

## **Can Biodiversity Conservation Benefit Local People? Costs and Benefits at a Strict Protected Area in Uganda**

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*This article examines the livelihoods and experiences of local people after two decades of living close to a strict protected area (PA). A total of 290 local PA neighbors and 60 key informants were interviewed. Findings reveal a limited access to assets and low incomes. An average PA neighbor earns US\$0.5 per adult equivalent unit (AEU)/day. PA proximity is associated with lower incomes, mainly because of wildlife damages that cost an average household (HH) up to 10% of its annual income. Other recurrent PA costs include the “invisible” costs incurred to cope with crop raiding, and restricted access to PA resources, that jointly amount to 16% of an average HH’s annual income. PA benefits include the sharing of tourism revenues, integrated conservation and development projects, and park-related employment. In total, benefits constitute 3.5% of the total annual income of an average HH, a figure higher than the contribution of other PAs in Uganda. However, overall, an average HH accrues a net annual loss of 12.5% of its total income or a total loss of US\$1.54 million for the 1,187 HHs, yet the park sends up to US\$7 million to the central treasury. This highlights the need for policy revisions of the political economy of PA management.*

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## PROTECTED AREAS AND RURAL LIVELIHOODS

Biodiversity conservation through protection of areas and impacts on local people are intimately connected phenomena. Whereas biodiversity conservation may generate substantial economic benefits that improve livelihoods of the local people, conservation particularly through the establishment of protected areas (PAs) with access boundaries may and frequently does imply local constraints or costs. These include evictions (Brockington & Igoe, 2006); loss of access to protected land and its resources (Igoe, 2006); and damage caused by wild animals to crops, livestock, and human lives (MacKenzie & Ahabyona, 2012; Tweheyo, Tumusiime, Turyahabwe, Asiimwe, & Orikiriza, 2011).

Increasing efforts are being instigated for pro-poor conservation in many PA sites (e.g., see Adams & Hutton, 2007; MacKenzie, 2012; Tumusiime & Vedeld, 2012; Walpole & Wilder, 2008) so as to “exploit the common ground between biodiversity conservation and poverty alleviation for the benefit of both” (Fisher, 2004, p. 119). Conservationists hope this can secure the support of local people for conservation (Adams & Hulme, 2001; Barrow & Fabricius, 2002). For example, at Bwindi Impenetrable National Park (hereafter Bwindi), where this study was conducted, park management has developed a two-pronged approach: a coupling strategy that allows access to limited resources within certain areas of the park; and a decoupling strategy that creates livelihood opportunities in the form of off-farm and non-farm employment and facilitates access to forest products outside the park (Blomley et al., 2010; Namara, 2006). Such people-park project approaches are now quite commonplace.

Conservation efforts can generally generate both positive and negative local outcomes. Andam, Ferraro, Sims, Healy, and Holland (2010) find that PAs reduced poverty in cases in Costa Rica and Thailand, Sims (2010) reports that PAs increased average consumption and lowered poverty rates in Thailand. Mullan, Kontoleon, Swanson, and Zhang (2010) find that PAs increased household (HH) income in Thailand. Naughton-Treves, Alix-Garcia, and Chapman’s (2011) study in Uganda shows that the “safety net” roles of PAs provide crucial temporary fixes in times of crisis while Bandyopadhyay and Tembo (2010) find some positive gains for some non-poor Zambian households adjacent to four game management areas. On the other hand, descriptions of net negative economic outcomes can be found in presentations of Robalino (2007); Robinson, Albers, and Williams, (2008); and Vedeld, Jumane, Wapalila, and Songorwa (2012). However, as a general statement the net impact remains ambiguous at best (Dixon & Sherman,

1991; Lewis, Hunt, & Plantinga, 2002, 2003; Robalino, 2007; Robinson et al., 2008).

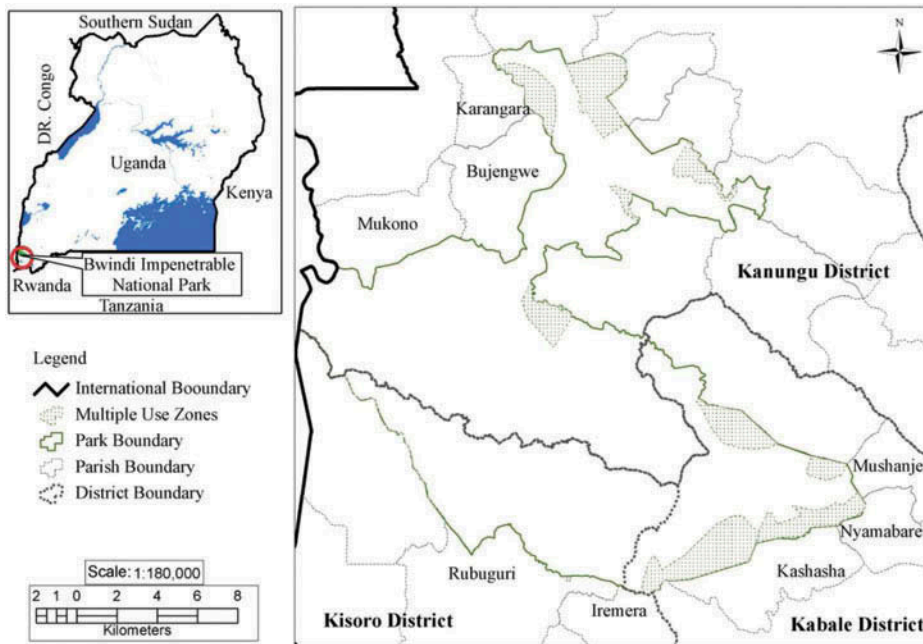
Empirical studies on socioeconomic impacts of PAs in developing countries still remain scanty (Sims, 2010), and especially those that take a quantitative economic approach (Agrawal & Redford, 2009; Ferraro & Pattanayak, 2006). Most of the existing analyses are qualitative, more based on judgements and on revealing power mechanisms and discussing issues around justice, rights, and legitimacy perspectives. But there is also a need to assess the relative importance of different causal factors, outcomes, and to put the costs and benefits accruing to local people on scale. These should also be compared with relevant factors such as household incomes, and state expenditures on park management. Such insights feed into broader issues of governance, political legitimacy, and economic efficiency of protected area policies. Much ecological research have been undertaken on the area, while research on local people have focused on participation and attitudes (e.g., see Namara 2000; Namara & Nsabagasani, 2003; World Wide Fund for Nature [WWF], 2006), and less on rigorous economic assessments of the park's impact on people's livelihoods. This article contributes toward filling such gaps.

