craft industry of the bamboo occupied the large majority of the people living in the surroundings of the forest. This artisanal exploitation of the bamboo was limited to the manufacture of domestic use objects.

Today, it can extend to considerable levels. One notices these last years a rise of prices of the products manufactured in bamboo. That would be due to the prohibition of the cuts which makes rare this raw material. The cultivated bamboo, although it is less preferred, cannot only satisfy the needs for the so eager population.

Chairs, tables and beds of the bamboo are usually manufactured in joineries (fig. 9). At the market place of Kayanza town, many tables used for the exposure of the goods have the form of beds.

The manufacture and the marketing of the baskets of bamboo constitute an activity which plays an important role in the life of people living around the Kibira National Park. Those who do not manufacture them themselves buy them to resell them. Others rather sell the raw bamboo, whether it is cultivated or sampled from the forest. Moreover, this activity occupies all the categories of people although the Batwa who do not practise agriculture remain the best craftsmen in this matter. Men do such an activity from which depends their life. We distinguish here 4 types of baskets whose principle of manufacture remains the same one (fig. 10):

- large manufactured baskets independently one of the other and whose dimensions vary according to the use which is intended for them;
- small baskets manufactured in pairs;
- small baskets with handles;
- the double baskets type.

The average daily incomes differ largely according to the type of selected basket. A difference of 700 FBU is observed between the prices of the baskets.

- baskets and the small baskets in pairs would be nevertheless enormous.

However, profitability is almost the same one. That results on the one hand from the social consideration of the basket-baskets which makes that they are especially used at the time of the bridal ceremonies or for the visits of the most honoured. They are thus used little, do not wear easily and consequently less asked on the market place. The practice "to lend" between the families would be another reason. In addition, the small baskets per pair have a whole range of uses (small harvest, visits family, bargaining...) reason for which they wear easily and are requested on the market.

The purchasing power, relatively high in dry season, conditions the prices of such products (Table 8).

Table 8: Incomes of the manufacture and the marketing of the baskets in bamboo (Muruta)

Type of basket	Daily number of baskets manufactured	Unitary price (FBU)		average daily Income (FBU)
		Rainy season	Dry season	
Big basket	2	200	300	500
Small basket per pair	2	150	200	350
Small handle basket	5	100	200	750
Double Basket	2	500	700	1.200



Fig 9: Chairs and table manufactured from the bamboo



Fig. 10: Small handle basket

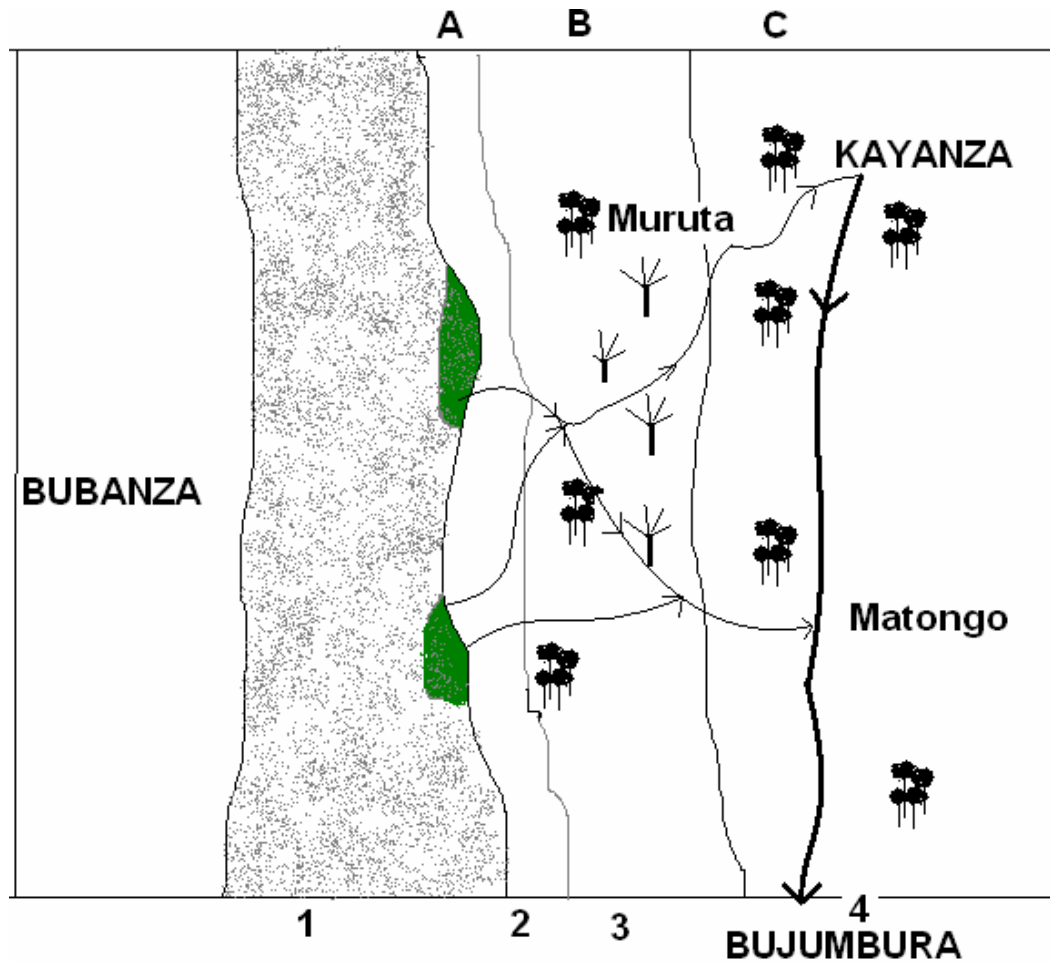
2. Exploitation of wood

- **Collecting of the deadwood**

The staff of the Kibira National park prohibited the collection of deadwood. That resulted in the fact that the residents cut trees and returned afterwards to collect them. Some could even carry out them at more or less long distances, but the distance separating the dwelling from the forest remains a limiting factor. However, that was not a solution because Saturdays and Sundays (or quite simply after the hours of service when foresters have returned home) are moments when the cutting of wood is the most intense. It is the most current infringement which does not even save the most expensive species (working wood from which the age of maturity would extend beyond 70 years).

The motivation of farmers for the plantation of trees on their own land decreases as one approaches Kibira. The latter, indeed, is considered as an inexhaustible wood reserve. That made that its residents, instead of planting trees on their pieces of land, rather prefer to reserve them for food crops and the tea plant. The agroforestry is also observed in the area. Indeed, according to the distance compared to the Park, the density of planted forest cover varies to a significant degree (fig. 11).

Following the closing of the Park, the zone B, another time directly dependent on the wood resources collected in the Kibira forest, reacted while answering in an important way the actions of popularization of agroforestry seedlings. The distance of 300 m corresponds to a psychological limit: the distance and the risk to seek wood in the park retain the use of it. Only the riparian population of the Park continue to exploit wood. The distance seems to discourage from the different ones running this risk.






- | | | |
|---|---|----------------------|
|  | : <i>Eucalyptus</i> plantation | A : 0-300 m |
|  | Bamboo plantation | B : 300-500 m |
|  | : Bamboo vegetation in Kibira National Parc | C : 500 m- |
| 1 | : Kibira National Park | |
| 2 | : Riparian zone of Kibira National Park, with a big density of Batwa | |
| 3 | : Zone with little number of <i>Eucalyptus</i> and bamboo plantations | |
| 4 | : Zone rich in the <i>Eucalyptus</i> plantations | |

Fig. 11: The infuency of the distance from Kibira National Park

- **Exploitation of the working wood.**

The Kibira National Park encloses a number of exploited flora species in the joineries (Table 9). This wood is very appreciated for its quality is found on market places and the exploitation is more and more becoming illegal. Many of these trees do not reject and their exploitability age is of more than 70 years.

Table 9: Plants required for working wood at Muruta

Species	vernacular names	Exploitability frequency (%)
<i>Entandrophragma excelsum</i>	Umuyove	100
<i>Symphonia globulifera</i>	Umushishi	100
<i>Hagenia abyssinica</i>	Umwuzuzu	100
<i>Faurea saligna</i>	Umukaragata	100
<i>Newtonia buchananii</i>	Umukerekwa	50
<i>Prunus africana</i>	Umuremera	50
<i>Chrysophyllum gorungosanum</i>	Ikigoma	50
<i>Strombosia scheffleri</i>	Umushiga	25
<i>Parinari holstii</i>	Umunazi	25
<i>Alangium chinense</i>	Umukundambazo	25

Number of time that the species is quoted

Exploitability frequency = _____

Total number of surveyed persons

- **Exploitation of the service wood**

The main species of service wood are needed in the various building industries and the most important remain the house and its fence. If they are not used for the frame, they are used as posts at the time of building houses in mangrove swamp mud (Table 10). To these two uses, we can also add the bridges and many other everyday life uses.

In the case building of a house, we do not quote here to the multiple uses of the bamboo. We limit ourselves to wood used for the building of frames and those being useful in their support, i.e. the posts.

We also notice that rubbish from wood of service (slabbing off-cuts) is used in building of bridges on nonsuitable roads, livestock buildings (pigsty in fact), kiosks in rural areas, etc. Some trees are used in building and in sawing. That should not astonish us because, even the *Eucalyptus* sp. which had been wood of service for a long time is today a working wood whose products are of great value. Only that species is legally exploited today. The age of use of the wood of service will depend upon the use which is intended for them.

Table 10: Use of the service wood

Species	vernacular names	Post	Frames	Observations
<i>Macaranga neomildbraediana</i>	Umutwenzi	+	+	-
<i>Ficalhoa laurifolia</i>	Umujegeshi	+	+	-
<i>Polyscias fulva</i>	Umwungo	+	+	Used at the young age
<i>Bridelia micrantha</i>	Umugimbu	+	-	-
<i>Ficus</i> sp.	Umuhumba	+	+	quite right Wood
<i>Indét.</i>	Umunyarugongo	+	-	Presence of bulge at the base

3. *Exploitation of the adhesive paste with Symphonia globulifera*

- **The manufacture of the adhesive paste**

The manufacture of the adhesive paste from *Symphonia globulifera* is a traditional activity made on the basis of gum collected on the trunk of this plant. The gum results from outgoing yellowish latex of small cracks of old trunks of *Symphonia* and, in contact with air, coagulates, blackens and becomes as a very hard ball. At the time of harvest, these gums are that one removes using a machete without wounding the tree. Because of the scarcity of this gum leaving tree trunks naturally, the people prefers to cause wounds to the tree using a machete. The yellow latex leaves and coagulates in contact with air and after about a month, one can carry out the harvest of gum. This second method can cause the death of the tree if the wounds are extended on a great surface of the trunk.

