

Local livelihoods and protected area conservation in Rwanda: A case study of Akagera National Park.

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Abstract: This study aims at investigating the local people's perceptions towards the conservation of Akagera National Park located in East of Rwanda. Due to different human activities such as cultivation, overgrazing and hunting, there is a conflict of interest between local livelihoods and conservation of the park. This study provides an insight into understanding the socioeconomic factors around the park and how they relate to its conservation. It also establishes a basis for decision-making in its management. Data was collected using a questionnaire survey in the villages neighboring the park. In total, 75 household heads were randomly selected and interviewed about the conservation of the park, its resource exploitation and the local people's socioeconomic conditions. Data has been analyzed using Descriptive Statistics and Logistic Regression Analysis. The inter method results suggest that the household size, the total livestock income and the age have a positive relationship with the forest resource dependency. The land scarcity, the crop raiding are statistically significant ($p < 0.05$) and have a positive relationship with the conservation attitude whereas the variables age, primary and secondary education, residency length and food insufficiency have a negative attitude towards conservation. We suggest that the government should keep on emphasizing the conservation of the park by taking into account the improvement of local people's welfare and providing the financial support to agricultural and livestock projects in the area. [Journal of American Science 2009; 5(4):171-178]. (ISSN: 1545-1003)

Key words: Local livelihoods, socioeconomic factors, forest resource dependency, conservation attitudes, Akagera National Park, Rwanda.

INTRODUCTION

While biodiversity conservation in Africa is complex (Vogel 2001), the Rwandan situation is even more complex because of the growing population pressure, rural poverty and land limited resources (Masozera 2002). Rwanda with a total surface of 26 338 sq. km, has approximately 8.4% of its land under protected areas (Figure 1). They include:

- 1) The Nyungwe Forest Reserve (970 sq. km) in the Southwest, which is the largest remaining lower mountain forest in Africa;
- 2) The Volcanoes National Park (425 sq. km) in the northern part, which harbors highly-endangered biota, including mountain gorillas and golden monkeys; and
- 3) The Akagera National Park in the East (900 sq. km), which is a complex of savanna and wetland that provide habitat for a diverse fauna, including nearly 600 species of birds (Rutagarama and Martin 2006). This park has suffered more than

others because of the conflict of interest between local livelihoods and conservation. An aerial survey of the park showed that between 1994 and 2002, wildlife declined by 50–80% due to human activities, including cultivation, pastoralism and hunting (Kanyamibwa 1998). The same author mentioned that in the last few years, additional pressures have been created by the settlement of people and cattle through the Ministry of Lands, Resettlement and Environmental Protection. The government has had to consider degazetting the entire park and it has maintained only 90 000 of the 245 000 ha originally gazetted (Masozera 2002). Since 1999, support for managing this threatened protected area has come from the German aid agency GTZ, through their project 'Protection des Ressources Naturelles'. However, this project faces complex problems and results to date have been mixed because the demand for land and grazing, together with conflicts between wildlife and

agriculture, continue to undermine conservation efforts (Kanyamibwa 1998). This study aims at investigating local community's perceptions on the conservation of Akagera National Park taking into account the economic and social status of the local people. Specific objectives are: To identify the socioeconomic factors determining Akagera National Park dependency and to assess local people's attitudes towards its Rwanda's protected area network currently covers 8.4% of the total land area of 26 338 sq. km. The Akagera National Park covers 900 sq. km of wetland and savanna habitats and has one of the most diverse avifauna of the African continent, with about 600 bird species recorded

conservation. On the completion of this study, the following questions will have been answered: Is there any forest resource dependency by the communities living around Akagera National Park? Do the human activities around Akagera National Park affect negatively its conservation?

MATERIALS AND METHODS

(Rutagarama and Martin 2006). This research was conducted during the summer 2008 in villages neighboring Akagera National Park namely Karangazi (north west of the park), Rugarama (west) and Rwinkwavu (south west).