The selected PA site constitutes a case that crucially differs from examples in Asia (e.g., see Andam et al., 2010; Sims, 2010), parts of Latin America (Pauchard & Villarroel, 2002; Sánchez-Azofeifa, Daily, Pfaff, & Busch 2003), and the United States (Scott, Davis, McGhie, Wright, Groves, & Estes, 2001), which dominate the scanty literature so far, where PAs were preferentially established in areas less suited for human utilization. This article thus examines livelihoods of a people who have and are still depending on the use of PA land and resources even after gazettelement and how these then are impacted by the PA through the costs and benefits it generates as the conservation policies are increasingly strictly enforced.

## THE CONTEXT: LOCATION AND SOME HISTORY

Bwindi is located in the southwestern corner of Uganda (Figure 1). People have lived in the Bwindi area since time immemorial and the Batwa people are thought to have been here since 30–40,000 yr ago. Bantu agriculturalists (Bakiga) in-migrated some 2,000 yr ago, utilizing the favorable conditions for banana production (Kabanankye & Wily, 1996). Most of the landscape in the highlands was cleared and cultivated even before 900 AD. Bwindi itself, however, was kept as a forest, possibly due to its rugged terrain, or the existence of competing tribes around the park, preventing stable settlements and forest clearing (Hamilton, Cunningham, Byarugaba, & Kyanja, 2000).

In 1932 Bwindi was designated a Crown Forest, primarily to protect and preserve the mountain gorillas and was gazetted as a gorilla sanctuary



**FIGURE 1** Location of Bwindi Impenetrable National Park, study sites, and multiple use zones (MUZs).

in 1961 (Uganda Wildlife Authority [UWA], 2001). The enactment of a Forest Act and a Game Act in 1964 put Bwindi under dual management of the newly formed Forest and Game Departments, as it was both a forest reserve and a game sanctuary. Both departments prohibited people from residing and farming inside the forest area. The Game Department banned hunting, while the Forest Department allowed local licensed timber concessions and the collection of forest products for subsistence purposes (Wild & Mutebi, 1996). From this time and up to 1991, the reserve shrunk as part of encroachment processes (by 29%) before it was made into a game reserve in 1961.

The 1970s were plagued by civil wars which hampered conservation efforts across Uganda. A survey carried out in the late 1980s revealed that only 10% of the reserve was still intact. About 61% had been heavily harvested for timber, in the remaining 29% the best hardwoods had been felled (Howard, 1991). Under the influence of donors—particularly the United States Agency for International Development (USAID; see Ditiro, 2008; USAID, 1991), as well as other processes and actors—Bwindi was converted into a National Park in 1991. This led to the eviction of local people from these areas and execution of a ban on accessing park resources. Given the substantial economic and sociocultural values of the forest resources and land, local people were antagonized (Namara, 2000). They reacted in various

ways. For example, in the first dry season following the promulgation, 16 fires were set or left to burn, some deliberately. This destroyed an estimated 5% of the park (Hamilton et al., 2000). Local people sometimes resorted to violence, and UWA employees lived in fear for their lives (Sandbrook, 2006).

Partly to reduce such conflicts, but also because of increasing global calls for locals to be involved as significant beneficiaries of conservation efforts, attempts were made to include people at Bwindi. Such strategies included provision of material goods: for example, allowing controlled access to select park products in selected areas of the park; the sharing of revenues from gorilla tourism; providing park-based employment; funding HH or community-level projects; and reducing the need for local people to use the parks, for example, by encouraging and supporting private tree growing (Blomley et al., 2010). The outcomes from these initiatives have been presented as success stories of how a protected area can bring about a win-win situation advancing both conservation and livelihood objectives (see WWF, 2006).

From a conservation viewpoint, considerable success has been made. Over the last 20 yr, there have been significant (a) reductions in human disturbance to the gorilla subpopulation (Olupot, Barigyira, & Chapman, 2009); (b) improvements in local people's attitudes and behaviors toward both conservation of the area (Blomley et al., 2010; Olupot et al., 2009; Tumusiime & Sjaastad, 2014; WWF, 2006) and park management (Baker, Milner-Gulland, & Leader-Williams, 2011); and (c) improvement in the ecological value of the park—declared a UNESCO World Heritage Site in 1994, and is identified by the International Union for the Conservation of Nature (IUCN) as the site of one of the most important remaining forests in Africa (IUCN, 2010).

## DATA COLLECTION

From 21 parishes that share a boundary with the park, five were randomly selected. From these, a total of 11 sample villages were randomly selected for individual HH interviews on park-related costs and benefits. Within each sample village, we targeted at least 15 HHs. In total, 190 HHs were interviewed. Based on a recall method (e.g., see Tumusiime, Vedeld, & Gombya-Ssembajjwe, 2011) for the year August 2008 to August 2009, HHs were asked to estimate their total annual incomes from the different sources as well as the associated costs of production. Consequently, net incomes (cash and subsistence) were computed. HH interviews targeted HH heads, and were carried out in Rukiga, a common local language and the mother tongue of the first author. For each individual interview, it was clarified that the study had no connection with the UWA and was purely academic and scientific reasons, and that the study had no legal implications

whatsoever. Respondents were further assured of anonymity and confidentiality. Information was gathered relating to access to land, labor, and capital assets; the time needed to walk to the park boundary; as well as to socioeconomic characteristics—i.e., HH size and the age, gender, and the educational level of the HH head. From a preliminary analysis, crop raiding emerged as a key cost. A deeper understanding of this phenomenon was sought through a follow-up study conducted in January and February 2012. We selected 100 farmers incurring damages from crop raiding in 2011. Of these, 21 HHs had been interviewed in 2008–2009. Estimate of cost to a victim HH is based on this study.