The manufacture of the adhesive paste will be done thus by a simple cooking of gums until obtaining a viscous matter. The latter will be pulled on a leaf of banana tree (prepared beforehand by a simple passage to fire) spread out over a plane surface. One will deposit a flat and nonheavy object above (a peace of wood some for example). The whole will give to the adhesive paste a plate form and it is the leaf of banana tree which will be used as a wrapping paper. It will be able to be kepted for a long time in a fresh state.

- **Use and trade of adhesive paste from *symphonia***

The adhesive paste with *Symphonia* is used to clog several types of objects perforated, notably the banana tree dugouts, terra cotta pots, the water-bottles, the chairs and the doors and the tools made out of plastics. Before using it, one will use an object made out of iron heated for cutting the adhesive well and spreading it on the crack to be clogged.

Traditionally the manufacture of the adhesive paste was done by the Batwa. Today, thanks to its importance in everyday life and as source of income, it interests also the remainder of the riparian communities of Kibira. The marketing of the adhesive paste from *Symphonia* is very practised in the inquired markets. This trade was very pratised a long time ago. The gum collected on a tree can give an adhesive paste able to be sold with at than 5000 FBU. On the market places, one sells it per piece considered as a unit (of more or less 5 cm broad, 10 cm long and 0,5 cm thick) with a value varying 250 to 300 FBU.

Currently, the trade exceeded, the limited national ones and the adhesive paste is forwarded to Rwanda where it would be enormously expensive (between 600 to 700 FBU), somely because of the rigour put in the protection of the forest of Nyungwe become nonaccessible for the Rwandan population.

In Muruta, the profitability of this product at the origin of the systematic hulling of the trees with *Symphonia* became finally nowadays of conflict between the owners and the persons in charge of the National park of Kibira (fig. 12). The adhesive paste with *Symphonia* is obtained on order and in hider-places, because this trade is prohibited by the NIENC. The staffs of the Park often carry out systematic excavations on the local market places to identify the salesmen of the adhesive paste.



Fig. 12: Systematic hulling of the trees of *Symphonia globulifera* in the Kibira National Park

4. Exploitation of *Cyperus latifolius*

- **Various uses of *Cyperus latifolius***

Cyperus latifolius is exploited for its qualities of fast decomposition in the production of the manure, the manufacture of the plaits, for mulching of the cultures like the coffee-tree. Thus, *Cyperus latifolius* is currently traded and constitutes an important source of incomes for many people. When it is used as litter of the cows, the cut is systematic. The species is cut with the other species characteristic of the marshes. But, for the manufacture of the plaits, the cut is selective. The cut is interested in the tufts which fill the qualities sought by the collectors.

For the litter the unit of sale is the trailer tractor and that costs 3000 FBU. The result of the litter which is the manure is sold by Ben to approximately 30.000 FBU. The manure is thus used in the fertilization of the arable land. The main exploitators of *Cyperus latifolius* are the stockbreeders. It is during the rainy season that one buys great quantities of *Cyperus latifolius* owing to the fact that its decomposition becomes quick.

- **Uses and sociocultural aspects of the plaits with *Cyperus latifolius***

The manufacture of plaits is one of the main reasons of exploiting *Cyperus latifolius* on the level of the marsh of Gitenge. It is an activity reserved primarily to the women and girls in the area of Rwegura near this marsh (Fig. 13 and 14). The unit of sale is the heap for the manufacture of the plaits and the latter costs 500 FBU at Rwegura. The transported quantity is variable according to people, from 16 to 23 kg. On 0,955ha, we obtained 211 ie 11 plaits. To have a plait, one needs 19 kg of *Cyperus latifolius* collected on a surface of 868 m² ie 0,0868 ha.

The plaits (Ibirago) play a considerable role in the Burundian culture. The word "Ibirago" is used in some burundian expressions as "Kwemera ibirago utabijisha" (literally to promise the plaits whereas one is not a braider), to mean that one should not promise evils and wonders or "Gusasira ibirago abakwe" (To prepare the carpets to accomodate the Son-in-law ", to mean the importance attached to the festival of equips. Among, the main uses of the plaits, we will quote the plaits like sleeping equipment, drying food products, plaits like carpet. According to the inquiry carried out to Rwegura, very close to the marsh of Gitenge, 30 households use 93 plaits of *Cyperus latifolius* (Table 11).



Fig. 13: Haversting of the *Cyperus latifolius* in Gitenge marsh for plait-making



Fig. 14: Plait-making from *Cyperus latifolius* plant

Table 11: Quantities of the plaits of *Cyperus latifolius* according to the various uses and according to 30 households inquired by site

Rwegura/144	Number plaits with <i>Cyperus latifolius</i>	Number of plaits of another nature	Total
Plait of bed	93	71	164
Carpets	19	25	44
Drying plait	47	17	64
Plait reserved	112	67	179
Sub-total	271	180	451
Kavoga/154			
Plait of bed	127	61	188
Carpets	31	27	58
Drying plait	23	26	49
Plait reserved	109	63	172
Sub-total	290	177	467

II.2.4. Access of the riparian population to the Kibira National Park resources

On the level of the Kibira National Park, as in all the protected areas of Burundi, the population does not have an easy access to the biological resources. For some resources like the bamboo, the access is normally granted by the National Institute for the Environment and the Nature conservation often without analysis of the quantity available and the risks of exhaustion of the resource concerned.

Unfortunately, the residents which need some available resources seek to reach them in a clandestine way, which involves a kind of conflict between the NIENC and the populations. Moreover, studies to allow the sustainable exploitation do not exist because of the lack of human capacities in this matter. In the same way, there is no law allowing access of the population to protected areas resources. All the environmental legal texts do not recognize the usual rights of user in particular the right of pasture, extraction, the gatherings of the medicinal plants, etc.

II.2.5. Conclusion on the modes of natural resources exploitation

The Kibira National Park is considered as a supermarket taking into account the biological resources which it contains. The edible products take part in the feeding population especially during famine period. Some traded species generate incomes. The Batwa who is people without arable land, benefit from these foodstuffs collected from forest.

More than 100 different medicinal plants are exploited in the only commune of Muruta. The Batwa are more the users because they seldom attend the health centers. Some traditional users earn their life by the curing of diseases with medicinal plants of which the most important come from Kibira National Park. It should be also stressed that the medicinal plants are traded in the local market places and are sent to Bujumbura town.

The bamboo (*Arundinaria alpina*) is the most exploited resource and, varied uses, permits the survival of a many people. It acts to some extent of a die bamboo which naturally constituted through several social groups in particular Batwa, haversters and salesmen, the craftsmen braiders, carpenters, masons, etc. and the tradesmen of the artisanal products. Several households thus live bamboo whose exploitation became a sector of unchoking from the agriculture which occupies 90% of the total population in area characterized by increased soil exiguity.

The use and the trade of the adhesive paste with *Symphonia globulifera* constitute important activities for the population survival notably the Batwa. However, the exploitation in particular by hulling does not leave in good condition and this species become rare.

The use and the sociocultural aspects of the plaits with *Cyperus latifolius* confer on this species a distinguished importance. By holding account of various uses, this species is irreplaceable for all the rural population with very low annual income. One could never plan to use modern mattresses which cost enormously expensive.

As a whole, it is advisable to highlight the importance of the biological resources of the Kibira National Park but also the very distinguished traditional knowledge. However, these resources will remain a long time only if they are rationally exploited. Suitable measurements for the maintenance of this usable biodiversity are very important.

As a whole, the activities of biological resources exploitation are undertaken in clandestinity and in illegal way to the Kibira National Park and are considered as infringements. These activities are generally the sawing of the high value trees, carbonization, the firewood cutting, gathering of the medicinal plants, the bamboos overcutting, etc.

However, the NIENC tried to initiate an associative movement of Rwegura around the bamboos exploitation. The members of these associations were not trained in rational exploitation in particular on the selective cutting. Moreover, there are no thorough studies made on a mode of exploitation of the resources to make it possible to know the resources available to a given date and to adopt the needs with the instantaneous potentialities in order to specify the methods of sustainable use.

II.3. MAIN SYSTEMS OF PRODUCTION

II.3.1. Background

A historical approach is essential to appreciate the local changes following the strong population increase and the progressive initiatives which militated towards the creation of the Kibira National Park. The following pages illustrate the evolution of the modes of land occupation since the beginning of the century.

Land occupation since 1910: This period corresponds to the installation of the first farmers in the area. Many pieces of land (under the authority of King Mutaga IV Mbikije who granted them) were still available, and this resulted in the appearance of large herds carried out on an extensive mode. There was no problem of fertility. Times of fallow were sufficiently long (sometimes more than 10 years) and the manure was abundant. In spite of the enclavement, it was a period of prosperity. The main exchanges took place between the families lately installed and Batwa, present a long time ago. The access to the forest was free but only Batwa and the transhumance of dry season in the pastures of the valley of Mpanda represented a pressure on Kibira. At this period, the density of the population could be evaluated with 100 inhabitants by km at that time.

Increasing use of the resources of the Park, 1930: It was the most prosperous period of the area. The only negative aspects came with the colonizer who instaurated a tax and many farming obligations. The manure resources did not diminish because there were still many not grazed pastures in the forest and enough fallow. The population increase caused an increase in exchanges which were done by barter, especially between the Batwa community and other people. The batwa were displaced on the border of the forest. Sons of the first families were installed on old pastures, there was not yet land competition. The old culture of Kiranga left place to the Christendom conveyed by the Belgian

colonizer, but that was difficult in the community of the batwa. During this period, the density went up gradually and was estimated to 200 inhabitants by km².

The density of the population estimated to 300 inhabitants by km² in 1960 became a constraint. The transfer of fertility ensured by the transumance, which owed an overexploitation of the pastures of the Park, allowed the reception of the migrants coming from the South. The heating wood supply was done primarily in Kibira and generally by the Batwas's intermediates. The resources decreased in a fast way but a strong social structuring dominated by the first families ensured a mutual aid and the management of collective attics. The paysants who were in the edge of the forest began to clear. But between 1960 and 1962, the access to the Kibira was gradually prohibited.

Since 1980, the adaptations to the crisis started: The forest whose access was prohibited, was again gradually closed. The number of timberings increased in compensation, either with the initiative of development projects or, more rarely, with private initiatives. The governmental programs for the promotion of the commercial cultures caused tea and coffee plantations' increase. But whereas coffee is lived like a constraint not very productive but at this altitude, tea was planted thereafter on private pieces of land. The closing of the altitude pastures condemned the extensive bovine breeding to the profit of the smaller live-stock. That generated considerable financial as well as moral losses. The compartmental one is much cut out and of many intra-family conflicts appeared. Batwa, expelled of the park, started to feudalize with the important families and to be reduced to poverty progressevement. Many young people then chose the exodus towards other areas of the country. Times of fallow were considerably reduced and the land fertility decreased, with direct consequences on the outputs. The pressures on the park, very important during this period, reflected obvious survival difficulties. But, government prefered to prohibit the resources sample in Kibira. It did not remain whereas very little of choice to the families in difficulty: to rent their labour force, to change activity or to leave.

