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Opportunity for canopy ecotourism in Kibale National Park: Analysis of forest resources and stakeholders' perspectives

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Abstract

Canopy ecotourism has been introduced in forest ecosystems across the world as a means to diversify ecotourism activities. However, in spite of the existence of vast forest ecosystems, limited studies have been carried out to assess the forests' suitability for canopy ecotourism. With reference to Kibale National Park in Uganda, this paper assesses the suitability of forest biophysical resources to support development of canopy ecotourism facilities, perspectives of the adjacent local community members and willingness of tourists to participate in canopy ecotourism if facilities are developed in the park. Results show that the park has the biophysical forest resources to support the development of canopy ecotourism in terms of suitable tree height, diameter, crown size, canopy openness and proximity of the trees. Survey results revealed that the majority (84.6%) of the local community members interviewed support the development of canopy ecotourism in the park, most (86%) of the tourists are willing to participate and pay for canopy ecotourism and 94.6% are willing to recommend the park to be visited by other tourists. The paper concludes that it is feasible to develop canopy ecotourism in the park and recommends measures to be taken before it can be introduced as a new tourism product.

Key words: Facilities, local communities, stakeholders, tourists, tree structure, Uganda, willingness

Introduction

Tourism has been in existence from the beginning of human civilization. It is one of the world's largest industries and one of the fastest growing economic sectors recognized in the United Nations Sustainable Development Goal (SDG) 8, 12 and 14 (Jurado-Rivas and Sánchez-Rivero, 2019). With more than one billion tourists travelling to international destinations every year before the outbreak of COVID-19 pandemic, tourism had grown exponentially and become a leading economic sector and the world's third-largest export industry after fuels and automotive products (WTTC, 2021). Globally, tourism plays a vital role in the creation of jobs; it's estimated that one in four jobs have been created across the world bringing in USD 9.2 trillion equivalent to 10.4% of the global GDP (WTTC, 2021). At the same time, international visitor spending amounted to 6.8% of total exports and 27.4% of global services exports, contributing USD 1.7 trillion in 2019 (Naseem, 2021).

Uganda has exceptional abundance of natural, cultural heritage and historical resources that can be harnessed for tourism development. In this regard, tourism has been prioritized in Uganda's Vision 2040, National Development Plan III (2020/21-2024/25) and the Tourism Development Master Plan (2014-2024) as one of the key growth sectors with high potential to spur economic development leading to socio-economic transformation from peasantry to modern middle income status in the next two decades. It is an economic growth sector that creates employment and earns foreign exchange for the country. In the financial years prior to the COVID-19 pandemic (2011 to 2019), the mean annual tourist arrivals growth rate was 2.5% (AUTO, 2020). Tourist arrivals grew steadily from 1.4 million in 2017 to 1.505 million representing a 7.4% increase. In the financial year 2018/19, travel and tourism in Uganda contributed approximately 7.7% to the GDP and over USD 1.6 billion in foreign exchange that was projected to reach USD 4.022 billion at the end of 2020 (Ssebwami, 2019). The growth was been attributed to a number of factors including the prevailing security in the country, availability of hotels and accommodation facilities, the growing transport sector, the country's hospitality and the rich wildlife resources, among others. Looking beyond the current economic position in the post COVID-19 era, the industry is expected to resume its leading and dynamic role in economic growth. However, this will entail implementation of innovative strategies to revitalize the sector including diversification of tourism products. Canopy ecotourism offers prospects as a new tourism product that can reduce the current over reliance on wildlife-based tourism.

Canopy ecotourism is a unique form of forest-based tourism that sets a new trend in experiencing the tropical forest by offering an alternative avenue for people to access, explore and experience first-hand the rich biodiversity in a forest ecosystem from the

treetops (Aswad *et al*., 2013). It aims at promoting tourists experience in tropical forest's arboreal environment with minimal negative impact (UNWTO, 2012; 2017). In spite of its huge potential, there has been limited research to inform the establishment of facilities and support the development and practice of canopy ecotourism (Senarathna, 2017). Most of the canopy studies undertaken since the 1950s have tended to focus more on canopy forest science including forest ecology and less on canopy ecotourism (Nakamura *et al*., 2017). As a result, there is paucity of scientific information to guide canopy ecotourism development. Following the approach by Nadkarni *et al*. (2011), a Google search was conducted on 31 August 2021 using key words "*what is canopy ecotourism*" and it generated 696,000 results (0.54 seconds) and "*the aim of canopy ecotourism"* that generated 368,000 results (0.46 seconds) with articles by Seibel (2013), Aswad *et al*. (2013), Califf (2019) and Patten (2020) as the most relevant. The other articles by Nadkarni *et al*. (2011), Girardun *et al*. (2013) and Lowman (2021) were also generated but they focused mainly on canopy science studies. Although google search engine is not the most robust, the above returns affirm that few studies have been carried out on tropical forest canopy ecotourism. Clearly, there is a dearth of research data to support systematic development of canopy ecotourism in tropical forest ecosystems in Africa including Uganda.