In addition, 60 open-ended qualitative interviews were conducted. Twenty-eight qualitative interviews were conducted with local political leaders, park staff, governmental bodies, and NGO representatives while 10 interviews were conducted with Batwa park neighbors. We took part in local meetings and regional workshops as well as some tourism experiences, and we visited tourist facilities. This article is part of a wider research program where Bwindi was selected as a critical case in order to understand the circumstances in which PAs can contribute to local livelihoods. The findings reported here are mainly from the structured interviews among the 190 sample HHs and with 100 victims of wildlife damages. The findings of the qualitative interviews are reported separately (Tumusiime & Vedeld, 2012; Tumusiime & Svarstad, 2011), but are drawn upon to provide deeper meaning of the statistics from quantitative interviews.

## DATA ANALYSIS

Data management was done in Stata and the R software (R Development Core Team, 2011) was used for computing statistics. Following a livelihood framework, HHs' access to assets, income sources, contributions to total income, and the variations of these with income status and proximity to the park were analyzed using univariate statistics. Statistical significance was examined using the nonparametric Kruskal-Wallis for continuous variables and chi-square tests for categorical variables. Postestimations were done using nonparametric multiple comparisons through R's *npmc* library, in the case of Kruskal-Wallis tests, while individual cell contributions to residuals were examined for chi-square post hoc tests. Nonparametric statistics were used because the normality assumption was not fulfilled (Logan, 2010).

The valuation and methods used to calculate HH incomes draw on research by Vedeld, Angelsen, Bojo, Sjaastad, and Kobugabe (2007). The HHs were divided into three income quantiles based on HH income per adult equivalent unit. These were labeled “poor,” “medium,” and “less poor.” Multiple regression models were estimated for the determinants of HH total income. To meet linear regression assumptions, we used robust regressions

and checked the model diagnostics. No multicollinearity, autocorrelation, or heteroscedasticity problems were encountered. To fulfill normality assumptions we logit-transformed the dependent variable (Logan, 2010). The income equalizing potential of environmental income (EI) was investigated using the Gini index (see Vedeld et al., 2007).

## RESULTS AND DISCUSSION

### Local Access to Assets

Key informants, focus groups, and individual HHs all report land to be the main livelihood asset and it is as such a good indicator of wealth among HHs adjacent to Bwindi. This focus on land also reflects a long history of land shortages in southwestern Uganda (Bamwerinde, Bashaasha, Gombya-Ssembajjwe, & Place, 2006; Turyahikayo-Rugyema, 1974). There are extremely high population densities, ranging from 800 to 1,000 people/km<sup>2</sup>, and these have doubled over the last 20 yr. Access to land is a major constraint for income generation in rural areas. HHs report heavy reliance on human capital in the form of family labor. Physical and financial capital is mentioned as important, but these resources are very scarce. We examine how access to these and other assets varies with income categories (Table 1).

HHs control land either privately or through social arrangements where clan members access jointly held land. The average HH is reported to use about 2 ha of land, which is well below the average of 4 ha for the Kigezi highlands as a region (Bamwerinde et al., 2006). Access to land however, increases with HH income (Table 1), and the less poor group owns about three times more land than the poor group. All land outside the park is claimed for and little wasteland and forestland offer fuelwood, grazing options, leaving the PA forest resources as an important alternative. Poor HHs have lower education levels, and a significantly higher proportion of female headed HHs. Livestock is usually regarded as a near-liquid asset in rural areas, but the local people around Bwindi are traditional crop farmers with low livestock holdings.

There are no formal banking institutions, but there are various institutional arrangements for microfinancing, ranging from small groups of HHs that pool money to village or community institutions based on existing social networks. Borrowing typically involves small amounts; these loans are usually to supplement consumption and not for investment purposes and the ability of these institutions to lend money is limited.

### Household Activities

HHs adjacent to Bwindi diversify their livelihood portfolios. The average diversification index is 0.4 with a range between 0.1 and 0.7. All households

**TABLE 1** Sociodemographics by Income Categories Around Bwindi Impenetrable National Park, Uganda, 2009

Household (HH) socioeconomic factors	Unit	HH income level			Sample mean ( <i>n</i> = 190)
		Poor ( <i>n</i> = 64)	Medium ( <i>n</i> = 63)	Less poor ( <i>n</i> = 63)	
<b>Natural capital</b>					
Total land area accessed***	Ha	1.24 (0.25) <sup>a</sup>	1.85 (0.27) <sup>bc</sup>	3.26 (0.69) <sup>bc</sup>	2.11 (0.26)
Own land***	Ha	1.00 (0.19) <sup>a</sup>	1.41 (0.20) <sup>bc</sup>	2.81 (0.66) <sup>bc</sup>	1.74 (0.24)
Land borrowed	Ha	0.13 (0.07)	0.18 (0.07)	0.21 (0.08)	0.17 (0.04)
Land rented	Ha	0.11 (0.05)	0.23 (0.06)	0.19 (0.06)	0.18 (0.03)
Own no land	%	4.69 (2.66)	1.69 (1.59)	4.76 (2.70)	3.68 (1.37)
<b>Human capital</b>					
HH size**	AEU	6.41 (0.31) <sup>a</sup>	5.42 (0.31) <sup>bc</sup>	5.23 (0.30) <sup>bc</sup>	5.69 (0.18)
HH head education***	Yr	5.41 (0.47) <sup>a</sup>	6.94 (0.48) <sup>bc</sup>	7.76 (0.48) <sup>bc</sup>	6.69 (0.28)
Number of males	#	3.59 (0.13)	3.18 (0.11)	3.30 (0.13)	3.36 (0.07)
Number of females	#	3.73 (0.20)	3.53 (0.21)	3.19 (0.18)	3.43 (0.12)
Female headed HH*	%	15.63 (4.57) <sup>a</sup>	7.94 (3.43) <sup>bc</sup>	4.76 (2.70) <sup>bc</sup>	9.47 (2.13)
Age of HH head	Yr	46.69 (1.76)	45.95 (1.72)	45.57 (1.68)	45.08 (1.00)
HH is an immigrant	%	20.31 (5.07)	9.52 (3.73)	12.70 (4.23)	14.21 (2.54)
<b>Physical capital</b>					
Livestock	TLU	0.64 (0.12)	0.96 (0.23)	1.72 (0.30)	1.10 (0.13)
HH physical assets***	US%	76.97 (19.20) <sup>a</sup>	118.25 (26.34) <sup>bc</sup>	208.97 (34.82) <sup>bc</sup>	134.43 (16.27)
<b>Financial capital</b>					
Borrowed money	%	67.19 (5.91)	68.25 (5.91)	65.08 (6.05)	66.84 (3.42)
HHs with savings***	%	7.81 (3.38)	17.46 (4.82)	38.10 (6.17)	21.05 (2.97)
<b>Social capital</b>					
Membership of social organizations	%	42.19 (6.22)	36.51 (6.11)	46.03 (6.33)	41.58 (3.59)
<b>Location factors</b>					
Time to walk to park boundary	Min.	33.59 (2.65)	35.60 (2.57)	35.60 (2.45)	34.84 (1.47)
Access to MUZ	%	4.69 (2.66)	11.11 (3.99)	9.52 (3.72)	8.42 (2.02)

