



**DEPARTMENT OF ANIMAL SCIENCE AND FOOD-PROCESSING IN TROPICS AND
SUBTROPICS**

**CONSERVATION APPROACHES OF WILDLIFE
PROTECTED AREAS AND THEIR BENEFITS IN
UGANDA**

(Bachelor study)

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Statement

I declare that i worked out this bachelor thesis titled, Conservation of approaches of wildlife protected areas and their benefits in Uganda“ alone and i used only literature that is cited and mentioned in the references. I agree with the storing of this thesis in the library of CULS Prague enabling it for study use.

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ABSTRAKT

Tato bakalářská práce se zabývá zřizováním a managementem přírodních rezervací v Ugandě. Zaměřuje se jak na rezervace samotné, tak i na přístupy k nim během vývoje státu Uganda. Popisuje historii země, přístup k přírodnímu bohatství a představuje nutnost zachovat rozmanitost živočišných druhů v přirozeném prostředí.

Je vysvětlený vliv všech politických režimů na život v divočině a chráněných oblastech.

Práce se snaží na základě udaje z dotazníku objasnit současnou situaci v chráněných oblastech, stavy zvířat, financování parků, atd. Zohledňuje vliv klimatu v dané oblasti, na počty zvířat, jejich početní nárůst, nebo úbytek. Upozorňuje na úbytky způsobené lovem, pytláctvím, neodborným zacházením, ale také požáry, dlouhodobými obdobími sucha, obdobími dešťů, propuknutím nakažlivých nemocí.

Zlepšení navrhuje pomoc nutného vzdělávání lidí pracujících v rezervacích a parcích, modernizací zemědělství, privatizací parků, snížením vytěžení dřeva na otop, modernizací způsobů pozorování a shromažďování dat o zvířatech v parcích.

Klíčová slova: přirozené příčiny, udržitelné řízení, vymýcení chudoby

ABSTRACT

This study is about management of wildlife protected areas in Uganda. It recognizes existing protected areas and conservation approaches used in the country. It explains political effects of last and current regimes on conservation of wildlife and creation of protected areas by giving overview of Uganda's political history. It also examines the current situation in protected areas, state of animals, management approaches used and sustainable methods used by Uganda's protected areas.

The thesis tries on basis of a questionnaire to examine the current situation in Uganda's protected area. It also examines the effect of climate change on distribution of animals. It further examines how the number of animals in protected areas effects revenue generation and conservation activities in protected areas. The study further points out hunting, poaching encroachment of protected areas and nature related causes such as bush fires, long drought season, heavy rainfall and out break of diseases as causes wildlife loss in protected areas. It also mentions animal health and community education as methods used by protected areas to reduce the rate of wildlife loss.

It also recommends methods like modernization of agriculture, privatization of some parks, reducing dependency on trees for fuel and data collection about existing species as ways for sustainable wildlife management. It emphasizes that poverty eradication in communities around protected area has to be the main objective of new conservation approach if wildlife in Uganda is to be sustainable used.

Key words: Natural causes, sustainable management, poverty eradication.

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INTRODUCTION

Uganda is a landlocked country that lies on Eastern part of Africa. The country has a total land area of 241,038sq km (93,078sq mil). The Capital is Kampala and population is 28.9 million. Uganda is a country rich in plant and animal diversity. The country has varied habitats and climate that supports diversity of plants and animal life, this makes it to be ranked among top ten countries in the world for animal and plant diversity especially of mammalian species (Bakama, 2010, Averbek, 2006).

Plumtre et al (2006) states that, 6% of Uganda's total land is covered by fresh water bodies, 81% covered by natural forests and 10% is wildlife protected areas. The Albertine rift has the richest number of species on the continent having more vertebrates than other region on mainland Africa. However, conservation of wildlife was not known in the pre-colonial Uganda. People used to hunt animals for either food or kill the dangerous animals like Lions for security reasons. Arab traders came to East Africa in early 1800 introduced ivory and skin trade and animals such as Elephants were hunted for their Ivory.