Since the middle of the 1980 years, many families left the area and tackled other activities (mainly trade). Those which left sold their property in the more or less long term, their grounds at increasingly low prices to the rich families likely to buy them. The great properties tended thus to increase. However, they are these great landowners who had the possibility of providing education for their children and they were less and less numerous to wish to continue to live on agriculture. Moreover, these families generally had a civil servant or a tradesman who granted the survival of those families. They did not consider any more the land as a vital resource and many among them improved their land in particular by planting tea, private timbering, etc).

The density of the population did not cease to increase, 1990: The first installed families continued to increase until exceeding 300 inhabitants by km². Agriculture became very alarming on very morcelled spaces however, and the marshes all were exploited. It is the agriculture which should provide a little income for the family. With the disappearance of the fallow, agriculture continued with a weak agricultural framing. That was at the origin of the land degradation. It was thus necessary to introduce the use of the chemical fertilisers to be able to ensure enough production.

II.3.2. Systems of production in Mutana and Rukoma hills

II.3.2.1. Agriculture

The populations of the Muruta and Matongo communes live primarily of agriculture and the breeding. It is a crossroads of two natural areas, Buyenzi and Mugamba. The locality of Rukoma-Mutana is entirely localised in Mugamba region. The wars disturbed some agricultural activities much and accentuated the organic lack of manure and the seeds.

Food crops

All the food crops cultivated in the natural areas of Buyenzi and Mugamba find there in particular corn, sweet potato, potato, bean, corn, pea, the colocase, the eulesine and the vegetables which are supported by the microclimate of the Natural Forest of Kibira. Among all these cultures, the corn and the corn bring more incomes to the populations and for others, it is especially subsistence farming (fig. 15). According to the information collected by the DPAE, the outputs present themselves as table 12 shows it.

These outputs remain weak for the locality of Rukoma and Mutana owing to the fact that this site with very mountain influence is not favourable for many cultures. But, the corn culture is favourable. The potato is rare because of unaccessibility of the population to this input.

For a long time, cultivating vegetables became a practice in communes of Muruta and Matongo. One finds there all kinds of vegetables (the cabbages, the carrots, let us oignons...). As for the cultivated fruits, one finds the fruits of passion, the plums of Japan, the currants, the cutters... the great share commercial of the Matongo commune is occupied by the vegetables which are sold at the edge of road or transported towards Bujumbura or the other centers of the country.

The locality of Rukoma and Mutana are not rich in marsh, the vegetable cultures are limited to leeks and tomatos. But, it is necessary to note the abundance of fruit of passion (Maracoudja) on the hill of Rukoma.

The family exploitations are too narrow because of the average density of population which is currently of approximately 350 inhabitants /km². The exploitation is estimated at 0,6 ha by household in Rukoma hill and at 0,8 ha in Mutana hill. Area not cultivated and not grazed are rare and is grounds are too abrupt or too stony, not very fertile famous grounds, communal or domanical grounds (generally wooded). The use of chamental fertilisers often nonsuitable on the ground or the cultures by the peasants, with an aim of raising the productivity takes part in the degradation of land.

In all the communes, there is not, for a given manufacturing unit, a stored dominant production but a whole of small productions distributed throughout the year. This system makes it possible as well as possible to use the possibilities of compartmental cut out, it reduces and guarantees more safety vis-a-vis climatic risks.

Table 12: Average outputs of some cultures in Muruta and Matongo communes

Crops	Output in tons /ha	Output in tons /ha estimated in the locality of Rukoma-Mutana	Some prices per kg in August 2006 (FBU)	First season	Second season	Third season
Maize	0,45	0,25	400	+		+
Manioc	5			+	+	
Bean	0,35			+	+	+
Sweet potato	8			+	+	+/-
Potato	10	6	250	+/-	+	+
Banana tree	15			+		
Wheat	0,6	0,6	600		+	
Peas	0,25	0,18	600	+/-		
Colocase	4			+		
Eulesine	0,45			+/-	+	

N.B. :

+ : frequently

+/- : Generally



Fig. 15: Crops dominated by wheat (write one) in Mutana hill

Industrial crops

As the communes of Matongo and Muruta are in the area of Mugamba and Buyenzi, the industrial crops that one finds there is the tea plant on the hills very close to the Kibira in the form of village tea dispersed in the area of other properties carrying of other cultures and the industrial block of the tea complex of Rwegura. On the hills of Rukoma and Mutana, the coffee-trees are less important than the tea plants because a great part of this locality has more characteristics of Mugamba than those of Buyenzi.

The tea culture is supported by the government but primarily intended for exportation. The OTB (Office of the Tea of Burundi) manages the collection and marketing. It has the fields of which it entrusts maintenance to the farmers (these fields are the properties of the OTB and the tea plants cannot be torn off).

Area being calculated according to the manpower available, the peasant supports farming work and it is remunerated according to harvest at a rate of 350 FBU of which 50 FBU are used to pay the manures provided by the OTB.

However, there are farmers who planted their tea plants of which they can lay out freely thanks to the influence of the rise of the prices. On the hills of Rukoma and Mutana, a model peasant has the plantations of tea plants providing him 250.000 FBU per year. But in this locality, the population declares that there are not ten peasants able of them to receive this annual income and that the majority receives approximately 20000 FBU per year. The adaptation of the tea on the poor ground ferralitic aluminiferous and the manure provided by the OTB make it possible to cultivate it in zones inaccessible to other cultures. It thus plays a very important role in the survival of the households.

II.3.2.2. Breeding

The pillaging of the cattle is frequent in Muruta commune because of its proximity with Kibira. Some organizations like FAO, the Action Against Hunger (ACF), Tear Fund, World Vision and the UNDP contributed to the rehabilitation of the domestic animals. The data available to the PDAE Kayanza reflect a current situation illustrated at table 13. The commune of Muruta is a commune where the breeding is almost non-existing. There is a cow for 100 households, a goat for 4 people, a sheep for 10 people, a pig for 5 people, a rabbit for 3 people and a guinea-pig for 2 people (table 13).

The Matongo commune, being riparian to the Kibira, the armed groups reduced remarkably the cattle and repopulation is done timidly. According to the annual report 2000 of DPAE KAYANZA, today there would be in all the commune 8.500 bovines, 12 000 small ruminants, 60 porcine and 14.000 poultries. There is a need of a particular effort to revive this economical sector and manage to reach the level of 1993.

Indeed, in 1993, the commune of Matongo preserved a number of bovines higher than the national average (KRUG, 1993). Two types of control of herds exist:

- large herds: it counts 10 to 30 heads (50 years ago, they counted some from 50 to 400) and are carried out on an extensive mode.

Last century, the herd was released in the pastures in altitude of the valley of Mpanda (currently forming part of the Kibira National park). Cow production was weak with 2 liters of milk per cow)

- herds of more reduced size (3 to 5 heads on average) led on asemi-extensive mode. They were formerly released in the fallow May today, space available is insufficient if we consider the introduction of fodder plants.

Generally, the resources pasture is insufficient (the peasant estimates surface minimum of pasture necessary in dry season for 2 ha per capita) and the bovine breeding disappears with the profit from the smaller live-stock. The situation is very dramatic in all these communes where all the population saw agriculture and where the manure plays a paramount role

The smaller live-stock finds itself in almost all the exploitations but adapted better to the constraints of density of population, the progressive disappearance of pasture and, moreover more easily money paying.

The more rustic caprine is more preferred than the sheep. In this area, the majority of herds of smaller live-stock are still led on a semi-extensive mode in the same way as the small herds of bovines described previously. The breeding of the pig takes also an important place in the production systems. The omnivorous mode of porcine and their prolificity make an appreciated placement of it.

The hens are easily bred everywhere. The rabbit breeding develops and returns in the present tendency of intensification of the modes of breeding.

The bee-keeping is an activity practiced everywhere and it was beforehand a speciality of Batwas. There are two types of traditional hives. The hives drink some whose body consists of a hollow trunk and the hives with basket making (usually the bamboo). The hives are generally placed at height (2-4 m) in the trees. At the time of harvest the bees are smoked out. The bee-keeping does not present a real danger to the forest if it is that the smoking which can cause a fire if the operation is badly carried out. The non use of the smoking out apparatus could avoid such accidents. The administration of the park has undoubtedly the role to play in the improvement of the apiarian techniques because that could represent a significant source of income for the bee-keepers and it is a not very detrimental development of the Kibira. Efforts were already undertaken in this direction by the NIENC but the crisis stopped down the progress.

Table 13: Current situation of breeding in Muruta commune

Type of animals	Effective of Muruta	Effective of Matonga
Bovine	161	827
Caprine	3522	4804
Sheep	1013	846
Porcine	2531	2402
Poultryes	1236	1578
Rabbits	4051	4433
Guinea-pig	7754	25649

* Data of the DPAE Kayanza (2002)

II.3.2.3. Forestry and agroforestry

The Muruta and Matongo communes do not have sufficient timberings. Some communal timberings are deforested and were not reconverted. Those which remain are neither well kept nor intertained. For family timberings, there are feet strewn in the exploitations, more on the hill of Rukoma than that of Mutana (fig. 16). However, the hill of Mutana counts many small family plantations of bamboos whereas that of Rukoma does not count any.

The species often used for timberings is *Eucalyptus*. Also one observes there agroforestral trees very scattered with species like *Grevillea*, *Cedrella* and *Calliandra*. The problem of land remains the factor limiting the development of communal and family timberings.



Fig. 16: *Eucalyptus* timberings in Mutana Hill

II.3.3. Social organization in the production systems

Two types of organization play a role in the systems of production systems. It is the family, considered as hill and manufacturing unit considered as a unit of production. It is of great importance to include these two organisational systems to be able to direct the interventions in a participatory appraisal.

Family like manufacturing unit

For a long time, the social organization was based on the widened family including the large parents (grand father being spiritual authority respected for its age), the children of the great parents and their children. With the death of oldest, the elder son took the chair of the family. This structures supposes an allocation of the quite precise functions: the children are under the orders of women.

Women and the young not-grooms work the fields and occupy themselves of the small craft industry, the married men occupy themselves of the commercial transactions, of the construction of the dwellings and hard work like the farming clearing. The prosperity of the group supposes obviously the increasing occupation of space.

In most of cases, the grand family results in the first populating people who gained great fertile land.

However, the increasing population and the progressive saturation of arable surfaces, of many land conflicts between families but also between the members of each family, cause the distruction of this organization. It then settles simple families, much more and constantly in difficulty because of the scarcity of land.