Kibale National Park is rich in tropical forest trees that provide a good habitat for many animals and alluring scenery for the tourists (Winterbottom and Eilu, 2016; Pomeroy *et al*., 2017). However, Uganda Wildlife Authority has not yet developed canopy ecotourism due to lack of information on the forest's biophysical resources which, according to the available records, was planned in the 1990s to supplement the wildlife attractions (Uganda Wildlife Authority, 2015). The introduction of canopy ecotourism will bring several benefits to Uganda that include, among others, a viable approach for biodiversity conservation as it promotes forest conservation education that diverts local people from engaging in illegal logging, poaching as well as instilling a sense of attachment and stewardship as they recognize the importance of keeping the forest intact (Lowman, 2021). At the same time, canopy ecotourism demonstrates economic viability of forest conservation as it is widely regarded as a sustainable alternative economic use of natural forests because it prevents forest degradation and deforestation (Lowman, 2021). It is a special niche product and flagship attraction that diversifies forest ecotourism activities and increases tourism revenue base. In Ghana, for instance, canopy ecotourism as a niche product in Kakum National Park that attracts more than 70,000 visitors and generates about USD 1 million annually (Amuquandoh, 2017). Furthermore, canopy ecotourism contributes to sustainable living of the local people through employment in construction and maintenance of walkways as well as running ancillary tourism-related enterprises (Ramlan *et al*., 2012).

The objective of this study was to determine if Kibale National Park's forest resources can anchor canopy ecotourism facilities; tourists' perspectives about canopy ecotourism and willingness to pay for it; and local community members' perceived participation and the benefits they expect from canopy ecotourism. In order to inform the planning and development of canopy ecotourism in the park, the paper answers the following questions: i) Which tree resources can support the development of canopy ecotourism? What are the characteristics of tourists who visit Kibale National Park? ii) What activities do they expect to participate in? iii) How do tourists perceive canopy ecotourism as an attraction in Kibale National Park? iv) Are they willing to pay for it? v) How do local people perceive the introduction of canopy ecotourism in the Park? vi) How do they expect to benefit from it? The results provide valuable scientific baseline data on the feasibility of developing canopy ecotourism in Kibale National Park, which was not available before. It is postulated that the development of canopy ecotourism will add a new tourism product niche and offer opportunity for local participation to improve the livelihoods of the people living adjacent to the park. Moreover, the methodology applied in this paper can be replicated elsewhere to assess canopy ecotourism potential of Uganda's forest ecosystems.

An overview of tropical forest canopy ecotourism

Canopy ecotourism is commonly practiced in mature primary tropical forests that have been relatively undisturbed by human activities such as logging. Forest canopies are home to an estimated 50% of the terrestrial biodiversity (Lowman, 2021) and about 50-90% of life in the rainforest exists in trees above the shrub layer (Butler, 2019). The canopy's diversity of flora and fauna attracts tourists and enables them to experience the panoramic view of the forest vegetation and wildlife that are seldom observed from the ground (Rajpar, 2018). The activities of canopy ecotourism are interrelated with those of forest ecotourism such as bird watching and primate viewing (Butler, 2019). Canopy ecotourism also involves cutting a corridor through the forest canopy to create facilities such as suspended walkways and zip lines. The walkways may be suspended by strong ropes and steel wires on mature trees and/or metallic poles (Califf, 2019).

Canopy ecotourism evolved as one of the niche products to diversify ecotourism activities and has been introduced in some forest ecosystems of the world, for instance in Rwanda, Australia, New Zealand, Germany, Panama, Costa Rica, Nicaragua and the Amazon (Califf, 2019). In Africa, canopy ecotourism was first introduced in Kakum National Park in Ghana in 1992; the walkway is 333 metres long and connects seven tree tops which provide access to the forest (Amuquandoh, 2017). The canopy walkway is comprised of a rope superstructure that provides support and the walkway is made up of wooden boards (Califf, 2019). Other canopy ecotourism facilities have also been developed in Nyungwe National Park in Rwanda and Aberdare

Forest in Kenya as a strategy to diversify tourism attractions (Cobbinah *et al.*, 2015; Seibel, 2013). The canopy ecotourism facilities that the tourists would use are aerial ropeways (*a*), tree houses (*b*) and suspended canopy walkways (*c*) (Fig. 1).

When canopy ecotourism is introduced in Kibale National Park, it will complement wildlife-based ecotourism that was introduced in 1994 (Uganda Wildlife Authority, 2015). The ecotourism activities in the Park include nature walks, bird watching, chimpanzee trekking, picnicking and camping (Obua and Harding, 1997). Canopy ecotourism has already been introduced in Uganda to a limited extent without a comprehensive study and scientific base line data. For instance, Griffin Falls Camp

(a) Aerial ropeway

(b) Tree house

(c) Suspended walkway

Figure 1. Pictorial examples of canopy ecotourism facilities.

Sources: (a) https://www.achieveglobalsafaris.com/mabira-forest/. (b) https://www.trees.com/gardening-and-landscaping/treehouse-ideas. (c) https://www.gorillaadventuretours.com/best-bird-watching-places-in-uganda/).

and Mabira Forest Integrated Community Organization (MAFICO) have established a network of five zip-lines that stretches 250 metres across River Musamya in Mabira forest reserve to the north of Lake Victoria. The facility was designed and certified by the Uganda Engineers Registration Board and insured by the National Insurance Corporation (Griffin Falls Camp, 2021).