Mbaiwa (2003) states that conservation of wildlife in Uganda began in the 19th century during colonial rule. British colonial power changed the traditional land and wildlife used system not only in Uganda but throughout Africa. The study indicates that, in western Uganda for example, British colonial Masters restricted locals in 1926 from accessing the 3480 sq km of land in Masindi district and Murchison fall national was established. Murchison falls National Park became the first protected area to be formed in Uganda. Four years later in 1930s, 473 sq km of land around Budongo forests were declared protected area and Budongo forest and game reserve was established. The following years, many areas were declared protected and National Parks such as Queen Elizabeth National Park, Kidepo Valley National Park, National Park, Kibale National Park, Pian Upe game reserve among those established by colonial Masters. According Chemonics (2001), civil wars that followed after independence from 1964 to 1985 hindered conservation activities in Uganda and protected areas were used as a safe haven by rebels groups. However, from 1986 relative peace brought by the current

government with commitment to preserve nature led to creation of more protected areas with help of donor groups mainly United State government and European Union.

The protected created between 1986 and 2000 are, Mahinga National Park, Mountain Elgon National Park, Rwenzori Mounntains National Park among others. Today, Uganda is home to 10 national parks, 13 game reserves and 11 wildlife sanctuaries (Polycarp et al., 2004). Maganga (2002), states that after independence in 1962, state maintained management of these wildlife protected areas. According to Namara (2009), all national Parks and game reserves in Uganda are under state control. State agency called Uganda Wildlife authority determines resource management and decide required activities that takes place in all protected areas.

The management of Bwindi Impenetrable, Lake Mburo, Queen Elizabeth, Kibale National Parks and others are the examples. Uganda Wildlife Authority co-ordinates all the activities in the parks including sport, hunting, and employs staffs. The study shows that, revenues from tourists are shared between protected areas and Uganda Wildlife Authority. The rest of revenue pays the staffs and rest goes to area maintaincy. Mbaiwa (2003) writes that, this was a colonial approach to management of wildlife resource. According to Adam (2003) it was widely argued that wild „life needs to pay its way“ meaning revenues from wildlife was expected to help in management and conservation practices.

However, according to Ngowe (2004) this approach to wildlife management is not effective. The loss wildlife in the National parks and other protected areas is constant or inccessing. The study indicates that nature related causes, poaching and encroachment of protected areas by the locals are ways through which animals and protected land areas are lost. Jannasen (2007) says that the need for more land increases as human population around protected areas increases. Livestocks also compete with wild animals in protected areas for food and water. Wolmer and Chandra (2005) wrote, as number of people increases, the demand for more land and resources also increases. According to the study, all Ugandans protected areas recorded animal loss through poaching, hunting and encroachment despite their efforts to educate communities around these areas about the

importance of wildlife resource. Community education is the only approach used in Uganda as a sustainable way of wildlife resource conservation. But this approach has not achieved its objectives as wildlife is constantly decreasing in Uganda's protected areas. The results show that all Uganda protected areas record animal loss through poaching, hunting, encroachment of protected areas and nature related causes. The further indicates that community education and immunization are the approaches used to reduce the rate of animal decline at their places of conservation yet measures such as repressive can reduce the high level poaching and hunting activities while investing in modern agricultural practices around protected areas can provide an alternative source of income to local families around protected areas. Only two of eighteen surveyed protected areas are privately owned. This means privatization of protected is not a common practice in Uganda yet Langholz (2000) comments that privatization of protected areas can open up private investment into the sector. This can increase tourism revenue and the increased revenue can help in sustainable conservation activities.

Geography of Uganda

Uganda is lying mostly between latitudes 4°N and 2° S and longitudes 29° W and 35° E. The country is bordered with Kenya on the east, Republic of South Sudan on the North, Democratic Republic of Congo on the west and South west by Rwanda. The Southern part of Uganda is covered with large portion of lake Victoria which stretches down to Tanzanian border. It averages between 1,100 metres above sea level (Longman, 2009).

Southern Uganda lies at an altitude of 1,134 meters above sea level. The plateau that stretches northward from Lake Victoria declines gradually to an altitude of 914 meters. The gradually sloping terrains are interrupted by shallow basins dipping towards the center of the country and areas of tropical forests form the western borders with Democratic Republic of Congo. Both eastern and western borders are covered by mountains. Ruwenzori Mountains also known as mountains of the Moon are approximately eight kilometers off the border with Congo. The highest peak of Ruwenzori is snowcapped called Margherita which reaches a height of 5,113 meters. Further South, is Mufumbiro mountain. The highest peak of Mufumbiro volcanoes

reaches 4,13 meters and Mount Mahavura which is also in the South reaches a height of 3,648 meters. Mountain Magahiga also on the western border reaches an height of 3,477 meters. In Western Uganda, also lies Mountain Sabinio that brings Uganda, Rwanda and Democratic Republic of Congo together (Bakama, 2000, Longman 2009).