Great exploitations of grand families become thus little exploitations. The simple family is characterized by the lack of land crisis and family conflicts. This results in population movements. Young people search for incomes in working as craftsmen (sawing, joinery, building) or for local projects or state organisations like OTB or the Kibira National Park. But, these incomes do generally serve to emergent needs, it is not frequent to a peasant exerting commercial or artisanal activity after having kept his money. Other young people leave home to look for a job elsewhere.

At the simple family level, it happens that peasants willing to find solutions to their problems are ready to receive and accept any advice. Generally, they are motivated by directives constantly given by state services like the DPAE. These model peasants who always regret to have left school want their children to go to school. These persons are always remarked while the delivery of the projects and they play the role of sensitizing farming techniques among their neighbors. They are likely to adhere at any intensification suggestion of their production system.

Hill like body of production

The hill gathers families including of the households. It is a social structure on a reduced territorial entity of such a way that the population of the same hill have the same economic and social problems, even mentalities, even habits and are often considered as families with non distant parental relationship. Headed in the past by "chief of the families", the hill is administratively directed by the "Chief of hill". He is elected because he plays a role of model and his initiatives are followed. He regulates conflicts of hill and none the inhabitants under his authority can go in justice without having initially consulted him. In the current state of the democracy, it is essential that chief of hill is elected by the population itself.

In the system of management of the social conflicts, the Chief of hill forms part of Bashingantahe who are the wise ones of Hill called to arrange differences among the population. They are these Bashingantahe who arrange the conflicts related to land, flights and other problems. Let us note that the great social conflicts between the members of the families relate to land.

The hill can then be thought as a company for which the chief of hill would be responsible, his pieces of advices and his directives are followed. The Hill is a manufacturing unit, a door of entry for the development in particular for the organization of local projects. It was noted that several local associative organizations which exist around the Kibira National Park always gather people of the same hill. It is this social organization which the protection of Kibira depend upon.

II.3.4. Local influence of the projects and other interventions

The term "project" gathers, for the local population, the whole of the structures, private or public, which invest funds locally. In area of study, the main interventions are made by OTB, the Kibira National Park, Burundian Association for Birds Protection and DPAE. But, the population deplors the weak interventions of the DPAE.

The OTB plays a role of permanent employer. Indeed, this institution misses manpower to carry out the gathering and is always petitioning. A gatherer is paid for the task, the average incomes are of 350 FBU per day, approximately 10500 FBU per month.

The Kibira National Park uses also a local manpower in the protection activities of the forest. The Rukoma and Mutana hills count two guards born in these localities. But, Batwa people always for claim their participation in the Kibira protection activities.

Burundian Association for Birds Protection initiated activities of the Kibira protection through micro-projects in Rukoma hill. They are breeding and forestry activities aiming at the increase of agricultural production. Let us note that projects consisting in the production systems are non-existing in hills of Rukoma and Mutana. The DPAE should be normally the large picture framer development based on agriculture and the breeding. However, it is observed that for the minimum of made intervention, authorities do not associate the peasants to management decisions. They seek to direct the productions according to more or less theoretical standards. The projects are in fact conceived by framing bodies of the rural communities without this one.

II.3.5. Conclusion on the production systems

Generally, the farming systems were highly struck by the crisis since 1993. The average size of a family exploitation ranged between 0,6 to 0,8 ha.

The increasing population constitutes the main cause of degradation. The land is overexploited; the system of setting in fallow does not exist because the same fields carry each year two successive harvests. The use of chamental fertilisers often non suitable on the soil or the cultures by the local communities, with an aim of raising productivity causes land degradation.

The exiguity of the arable lands and the weak fertility of the hills soil and the disappearance of the pastures impose agriculture promotion combined with the breeding adapted to the current situation.

II.4. WELLBEING OF POPULATION

The protection of Kibira does not suppose only the availability of incomes to raise the standard of livelihood of riparian population, but also refers to the other aspects of life. The participation of the population in the development policy supposes that it has beforehand a good health, and that it is educated for reasoned contributions, that it has a decent housing and that the vulnerable groups are socially and economically supported in order to promote their development.

II.4.1. Education

Primary schools

In all the communes of Muruta and Matongo, all the riparian schools of Kibira were destroyed during the crisis. The commune of Muruta counts 7 school directions and 10 primary schools. The commune of Muruta counts 84 teachers comprising 39 men and 45 women. Manpower of the pupils on the level of the primary school increased much. In 2000-2001, they amount 4651 including 26 Twa. Pupils. The school year 2001-2002 knew an increase in the manpower of children registered in first year, that is to say 1160 schools against 1007 for the preceding school year. The commune of Muruta recorded 4914 schoolboys during the school year 200-2003. The rate of schooling on the level of primary education is estimated at 63,1% and the rate of success of the children who reach the 6th year with 7th is 7%. For the school year of 2005-2006, the ruling from the Chair of free schooling at the primary school allowed to an excessive increase children registered in first year, including Batwa.

The commune of Matongo counts 11 school direction with a current manpower of 11.390 pupils. The success at the school with the national course is evolving. From 2000-2001, the common one registered 160 pupils who succeeded to the national test and of 2004-2005, 309 pupils were registered. Whereas the commune of Mutana does not have a school, that of Rukoma has some but in precarious state. There are only 4 buildings lodging 6 classes. That wants to say that there is an alternation of some classes in only one room. However, it is astonishing that one manages to record 18 pupils who succeed with the national test notably for the school year 2004-2005.

Everywhere in all the hills, one notices an increase in the manpower of Batwa which are made register at the beginning of the school year and the progressive abandonment as the year advances. That being related to the poverty of Batwa, children do not have what to eat everyday and prefer to give up school.

Secondary schools

Three communal colleges exist in the commune; that of Muruta, Campazi and Rwegura. The zone of Nkongé does not have a communal college. The didactic material is no available, not laboratory for the communal colleges and teachers do not have housing; what limits their availability. No school of the trades on the level of the commune, the Centers of Vocational training (CFP) of Campazi and Rwegura are more functional.

The commune of Matongo has 4 communal colleges and a teachers's College. There is no secondary school on the level of the riparian zones of the Kibira.

II.4.2. Health

The commune of Muruta has two health centers, the one of Mubuga and Nkongé. Thanks to crisis, one of these centers does function suitably any more, that of Mubuga in Nkongé zone. The problem of availability and accessibility of drugs arises with acuity especially in this period of epidemic malaria.

The commune of Matongo has 3 located centers of health in Matongo, Burarana and Banga. However, all the centers do not have equipment.

In the two communes of Muruta and Matongo, the most frequent diseases are: malaria, bacillar dysentery, diseases of the respiratory tracts, verminosis, diarrhoeal diseases and malnutrition which kills children and adults. The problem of well built latrines arises as well. The lack of center of health near the Kibira forest imposes the Rukoma-Mutana population to go a long distance to see a doctor.

II.4.3. HOUSING

If there had not been crisis, Muruta-Matongo locality was among the communes with a decent habitat. Much destruction took place during the crisis of 1993 and the rebuilding is now difficult because of the incursions of the armed groups. On the level of Mutana and Rukoma hills, there is no grouping of brick-makers because of layers lack of clay. That constitutes one major handicap for the construction of the house with cooked bricks and tiles. In spite of that, one notices that the majority of the houses are built with mud out of bricks and cooked tiles (Fig 17). That made exception of Batwa whose habitats are very rudimentary.



Fig. 17: The majority of the houses are built with mud out of bricks and cooked tiles in Mutana and Rukoma hills

II.4.4. Associative movements

The communes of Matongo and Muruta attend the proliferation of the country organizations. These groupings are organized around breeding, food crops, the seedbeds and especially the manufacture of bricks and tiles. The majority of these groupings are born from the humane support (WFP, FAO, ACF, etc.) because the area was strongly shaken by the crisis. However, on the level of the Mutana and Rukoma hills, associations are few.

An association named DUKINGIRIBIDUKIKIJE supported by the ABO was just born in Rukoma and has as an objective to take part in the protection of the Kibira in collaboration with the staff of the Kibira National Park. Its activities are based on forestry and goats breeding (fig. 18).



Fig. 18: A nursery of fruits plants developed by an environmental association at Rukoma hill

II.4.5. Communal taxes and commercial activities

The commune of Matongo is crossed by only one road: the RN1 commonly named “Northern Corridor”. It has other small practicable transportation roads which are destroyed during the rainy season. On the level of the commercial infrastructures, Matongo commune has two market places, one in Bandaga and another in Kibaya. There are also 4 small centers with small food shops and bars.

The Commune of Matongo gains the receipts through the taxation taken of the cattle in particular by demolition of cattle, the sale of food products, the forest products (trade of the plaits, the boards, the baskets, etc), of the products of the fruit-bearing culture especially maracoudja and the communal plantation of tea.

The Mututa commune is disenclosed by the only road (RN9) through Kayanza towards Cibitoke, but does not have much traffic. The sources of funds of the commune are royalties on the arranged terminals fountains and sources which generally are reallocated in the repair of the various adductions. A household which draws water of a terminal fountain pays a yearly rent of 300 FBU, and the one which exploits an arranged source pays 200 FBU.

Other sources of income are the taxation of the markets (Remera, Rwegura and Mubuga), the small shops, drinks sailing, the charts of sickness insurances, and the barriers drawn up on the roads to control the goods (baskets, plaits, boards, etc).

II.4.6. Conclusion on the population wellbeing

The living conditions of the population of Rukoma-Muruta do not permit a sustainable safeguarding of the Kibira National Park. From the educational point of view, it was noted that many children do not have access to studies. The Batwa children registered at the school ends up giving up and joining their parents at home where they remain poor. That results in believing in a possible increase of misery orchestrated by the increasing non educated population considering only agriculture as the only activity in precarious situation.

The lack of health center worsens an already worrying situation of a population suffering from malnutrition. On the level of the hills of Mutana and Rukoma, the scarceness of wood especially for Batwa and the layers lack of clay constitute one major handicap for the building of the decent housing.

With the crisis of 1993, poverty worsened and the very poor communal receipts cannot be paid any more to supplement the population's. The lack of associative movements show that the population is not highly assisted and is not sensitized for common actions of self-development and do not allow the external interventions.

II.5. SOCIAL GROUPS IN THE RIPARIAN AREA OF THE KIBIRA NATIONAL PARK

This study made it possible to highlight the close connections between the human pressures and the social groups (example: bamboos and Batwa, pastures and stockbreeders, haversting of some resources and women, etc.). These relations evolve and this evolution can be orientated in a precise direction, a better conservation of the Kibira firstly, an improvement of the local conditions then.