Despite the potential for development of canopy ecotourism in Uganda's natural forests, limited studies have been carried out on the biophysical forest resources and the stakeholders' perspectives on their participation and expected benefits. Paucity of such information curtails development of canopy ecotourism as a unique tourism product niche in the country's tropical forests including Kibale National Park and hinder opportunity for development of canopy ecotourism that can diversify nature-based tourism products, support biodiversity conservation and enhance local community livelihoods.

Methodology

Study area

Kibale National Park (766 km^2) is 20 km south-east of Fort Portal city in western Uganda located at 0^o 13' - 0^o 41'N and 30^o 19' - 30^o 32'E (Fig. 2). The park occupies an undulating terrain on the main Ugandan plateau (Uganda Wildlife Authority, 2015). It is a semi-deciduous moist evergreen forest lying at an elevation of 1,110 m in the south to 1,590 meters in the extreme north (MacKenzie *et al*., 2017). It was a forest reserve from 1932 until 1993, when it became a national park (Chapman *et al*., 2018). While a reserve, the forest was logged at various intensities, pine plantations established on former grasslands, and some parts cleared for agriculture. On becoming a national park, the logging stopped, the pine plantations were cleared, and disturbed areas left to passively regenerate. The Park receives 1,749 mm of bimodal rainfall, and mean daily temperature range of 14-20 ^oC (Kolinski and Milich, 2021). The park is home to three hundred and fifty-one forest tree species (28% of the country's total); 12 species of primates, six of which are diurnal (MacKenzie *et al.*, 2017), and 372 species of birds (Uganda Wildlife Authority, 2015).

Research design

A qualitative and quantitative research design with an exploratory mixed methods approach (Asenahabi, 2019) was applied in this study because of its methodological eclecticism that allows methods to complement one another thereby yielding more reliable qualitative and quantitative data (Hall, 2013). The mixed methods approach involved biophysical assessment of the forest and social survey of the tourists, tour

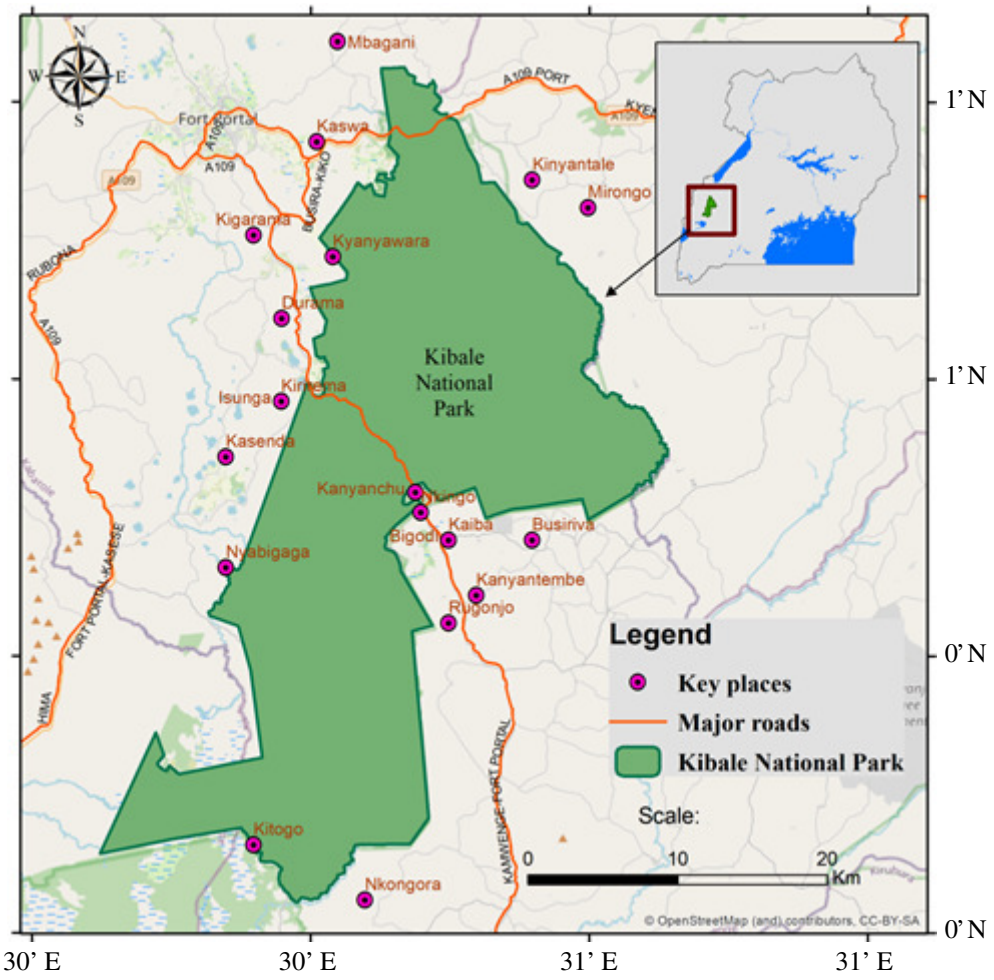

Figure 2. Map showing location of Kibale National Park in Uganda.

operators and the local community members living in Kiyoima ward/village in Bigodi Town Council, which is adjacent to the park.