In eastern Uganda, volcanic Mountains dominates the borders with Kenya. North of the equator lies Mountain Elgon which rises from 1,200 meters hills to reach the height of 4,324 meters. Mountain Elgo is an extinct volcano and its ridges radiates approximately thirty kilometers from its crater lakes. On the eastern is also Mount Moroto which reaches the height of 3,085m. On northeast Uganda are also Mountain Zulia, Morungole and Labwor and Dodoth Hills that reaches the heights of about 2,000 meters. The Langia Mountains and Imatong are as high as 3,029 meters lie on the border with South Sudan (Bakama, 2000).

Uganda is also well endowed with water, about 44,00 square kilometers is open water or swampland. Four of East Africa's Great lakes Lake Victoria, Lake Kyoga, Lake Albert, and Lake Edward are found within Uganda or on its borders. Lake Victoria occupies the Southern portion of the country with almost one-half of Lake Victoria's 10,200 square-kilometers area are found inside Uganda. Lake Victoria is the source of River Nile and feeds the upper waters of Nile River. Lake Kyoga and its surrounding basins occupies the central part of Uganda. Lake Kyoga extends to form Lake Kwania, Lake Bugondo and Lake Opet. These Finger Lakes are surrounded by swamps especially during rainy seasons. All lakes in the Kyoga Basin are shallow, reaching a depth of 9 meters on average. Along the border with Congo there lie Lake Albert, Edward and Lake George occupies the western Albertine rift valley (Prumptre 2006 and Bakama 2010). On West is also Katonga River which flows westward from Lake Victoria to Lake George. Lake George and Lake Edward are connected by Kazinga channel. Semliki River also in Western Uganda flows into Lake Edward from the North part of Country where it forms part of the Uganda –Congo border (Longman, 2009).

Figure 1: Geographical map of Uganda



Source: Google www.google accessed January 2012

Climate

The climate is generally equatorial, but not uniform as the altitudes determine the climate. Uganda receives plentiful sunshine and the sunshine is moderated by high altitude of most parts of the country. Southern Uganda lies at an average altitude of 1,134 meters above sea level and receives less sunshine with mean annual temperatures ranging from about 16°C in the Southwestern highlands to 25°C in the northwest. But in the northeast Uganda, temperatures exceed 30°C about 254 days per year. Southern Uganda is wetter with rain that spreads throughout the year. Northern Uganda is dry and receives two seasons of rain from December to February and the second season is from June to August. The Rwenzori Mountains surrounded by tropical rainforests in the Southwest Uganda receive heavy rainfall throughout the year (Longman 2009).

History of Uganda

Uganda got her name from the largest and strongest Kingdom Buganda which occupies the central and southern part of the country. Buganda people from Buganda kingdom makes up the largest portion of the population, and Luganda language from Buganda Kingdom is the most widely spoken language in the country. Uganda is occupied by the Bantu speaking people who migrated around 2000 thousand of years BC from Congo Basin. They were farmers looking for fertile land and pastures for their animals, escaping the tropical rainy forests of Congo which did not provide enough pasture for their animals. They settled around the great lakes of Eastern Africa. The first settlers settled around Lake Albert, Edward and Victoria and others moved far east to Kenya and Southwards to Tanzania, Zimbabwe, Namibia, Zambia by 300AD small groups had reached Modern Kwazulu Natal in South Africa. They developed centralized chiefdoms which later expanded into big Kingdom around Lake Albert called Bachwezi dynast. Chwezi dynasty is strongest kingdom in modern day Uganda (Longman, 2010).

However, the royal conflicts and Luo invasion led to split of Bachwezi dynasty into smaller Kingdoms of Ankole Kingdom, Bunyoro and Buganda Kingdom. Royal twins from Bachwezi dynasty Rukidi Mpuuga and Kato Kintu formed their own Kingdoms. Rukidi became the king of Bunyoro and Kato Kintu became the King of Buganda. However, Luos from Sudan invaded Bunyoro Kingdom and weakened it while Buganda Kingdom with Kato Kintu in South expanded as far as Tanzania on Lake Victoria and Northward into the central part of Uganda (Longman, 2010).