The Batwa Communities

On the level of the population, Batwa who is a minority and marginalized social group of Burundi occupies a dominating place in the commune of Muruta. Batwa are not traditionally farmers. It is above all the craftsmen, formerly hunters-gatherers. But nowadays, they depend upon the park which provides the great share of the raw materials needed for their craft industry (fibres and bamboos for basket making, clay for the pottery, medicinal plants, etc) (fig. 19). With the protection of the Kibira National Park, several Batwa families requested asylum from the widened families which still had the land. The traditional reception and Batwa life in community differ deeply from the individualism of the other social groups. That implies advantages (solidarity amongst other things) but also lack of crucial space. If Mutwa is owner, he must accomodate his cousin in difficulty like his family and the received land of the widened family quickly becomes insufficient to lodge everyone. In this case, there is emergency to look other resources and the craft industry with the Kibira National Park products.

All the bamboos sold to the Kayanza town are cut by these Batwa and come from Kibira. The riparian population affirms that without these bamboos, there would always be conflicts between these Batwa and other social groups.



Fig. 19: A big community of Batwa living near Kibira National Park at Mutana hill

Women in the natural resources management

As in all the households of Burundi, women of the locality of Rukoma and Mutana are the first persons in charge of agriculture and breeding thus of the agricultural production. The woman is also responsible for the livelihood of all the household as an educator of the children. It is he who ensures the daily food to the family. However, it was noted that in spite of this important role of the woman, she is almost absent in the decision-making for the orientation of the family economy. The women of Rukoma and Mutana hill gain few incomes to initiate their projects. There do not even exist neither groupings nor female associations.

According to the population of Rukoma-Mutana locality, the daily activities make it possible to arrange him in three groups. Indeed, 75 % of the population are occupied of agriculture, while the remainder i.e. 24,8 % and 0,2% are respectively in the craft industry dominated by Batwa and the work paid for the OTB.

Talking of poverty, the available data, for riparian the Kinyovu sector of the Kibira in Matongo commune, show four categories (table 14). There are the vulnerable ones who are stripped people. They must receive all by free from others even a dress. The Poor wretches are people who do not have land or cattle and who must work for the others in order to have thin wages. The average poor have very narrow grounds and some livestock. When the conditions are hard, they sell the coffee on foot instead of awaiting the selling campaign. The rich persons have coffee and tea plantations. They have cows and their children go easily to school.

The average poor and poor wretches constitute the group who always exploit the Kibira resources and Batwa are arranged among the poor wretches.

Table 14: Manpower of the poor by categories in the sector Kinyovu

Category of the poor	Manpower by Hill			
	Kinyovu	Camizi	Gitwe	Rukoma
- Vulnerable (Abarushwa ruhebwa)	33	49	57	34
- Poor wretches (Abatishoboye)	143	532	348	268
- The average Poor (Abakene)	312		30	
- Rich person (Abishoboye)	82	6		8

Source : (Asbl Twitezimbere, 2002)

II.6. ADMINISTRATIVE STRUCTURE AND LEVEL OF DECENTRALISATION IN RIPARIAN AREA OF THE KIBIRA

Since the establishment of the last elected institutions and in the strict respect of the agreements of Arusha, Burundi obtained a new administrative structure founded on decentralization. This decentralization aims at the responsabilisation of the communes in the development activities. It acts as it were of autonomy of management granted to the commune. Thus, at the communal level, the new structures are built in the following way:

- ***The communal Council***: It is a committee whose members are elected by the population. It supports and controls the communal administrator in all the activities of the commune.
- ***Communal Administrator***: It is the person in charge for the commune having been elected by the communal Council.
- ***Communal Committee of Development Community*** (CCDC): They are the representatives of the populations having the role of mobilization of the population for the development activities.

This new structure on the level of communes plays an important role in the involvement of the population in protection activities. It is the participatory appraisal where the development activities are identified starting from the base to the stakeholders. It is then Development Communal Committee which mobilizes the population for the implementation of the development projects. That new approach is quite different from that used a long time ago in Burundi where the interventions should be identified by the high authorities and then imposed to the population for execution. This old method obviously could not support the promotion of the development and the establishment of wellbeing for the local population.

In the activities of conservation of the Kibira National Park, these institutions at the communal level must play a paramount role as mobilizing the population. Their participation in the protection activities notably sensitizing and environmental education will have an added value and will allow the easy population integration in the environmental protection. The Communal Committee of Development Community can be considered as a range of entry for the Kibira authorities on the population.

II.7. TOURISM

The tourist frequentation in the Kibira National Park was favoured by its panoramic assets, its exceptional and the installation touristic paths, camp-site and the installation of beaconing and interpretation system for the visitors.

It is from year 1990 that one knows tourist promotion in the protected areas from Burundi and for this time the Kibira National Park has cut a place of choice as regards frequentation by tourists, before the Rusizi Natural Reserve however favoured by its proximity of Bujumbura town. The number of visitors listed in the Kibira National Park for 1990 to 1995 is 10.369 (NIENC, 2000). From 1996 to our days, no tourist was recorded because of the crisis which made that Kibira lodges the armed groups.

The commune of Muruta presents its own characteristics compared to the other communes. The most Burundi hydroelectric dam is in this commune. The commune contains also the greatest seed-bearer center for potato inside Kibira; the greatest tea industry of the country (Rwegura) is in this same commune with timberings on the edge of the Park.

Another characteristic is that the zone is disenclosed by the RN9 which crosses Kibira and which connects the centers of Kayanza, Ndora, Mabayi and Cibitoke. The tourist trips are facilitated by this road.

The Office of the Kibira National Park is located in Rwegura zone. This Park contains touristic villas and lodging. However, because of the crisis of 1993, these infrastructures are destroyed. Before the crisis of 1993, this locality was always full of tourists as well as foreigners as national.

The ecotourism itself was done through the various touristic paths starting from the Office of the Rwegura Sector.

On the level of the locality of Rukoma-Mutana, the tourist attractions are tiny, but the tracks to arrive there are practicable. It is thus obvious that tourist promotion can be founded on the sale of the artisanal products. That requires an organization of the craftsmen especially Batwa of Mutana on the manufacture of several bamboos products. One could consider the creation of bamboos industry in the tourist centers of the Bujumbura town.

III. ORIENTATIONS OF THE POPULATION ON THE CONSERVATION OF THE PARK AND SOCIO-ECONOMICAL DEVELOPMENT IN RUKOMA-MUTANA LOCALITY

With an aim of supplementing our information on the zones of study, a participatory appraisal was carried out on Mutana and Rukoma hills. On each hill, 30 representatives of the local communities were targeted and took part to these consultations.

An inventory of the constraints was made by the population guided by the organizer of the Participatory appraisal. The members of the local communities carried out the regrouping and the hierarchisation of the main constraints.

III.1. INVENTORY OF THE CONSTRAINTS

1. Poverty of Batwa at the origin of the exploitation of the bamboos in Kibira,
2. Plundering perpetrated by Batwa once prevented from bamboos cutting in Kibira,
3. Lack of properties for Batwa of Mutana hill,
4. Insufficiency of afforestation,
5. Insecurity in Kibira,
6. Exiguity of the grounds,
7. Insufficiency of firewood,
8. Insufficiency of bamboos plantation,
9. Lack of access to the natural resources of Kibira,
10. Illicit bamboo cutting, the poles and service wood in Kibira,
11. Bush fire in Kibira,
12. Lack of livestock,
13. Lack of breeding seeds
14. Lack of employment,
15. Lack of manure,
16. Bad habitat,
17. Loss of the land fertility,
18. Insufficiency of associations and lack of support for their operation,
19. Insufficiency of manure,
20. Population increase,
21. Lack of grass of mulching
22. Escape of the population following repressive measurements for the exploitation of the biological resources of Kibira.

III.2. RELEASE OF THE MAIN CONSTRAINTS AND THEIR DEMONSTRATION

Among the quoted constraints, their regrouping made it possible to release 8 principal constraints showing the difficulties of the population of this locality for their development and the conservation of the Kibira National Park.

1. Batwa Poverty at the origin of the bamboos exploitation in Kibira,
2. Lack of livestock,
3. Degradation and exiguity of land,
4. Insecurity due to the presence of the armed groups in Kibira,
5. Insufficiency of service wood and firewood,
6. Lack of access to the natural resources of the Kibira,
7. Lack of pasture,

8. Bush fires in the Kibira

1. Batwa Poverty at the origin of the exploitation of the bamboos in Kibira

For the Rukoma-Mutana population, Batwa are confronted to the lack of arable lands which is the cause, mainly of the exploitation of the bamboos in Kibira. The single source of income for Batwa is the bamboos cutting. According to this same population, once that it is prohibited for Batwa to enter in Kibira that would have a serious recovery on the other social groups of the population in particular the agricultural product plundering in the households and the fields. This prohibition can moreover cause the scarcity of the bamboos and the structural timber in the riparian households since Batwa are the principal suppliers of these products.

The extremely low level of instruction of the Batwa populations and the lack of association of self-development accentuates their misery situation having another source of income only the bamboo of Kibira. Consequently, the granting of the permissions to cut bamboos, the granting of properties and the formation of associations of Batwa can help to attenuate their poverty.

2. Lack of livestock

According to the population, this locality was riche in herds of cows before 1993. Following the war, this locality counts fifty only at a rate of 2 on Mutana and 48 on Rukoma. The goats, the pigs, the hens were decimated by the armed groups. That was reflected on agriculture by the loss of fertility of the soil because of the lack of the manure. The population stressed well that several households must collect the manure in the forest.

3. Degradation and exiguity of land

The population of the Rukoma and Mutana hills underlines the erosion of land as being at the origin of the impoverishment of the soil. The bush fires in the Kibira degraded several area and it is risen from it an intense erosion in the cultivated downstream zones. Moreover, the reduction in the livestock also amplified the situation. This population highlights that the demographic pressure also causes the impoverishment of the soil.

For this constraint, the population of this locality recommended the use of the modern farming technics, the breeding of the domestic animals and the family planning before adding that all that is possible with peace recovery. The Administration, the population and the D.P.A.E were challenged for the support with the restoration of fertility.

4. Insecurity due to the presence of the armed groups in the Kibira national Park

The population pointed out that the armed groups being in Kibira create insecurity in the riparian human environment and causes plunderings of the cattle, food, etc. This same population suggested an agreement between the leader of the country and the armed groups for the restoration of peace.

5. Insufficiency of service wood and firewood

Whereas the population of Rukoma hill carries micro-timbering, Mutana hill is very poor. The population must resort to the forest to have service wood and firewood. It was proposed the intensification of the activities of afforestation, the introduction of the agroforestry species. For the bamboo, the population suggested a distribution of the bamboos stool of the forest to cultivate them.

6. Lack access to the natural resources of Kibira National Park

The population of Rukoma and Mutana indeed showed the importance of the natural resources of Kibira in particular the bamboo, a useful product not only for him, but also for all the Burundian people. He then underlined the poverty of Batwa which is at the origin of the bamboos exploitation in the Kibira and that since a long time ago. The population however deplored the fact that the foresters prevent them to collect this resource.