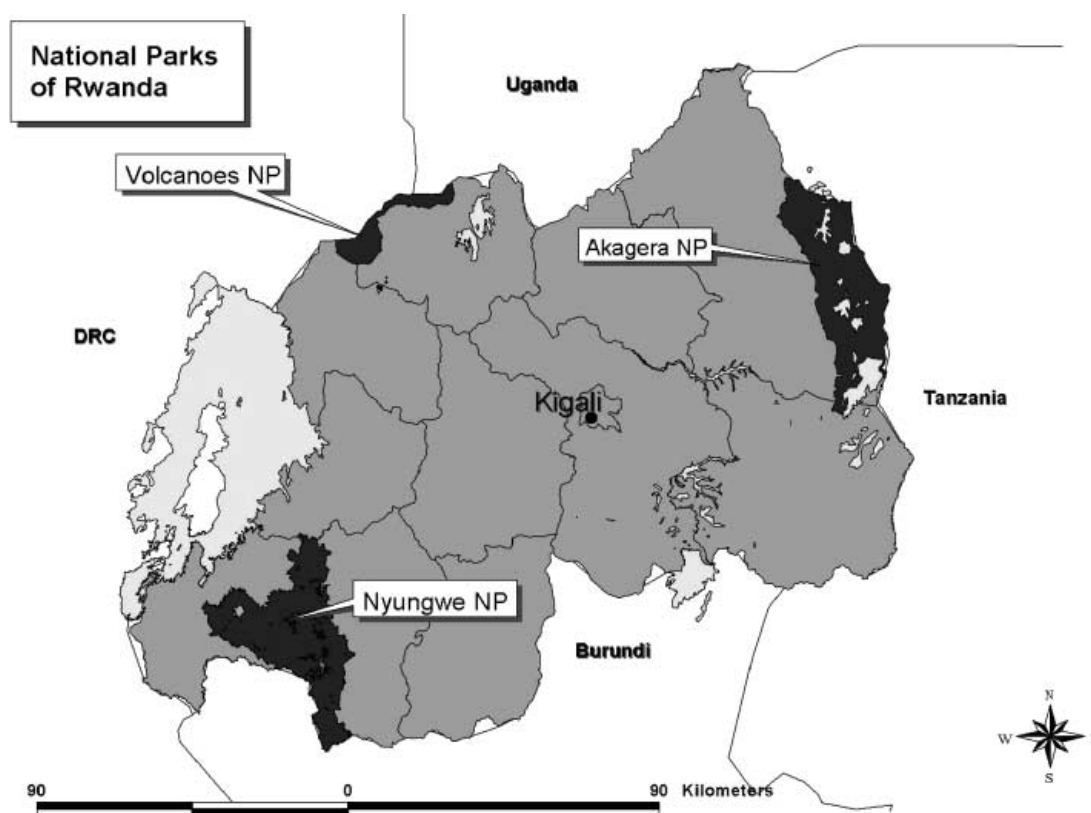


Figure 1: National Parks of Rwanda (map by Jose Kalpers)

The primary and the secondary data have been collected. The primary data was collected using a questionnaire survey which was translated in Kinyarwanda and orally administered. The secondary data was obtained from different documents already published about Akagera National Park conservation. Within each village, twenty five households were randomly selected for interview. In total, seventy five households were randomly selected from villages around the Akagera National Park. The survey was divided

into three main sections. The first section included questions about attitudes towards Akagera National Park conservation. The respondents were asked to report on the different issues facing their daily economic life. The second section was composed of questions about Akagera National Park resource exploitation. The respondents were asked to report and quantify all items they collect from the forest. The third section dealt with questions about the socioeconomic conditions. Specifically, the

respondents were asked to report on the size of the land they own, education level, age, gender, household size, market accessibility, food availability, the main crops they grow, their annual crop and livestock output. In addition, the respondents were asked to list all capital assets they own. A combination of descriptive statistics and logistic regression analysis model are used

to address stated research objectives. Logistic regression analysis is used to determine which independent variables are significant in predicting attitude towards conservation or forest resource dependency. The same technique has been used to assess the relationship between socioeconomic factors and conservation attitude (Masozero and Alavalapati 2004).

RESULTS AND DISCUSSION

Forest resource dependency

Table 1: Descriptive Statistics for forest resource dependency

Independent variables	Minimum	Maximum	Mean	Standard Deviation
Education level	1	3	1.38	0.59
Age	32	71	48.77	10.84
Gender	0	1	0.66	0.47
Land size	0.20	7.00	2.41	1.81
Total agricultural income	70	5400	487.85	1016.30
Total livestock income	67	9450	1310.06	2043.05
Market accessibility	0	1	0.31	0.47
Household size	2	8	5.4	1.40

Source: Data analysis 2008

66.66% of respondents have finished 6 years of primary education of whom 38% are women. Four men (5.33%) have graduated from university. Twenty one respondents (28%) have finished the secondary education of whom 28.57% are women. The age of respondents ranged from 32 to 71 and 66.66% are men. In total, 405 individuals have registered in the visited families and 69.34% of respondents live nearby the town (distance inferior to 10 km on foot) where the schools, hospitals and other

different infrastructures are located. The land size of the respondents ranges from 0.2 to 7 ha and the average annual family income of the respondents was about 899 US\$. By using enter method, we have got -2 log likelihood values of 46.112 for forest resource dependency and 65.316 for conservation attitude. This means that the model used fits the data better because the values of -2 log likelihood are small (George and Mallery2006).