*Note.* AEU = adult equivalent unit; TLU = tropical livestock unit. US\$1 = USh 2,200. Mean values are given for continuous variables; percentages of respondents in each category are given for categorical variables. Figures in the parentheses represent standard errors. Significant differences across income group using Kruskal-Wallis test: \*\*\* at *p* < .01; \*\* at *p* < .05; \* at *p* < .1. Nonparametric multiple Steel-test analyses differences between income groups with different letter superscripts at *p* < .05.



interviewed were subsistence crop farmers. Off-farm and nonfarm activities were generally scarce in the area, but HHs report collecting environmental resources from multiple use zones (MUZs) inside the park and from areas outside the park.

The agricultural system is a classical great lakes production system with a variety of cash and subsistence crops produced often through intercropping and with tea as the main crop sold. Most HHs also keep some small livestock (sheep, goats, chicken) and only a few keep some cows—thus the low tropical livestock unit (TLU) for an average farmer.

The pursuit of casual agricultural employment for wages (guarding against crop raiding or crop husbandry in other farms) is the main off-farm (agricultural related) activity. Nearly 21% of the HHs rely on such income, but the likelihood of deriving income from these sources decreases significantly with increasing per capita income ( $p < .05$ ). HHs with higher per capita income are significantly more likely to engage in nonfarm (nonagricultural) activities. These include teaching, working in shops or bars, trading agricultural produce, and park-related activities (e.g., working as a tourist guide or porter). Only 5% of our sample HHs report park-related employment. Many of our interviewees stated that most of these opportunities go to people from outside the Bwindi area. Some authors have attributed this to a lack of education and relevant skills among the local people (Sandbrook, 2006).

While all HHs collect environmental resources, especially firewood, only 9% of HHs collect resources from MUZs. The likelihood of participating in MUZs increases in accordance with HH income. Despite the implicit statement in UWA documents that HHs residing in villages sharing a park boundary are target beneficiaries, we could find no evidence that residing close to a park increased the probability of receiving park-related benefits.

### Household Income by Sources

The average HH annual income is \$1,038 (or \$0.54/capita/day). Agriculture is the main source of income for the average HH, contributing on average 50% of its income. This is supplemented by nonfarming activities (29%), environmental resource collection (17%), and by off-farm (4%) activities (Table 2). However, there is a distinct variation between income groups, both in the absolute amounts generated from each source and in the share of total income. The less poor have the highest income from all sources, are least dependent on agriculture, and derive a much higher proportion of income from nonfarming sources. The poorest group has the lowest income from all sources and is most dependent on income from agriculture and environmental sources. The less poor have better access to assets, which probably facilitates entry across barriers, such as capital investments for nonfarming activities. Poor HHs, with less access to assets, usually engage in

**TABLE 2** Household (HH) Income by Source and by Income Status for HHs Adjacent to Bwindi Impenetrable National Park, Uganda, 2009

HH income sources	All HHs ( <i>n</i> = 190)	By income categories		
		Poor ( <i>n</i> = 64)	Medium ( <i>n</i> = 63)	Less poor ( <i>n</i> = 63)
On-farm*** (**)	520 (50)	238 <sup>a</sup> (65) <sup>a</sup>	433 <sup>b</sup> (64) <sup>a</sup>	893 <sup>c</sup> (43) <sup>b</sup>
Off-farm <sup>ns</sup> (ns)	39 (4)	36 (10)	40 (6)	42 (2)
Non-farm*** (***)	303 (29)	5 <sup>a</sup> (1) <sup>a</sup>	97 <sup>b</sup> (14) <sup>b</sup>	813 <sup>c</sup> (39) <sup>c</sup>
Environmental* (***)	176 (17)	88 <sup>a</sup> (24) <sup>a</sup>	108 (16) <sup>b</sup>	333 <sup>b</sup> (16) <sup>b</sup>
Total	1,038	366	678	2,081

*Note.* US\$1 = USh 2,200. Figures are for absolute incomes in US\$. Figures in parentheses represent percentage contributions to the total income. Significant differences across income group using Kruskal-Wallis test: \*\*\* at  $p < .01$ ; \*\* at  $p < .05$ ; \* at  $p < .1$ . Nonparametric multiple Steel-test shows differences between income groups with different letter superscripts at  $p < .05$ .

activities with lower entry requirements, particularly the sale of labor on other people's gardens. Almost all HHs involved in selling labor complain that the remuneration is marginal compared to the labor input.

Poor HHs have significantly lower access to incomes from outside the family farm (Carney, 1998). Bwindi should have represented a special case, given its particular history and present context because Bwindi has since 1991 had a large number of project-based interventions implemented with the expressed aim of increasing opportunities for the generation of off-farm and nonfarm income, especially for the poorest groups (see Blomley et al., 2010).

The total incomes from environmental resources is significantly higher among the less poor because most of these resources are found on private land to which the poorest HHs have little access (Table 1). However, even if total income from environmental resources is low among poor HHs, their dependence on these incomes is higher (24%) than the medium and less poor HHs (16%). Similar observations have been made in a number of other studies (Tumusiime et al., 2011; Vedeld et al., 2007), which supports the assertion that EI is more important for poorer HHs.