At the beginning of 17th century, Buganda had become one of the strongest Kingdoms in East Africa. The Kingdom traded ivory with Arabs far east at the coast in the present day Kenya and with the Zulutan of Zanzibar. The first Arab traders who visited Buganda Kingdom arrived in middle 1800s looking for more Ivory and slaves. In 1862, the first Europeans Uganda arrived. They were British explorers John Hanning Speak and James Grant. They were searching for the source of River Nile. After their arrival in Buganda, they visited Mutesa's palace at Mengo hill in present day Kampala. Mutesa who was the king of Buganda at the time of arrival Speak and Grant. Speak and Grant were followed by Samuel Baker and Charles Gordon (Longman, 2010).

In 1885 Henry Stanley, the first missionary arrived in Buganda and received a warm welcome from King Mutesa. Stanley excited the Mutesa and the King got interested in learning Christianity. The King wrote a letter to the Queen of England requesting her for more missionaries to come to Buganda and teach his subjects about Christianity. The year 1887, more Catholics and Protestants were working in Buganda. British Imperial East Africa Company that was already operating in Kenya was extended to Uganda in 1888 under the command of Captain Frederick Lugard. However, religious faction groups developed and a civil war broke out. Buganda became the object of European nations scrambling for African territory. Frederick Lugard working with British East African Company ended the civil war between Catholics, Muslims and Protestants. With the help of Buganda Army, British conquered the Kingdoms of Ankole, Bunyoro, Busoga and other small chiefs and the result was the formation of Uganda. In 1889, Uganda was declared a British colony and British Commissioner Sir Harry Johnston became the Queen's representative at that time (Longman, 2010).

However, according to Phares (1992), the British preserved Buganda as a self-governing entity continuing their royal line of Kabakas (Kings) until 1962, when Uganda got its independence. Sir Edward Walugembe Mutesa (ii) the Grand Son of Mutesa who invited the British missionaries became the first president of Uganda on 9th of October 1962 and Dr Milton Obote became the prime minister. At the time of independence, Uganda had 3 major political parties formed a year before independence. These were Democratic Party (DP), was based on Catholic religion and was predominantly Catholic, UPC (Uganda Peoples Congress), was predominantly Protestant with support in Northern Uganda and Western Uganda and Kabaka Yeka (Meaning only the King), was a Buganda political party with Baganda supporters. Shortly before independence a coalition was formed between UPC and Kabaka Yeka with King Edward Mutesa. However, the power struggle between Prime Minister Obote and President caused a civil war. The Prime Minister attacked King's palace at Mengo in 1964 King (President at the time), was overthrown and forced into exile. Obote became the second president of Uganda in 1964. In 1971, army commander Major General Idi Amin with help of British government overthrew President Obote through a military coup while the president was

away for Common Wealth Meeting in Singapore. To win the support of Baganda, whom Obote has made enemies after the overthrow of their King and abolishing their Kingdom, Amin released all political prisoners mainly Baganda including Democratic Party leader Beny Kiwanuka whom on his inauguration appointed the chief justice. However, President Amin killed all that opposed him. He later expelled all the Arab traders from the country and gave them three months to leave the country and take nothing with them. All Asians shops and properties were given to Ugandans However, Ugandans did not have knowledge of business so when the shops became empty, they were closed them because Ugandans did not know where to buy other products. This brought Ugandas economy to a total collapse (Longman 2010).

After the overthrow of Amin, the caretaker government headed by president Lule organized a general election in 1980 where all traditional political parties in Uganda participated including UPC (Uganda Peoples Congress), Democratic party (DP), Kabaka Yeeke became the Conservative Party and Movement party which was formed that year by a former Army officer called Yoweri Kagutta Museni (Longman, 2010).

UPC won elections having got the highest number of Parliamentarians and chose Obote to lead their party. This gave Obote a chance to become a president again. Yoweri Museni with Movement Party claimed that the elections were not free and fair and formed a rebel group called NRM (National Resistance Movement) which fought a five years guerrilla war until 1986 when the rebels captured the capital. President Yoweri Kagutta Museni leader of the rebel group, became the president of Uganda. New constitution was drafted through constitution assembly where locals choose their representatives. The new constitution was drafted and adopted in 1995 that gave power back to Ugandans.

In 1996, Uganda held a second general election where Ugandans choose their president directly (Longman, 2010).