Table 2: Logistic regression analysis for forest resource dependency

Independent variables	B coefficient	Standard error	Significance
Household size	1.246	0.398	0.002
Market accessibility	-1.373	0.976	0.159
Total livestock income	0.001	0.001	0.051
Total agricultural income	-0.002	0.001	0.142
Land size	-1.050	0.519	0.043
Gender	-0.594	0.814	0.466
Age	0.015	0.037	0.686
Primary education	-0.372	1.551	0.811
Secondary education	-21.576	7007.226	0.998

Source: Data analysis 2008

The table 2 shows the significance and B coefficient of each independent variable on the dependent variable. Five variables have got expected results namely the education level, the land size, the total agricultural income, the household size and the accessibility to the market.

It was hypothesized that the size of the household is directly related to forest resource dependency. The large families generally require many resources to satisfy their daily needs, therefore there is a higher tendency to extract forest resources. The variable household size has a positive relationship with forest dependency and it is statistically significant. This suggests that large families tend to rely on the forest resources in order to increase their income. Masozera and Alavalapati (2004) also found the same relationship between household size and Nyungwe forest resource exploitation.

It was also hypothesized that people's accessibility to the market reduces forest resource dependency. On the one hand, people living in isolated areas with limited access to external markets and infrastructure facilities are likely to remain poor and will continue to depend on surrounding forest resources. On the other hand, people living closer to the town may have a wide range of opportunities such as employment in small businesses. This study found that there is a negative relationship between people's accessibility to the markets and the forest resource dependency. Another study carried out by Gunatilake (1998) showed that the access to outside markets reduces forest dependency.

It was also hypothesized that the land size is inversely related to the forest resource. Families with a wide land are likely to raise their incomes by being engaged in off-farm activities and therefore depend less on forest resources. This study revealed this relationship with significance. Moreover, it is difficult for a big family to meet its daily needs without any other employment opportunities owing to the poor quality of land, the agricultural practices of land renting, lending and share-cropping.

The variable total agricultural income shows the negative relationship with the forest resource dependency, meaning that the family with higher agricultural income depends less on the forest resources. The same case was found around Nyungwe forest reserve where the agricultural income has got a negative impact on the forest (Masozera and Alavalapati 2004).

The negative coefficient of education level, both primary and secondary education suggests that educated people can easily get off-farm employment opportunities than non-educated people. The education allows people to move away from subsistence agricultural activities. Hedge and Enters (2000) showed that high educated people will have greater off-farm employment opportunities than less educated ones.

The variable total livestock income has got a positive relationship with the forest resource dependency. This suggests that, due to a large number of heads of cattle in the area, the farmers

can sometimes enter the forest to fetch for water and pasture especially during the dry season.

The two variables namely age and gender have got the contrary results of what we expected to get. Indeed, the variable age which was supposed to be negatively related to the forest resource dependence showed a positive relationship because, even though illegal activities in the park are not allowed, people can sometimes take the risk of entering the forest. This study showed that aged people depend more on the forest resources than younger people. However, a study done around Nyungwe forest reserve revealed

that younger households rely more on the forest resources to meet their daily needs (Masozera 2002). The variable gender which was supposed to have a positive relationship with the forest resources showed a negative value because both men and women have been sensitized on Akagera National Park conservation. However, around Nyungwe forest reserve, men are more dependent on the forest resources than women (Masozera and Alavalapati 2004). In Rwandan traditional society, there are some activities done especially by men like hunting and others by women like water collection.

Conservation attitude

Table 3: Descriptive Statistics for forest conservation attitude

Independent variables	Minimum	Maximum	Mean	Standard Deviation
Land scarcity	0	1	0.57	0.50
Water scarcity	0	1	0.76	0.43
Crop raiding	0	1	0.80	0.40
Food insufficiency	0	1	0.15	0.36
Inaccessibility to forest resources	0	1	0.21	0.41
Residency length	6	66	31.63	19.67
Dependency level	0	1	0.16	0.37
Education level	1	3	1.39	0.60
Age	32	71	48.77	10.85

Source: Data analysis 2008

Table 4: Logistic regression analysis for people's attitude towards conservation

Independent variables	B coefficient	Standard error	Significance
Land scarcity	1.842	0.756	0.015
Crop raiding	2.159	0.962	0.025
Water scarcity	0.880	0.818	0.282
Food insufficiency	-0.015	1.086	0.989
Inaccessibility to forest resources	0.515	1.106	0.641
Residency length	-0.034	0.023	0.134
Dependency level	0.583	1.445	0.687
Primary education	-2.544	1.466	0.083
Secondary education	-0.939	1.536	0.541
Age	-0.005	0.036	0.887

Source: Data analysis 2008

The table 4 shows the values of B coefficient (the magnitude of B indicates the effect of the predictor variable on the predicted variable), the standard error (the measure of the dispersion of B) and the significance of the wald test of all independent variables.