Sample size and sampling procedure

Ninety three tourists and 10 tour guides were purposively sampled (Campbell *et al.*, 2020) while 53 local community household heads were sampled from 198 households in Kiyoima ward using Slovin's formula (Ellen, 2019) expressed as follows:

$$n = \frac{N}{1+N(e)^2}$$

Where:

n = sample size, N = Total population and e = margin of error.

Simple random sampling technique (Jangra *et al*., 2021) was applied in which every second tourist encountered as they arrived at the park or as they prepared to embark on nature walk or were resting upon return from the nature walk was interviewed. Tourists who travelled alone were approached to grant an interview before or after participating in nature walk. In the case of tourists travelling in a group, the first tourist was selected at random and every second tourist was requested for an interview. Based on DeJonckheere and Vaughn (2019) tourists were interviewed using a structured questionnaire comprising open and closed ended questions. The method was used because it allowed collection of closed and open-ended data and exploration of tourists' perspectives about introduction of canopy ecotourism in Kibale National Park. The questionnaire was divided into four parts; the first part gathered information on the tourists' profile, the second part sought information on the activities they would be interested in, the third part collected data on their expenditures while in the park and willingness to pay for canopy ecotourism if it were offered, and the fourth part gathered their views on the possible contribution of canopy ecotourism to local communities' livelihoods.

Considering that tourism is one of the most dynamic economic activities with many socio-economic, environmental and cultural benefits (Tapak *et al*., 2019), local community members living in Kiyoima ward/village mentioned above were selected using the simple random technique (Thomas, 2022) in which the first household encountered upon entering the community was selected and interviewed using a question check list consisting of 14 questions. A local research assistant fluent in Lutoro and Lukiga was recruited and helped to interview the local community members in the local languages. The questions were posed in local language and the response written in English in the questionnaire copy. The research assistant explained the concept of canopy ecotourism as simply as possible in the local language. After interviewing the first household head, every second household encountered along the village foot path was selected and the head or an adult member aged 18 years and above interviewed. The questions focused on their knowledge of tourism activities in the park and how they would benefit from canopy ecotourism if it is introduced in the park. Where a local community member turned down a request to be interviewed, the next household was approached. Tour guides were also interviewed using a question check list consisting of ten questions to gather information of their experience in tour guiding and knowledge of canopy ecotourism.

Biophysical forest resources assessment

The biophysical forest resources assessment included an in-forest tree inventory to determine the suitability of the trees to support establishment of canopy ecotourism

facilities. Ten belt transects (Salifu *et al*., 2018) measuring 200 x 5 metres were established in two compartments in the mature unlogged forest areas that are adjacent to Makerere University Biological Field Station in Kanyawara in the national park (Fig. 2). A relatively undisturbed/unlogged natural forest is suitable for establishing canopy ecotourism facilities as the trees are mature. In each transect mature trees were recorded by species and the height, diameter at breast height (DBH), crown size, canopy openness, proximity to each other (distance between them), altitude and slope measured. These are parameters of the anchor trees that would support canopy ecotourism facilities (Lowman, 2020).

Survey of stakeholder perspectives

In order to determine stakeholders' perspectives on the development of canopy ecotourism as a new tourism product niche in Kibale National Park, tourists visiting the Park (*n=93*), local community members living adjacent to the Park (*n=53*) and tour guides (*n=10*) were interviewed using a structured questionnaire. In-depth key informant interviews were also held with officers in the Ministry of Tourism, Wildlife and Antiquities (MTWA) and Uganda Wildlife Authority (UWA) (*n=5*) and heads of community-based organizations (*n=2*) operating near the park.

Data analysis

Data on the tree parameters were subjected to one way Analysis of Variance (ANOVA) to show variations in the transects, and tree characteristics. To guide the possible location of canopy ecotourism facilities, tree inventory data were subjected to correlation analysis to determine the relationships between tree height, diameter, crown size and canopy openness of anchor trees (Hanneman, 2000). Data collected from the stakeholder interviews were edited, coded and entered in SPSS Version 22.0 to create a data file and to generate statistical summary of the responses by tourists and local community members. Responses by key informants in MTWA and UWA were synthesised and presented as a narrative based on Nasheeda *et al*. (2019).