Politics

Uganda, officially the Republic of Uganda, the country was described by former British Prime minister Winston Churchill as the Pearl of Africa due to her beautiful nature and rich water reserves. Today Uganda is commonly known as the Pearl of Africa.

From the time Uganda was declared a British protectorate in 1889, the colonial Masters preserved Buganda Kingdom and its Kings successions during the colonial rule. The Kingdom under British was an independent political entity with its Kabakas (Kings) succeeding each other up to the time of independence. on 9th October 1962, Uganda gained independence within common wealth Nations and Doctor Apolo Milton Obote became the first Prime Minister while Edward Mutesa (ii) became the president with Buganda having a significant degree of autonomy within the country. However, in 1963 Prime Minister Apolo Obote withdraws Uganda from the commonwealth nations and announced that Uganda is not a federal state anymore, and declared Uganda a Republic. Few months later Prime Minister Obote seized power by attacking the Kings palace and declared himself a president of Uganda. He dismissed Mutesa(II) from the presidency and abolished the Buganda Kingdom. Buganda was dived into four states and traditional Kingships were abolished. In the same year, Idi Amin was made a chief of staff of military forces by president Apolo Milton Obote. A new constitution was drafted that gave considerable power to the president. In January of 1971, general Idi Amin took power by a military coup while president was at a commonwealth meeting in Singapore. On 4 August 1972, he expelled all Asian families who were not Uganda citizens and confiscated their assets. They were given 90 days to leave the country. After they left the country, the president gave the Asian shops to Ugandans. In 1972, troops royal to former president Milton Obote attacked the country from Tanzania. This brought chaos in Uganda as president Amin ordered the killing everyone suspected of being close or related to the former president (Obote) including all those who opposed the president. In 1973, over hundred Peace Corps workers were detained and expelled from Uganda by President Idi Amin. United States government responded by denying entry of Ugandan ambassador to Unites States (Longman, 2010).

In 1976, Idi Amin declared himself a life President of Uganda and declared his desire to extend Uganda borders into Kenya and Tanzania claiming those are part of Uganda that were given way by British imperialists. In 1977, he ordered the arrest of the Most Reverend Anglican archbishop of Uganda Janani Luwum who was murdered later after his arrest. In 1979, Ugandan's capital Kampala was taken over by combined Ugandan

rebels with the help of Tanzania forces. Yusufu Kironde Lule of Uganda liberation Front was chosen to lead the caretaker government and he became the 4th president of Uganda (Phares,1992).

In 1980, general election was conducted and all traditional political parties abolished by Amin participated in the elections. Uganda Peoples congress got the highest number of members in Congress, and chose Obote as their leader. Milton Obote became a president of Uganda again. However, a youth wing led by a military official Yoweri Kagutta Museni declared that election was not free and fair. He formed a rebel group in Name of National Resistance Movement. The rebel group fought a guerrilla war in Northeast part of Uganda in Luwero jungles. President Obote tried to defend his regime by killing challengers however, his presidency lasted for only five years. In January of 1986, the National Movement Rebels captured Kampala under the leadership of Yoweri Museni. During the civil war the rebels were supported by a Son of former Buganda King to win the support of Buganda people on the promise that when they capture power, they will restore Kingship to every kingdom that once existed in the country. By 1991, Ronald Mutebi a Son of Edward Mutesa was crowned the king of Buganda. Other kingdoms of Ankole and Bunyoro also crowned their Kings though they lacked political power. Kings role in Uganda is more cultural than political. However, King Mutebi of Buganda re-introduced the same type of leadership similar to that seen before the Kings were abolished. Now Buganda kingdom is independent Kingdom in the country with its own parliament, flag, national anthem, Universities and ministers performing mainly culture and economic roles (Longman, 2010).

According to Phares (1992), in 1987 in northern Uganda was a rebel uprising started by an insane and sadistic leader called Joseph Kony, who was driven by his insanity demon possession and started to murder his own people, cutting off lips and ears, and all this, for no apparent reason. Before Kony, there was his mentor a strange, illiterate woman called Alice Lakwena.