Though the land is not enough around the park, the variable land scarcity is no longer a threat against the conservation. However, the test is statistically significant with $p < 0.05$. This is due to the recent decision of the government to redistribute equitably the land among the population living around the park and this was a long- term solution to the resettlement of new people in that area.

The crop raiding has not shown the negative attitude towards the conservation as it was expected. However, around the park, the crops are sometimes damaged by buffaloes and the compensation process was under discussion between the government and the population. The wildlife damage in the form of crop raiding has led to a negative attitude towards conservation of Nyungwe forest reserve (Masozera 2002).

The variable water scarcity has got a positive relationship with the conservation attitude. Even though Akagera National Park is located in semi arid region, the effort has been made to pump water from aquifer zone and make it available for daily domestic use. The shortage of water is not a common problem but it becomes serious during the dry season because of the presence of many heads of cattle in the area.

The variable food insufficiency has got a negative relationship with the conservation. People who do not meet their daily needs like food may not care about conservation (Masozera and Alavalapati 2004).

The residency length has got a negative relationship with the conservation because former residents are likely to hold a negative attitude towards the conservation. This is due to

CONCLUSION

In total 75 household heads were surveyed around Akagera National Park where local people rely on agricultural and livestock activities. The study revealed that the people's dependency on forest resources is driven by many factors. The results show that the education level, the market accessibility, the total agricultural income, the

the poverty and the lack of diverse economic opportunities. Moreover, the aged people held a negative attitude towards Akagera National Park conservation because of their tradition according to which people adjacent to forest were living on the forest resources like hunting, honey, wood and water collection (Masozera and Alavalapati 2004).

The variable dependency level has got a positive relationship with the conservation because many people interviewed in the area do not highly rely on the forest resources for their daily needs. The ORTPN and the government have focused on Akagera National Park conservation by taking into account the improvement of community welfare around the park and providing the financial support to agricultural and livestock projects able to regenerate employments like Send a cow, PADEBEL (Dairy Cattle Development Support Project), PAPSTA (Agricultural Transformation Strategic Plan Support Project), RSSP (Rural Sector Support Project), PEDERCIU (Umutara Region Development Project) and EDPRS (Economic Development and Poverty Reduction Strategy) (MINAGRI 2003).

People who have finished primary and secondary education had demonstrated a negative attitude towards conservation because of the lack of variation in their education enabling them to find various employment opportunities in rural areas. Age is considered as important independent variable to determine conservation attitude. The negative value of B coefficient means that elderly people living around Akagera National Park have complained about the conservation initiatives because of the tradition according to which people were living by exploiting forest resources. This study showed that, due to the urban migration, younger people support conservation because most of them do not live permanently in the area. Harada (2003) showed that elderly inhabitants are less likely to support conservation than younger people.

land size, and the gender have got a negative relationship with the forest dependency. However, larger families are more dependent on the forest resources. Moreover, people having many heads of cattle together with aged people are likely to exploit the forest resources. The significance of the wald test showed that the

household size, the land size and the total livestock income are the most influencing factors for forest resource dependency. As far as Akagera National Park conservation is concerned, the variables land scarcity, crop raiding and education level are statistically significant. Though some respondents showed that the land scarcity is not actually a big threat against the conservation, there has been an overgrazing pressure on the land because of a large number of heads of cattle in the area. The variables primary and secondary education level, long-term residency length, food insufficiency and age have got a negative attitude towards the conservation of Akagera National Park.

In order to resolve the conflict between local livelihoods and the conservation of the park, the government has taken measures to increase agricultural and livestock production and generate off-farm employment opportunities for rural communities in general and around Akagera National Park in particular. This has been done through different support projects operating in the area. They provide many job opportunities and offer small credits to farmers. The government has also taken decision to provide 10% of its total annual ecotourism income in order to reinforce the community-based conservation projects.

ACKNOWLEDGEMENTS

I would like to acknowledge the financial support provided by China University of Geosciences (Wuhan) and the Student Financing Agency of Rwanda (SFAR).

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