Results

Forest's biophysical resources

A total of 208 trees belonging to 36 species and with DBH >20 cm was enumerated within the selected transects. In the science of forest mensuration, trees with the DBH>20 cm are regarded as mature and, in the context of this study, can anchor canopy ecotourism facilities. Analysis of the biophysical variables (Table 1) show that tree height, with a range of 20-50 m and mean of 34.14 m, significantly varied ($P<0.001$) among transects as did diameter at breast height (DBH) with range of

Table 1. Mean squares and other descriptive statistics of the forest's biophysical parameters among the transects

Biophysical parameters	DF	SS	MS	Range	Mean	F	P-value
Height (m)	6	1260.8	180.1	20-50	34.14	4.24	0.000**
DBH (cm)	6	16867	2410	100-160	69.46	2.36	0.024*
Crown size (m^2)	6	331219	47317	4-397	88.57	4.46	0.001**
Canopy openness (%)	6	1189.4	169.9	1-60	7.38	3.18	0.003*
Distance between trees (m)	6	152.3	21.8	1-30	8.59	1.20	0.305ns
Altitude (m.a.s.l)	7	1588637	226948	1202-1502	1364	60.91	0.000**
Slope (^{o})	7	1565.5	223.6	1-20	5.74	15.57	0.000**

** = significant at P < 0.001; * = significant at p < 0.05; ns = not significant m.a.s.l = metres above sea level

100 -160 cm and mean of 69.46 cm (P<0.001). Mean height and DBH of the trees that were enumerated and can support/anchor facilities are presented in Table 1. The tallest trees (mean > 40 m) also had the biggest stems (mean DBH of 100-140 cm (Table 2). Similarly influenced by transects were crown size with a range of 4-397 m^2 and mean of 88.57 m^2 (P<0.05); canopy openness with a range of 1-60% and mean of 7.38% (P<0.05); altitude with a range of 1202-1502 m and mean of 1364 m; and slope with a range of 1-20 and mean of 5.74^o (P<0.001). The distances between trees (mean of 8.59 m) were not significantly different (P>0.05) among transects.

With regard to the relationship between biophysical variables, there were significant correlations (P< 0.01) between crown size and tree height, crown size and distance between the trees, crown size and DBH, and tree height and DBH (Table 3). Canopy openness was not significantly correlated to any other tree variable. These correlations guide the establishment of canopy ecotourism facilities such as ziplines and walkways which require closely spaced trees with large stems and interlocking crowns.

Tourists' profile and perspectives of canopy ecotourism

Based on Pagliara (2015) and Rodríguez *et al*. (2020), the tourists' profiles are presented here as summary statistics. Out of the 93 tourists interviewed, 53.8 % were male and 46.2% were females. The majority (52.7%) were 20-40 years old, 33.3% aged 41-60 while 14% were above 60 years. Seventy eight percent travelled in groups and 21.5% alone. The majority were from Europe (59.1%) followed by North America (28%), Australia (5.4%), Latin America (4.3%) and Africa (3.2%) (Fig. 3). The top three activities they participated in were primate trekking and viewing (33.3%), nature walk (28.7%) and camping and picnicking (22.6%). The tourists expressed willingness to participate in canopy ecotourism if the facilities are established

Table 2. Mean height and DBH of tree species that can achor establishment of canopy ecotourism facilities

Tree species	Mean height (m)	Mean DBH (cm)	Description
Balanites wilsoniana Dawe & Sprague	35	110	Evergreen tree 30–50 m high with an irregular, sometimes open crown; trunk up to 120 cm in diameter, sometimes buttressed and deeply fluted.
Celtis Africana Burm.f.	40	100	Deciduous forest tree about 30-40 m tall with spreading crown, DBH up to 100 cm, stem slightly fluted without buttresses.
Chrysophyllum albidum G. Don	35	105	Buttressed tree species, 25-37 m in height, low branched crown, DBH of 150-200 cm fluted stem free of branches for 21 m.
Cynometra alexandri C.H. Wright	40.2	118.8	Evergreen tree up to 50 m tall, DBH 150–180 cm with large, thin plank buttresses up to 5 m high. Flattened crown with spreading branches.
Ficus exasperata Vahl	40	140	Grows up to 20–50 m tall with spreading crown; DBH up to 150 cm, stem is fluted or buttressed.
Ficus mucuso Welw. ex Ficalho	37.5	150	Evergreen tree grows up to 40 m high with open crown, DBH up to 150 cm, buttressed triangular stem up to 4 m high.
Funtumia latifolia (Benth) Stapf	40	137	Tree grows up to 40 m high with narrow crown, DBH of 160 cm with cylindrical unbuttressed stem.
Mimusops bagshawei S. Moore	44	112	Grows up to 30–40 m tall with spreading crown, branches up to 15-20 m; DBH up to 100 cm with fluted stem.

Table 2. Contd.

Tree species	Mean height (m)	Mean DBH (cm)	Description
Monodora myristica (Gaertn) Dunal	45	100	Grows up to 40 m high with lush crown, DBH up to 200 cm, A tree of the evergreen and deciduous forest, to 35 m high by 2 m in girth.
Myrianthus holstii Engl.	35	120	Tree with large branches growing from 20 m, has a short bole, DBH of 20 cm and stilt roots up to 60 cm high.
Olea welwitschii (Knobl.) Gilg. & G. Schellenb.	50	100	The tree can reach 50 m high with a straight stem, DBH up to 100 cm and small crown.
Parinari excelsa Sabine	41.6	139	Grows up to 45–50 m tall with flat spreading crown; DBH up to 150 cm with branchless, straight and cylindrical stem up to 20-25 m, buttresses up to 3 m high.
Piptadeniastrum africanum (Hook.f.) Brenan	50	160	Grows up to 50 m tall with flat crown spreading in the upper forest canopy, DBH of 180-300 cm, straight cylindrical stem up to 2m high above the buttresses.
Premna angolensis Gürke	25	120	Grows up to 21–33 m tall with spreading crown and almost horizontal branches; DBH up to 120 cm, stem is often crooked, sometimes fluted and hollow.
Prunus Africana (Hook. f.) Kalkman	38.3	105	Grows up to 40 m in height heavily branched with spreading spherical crown, DBH of 110 cm.
Warburgia ugandensis Sprague	40	120	Evergreen tree up to 42 m high with spreading and rounded crown; DBH up to 120 cm, straight unbranched stem up to 3 m.