In 1996, the new constitution was adopted and Ugandans held their first general elections in more than a decade under one political Movement. Yoweri Museveni president of military government won the general elections, and he became the first president to be

elected directly by people. Ugandan constitution allowed president to lead the country for only two terms. The parliament amended the constitution in 2001, to lift term limits to allow the incumbent president to stand for many of presidency. However, the amendments was not president's Bush war doctor, Conel Doctor Besigye who opposed the president in 2001 and later stood against his Boss 2001 general election. By at that time, Besigye was a political adviser. Though Museveni won in 2001 general election, Besigye became a very popular political figure and formed his own political party called Reform Agenda which later became Forum for Democratic Change. Today it is the strongest and the biggest opposition Party in the country. In 2006, Uganda adopted Multi-party politics and Museveni NRM won the elections under President Museveni who is continuing to leader Uganda today (Bakama, 2000).

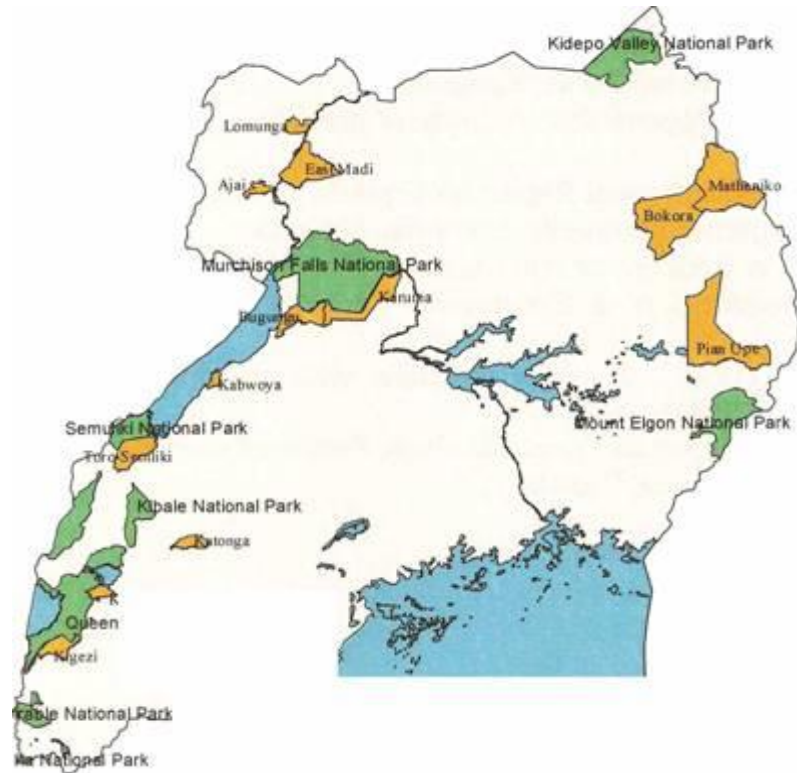
Uganda's wildlife protected areas

According to Hogan et al (2009), wildlife in Uganda is an important source of food, recreation, education, scientific research and mainstay of tourism development. The country has invested considerable efforts in the conservation of wildlife protected areas since 1992. Yellowstone, the oldest Park in USA was formed 200 years before Uganda's first National Park Murchison fall was formed. Meaning conservation of wildlife is was not known in pre-colonial Uganda. Today Uganda is home to ten National parks namely, Queen Elizabeth National Park, Kidepo valley National Park, Bwindi Impenetrable National Park, Lake Mburo National Park, Kibale National Park, Mountain Elgon National Park, Murchison fall National Park, Rwenzori National Park, Semuliki National Park and Mahinga National park.

Thirteen game reserves namely Ajais, Bokoro corridor, Bugungu Game reserve, Eas Madi, Katonga game reserve, Kabwoya, Karuma, Kigezi game reserve, Kyambura, Lomunga, Matheniko, Piane-upe game reserve Toro-Semiliki game reserve and eleven wildlife sanctuaries namely Entebe, Jinja, Mt Kei, Orze forest, Kyambura, Kashero, Kayanja, Kazinga, Kisenyi among others and five community wildlife areas Amudati, Iriri, Karenga, Kairo- Tonya and Rwengera (Uganda wildlife policy 1999, Green belt consultant., 2007). Plumptre et al (2003) states that, Uganda's position between East Africa Savannas and west Africa rain forests, makes it a country with exceptional