A major objective of a rural household is to secure a sustainable livelihood. In economic terms this is measured as the ability to generate cash and subsistence incomes sufficient for survival and for reasonable livelihoods. We find that poor HHs and those bordering the park are more likely to have to generate income from family farming; and most dependent on environmental incomes. Restricting access to environmental resources through stricter enforcement of protection is therefore likely to have a disproportionate effect on these HHs, most of which already live on less than a dollar a day.

## DETERMINANTS OF TOTAL INCOME

Household income increases with the amount of land accessed, and TLUs owned (Table 3). The existence of the park thus seems to negatively affect local people's incomes because it diminishes HH access to these assets.

There are land use restrictions that constrain local access to farming land as people are physically evicted from park land and they cannot open new land for cultivation inside the park. They are further not allowed to graze livestock in the park. Households with access to the MUZs in the park report significantly higher incomes. This is probably because participation in beekeeping, the most lucrative activity within the zones, is selectively available to better-off HHs. The activity has entry barriers such as membership fees, purchase of beehives, and it generally requires connections with the chairpersons of resource user groups.

Total incomes are significantly lower among female headed HHs, possibly because of a lack of means to seek employment away from family (Shackleton & Shackleton 2004; Vedeld et al., 2007). Such HHs usually have

**TABLE 3** Determinants of Household (HH) Income Around Bwindi Impenetrable National Park, Uganda, 2009

HH characteristics	Unit	Estimate	Std. error	<i>t</i> -value
Natural capital				
Total land area accessed	Ha	28.21	10.10	2.79***
Own no land	Ha	176.02	199.31	0.88
Human capital				
HH size	AEU	13.35	21.14	0.63
HH head education	Yr	8.94	9.89	0.90
Number of males	#	58.01	50.29	1.15
Female headed HH	%	-199.75	115.40	-1.73*
Age household head	Yr	1.25	2.70	0.46
HH is immigrant	%	15.87	95.47	0.17
Physical capital				
Livestock	TLU	59.09	20.04	2.95***
HH physical assets	US\$	0.13	0.15	0.83
Financial capital				
Borrowed money	Yes	-104.06	72.63	-1.43
HH has savings	Yes	86.89	85.33	1.02
Social capital				
Membership to social organizations	Yes	1.44	67.36	0.02
Location factors				
Time to walk to park boundary	Min.	0.85	1.61	0.53
Access to MUZ	Yes	214.16	116.41	1.84*
Intercept		-6.40	267.07	-0.02
<i>F</i> -statistic (15, 172 <i>df</i> )		4.68		
Prob > <i>F</i>		.000***		
<i>R</i> <sup>2</sup>		.35		

Note. AEU = adult equivalent unit; MUZ = multiple use zone. \*\*\* is significant at  $p < .01$ ; \* is significant at  $p < .1$ .

poorer access to assets, particularly to labor (Shackleton & Shackleton, 2006) which limits their ability to pursue particular income generating activities.

#### ENVIRONMENTAL INCOME RESOURCES AND DEPENDENCIES

We have seen that poor HHs obtain a higher proportion of their income from the environment through combining the collection of park and nonpark environmental goods. Three key observations emerge:

1. The less poor collect environmental resources for cash generation, while the poor focus on subsistence collection. Timber, poles and carpentry, and wild food, especially honey, are the main sources of cash income and these account for about 78% of the EI of the less poor households, compared to 34% among the poor HHs. Firewood, the main resource used for subsistence, contributes about 60% of the EI of poor HHs as compared to 21% among less poor HHs.
2. For the total environmental incomes, the less poor households collect more from nearly all sources, and especially timber and wild food.
3. The park contributes only marginally (1.5%) to HH total environmental income. This is because of the strong restrictions in the kind and amount of environmental resources permitted in the MUZs. The park is thus currently an insignificant source of environmental income.

#### INCOME INEQUALITY AND THE EQUALIZING POTENTIAL OF ENVIRONMENTAL INCOME

Does access to EI, even if there are constraints, reduce income disparity in Bwindi? Income inequality measured on the basis of total per capita income is 47.5% and rises to nearly 51% in the absence of EI (Table 4), suggesting that EI has an inequality alleviating effect. A similar trend is observed within categories when data is disaggregated according to income level and park proximity. The change is greatest among the poor households (6.2%) and is least among less poor households (3%). This suggests that EI is more important to the most poor within each group, especially the poorest of the poor.

**TABLE 4** Effect of Environmental Income (EI) on Income Equality by Income Group, Bwindi Impenetrable National Park, Uganda, 2009

	All households	Within wealth categories		
		Poor	Medium	Less poor
All income	47.5	16.7	10.9	29.1
In absence of EI	50.9	22.9	14.9	32.1
% changes less EI	3.4	6.2	4.0	3.0

## People and Park Costs

The park costs for these communities are related to the direct consequences of physical eviction, such as the loss of agricultural land and properties when the park was established in 1991. This also resulted in restricted access to in-park resources. The protection afforded to wild animals also resulted in long-term and increased damages to crops, livestock, and human life.

### PHYSICAL EVICTIONS

Human settlements in the Bwindi area probably date back to between 32,000 and 47,000 yr (Cunningham, 1996). These early settlers were hunters and gatherers. Clearing of forested areas for cultivation started about 2,200 yr ago (Taylor & Merchant, 1995) when Bantu (Bakiga) people arrived in the area and brought with them iron-smelting technology (Wild & Mutebi, 1996). An interdependent barter system developed, involving the Batwa hunter-gatherers who lived in the forest and the Bakiga cultivators, with the exchange of forest products for food (Namara, 2000). Over centuries, forests were gradually converted to agricultural land, resulting in a mixed agricultural and forest landscape. When the area became a national park in 1991, both the Batwa hunter-gatherers and their Bakiga neighbors were evicted and exposed to various impoverishment risks, leading to the need to reconstruct their livelihoods.

Local people mentioned effects such as landlessness, homelessness, joblessness, and loss of crops from land. This did contribute to food insecurity, and has recently been exacerbated by increased crop raiding from park animals. Records of affected people are scanty, but generally Bakiga HHs also had land or relatives outside the park boundaries and were less affected than the Batwa, who were more directly reliant on the forest (Kidd, 2008). Between 50 and 100 Batwa families were evicted (IUCN, 1994). The Bwindi (and neighboring Mgahinga gorilla park) region is now home to some 3,500 Batwa (Neza, 2006). Settled in 39 communities, these at best have very limited access to land. About 9.4% live on government land, 10% on land belonging to the Church of Uganda, while over 80% are dependent on private, but exploitative arrangements with local landlords (African Commission on Peoples' Human Rights, 2009).