Table 3. Correlations between tree parameters in the compartments

Tree parameter	Correlation coefficient (r)	Significance (P-value)
Canopy openness x Crown size	0.24	0.732^{ns}
Canopy openness x Height	0.43	0.537^{ns}
Canopy openness x Distance between trees	0.11	0.887^{ns}
Canopy openness x DBH	0.87	0.207^{ns}
Crown size x Height	0.40	0.000**
Crown size x Distance between trees	0.27	0.000**
Crown size x DBH	0.29	0.000**
Height x distance between trees	0.04	0.577^{ns}
Height x DBH	0.63	0.000**
Distance between trees x DBH	0.040	0.561^{ns}

** = significant at $P < 0.001$; ns = not significant

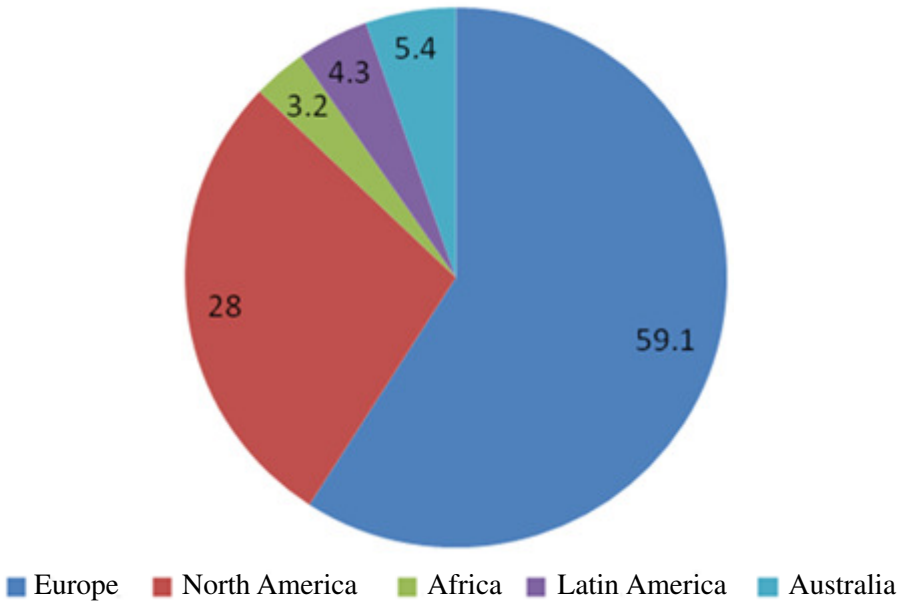

Figure 3. Tourists' countries of origin.

and to inform other potential tourists about the product. Furthermore, the tourists indicated that they had ever participated in canopy ecotourism and used facilities such as canopy walk ways and aerial ropes. Although only 47.3% had ever participated in canopy ecotourism, 86% were willing to participate in forest canopy ecotourism if the facilities are established. They perceived the benefits of canopy

ecotourism in terms of enhanced visitor's experience, longer stay to interact with nature and engagement of local people in bottom-up forest conservation activities.

Local communities' profile and perspectives of canopy ecotourism

Out of the 52 respondents interviewed from the adjacent community, 60% were below 40 years, 53.85% were subsistence farmers and 42% depended on environmental resources for their livelihoods. The majority (84.6%) were willing to participate in canopy ecotourism by providing home-stay services to tourists, working as tour guides, providing transport services, supplying food to hospitality establishments and selling hand crafts to tourists. Sixty-five per cent of the respondents expect canopy ecotourism to improve their livelihoods through employment, provision of markets for their agricultural produce and improved road infrastructure. In terms of revenue sharing where the local communities were already receiving 20% of gate collections from Uganda Wildlife Authority, 26% suggested that part of the revenue should be channelled to improve health care facilities, construct classroom blocks and supply of clean water.

Key informants' synthesis

The qualitative results of the key informant interviews are summarized in this section as a narrative following Moen (2006). As key informants in this study, officers from the Ministry of Tourism, Wildlife and Antiquities, Kibale National Park and tour guides supported the development of canopy ecotourism and suggested the need to put in place a policy and regulatory framework to guide the development of the facilities. The tour guides perceived the benefits in terms of enhanced knowledge and acquisition of new skills in canopy ecotourism tour guiding as a new tourism product niche. Leaders of community-based organizations perceived the benefits in terms of increased flow of tourist numbers and incomes, growth of local community-based tourism enterprises and availability of market for local produce such as hand crafts and food as well as increased incomes to the local people.