biodiversity. It has varied habitats and climate that supports diversity of plants and animal life, this makes Uganda to be ranked among top ten countries in the world for animal and plant diversity especially of mammalian species. Plumtre et al (2003) and Hogan (2009) states that, in 2002 more than 1,585 species of terrestrial vertebrates were recorded in the country. Uganda is also home to 11% of world's bird species and more than half of world's mountain gorillas are found in the country. However, data on many taxa are scarce and knowledge of them is highly localized. Albertine Rift is the most species-rich region in Africa. The Albertine rift is the richest in Africa for vertebrates with more than 50% of mainland birds, 39% of mammals, 19% of amphibians and 14% of reptiles lies within its boundaries. It contains many endemic and threatened species and it therefore an area of particular conservation concern (Pomery et al., 2006). Wildlife in Uganda has been decreasing over decades, however, according to Hogan et al (2009), the number of Chimpanzees increased from 4,000 in 1989 to 4,950 in 2003. Hogan et al (2009) also says that, the most recent census of mountain gorillas in Bwindi Impenetrable National Park (BINP) showed that there is an increase in number of Mountain gorillas from 320 in 2002 to approximately 340 in 2006 with the population of virungas increased from 320 to 380 in the same respective years. It showed that some of mammal species are either stable or increasing for example elephants, buffalos and impalas nevertheless the population of most species remains below the carrying capacity (Hogan et al., 2009).

MAP OF UGANDA SHOWING WILDLIFE PROTECTED AREAS



Source Google Maps www.google.com/maps accessed January 2013.

AIM OF THE STUDY

The aim of the thesis is to overview status and presents conditions of management in National Parks in Uganda and to link the trend of game populations. Thesis would describe relation between conservation practices and their benefits for human settlements and population in Uganda and to create for better sustainable (sustainable) management of National Parks.

Tasks of major importance analyzed in the thesis

1. To recognise some of national parks in Uganda
2. Investigate existing species in these parks
3. Consider wildlife management of the different National Park
4. Evaluate, how the rate of animals is increasing or decreasing
5. To find the relationship between conservation practices and their benefits
6. Create recommendations for the better (sustainable) management of the National Park

METHODOLOGY

In summer of 2011 the author visited important protected areas in Uganda and handed over 18 questionnaires to managers of protected areas and requested them to answer questions on the questionnaire

Questionnaires

Filion (1980), defined a questionnaire, as a data gathering instrument through which corresponds answer questions or respond to the statements in writing. The advantage of this instrument is that it facilitates the acquisition of any qualitative information, which can be objectively quantified. This research had the following to increase its validity and reliability. All the questions were framed in a manner that the correspondants would understand. Bias that might encourage the correspondents to give an answer that the researcher expected them to give was avoided. To lesser extent, open-ended questions were used to allow correspondents to provide answers in their own words. This presented the correspondents with the chance to give their view, which the researcher would have overlooked. To a larger extent, restricted questions or closed were to the correspondant by choosing an answer from a set of alternatives. This provided a control over the correspondents, range of responses by providing specific response alternatives.

The following questions made up the questionnaires

- 1) State the year of establishment of your area of protection
- 2) Name the type of wildlife protected area under you control
- 3) State the size of your conservation area
- 4) State the number of animals, birds and insects you have your area?
- 5) How many different Animal species do you have in your area?
- 6) State the geographical of your wildlife protected area? State for example, Savanah, Sem-Arid, tropical rain forest or protected water reserve
- 7) Do you record loss of wildlife species at your area of protection?
- 8) If yes, what is the major cause of animal loss at your area of conservation?

- 9) What are steps taken to reduce wildlife loss at your protected areas?
- 10) State the amount of revenue in (USD) generated at your protected area per year?
- 11) Does revenue generated at your area of protection depend on the number of tourists and days they spend at you area?
- 12) What is the major source of revenue at your area of protection?
- 13) Does revenue generated at your area of protection depend on specific animal species?
- 14) Name some of animal species at your area of protection
- 15) Do you carry out conservation activities on surplus, deficit or a balanced Budget?
- 16) Do you receive some grant from the government to carry out conservation activities at your protected Area? Yes, or No
- 17) If yes, how much do you receive from government per year?
- 18) Do you also receive some donations from abroad to carry out conservation activities at your area of protection? Yes or No
- 19) State the amount of fund you receive from international donors per year?
- 20) Name some international donors to wildlife conservation activities?
- 21) Suggest any sustainability wildlife use?
- 22) Any other comment?