Several households mentioned that landlessness or joblessness led some family members or relatives to take seasonal work away from home, while others were forced to migrate. This is also confirmed by official records: by 1991 about 320,000 people born in the area had migrated to other parts of Uganda. This was more than half of the area's population in 1991 (Ministry of Finance, Planning and Economic Development [MFPED], 1994). However, population growth throughout the southwestern corner of Uganda has generally led to high out-migration (particularly among the Bakiga) to other areas of Uganda and the park creation is only a partial explanation. But in

general, such migrations often cause social disarticulation as they break up the extended families and their social networks. An estimate of the costs related to these evictions is beyond the scope of this article, but it suffices to note that local people still mention these costs more than two decades after the evictions.

#### RESTRICTED ACCESS TO PARK RESOURCES

Local people also lost access to common property following the park declaration. The park management decided in 1993 to pilot multiple use zones (MUZs) to allow people to collect selected resources in about 20% of the park area, well outside the gorilla ranges (see [Figure 1](#)). Only 9% of our sample HHs reported that they collected in-park forest resources. This low figure may be explained by the following factors: (a) the location of zones does not match local human needs; (b) access is allowed in areas lacking valuable resources; and (c) annual harvest quotas are set at only 1% of the available plant biomass for allowed species.

The restrictions in defining MUZs and the kind of resources to be accessed highlight the difficulty of reconciling the multiple interests in conservation. How does one make sensible trade-offs? The interests of nonlocal actors may often dominate because of asymmetrical power relations; the trades-offs often constrain rural livelihoods and reduce local support for conservation efforts. The pressure to introduce more protective measures is increasing in many developing countries as a result of commitments to the Convention on Biological Diversity and of recent, agreements to reduce emissions from deforestation and degradation (REDD).

HHs reported difficulty in accessing forest products privately. This applied especially to the poor HHs which have less access to land ([Table 1](#)). When looking at the number of HHs accessing MUZs, there is little evidence that poor HHs obtain much benefits from MUZs. Also, HHs bordering the park do not access MUZs more than distant HHs. As has been pointed out, the findings of this study indicate that only 0.4% of HH total income comes from the MUZs environmental resources. In other rural areas, an average park neighbor obtains up to 6% of HH income from common forests (e.g., see Tumusiime et al., 2011).

#### CROP RAIDING

About 25% of the sample HHs report marauding park animals as a major constraint on their livelihoods. Major culprits are gorillas (in Kanungu and Kabale areas), elephants (in Kisoro), and monkeys and baboons (throughout the whole area). There is a wide variation in the reported extent of direct annual losses. Amongst the victims, estimates range from 27 to US\$2,700, with an average victim reporting a loss of US\$384 per year or 37% of the

HH's annual income. We acknowledge a tendency for people to overestimate their losses. For example, Tchamba (1996) found a 30% difference between farmers' estimates and actual losses in Cameroon, while MacKenzie and Ahabyona (2012) report a 20% difference around Kibale National Park in Uganda. If we allow for a 30% disparity, an average victim HH still loses about \$269 per year or 26% of its annual income.

Crop raiding cases are reported to be on the increase because (a) gorillas become accustomed to people and increasingly spend more time outside the park; and (b) the general animal population has increased as a result of protection. Crop raiding has serious consequences for food security. HHs that do not border on the park also report frequent visits by park animals, but the probability of these visits is significantly higher for HHs at the park border ( $p = .061$ ).

The need to guard against crop raiding imposes an additional cost to the HHs. About half the affected HHs employs paid guards, the other half uses family labor. Among those hiring labor, the average annual cost is reported to be US\$190 or 18% of a HH's annual income. HHs using family labor can be expected to spend about half this amount since the guarding is usually done by (low cost) children. However, this chore disrupts their formal education: many youths attribute dropping out of school to guarding against crop raiding (Tumusiime & Svarstad, 2011). The marauding animals also threaten human life through direct attacks and interspecies transfer of diseases. Interviewees also reported abandoning land immediately bordering the park. Villagers reported inordinate levels of stress as a result of livelihood losses from crop raiding and the lack of compensation. UWA itself accepts that there are problems, but is reluctant to consider compensation schemes because of their "complexities"—but also, as these figures reveal, because of the sums involved. There are thus substantial costs for people living around the park. As much as 30 to 40% of the annual income of victim HHs is lost due to crop raiding. Since these HHs constitute about a quarter of the sample, this amounts to about 10% of the annual income of an average park neighbor.

In sum, recurrent costs for an average HH from park proximity amounts to an annual loss of 16% of the total HH income—i.e., 6% from limited access to park resources; and 10% related to crop raiding. In addition one should take into account the historical costs related to the loss of agricultural land and property inside the park. As Hirsch et al. (2011) note, there is a need to acknowledge conservation trade-offs.

### Benefits of Living Close to Bwindi

Bwindi delivers a number of benefits to local people through the livelihood opportunities associated with gorilla tourism and support from park-related nongovernmental organizations (NGOs): (a) tourism revenue sharing, (b) employment opportunities, and (c) support from park-related NGOs.

## TOURISM REVENUE SHARING

The mountain gorillas make Bwindi a highly valued tourist destination. The UWA organizes “tracking” tours for the tourists to see the eight groups of gorillas that are habituated to people. Each tour group accommodates up to eight tourists per viewing day.