The population proposes that he can be involved in the activities aiming at protecting the Kibira National Park. To reach this goal, the NIENC and the administration must organize the population in the development activities implying the safeguarding of the natural resources of the Kibira National Park.

7. Lack of pasture

Because of the exiguity of land, the population of Rukoma and Mutana do not find any more pasture for their cattle. This same population proposes the introduction of appropriate methods of breeding notably the permanent stalling.

8. Bush fires in Kibira

Following the insecurity prevailing in the Kibira forest the population declared that it is unable for the moment to extinguish fire in Kibira like formerly. Nevertheless, this same population understands their bad consequences effects perfectly resulting from the fire of Kibira especially the erosion which is at the origin of the loss fertility of downstream lands. With this intention, and according to the population, peace recovery is the paramount condition for this constraint eradication.

At the end of this constraints review in the riparian area of Rukoma and Mutana hills, it is released that all the population lives the same constraints, except that Batwa live only the hill of Mutana. It is clear moreover that Batwa strongly require this forest for their survival at once that there are not yet activities of substitution. The inquired population gave a proposal of an action plan to protect the Kibira and to improve his livelihood (Table 15, in appendix 2).

IV. STRATEGIC PLAN FOR THE NATIONAL PARK OF THE KIBIRA CONSERVATION AND THE DEVELOPMENT OF THE POPULATION LIVING ON RUKOMA AND MUTANA HILLS

The strategic plan suggested here is conceived like an action plan for a safeguarding of the Park but also for a development of the riparian population (Table 15, appendix 2). It is a plan which seeks to establish harmony between the population and the Kibira National Park. It is built on the the recommendations made throughout this study and also take into account orientations provided by the population.

IV.1. VISION

The modifications of the practices of the riparian population of the Park must go in the direction of a detachment from of the resources of the forest. The exception must however be reserved for the resources of undeniable interest to which it would be emergent to find substitutes or to adopt a rational exploitation.

A close connection between the Park and the agricultural riparian area was shown. The reduction in the pressures on the Kibira National Park complies with the improvement of the agricultural landscapes. Moreover, one needs a promotion and a framing of the craft industry and the associative movements who are able, in the long term, to intervene actively in a sustainable management of the Park. An integral policy taking into account the vulnerable groups especially Batwa whose life is closely related to the Park is more than necessary.

With regard to the image of the Park in front of the population, progress should encourage a public awareness campaign on the interests of conservation.

The system of decentralization adopted by the government up to the communal level and attributions of the communal council in the management of the development and environmental activities supposes that the support of the commune in the protection of Kibira will be a priority.

The Park administration does not have, currently, financial resources for implementing the dialogue policy with the riparian population. Each one draws on oneself of the forest products and the resources of the Park decrease constantly. It is very emergent that there is a framework of collaboration between all the stakeholders.

It is obvious that more the Park will be preserved, therefore biologically rich, more the resources will be important and sustainable, more they will be economically interesting. The riparian population must be associated to the management of these resources and profit from the economical repercussions of their increase.

Accordingly, we propose strategies of alternatives to the ways of life and supporting mechanisms in order to encourage the local communities to change practices which endanger Biodiversity of Kibira National Park.

IV.2. PRIORITY STRATEGIC AXES AND ACTIONS

The strategic axes formulated here are to some extent priority solutions for the promotion of the socio-economical and cultural conditions of the riparian populations of the Kibira National Park. Thus, the strategic axes selected are:

- Rational exploitation of the biological resources of the Kibira National Park;
- Improvement of the productivity of the arable land in riparian area of the Park;
- Promotion of a sustainable and ecologically rational development in the area surrounding the Park in order to reinforce its protection and to attenuate the conflicts resulting from resources use;
- Involvement of all the stakeholders in the conservation of Kibira;
- Reinforcement of the administrative system capacities of the Kibira National Park for an effective protection of the Park.

The strategic axes have been used to do the action plan to protect Kibira and to improve the way of living of population (Table 16).

Table 16: proposal of an action plan for protecting the Kibira National Park and improving the population well-being

Strategic Axes	Solutions	Activities	Indicators of performance	Responsible
- Rational exploitation of the biological resources of the Kibira National Park	- Improvement of the easy access to the biological resources of the Kibira National Park in manner that there is a sustainable use	- To revise the rules access of the resources (medicinal plants, wood collecting, collects food plants, cuts bamboos, etc.) so as to prevent degradations related to the easy clandestine access	Access to the resources regulated	NIENC, Funding organisms, civil society
	- Protection and encouragement of the traditional use of the biological resources compatible with the requirements of their conservation and their sustainable use	- To work out plans of based onrational use on an adequacy between the capacity of renewal of the resources and their taking away	- a plan of use for each resource is available	NIENC, Funding organisms, civil society, Population
		- To encourage the traditional activities supporting the conservation of the biological resources (Bee-keeping, medicinal plants, basket making, etc.)	- the number of the biological resources in exploitation on the basis of plan of use	NIENC, Funding organisms, civil society, Population
	- Identification of the practices likely to mitigate the consequences of the use of firewood over the forest resources	- To popularize and diffuse the hearths improved in the riparian households of Kibira	- Number improved hearths of use in the riparian households of Kibira	NIENC, Funding organisms, civil society, Population
		- To popularize the culture of the bamboos by the riparian population	- the number of households having a plantation of bamboos	NIENC, Population
- Improvement of the productivity of the arable land in riparian of the Park	- Promotion of breeding adapted to agriculture	- To increase the manure by the introduction of the smaller live-stock into the riparian households of the Park	- Quantities of produced harvests - the number of introduced livestock	- NIENC, Funding organisms, civil society, Population, D.P.A.E
		- To encourage the practice of breeding by permanent stalling	- the number of households raising by permenante stalling - Reduction in case of pasture in forêt	- NIENC, Funding organisms, civil society, Population, D.P.A.E
	- Promotion of private timberings	- To encourage and sensitize the population to retimber the land	- Number of timberings available	- NIENC, Funding organisms, civil society, Population, D.P.A.E
	- Popularization of the farming techniques of exploitation of small land	- To introduce agroforestry plants	numbers of produced and diffused agroforestry plants	- DPAAE, Funding organisms, civil society, Population, NIENC
		- To install the level lines and the antierosives hedges	- the number of ha of the arable lands carrying the antiérosives hedges	- DPAAE, Funding organisms, civil society, Population, NIENC
	- Popularization of the methods of birth-control	- To teach the family planning on the level of the households	- Reduction in the density of the population	Health sector, social organizers, population

Strategic axes	Solutions	activities	Indicators of performance	Responsible
Promotion of a sustainable and ecologically rational development in the area surrounding the Park in order to reinforce its protection and to attenuate the conflicts resulting from resources use	- Improvement of the living conditions of Batwa	- To set up an organisational system around the Batwa community for a controlled exploitation of bamboos in Kibira	income received by Batwa	- NIENC, Funding organisms, civil society, Batwa
		- To support the school fees and other school materials for Batwa	the number of Batwa children in schooling	- NIENC, Funding organisms, civil society, Batwa
		- To form and inform Batwa on the existence of the laws governing the protected areas	the number of meetings and workshops of formation for Batwa	- NIENC, Funding organisms, civil society, Batwa
		- To sensitize Batwa to develop their trade of pottery and to embrace other trades and to work in association	- the number of association of Batwa, - types of trades embraced by Batwa	- NIENC, Funding organisms, civil society, Batwa
		- To give employment to Batwa like foresters in the Kibira National Park	the number of Batwa engaged like foresters	- NIENC, Funding organisms
	- Identification of the alternative activities to the vulnerable resources of the Park	- To develop activities of breeding of the smaller live-stock for the groupings and associations of the women	the number of associations or grouping of women - stockbreeders - the number and the type of small stock cattle	- NIENC, Funding organisms, civil society, Batwa
		- To frame Batwa with the modernization of their activity of pottery	- modern types of products manufactured by Batwa	- NIENC, Funding organisms, civil society, Batwa
		- To develop tourism goshawks of the artisanal activities	the number of recorded visitors	- NIENC, Funding organisms, civil society, Batwa

Strategic axes	Solutions	Actions to carry	Indicators of performance	Responsible
Integration of all the stakeholders in the conservation of Kibira	- Popularization of the legal texts governing the Kibira National Park	- To organize meetings of popularization of all the legal texts concerning the Park conservation	- the number of organized meetings - the rate of reduction in the infringements made in the park	- NIENC, civil society, Administration
	- Education and sensitizing for the safeguarding of the Kibira National Park	- To organize meetings and formations of the population and the other stakeholders on the importance of the safeguarding of the Park	- the number of organized meetings - the rate of reduction in the infringements made in the park	- NIENC, civil society, Administration
		- To promote collaboration between the administrative authorities, the environment police force and personnel of the Park through regular meetings	- Activities jointly made	- NIENC, civil society, Administration, Police force of the environment
	Responsibilisation of the population in the monitoring of the Park	- Set up local committees of Kibira protection and involve them in the monitoring activities	- Names of the members of the committees - Number of seizures operated by the committees	- NIENC, Funding organisms, civil society, Population, administration
Reinforcement of the administrative system's capacities of the Park for its effective protection	- Reinforcement of the monitoring by the increase in the personnel of survey	- To increase the manpower of survey	- the rate of increase in the body of guards	NIENC, Funding organisms
		- To train the personnel of the Park on the participatory appraisal and the rural animation techniques	- the number of formation and the number of participants - the number of rural animation made by the agents of the Park	- NIENC, civil society
	- Management of the park on the basis of reliable data	- To work out a management plan of the Kibira National Park	- a management plan and elaborate installation	NIENC, Population
	- Development of the ecotourism to the Kibira National Park	- To rehabilitate the touristic infrastructures of the Park	- tourist Infrastructures rehabilitated - the rate of increase in the number of visitors	- NIENC, Funding organisms, civil society, Population, administration

IV.3. IMPLIMENTATION MECHANISM OF THE ACTIONS SUGGESTED

The present study is a step to reinforce the protection of the Kibira National Park by the reduction of the conflicts with the riparian population. It is an ecosystemic approach aiming at improving the riparian human environment of Kibira and finally at integrating the riparian populations in the conservation activities. Thus, 4 main complementary strategic orientations are followed to make objective be a success:

- Elaboration of integrating policy and a program of sensitizing and environmental education;
- Follow-up of the guideline for a controlled exploitation of the biological resources;
- Involvement of the population in the activities of Kibira National Park protection through a Program "Peripheral Zone";
- Participatory appraisal in the agricultural production improvement.

IV.3.1. Elaboration of an integrating policy of sensitizing and environmental education programm

One records in the Kibira National Park a weak sensitizing of the population on the threats weighing on the wild biodiversity. There is a lack of a suitable education as regards the guarding and the attenuation of the threats observed. There is a need for a system of information and communication between the stakeholders. The population must be informed on the laws governing the Park.