Discussion

Biophysical forest resources for establishment of canopy ecotourism facilities

Establishment of canopy ecotourism facilities requires sound knowledge of the forest's biophysical parameters such as tree height and diameter and topographical features which are crucial for establishment of canopy ecotourism facilities (Sterck *et al*., 2005; Imani *et al*., 2017). This study has revealed that there were enough tree species in the compartments studied with average heights and diameters that exceed those recommended by Ramlan *et al*. (2012) as appropriate for establishment of canopy ecotourism facilities, that is, tree heights of 30-40 meters and stem diameters of 30 cm. Tree heights, diameters, crown size, canopy openness, distance between

trees, altitude and slope are parameters that are simultaneously taken into account during construction of canopy walk ways. For instance, tree crowns are important because they configure the canopy structure and closely correlate with stem diameter and tree density in the forest (Hemery *et al*., 2005; Suhardiman *et al*., 2016). The trees in the park can anchor canopy walk ways because elsewhere in the world, forests with varying tree heights anchor facilities such as canopy walk ways and aerial ropeways. For instance, trees that anchor canopy walk ways in other countries are 11-23 metres in Queensland (Australia), 8-42 metres tall in the Bavarian forest (Germany) and 22 metres tall in Borneo (Malaysia).

This implies that the trees in the assessed compartments can anchor canopy tourism facilities such as canopy walkways, aerial rope ways and tree houses (Califf, 2019). Establishment of such facilities on fruiting trees such as *Ficus mucuso* and *Ficus exasperata* (Table 2) frequented by birds and primates (personal observation) provide additional attraction to tourists. With the average tree height of 34.14 meters, mean diameter of 69.46 cm, elevation of 1364 meters *a.s.l,* and slope of 5.74^{o}, it can be affirmed that the park's forest resources in the studied compartments are suitable for establishment of canopy ecotourism facilities mentioned above and also observed by Girardun *et al*. (2013) and Patten (2020).

Stakeholders' perspectives of canopy ecotourism development

Studies of stakeholders' perspectives of protected area-based tourism are widely reported in literature, notably, Hartter *et al*. (2016), Randle and Hoye (2016), Al-Tokhais and Thapa (2019) and Amoako *et al*. (2021). According to Sanchez Cañizares *et al*. (2016), the perceptions of stakeholders regarding the effects of tourism development in an area are essential in ensuring the proper design and implementation of tourism development strategies. Stakeholders' perspectives in development initiative, such as canopy ecotourism in Kibale National Park, are crucial as they influence strategy formulation and their participation (Bourne and Walker, 2005). Results of this study affirm that all the stakeholders support the development of canopy ecotourism in Kibale National Park based on their willingness to participate and also in view of the anticipated benefits. The park is rich in biodiversity and supports a number of nature-based recreational activities, for instance it has 12 species of primates that can anchor primate viewing and 372 bird species that can support birding activities. Managers of Kibale National Park, Uganda Tourist Board and tour companies that market Uganda's tourist products and the country as a destination need to consider these attractions and travel characteristics of tourists and plan the itineraries accordingly. Furthermore, the tourists perceive canopy ecotourism as an additional attraction in the park and are willing to pay and participate if facilities such as aerial rope ways, tree houses and suspended walkways are established.

It was imperative to solicit tourists' perspectives in this study because they are the prime users of the facilities. Considering that slightly more than half of the tourists were aged between 20 and 40 years and the minority was above 40 years, it would be logical to take the age factor into account when establishing the canopy ecotourism facilities as younger visitors tend to participate in physically challenging activities (Veitch *et al*., 2016; Manz *et al*., 2018). Furthermore, given that most of the tourists travelled in groups, it would be realistic to establish facilities and activities that carter for group participation in canopy ecotourism. Considering that tourism is private sector led, Uganda Wildlife Authority need to provide guidelines for investments in canopy ecotourism facilities so as to promote it as product niche in the park without adversely affecting the natural forest environment.

Tourists' willingness to pay and participate in activities are critical success factors in sustainable tourism destinations (Juardo-Rivas and Sánchez-Rivero, 2019), and more so for canopy ecotourism in Kibale National Park. Based on the results that the majority of tourists are willing to participate and pay for the activities, it is reasonable to conclude that canopy ecotourism will be successful if developed in Kibale National Park. However, it will also be important to consider other factors that are critical to the success of canopy ecotourism such as professional tour guiding, easy access, security, safety, quality of facilities and support services such as accommodation and transport for tourists (Marais *et al*., 2017; Chingarande and Saayman, 2018). Experience elsewhere has shown that these aspects increase the demand and revenue from ecotourism products and services (Cobbinah *et al*., 2015) and make tourism destinations sustainable. The development of canopy ecotourism should draw on the triple bottom line theory discussed by Kenton (2021) which is crucial for achieving a balance between social, economic and environmental benefits of canopy ecotourism.

Although various studies indicate that canopy ecotourism can contribute to improved local communities' livelihoods (Lowman, 2021), this is not always obvious due to a number of factors which hinder their participation and reduce the anticipated benefits. For instance, development of canopy ecotourism facilities entails technical and capital investment which the local communities may not afford easily and their limited knowledge of public private partnership inhibits the choice of such an investment option.