A Uganda wildlife statute requires that park management ploughs back US\$6 in payment from every park visitor into adjacent local communities. From the start of the revenue-sharing scheme in 1996 to the end of 2009 (a period of 13 yr), an estimated US\$178,902 has been spent among the local communities adjacent to Bwindi. This amounts to an average annual disbursement of US\$13,000. This amount has gradually increased as more gorilla groups have become habituated to human contact. The amount available per individual has also increased as since 2006 the focus has shifted to direct support of the livelihoods of people in the villages which border on the park. For example, whereas Nyamabare (one of the 21 parishes surrounding the park) has 11 villages, only four share a boundary with the park. In 1996 the parish received US\$1,818 which was invested in constructing a primary school for the benefit of the whole parish. In 2009 the parish received \$1,976 in direct support of projects aimed at improving HH livelihoods in the four villages sharing an immediate boundary with the park. However, the revenues are inadequate for the local population as expressed in the comment of one resident:

Currently, the only way the park is beneficial is through the revenue sharing. . . . In these last 2 yr, park management has used these revenues to buy us goats. For example, a village could be given five goats, but a village has a lot of people and five goats are not enough . . . because the benefits come in small amounts, people keep on disgruntled . . . because a large number of people goes home empty handed, they cannot be happy. (Respondent 15)

Through the advocacy of civil society organizations, efforts have been made to increase the proportion of tourism revenue allocated to local people. In 2006, a Gorilla Levy fund was established, requiring that from each permit bought, US\$5 should be allocated to local governments as a conditional grant to support livelihoods in villages adjacent to Bwindi. The funds are disbursed after every 2 yr. They were disbursed in August 2009 during UNEP’s celebration of “the year of the gorilla” (for the July 2006–June 2008 collection) and in July 2010 (for the July 2008–June 2010 collection; see [Table 5](#)).

Between 2006 and 2010, an annual average of US\$65,584 was remitted to the communities from the Gorilla Levy fund. In total, the two sources jointly brought in US\$78,584 to the communities per year, or US\$6.62 to each of the 11,875 HHs residing in the 21 parishes sharing an immediate boundary with the park. In comparison, at a nearby Kibale National Park, a sharing



**TABLE 5** Distribution of Gorilla Levy Funds at Bwindi Impenetrable National Park, Uganda, 2006–2010

District	2006–2008	2008–2010
Kanungu	79,321	78,132
Kabale	33,995	33,324
Kisoro	18,302	19,262
Total	131,618	130,717

*Note.* Unit = US\$ (US\$1 = USh 2,200).

scheme from chimpanzee (*Pan troglodytes*) based tourism has disbursed an equivalent of US\$1 per HH per year in community projects (MacKenzie, 2012). Therefore, Bwindi contributes substantially to the local people. This is partly because of higher revenues accrued since gorilla trekking costs US\$500 whereas chimp trekking costs \$80.

#### EMPLOYMENT OPPORTUNITIES

Although some access constraints exist (Sandbrook & Adams, 2012), a limited number of local people are employed in some positions related especially to gorilla tourism. This is mainly in service provision (e.g., tourist guides and porters, waiters) but also the sale of produce to lodges and camps where tourists are accommodated. These opportunities are generally concentrated at four points (Buhoma, Ruhija, Nteko, and Rubuguri) where they generate considerable sums to a few HHs (e.g., see Ahebwa & van der Duim, 2013), but on average generate US\$5 per HH per year or a total of US\$59,375 per year for the surrounding communities.

#### SUPPORT FROM PARK-RELATED NGOS

Ever since the establishment of the park, and till the present day, several NGOs work in the area to promote conservation and improve local livelihoods. The oldest is CARE's Development Through Conservation (DTC) program that started in 1988. The main goal of this program was to improve local perceptions of the park. In its first phase, which ended in 1991, the program targeted increased awareness of environmental conservation and trained local communities in tree planting and soil conservation. Once the park was established, DTC started its second phase, collaborating with the UWA to pilot and establish MUZs. The third and final phase of the program ran from 1997 to the end of the program in 2002. Here the focus was on sustainable improvements in the ecological status of the park's biodiversity, on livelihood security, and on ensuring that HHs receive an equal share of the economic and social benefits of conservation (Malpas, Ishiriza, Johnson, Masanyika, & Tumushabe, 2002). CARE-DTC spent US\$340,457 per year between 1996 and 2006 (Bush & Mwesigwa, 2007).

The Bwindi Mgahinga Conservation Trust (BMCT) was established in 1995 with the assistance from the World Bank's Global Environment Facility (GEF) to support park management and local development. BMCT spent US\$319,049 per year between 1996 and 2006 (Bush & Mwesigwa, 2007) in the 54 parishes surrounding both Bwindi and Mgahinga Gorilla parks. Of this, 60% (or \$191,429) was invested in community development projects, 20% supported ecological and socioeconomic research and monitoring activities, while 20% supported park management. These institutions work in both the first and second parish from the park boundary.

The Trust and CARE jointly thus spent US\$531,886 per year or US\$9,850 per parish per year in the period between 1996 and 2006. Taking Nyamabare Parish as an example, this translates into US\$26 per HH per year, or about 2.5% of the average HH income. The Trust continues to work in the area. Whereas CARE now mainly supports management, other players have come in, notably the International Gorilla Conservation Project (IGCP). The IGCP is a coalition established in 1991 comprising the World Wide Fund for Nature (WWF), the African Wildlife Foundation (AWF), and Fauna and Flora International (FFI). The IGCP works to improve the socioeconomic conditions of people living adjacent to the gorilla ranges, and seeks to influence local attitudes to favor conservation (WWF, 2006). It can be approximated that the average household continues to get at least 2% of its annual income from the support offered by park-related NGOs. Overall, however, the benefits are small, and as pointed out by Laudati (2007), "few ICD [integrated conservation and development] goals have been achieved in practice because the historically-rooted hierarchical, and often exploitative socio-political contexts in which ICDs have been implemented have remained largely unexamined, much less changed" (p. 153).

### Comparing Costs and Benefits

It is a challenge to compare park benefits and costs. Balanced studies of the benefits and losses that communities incur from proximity to PAs are still hard to find, but they are useful guides to the study of conservation approaches that minimize local conservation costs (Brockington, Duffy, & Igoe, 2008; Igoe 2006). The benefits of Bwindi to the annual income of an average park neighbor are significant. Adding them up by HHs gives an average of 5.7% of total HH incomes. Few other studies of this nature have been carried out in Uganda, but a recent, related study in Tanzania reveals a 2.5% contribution (Vedeld et al., 2012).