In addition, the NIENC must set up mechanisms which permit to associate and responsabilise the local communities. The collaboration between the various institutions involved in the protection and the conservation of the protected areas is to be improved.

Sensitizing must have three objectives:

- To persure the ecological interests of the conservation, as well as erosion or hydrological regulation;
- To obtain a moral appropriation of the Park by the populations. The population must be responsible for its safeguarding;
- To revalorize the image of the administration of the Park. This could be obtained only if the personnel of the Park especially foresters adopt the participatory appraisal in discredit of the police method a long time applied to the population.

That also supposes a formation of this body of foresters on the new techniques of population involvement in the conservation activities.

IV.3.2. Follow-up of guideline for a controlled exploitation of the biological resources of the Kibira National Park

The suitable way to set up a system of rational management of the natural resources is to intervene on the level of the hill as a management unit. Indeed, it appears in this study that the hill is the broadest space unit in which one finds the feeling of membership. The chief of hill is generally respected and he is ready to be responsible for a natural inheritance. A technical support and a control of the good management could be carried out by Park personnel who work in narrow partnership with the chiefs of hills. That will permit to develop this social structure and to benefit from traditional knowledge of the population concerning the vegetation and its uses.

To be able to set up coherent and effective actions of rational management of the Kibira National Park resources, some stages must be respected:

- Creation beforehand a committee of the Kibira protection on the level of the hill whose members, elected by the population, become direct interlocutors of the Park authorities and the local administration.

- Identification of the needs of the populations on the level of the resources, whatever they are. The more important one need is, the more the action could be effective if the response to this need is coherent with the constraints and the local systems of production.

For the precise case of the bamboo cutting and manufacture of the adhesive past with *Symphonia globulifera* Park, the needs for the populations notably Batwa are initially to have a financial independence, the answer being to develop, by marketing, their artisanal products.

- Determination of the main pressure exerted by these same populations on the Park.

Always for the bamboo and the traditional adhesive paste, the main pressures are respectively the excessive cut of the bamboo and the hulling of the trees.

- Dialogue with the populations to find solutions on their problems in exchange for a sustainable management for the resource used in the Park.

It will be necessary in this case to negotiate with the Batwa community and other communities involved in the trade, the manufacture of the artisanal products, etc. to propose to them for example the creation of bamboo eco-tourism system which the park, allowing the rise of the prices of their artisanal products in exchange of the respect of a sustainable bamboos exploitation mode proposed by the park and controlled by the park personnel, leaders of the communities and the protection committees.

- Ceation of a framework of collaboration probably around a contract under the direction of the National park and determination of the code of conduct and the alarm system in the event of going beyond the limits of the contract

- Permanant control of the respect of the contract; this will allow the reduction of the survey service and the Park personnel trained could regularly check the bamboos vegetation evolution and advises for their exploitation.

- Assignment of the incomes obtained by products exploited to set up a system of self-financing of the Park and communities living in the "peripheral zone".

These stages must imperatively be carried out in close partnership with the concerned populations. And not only as executors but especially as decision makers. This obligation rests on the principle which the peasant knows always better than whoever what it needs. Admittedly, it will be ready to make sacrifices only for one thing which it claimed itself and to which he fully adheres at.

IV.3.3. Population involvement in the Kibira protection activities through the "Peripheral Zone" programm

To involve the population in the Park management, it is necessary beforehand to set up a program "Peripheral Zone" from which will profit the riparian populations to which the administration of the Park will have an active share, through personnel, qualified, motivated, available, trained to the analysis of the dynamic system. The creation of this Peripheral Zone is essential given because that the Kibira National Park does not have a buffer zone. The Peripheral Zone should not thus be considered as a buffer zone.

The geographical definition of the zone of influence is essential before the begining of projects. Indeed, the term "peripheral zone" is defined as a unit of regional planning in which the State seeks to encourage, by a negotiated process, a sustainable exploitation of natural resources.

Suitable practices of resources exploitation must reach, in the relatively short term, an autonomous operation of the “Peripheral zone” towards the National Park. The populations would be detached from the resources of the Park whatever they are. It must correspond to the zone occupied by the populations which exploit direct the resources of the forest. It is not a question to make a stopping of the close populations vis-a-vis to distant populations but dependent on these resources, nor to include the populations which are not directly users. The ideal zone would be the whole of the hills located at less than one half an hour of walk around the current administrative limits because that seems the maximum covered by the women to go to seek firewood, product everywhere more used and that support on precise management units.

It is thus in this zone that the administration of the Park will play a major role of intervention for reconciling the vital needs for the populations with the safeguarding of the Kibira and that it must adopt a dynamic system which allow a sustainable development, an improvement of the living conditions and pressure reduction on the Park, thus a development which can not consider the Park resources exploitation or which is based on resources exploitation but in a sustainable way.

IV.3.4. Participatory appraisal in the agricultural production improvement

With regard to the improvement of the agricultural modes of production, it is judicious to establish beforehand a framework of collaboration between the official services and the civil society having the mission of framing the population and of popularizing appropriate techniques. The Park will be able to play a role by transmitting the request of the farmers. But, the personnel of the Park cannot be limited to a letter box role. They must be involved in development actions and fields in relation to stock management of the park in particular the framing of local associations in bee-keeping, agroforestry, microphone-forestry, breeding, etc.

IV.4. MONITORING AND EVALUATION INDICATORS

The impacts of the actions suggested in this study will be analyzed and evaluated on the following:

- **Strategy** by the creation of favourable conditions for the Kibira National Park safeguarding;
- **Appropriation** of the conservation activities by all the stakeholders, including Batwa and the women;
- **Durability** of the Kibira National Park conservation and the development of the riparian human environment;
- **Set of themes**: including:
 - Rational exploitation of the biological resources of the Kibira National Park;
 - Improvement of the productivity of the arable land in the riparian area of the Park;
 - Improvement of a sustainable and ecologically rational development in the area surrounding the Park in order to reinforce its protection and to attenuate the conflicts resulting from resources use;
 - Integration of all the stakeholders in the conservation of Kibira;
 - Reinforcement of the administrative system’s capacities of the Kibira National Park for an effective protection.

On each one of these levels, the objectively verifiable indicators of impact are notably:

At the strategic level:

- Conscious and active population in the Kibira National Park protection;
- A framework of consultation and dialogue concerning the biological resources exploitation;
- A Peripheral Zone delimited and functional;

- Participation of all the population of the peripheral zone in the activities aiming at the improvement of the agricultural production.

With regard to **the appropriation of the results of the project**, it is necessary to note the various levels of various groups responsabilisation.

On the level of *durability*, one will be able to evaluate the *effectiveness* of the operation of the personnel of the Park and the other stakeholders, as well as the level of the riparian population development.

With regard to the aspects *sets of themes*, the evaluation of the impacts will be referred to all the subjects of the action plan. This evaluation will include an analysis of the progress made as regards:

- *Rational Exploitation of the biological resources of the Kibira National Park with indicators like:* Population or social groups having easy access to the resources and texts regulating the easy access available; The resources use plans; the number of the biological resources in exploitation on the basis of use plan; the number of diffused improved hearths, the number of households having a bamboos timberings; etc.

- *Improvement of the productivity of the agricultural grounds in the riparian area of the Park whose indicators can be:* quantities of produced harvests, the number of introduced livestock, the number of households raising by permanent stalling, reduction in case of pasture in forest, the number of timberings available, the number of seedlings produced and diffused agroforestry, the number of ha of the arable lands carrying the vegetative contour hedges, the rate of reduction in the density of the population, etc.

- *Improvement of a sustainable and ecologically rational development in the area surrounding the Park in order to reinforce its protection and to attenuate the conflicts of resources use with indicators like:* income received by Batwa, the number of Batwa children attending school, the number of meetings and formation workshops of Batwa, the number of Batwa associations, the types of trades embraced by Batwa, the number of Batwa engaged like guards foresters, the number of associations or grouping of women stockbreeders, the number and the type of small stock cattle, the modern types of products manufactured by Batwa, the number of recorded visitors.

- *All the stakeholders integration in the Kibira National Park conservation. The indicators are notably:* the number of organized meetings, the rate of reduction in the infringements made in the park, the number of organized meetings, activities made jointly run, names of the members of the committees, the number of seizures operated by the committees.

- *Reinforcement of the administrative system capacities of the Park for an effective protection of the Park with indicators like:* the rate of increase in the body of foresters, the number of formation workshops and the number of participants, the number of rural animation meetings made by the Park personnel, a management plan and worked out installation, the touristic infrastructures rehabilitated, the rate of increase in the number of visitors.

CONCLUSION

The riparian area of the Kibira National Park is overpopulated and several anthropic activities proceed there. The local communities sample various products in this protected area. These pressures correspond to the needs whose substitutes can be found there in order to ensure a sustainable management.

The various information presented in this study should allow progressive creation and negotiated relations between the riparian communities and the administration of the park, taking into account the logic of the production systems and the modes of exploitation of the local populations as regards space and natural resources, notably the biological resources of the park, in order to ensure of it a sustainable use while preserving these resources.

If these measures are adopted, the Kibira National park should quickly become richness at the national level as well as at the local level.

BIBLIOGRAPHY

1. **ARBONIER M., (1996)** : Parc National de la Kibira. Plan de gestion, NIENC, CIRAD-FORET, 56 p.
2. **Asbl Twitezimbere, (2002)**- Diagnostic Participatif en Province de Kayanza : synthèse des rapports communaux
3. **CHRETIEN, J.P. (1977)** - Les deux visages du clam. Points de vue français du XIX^e siècle sur les races africaines d'après l'exemple de l'Afrique Orientale, Paris, P. 182.
4. **DEPARTEMENT DE LA POPULATION, (1990)** : Résultats définitifs du recensement du mois d'Août.
5. **GOURLET S. (1986)**- Le Parc National de la Kibira au Burundi. Quelles potentialités pour avenir ? GREF, Rapport de stage.
6. **IGEBU, (1986 – 2001)** : Données climatologiques
7. **NIENC, (1988)** : Etude du massif forestier de la Kibira. Ed. Sc.Agr. Paris, 28 p.
8. **NIENC, (1992)** : Plan de gestion de Parc National de la Kibira. Ed. Sc .Agr. Paris, 90 p.
9. **KRUG O., (1993)** : Etude des systèmes de production et des systèmes agraires de trois communes riveraines du Parc National de la Kibira : proposition en vue d'une réduction des conflits. Mémoire de DSPV Formation Supérieure Tropicale du CIHEAM, NIENC, 71 p.
10. **LEWALLE J., (1972)** : Les étages de végétation du Burundi occidental. Bull. Jard. Bot. Nat. de Belgique, 247 p.
11. **NDIKUMAKO, (2000)** – Analyse de la biodiversité animale et identification des priorités pour sa conservation . Rapport du Pojet PNUD/GEF/ BDI/98/G31, Bujumbura.
12. **NZIGIDAMERA, B. (2000)** - Analyse de la biodiversité végétale nationale et identification des priorités pour sa conservation. PNUD/GEF/ BDI/98/G31, Bujumbura. 127p
13. **MINATTE, (2000)** – Stratégie Nationale et Plan d'Action en matière de Diversité Biologique. Rapport du Pojet PNUD/GEF/ BDI/98/G31, Bujumbura.
14. **MWOROHA, E. (1987)** - Histoire du Burundi des origines à la fin du XIX^e siècle, Paris, P. 116.
15. **MWOROHA E. (1977)** - Peuples et Rois des Pays des Grands-Lacs, Dakar, P. 145.