Of the various factors reported in literature as hindering the success of ecotourism is the lack of effective stakeholder participation (Wondirad *et al*., 2020). Thus, ensuring local community participation is critical to sustainable canopy ecotourism development as a new product niche in Kibale National Park. Failure to empower and meaningfully engage local communities will undermine canopy ecotourism and jeopardize its long-term benefits. However, if well planned and developed, canopy ecotourism will

complement the on-going ecotourism activities in the park with a ripple positive socio-economic effects.

Furthermore, the local community will have to be sensitized about the development of canopy ecotourism to make them embrace, participate and benefit from it. Community participation is one of the central tenets of participatory management and conservation of protected areas and supports tourism development (Umuziranenge, 2019). Although not explicitly covered in this study, experience from elsewhere shows that park managers also need to be sensitized about new tourism products to avoid applying restrictive management approaches that demotivate visitors and affect their participation in canopy ecotourism in the park (Gundersen *et al*., 2015). In this regard, Uganda Wildlife Authority will have to sensitize the Park managers and equip them with knowledge and skills to effectively supervise and monitor canopy ecotourism activities.

The local community members that were interviewed in this study live within the administrative boundaries of Kamwenge District Local Government (KDLG) whose development objective, among others, is to increase household incomes by promoting sustainable utilization and management of environmental, natural and cultural resources for socio-economic development (KDLG, 2015). In terms of tourism development, one of the District's strategies is consistent with the objective of this study namely to harness the tourism potential in the district by developing tourism products. This strategy is to be achieved by incentivizing private sector investments in tourist attractions and amenities, marketing of priority tourism products and providing security and protection of tourists and the sites. The development of canopy ecotourism in Kibale National Park, which occupies part of the district, would contribute to the attainment of the district's goal of increasing the incomes and up lifting the households' wellbeing through engagement in a number of tourism enterprises such as homestays.

Although not explicitly examined in this study, but mentioned by respondents, homestay is an attractive tourism product, a tool for strengthening social and economic capacities of the local community and fosters close linkage between the tourists and the local community members (Ogucha *et al*., 2015). It adds authentic socio-cultural richness to the tourist's experience (Acharya and Halpenny, 2013). It is also viewed as a pro-women tourism product that fosters gender equality and secures women's involvement in income generation enterprises. Two thirds of the respondents expect canopy ecotourism to improve their livelihoods by working as tour guides, providing transport services and selling food and hand crafts to tourists. Local community members also expect to work as tour guides, provide transport services, sell food and hand crafts to tourists. In addition, they expect to benefit through employment, availability of markets for their agricultural produce and improved road infrastructure. The tour

guides expect to benefit from canopy ecotourism in terms of enhanced knowledge and acquisition of new skills in the new product niche. Local community leaders expect to benefit in terms of incomes, springing up of local community-based tourism enterprises and increased incomes to the local people.

Conclusions

This study makes a significant contribution to the existing body of knowledge to guide development of canopy ecotourism in Uganda and beyond. The study is the first major attempt to empirically document and elucidate the biophysical forest resources that can anchor canopy ecotourism facilities in Uganda's forested national park. The study has generated baseline data on forest resources and stakeholder perspectives that are valuable for planning and guiding decision making prior to introduction of canopy ecotourism in any protected area of Uganda. The following conclusions are drawn from this study:

a. It is feasible to develop canopy ecotourism in the park because it has biophysical forest resources to support the development of canopy ecotourism in terms of suitable tree height, diameter, crown size, canopy openness and proximity of the trees.
b. Survey results revealed that the majority (84.6%) of the local community members interviewed support the development of canopy ecotourism in the park, most of the tourists (86%) are willing to participate and pay for canopy ecotourism, and 94.6 % are willing to recommend the park to be visited by other tourists.
c. Majority of tourists that visited Kibale National Park during the study period originated (by continents) from Europe, North America (USA and Canada), Australia, Latin America and Africa. Most of them travelled in groups and nearly ninety percent were visiting the park for the first time. They participated in chimpanzees viewing, nature walk including birding and camping and picnicking.
d. Officers from the Ministry of Tourism, Wildlife and Antiquities, Kibale National Park and tour guides support the development of canopy ecotourism.

Recommendations

The following recommendations are advanced from this study:

i. Much as Kibale National Park is visited mainly by foreign tourists, canopy ecotourism is a product that should also be marketed by UWA, Uganda Tourism Board and tour operators to promote domestic tourism.
ii. The Kibale National Park general management plan will have to incorporate the development and maintenance of canopy ecotourism facilities and define ways in

which the local communities will participate, provide homestay facilities and benefit as a key stakeholder.

iii. Given that it is feasible to develop canopy ecotourism in Kibale National Park, further studies to determine the environmental and social impact assessment (ESIA), e.g. carrying capacity of the facilities, management of littering and noise pollution as well as possible introduction of alien invasive species) should be conducted before establishing facilities such as aerial walk ways, tree houses and aerial ropes to avoid the likely negative impacts.

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