By comparison, the average HH loses an overall 16% of its annual income through the various costs. Loss from wildlife damage alone amounts to 10% (Table 6). This figure is about twice the benefits the HH gets from the park. An additional concern derives from Tumusiime and Sjaastad's (2014) observation that the distribution of goats (currently the main mode of sharing

**TABLE 6** Summary of Park Benefits and Costs for an Average Farmer Household (HH) Around Bwindi Impenetrable National Park, Uganda, 2009

Source of benefit or cost to park neighbors	Amount gained or lost (US\$)	% of HH income	
		Benefits	Costs
<b>Benefit</b>			
ICD projects	20.8	2.0	
Tourism revenue sharing	6.6	0.6	
Park-related jobs	5.0	0.5	
Multiple use zones	4.2	0.4	
Subtotal	36.5	3.5	
<b>Cost</b>			
Crop raiding	103.8		10
Restricted access	62.3		6
Subtotal	166.1		16

*Note.* ICD = integrated conservation and development. The total annual income for an average farmer is US\$1,038.

tourism benefits) does not significantly benefit cost bearers. There are several reasons for this, also related to the institutional failures highlighted by Tumusiime (2012) and Tumusiime and Vedeld (2012) for Bwindi, but also present at many East African National Parks (e.g., see Homewood, Trench, & Brockington, 2012) and these constitute important reasons for the present inability of the PA to make significant contributions to local livelihoods. They are linked to a lack of real participation, involvement and the empowerment of local people, and the capture of benefits by local elites. One respondent thus observed:

When they [local leaders] have brought park resources, they have given to others and not me. The parish chairman and Community Protected Area Institution representative just choose themselves; they select themselves and do not consider us the ordinary people. . . . I really do not have any hope of ever benefitting from any park scheme because I am not a leader and I am not close to any of them. (Respondent 17)

The MUZs, meant as a replacement or consolation for the previous rather good access people enjoyed prior to the PA establishment, presently make only a marginal contribution to HH incomes. Given the well-established importance of environmental income to the rural poor (Vedeld et al., 2007; Naughton-Treves et al., 2011), restricted access to park resources impacts most severely on poor HHs. One respondent thus commented:

We freely collected forest resources from the reserve, and many of us really derived our livelihood from the forest. . . . They [park management] tell us that the park is still useful to us . . . but how? They talk of us

accessing resources from areas away from gorillas, but the resources we need are not permitted. (Respondent 34)

At an aggregate level, we find that HHs accrue a net loss of 12.6% of their total incomes or an annual US\$127. If all HHs around the park experience similar losses, the total net economic loss for 11,875 HHs is US\$1.54 million. By comparison, based on a 2009 estimate, the Uganda authorities allocate some US\$0.124 million per year to Bwindi, while the park sent back to central headquarters in UWA some US\$7 million. Bwindi is subsidizing the other parks in Uganda; and moreover, Bwindi local population are contributing to this on a rather large scale (see also Kvalvik & Bitariho, 2011).

## CONCLUSION

HHs in the Bwindi area have limited access to assets, and PA entry barriers constrain their ability to provide reasonable livelihood options for themselves. An overwhelming majority of local people are subsistence farmers living on about half a dollar a day. Their main income derives from agriculture (51%), nonfarming activity (61%), off-farming activity (9%) and environmental sources (14%). These limitations are most severe among poor HHs. Opportunities for income generation away from the family farm are significantly weighted in favor of less poor HHs, generally because of their greater access to assets. A poor HH gets less than 2% of its income from nonfarming sources, and relies substantially on environmental resources to fill the gap. Environmental resources contribute nearly a quarter of the total income of poor HHs, as compared to 16% for medium and less poor HHs. Most of this is derived from private sources. The park resources contribute only 0.4% of an average HH's income. Even then, these resources contribute more to the environmental income needs of poor HHs (2.7%), compared to 1.7 and 0.9% for medium and less poor HHs, respectively. The poor are thus more dependent on environmental resources (Vedeld et al., 2007).

The park organization is an important factor in the lives of the surrounding communities, partly through the cost implications relating to the use of agricultural and environmental resources, but also through the benefits generated by the park's initiatives to combine conservation with development. With regard to income from agriculture, the existence of the park restricts the livelihoods obtained from the traditional expansion of agricultural into forestland. Many people also report abandoning land on the park boundary as a result of increased wildlife crop raiding. These costs are not examined here, but evidence from other Ugandan national parks reveal these to be substantial (e.g., see Ditiro, 2008). Costs related to crop raiding show that an average park neighbor loses 10% of the total HH income from wildlife damage, while an extra 6% is lost because of restrictions on accessing wild resources from the park.

By comparison to the costs, an average household receives only about 3.5% of its income from park-based initiatives. Proximity to the park increases probability of incurring park costs yet there is no matched increase in access to park benefits. The figures reported here are rough estimates and we recommend a more comprehensive study of the park benefits and costs. However, these figures are indicative of the scale and trend of the costs involved. The average park neighbor HH loses more than it gains from its proximity to the park.

When compared to other national parks in Uganda, or in the region, Bwindi seems to generate some benefits for segments of local people, and the flow of benefits has gradually improved with developments in gorilla tourism, and with a more specific focus on HHs in villages bordering the park. But overall, park costs still outweigh benefits for the local people by far, and more concerted efforts are needed to increase benefits to the local people (e.g., by increasing the proportion of the revenues allocated for local people) while at the same time reducing the costs, particularly costs related to crop raiding by for example institution and proper management of a mechanism for direct compensation of victim HHs. The inability of the relatively extensive interventions at Bwindi to provide satisfactory livelihood outcomes for the local people suggests a general need to revise policies on costs and the sharing of benefits and the introduction of local people in park management in Africa. This applies even more forcefully to other parks, where much less is done to benefit local populations. Such steps are necessary preconditions if we are to move beyond the rhetoric in our efforts to ensure that conservation does not have a detrimental effect on local livelihoods.

At the same time the PA establishments and the way public sector officers, donors, and other external actors operate drive a wedge between the forest and local people, constrain local activities also outside the park including the loss of control over own land, and generate alienation processes that do not foster good institutions for future sustainable management of the PA. The alternatives of either moving back to the barriers as increasingly advocated by conservationists or “clearing the lines” by advocates of social justice do not hold promise for sustainable management in the future. One should rather move toward improved, context-sensitive integrated conservation and development.

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