APPENDIX

Appendix 1 :

Table 1: Endemic flora species (Lewalle, 1972 ; Ndabaneze, 1983 ; Arbonnier et Greerinck, 1993)

Familles	Espèces	Familles	Espèces
Acanthaceae	<i>Anisesepalum lewalli</i>	Orchidaceae	<i>Habenaria myodes</i>
	<i>Isoglossa runssorica</i>		<i>Cynois symoensii</i>
Apiaceae	<i>Peucedanum runssoricum</i>		<i>Diaphananthe alfredi</i>
Asteraceae	<i>Vernonia ischnophylla</i>		<i>Diaphananthe arbonnieri</i>
Caryophyllaceae	<i>Uebelinia kivuensis</i>		<i>Polystachya maculata</i>
Clusiaceae	<i>Harungana montana</i>		<i>Polystachya virginea</i> var. <i>parva</i>
	<i>Pendadesma reyndersii</i>		<i>Polystachya stauroglossa alata</i>
Cyperaceae	<i>Carex ramosipes</i>	Rosaceae	<i>Hirtella montana</i>
Euphorbiaceae	<i>Macaranga neomilbraediana</i>	Rubiaceae	<i>Ixora burundensis</i>
Fabaceae	<i>Humularia meyeri-johannis</i>		<i>Mericocalyx devredianus</i>
	<i>Lotus becquetii</i>		<i>Mericocalyx lebrunianus</i>
	<i>cleomifolia</i> var. <i>kassneri</i>		<i>Otiophora rupicola</i>
	<i>Crotalaria andromedifolia</i>		<i>Pauridiantha butagnensis</i>
	<i>Eriosema scioanum</i>		<i>Pavetta scaethae</i>
	<i>Erythrina orophila</i>		<i>Pseudosabicea arborea bequaertii</i>
Gentianaceae	<i>Faroa acuminata</i>		<i>Psychotria bugoyensis</i>
Gesneriaceae	<i>Streptocarpus burundianus</i>		<i>Psychotria chalconeura</i> var. <i>montana</i>
Lamiaceae	<i>Leucas urundensis</i>		<i>Rytigynia kivuensis</i>
	<i>Plectranthastrus clerodendroides</i>		<i>Rytigynia lebrunii</i>
	<i>Pycnostachys rwandensis</i>	Rutaceae	<i>Orica renieri</i>
Lobeliaceae	<i>Lobelia mildbraedii</i>		<i>Vepris orophila</i>
	<i>Lobelia minutula</i> ssp. <i>rugensis</i>	Santalaceae	<i>Thesium passerinoides</i>
Loranthaceae	<i>Phragmenthera rufescens</i> ssp. <i>usuensis</i>		<i>Thesium urundiensis</i>
	<i>Tapinanthus brunneus</i> ssp. <i>krausei</i>	Scrophulariaceae	<i>Buchnera keilii</i>
Lantibulariaceae	<i>Utricularia troupinii</i>		<i>Thunbergianthus ruwenzoriensis</i>
Melastomataceae	<i>Dissotis alata</i>	Theaceae	<i>Balthasaria schliebenii</i> var. <i>intermedia</i>
	<i>Dissotis rwandensis</i>	Turneraceae	<i>Stapfiella lucida</i>
	<i>Gravesiella speciosa</i> var. <i>grandiflora</i>	Xyridaceae	<i>Xyris ochracea</i>
Moraceae	<i>Ficus acuta</i>		<i>Xyris turbinata</i>
	<i>Ficus oreodryadum</i>		
Myrsinaceae	<i>Embelia libeniana</i>		

Appendix 2:

Table 15: Action plan suggested by the population of Rukoma and Mutana to improve their way of life and the Conservation of the Kibira National Park

Constraints	Causes	Solutions	Activities	Intervening	
				Local	Others
1. Poverty of Batwa at the origin of the exploitation of the bamboos in Kibira	- Lack of the properties for Batwa	- Granting of properties to Batwa	- To identify and grant properties in the fields of the State - To build the houses for Batwa - To sensitize Batwa to prevent them from selling the received properties - To give to Batwa agricultural inputs	- Local government - Population, Administration - Population, Administration - D.P.A.E, Administration	- Funding organisms - Funding organisms
	- Marginalisation of Batwa influenced by their habit of insulation	- Inciting Batwa to attend school	- To support school fees other school materials for Batwa - To form and inform Batwa on the existence of the laws governing the park - To sensitize Batwa to develop their trade of pottery and to embrace other trades - To sensitize Batwa to work in association	- Population, ABatwa - Population, administration, ABatwa - Population, administration, ABatwa	
	- Dependence of the only forest resources	- Organization of Batwa for the controlled exploitation of the bamboos in Kibira	- To organize and support Batwa to work in association to exploit the bamboos	- Batwa, foresters of Kibira	
2. Miss livestock	- Insecurity following the war	- Negotiation between the political authorities and the rebels	- To negotiate with the last rebellious group - To reinforce peace recovery for all	- Military, government Authorities - Soldiers, government	international Opinion
	- Lack of pasture	- Improvement of the breeding by permanent stalling	- To organize and support associations and groupings of breeders - To form and support the population on the breeding by permanent stalling	- NIENC, DPAAE	

Constraints	Causes	Solutions	Activities	Intervening	
				Local	Others
3. Land degradation	- Lack of the manure	- Promotion of the breeding adapted to agriculture	- To adapt the breeding to agriculture - To introduce agroforestry plants and fodder	- Population, D.P.A.E - Population	- Funding organisms
		- Prohibition of burn cultivation	- To sensitize the populations to give up burn cultivation	- Population, NIENC , DPAE	
	- Lack of timberings	- Encouragement of private afforestation	- To encourage and sensitize the population to retimber their land	-Population, D.P.A.E	
	- Exiguity of the arable land	- Popularization of the farming techniques of exploitation of small land	- To introduce agroforestry species and vegetative contour hedge - To sensitize the populations to give up burn cultivation	- D.P.A.E, NIENC	- Funding organisms
	- Overpopulation	- Sensitizing and popularization of the methods of birth-control	- To teach the family planning on the level of the households - To take part in meetings of the family planning	- Health sector, organizers social -Population	
4. Insecurity due to the presence of the armed groups in Kibira,	- No peace recory	- Negotiation between the political authorities and the rebels	- To negotiate with the last rebellious group - To reinforce safety for all	- Authorities political, Military, government	- Groups armed
5. Insufficiency of service and firewood	- Lack of timbering	- Encouragement of the private micro-timberings	- To produce and distribute the seedlings of the foresty species to the riparian population - To distribute the bamboos stocks to the farmers	- NIENC, MINTATET, Administration	- Funding organisms

Constraints	Causes	Solutions	activities	Intervening	
				Local	Others
6. Lack of pasture	- Exiguity of land	- Promotion of the breeding by permanent stalling	- To organize and support associations and groupings of breeding - To train and support the population on the breeding of permanent stalling		
7. Lack of access to the natural resources of the Kibira,	- No involvement of population in protection activities	- A framework of dialogue of the population in the activities aiming at protecting Kibira	- To imply the population in the safeguarding of the Kibira natural resources	-NIENC, administration	
8. Bush fires in Kibira	- Presence of the rebellious groups in Kibira	- Negotiation between the political authorities and the rebels	<i>See constraint 4</i>		
	- Fires caused by the bee-keeping	- Identification of a site suitable and known for the bee-keeping in Kibira	- To identify and practise the bee-keeping in a known place and supervised in Kibira - To form groupings of bee-keepers	- Bee-keepers, guards of Kibira - model Bee-keepers of Kibira, foresters	
	- Fires caused by the cattle breeding	- Prohibition of breeding cattle in Kibira	- To prohibit the cattle breeding in Kibira	- tockbreeders, foresters, administration	
	- criminal Fires	- Participation of population in the extinction of fire	- To cultivate the spirit of mutual help in the populations to extinguish fires in Kibira	- Population, foresters, administration	

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ABO	: Burundian Association for the Protection of Birds
ACF	: Action Against Hunger
CC	: communal Council
CCDC	: Communal Committee of Development Community
CFP	: Centers of Vocational training
FAO	: Food and Alimentation Organization
GEF	: Global Environment Facility
IGEBU	: Geographic Institute of Burundi
MINATTE	: Ministry of Land Management, Tourism and Environment
NIENC	: National Institute for Environment and Nature Conservation
OTB	: Office of the Tea of Burundi
PA	: Protected Area
PDAE	: Provincial Direction of Agriculture and Breeding
UNDP	: United Nations of Development Program
UNOPS	: United Nations Office for Project Services
WFP	: World Food Program
GDP	
ISTEEBU	: Institut des Statistiques et d'Etudes Economiques du Burundi
IMF	: International Monetary Funds
FRPC	: Facility of Reduction of Poverty and Growth
METT	: Management Effectiveness Tracking Tool
IUCN	: World Conservation Union
RAPPAM	
WWF	: World Wide Fund for Nature
PES	
ODEB	Office de Défense de l'Environnement au Burundi
Enviroprotec	Environnemental Protection Association
AFEB	: Women and Environment Association
UE	: European Union
NBI	: Nile Basin Initiative
MINAGRI	: Ministry of Agriculture
NGO	: Non Governmental Organization
CBD	: Convention of Biological Diversity
CHM	: Clearing House Mechanism
SPNA-DB	: National Strategy and Action plan on Biological Diversity
ANCR	: Project of Self-assessment of the Capacities in Reinforcement for the global environment
UNFCCC	: United Nations Framework Convention on Climate Change
CCD	: Convention on Combat Desertification
IDA	: International Development Association
PRASAB	: Project and Sustainable Land Management
PMG	: Project Management Group
PMU	: Project Management Unit
CSLP	: Cadre Stratégique de Croissance et de Lutte contre la Pauvreté
PIB	: Produit Intérieur Brut
NEPAD	: Nouveau Partenariat pour le Développement
REGIDESO	: Régie de production et de distribution d'eau et d'électricité

SIDA	: Syndrome de l' Immuno Déficience Acquise
SP/REFES	: Secrétariat Permanent de suivi des Réformes Economiques et Sociale