Species

Species, is defined by Wiley (1997), a lineage of ancestral descendent populations which maintains its identity from other such lineages and which has its own evolutionary tendencies and historical fate

Population

In the study, the questions were answered by managers of both, state owned and private owned wildlife protected areas in Uganda. These are people with enough and more accurate information about the areas under their protection. The questionnaire was given to 25 heads of protected areas known in Uganda

Accuracy of obtained Results

The questions were asked directly by the researcher and correspondants answered without hesitation. However, figures about the actual number of animals in protected areas and revenue generated are not accurate as some correspondants gave approximate figures not accurate ones because they did not have accurate figures at the time of interview.

RESULTS

The results are from 18 protected areas out of 25 that received questionnaires. The questionnaires were answered by protected area managers. The results were selected and put together presented in tables 1, 2, and 3 below. All surveyed areas were recorded by names, year of establishment, area size, number of animal species, climate zone in which they are found, their revenue collection from tourists per year, loss of animals, causes of wildlife loss and donors to management activities in these protected areas.

Table 1 shows the results obtained from surveyed protected areas

<i>Name of Area</i>	<i>Year of formation</i>	<i>Size (km²)</i>	<i>Number of species (hundreds)</i>	<i>Climatic zone</i>	<i>Tourist revenue (\$Million)</i>	<i>Loss of animal</i>	<i>Causes</i>	<i>Donors</i>
<i>Bwindi NP</i>	1954	331	414	Tropical	1.15	yes	Nature, poaching	US AID
<i>Kidepo NP</i>	1946	1442	163	Sem-arid	0.6	yes	Hunting, poaching	USAID
<i>Kibale NP</i>	1936	759	230	Tropical	0.8	yes	Nature, poaching	USIAD, EU
<i>Mahinga NP</i>	1991	33.3	750 gorilla	Tropical	1.3	yes	Nature	USA ID, UK
<i>Murchison Fall NP</i>	1926	3480	115	Tropical, water	0.65	yes	Poaching, nature	US AID
<i>Lake Mburo NP</i>	1982	260	313	Tropical, water	1.15	yes	Encroachment, Hunting	EU, UK
<i>Pianet G R</i>	1962	278	200	Sem-arid	0.4	yes	Poaching, nature	US, UK, EU
<i>Budongo forest</i>	1930	473	600	Tropical forest	0.7	yes	Nature	UK, US

Source: Author's survey, 2011

Table 2 Show results obtained from suryed protected areas

<i>Name of place</i>	<i>Year of formation</i>	<i>Size (km2)</i>	<i>Number of species(hundreds)</i>	<i>Climate</i>	<i>Tourist revenue(\$millions)</i>	<i>Animal loss</i>	<i>Causes</i>	<i>Donors</i>
<i>Katonga.G R</i>	1998	211	190	Water, savana.	0.35	yes	Encroachment	US AID, EU,
<i>Semuliki NP</i>	1993	558	250	Tropical	0.42	yes	Poaching,hunting	EU,UK
<i>Queen Elizabeth</i>	1955	1978	701	Tropical savana	1.25	yes	Poaching,nature	UK,US
<i>Rwenzori mts NP</i>	1991	985	620	Tropical rain	1.25	yes	Nature, encroachers	UK,US
<i>Mt Elgon NP</i>	1993	473	200	tropical	0.76	yes	Nature, encroachers	US,UK, EU
<i>Bugungu wildife reserve</i>	1988	348	275	savana	0.35	yes	Nature, poaching	US,UK
<i>Budongo forest</i>	1930	473	600	Tropical forest	0.7	yes	Nature	UK,US

Source: Author's survey, 2011

Table 3 Show results obtained from suryed protected areas

<i>Name of Place</i>	<i>Year of formation</i>	<i>Size (km2)</i>	<i>Number of species(hundreds)</i>	<i>Climatic zone</i>	<i>Tourist revenue(\$ millions)</i>	<i>Animal loss</i>	<i>Causes</i>	<i>Donors</i>
<i>Ziwa Rhinos</i>	2005	0.7	10(rhino)	Savanah	0.12	yes	Nature	individual
<i>Karunma G Reserve</i>	1990	3480	160	Water, Savana	0.3	yes		USAID,EU, UK
<i>Uganda Wildlife E centre</i>		1950s	450	Savanah	2.2	yes		individuals
<i>Budongo forest</i>	1930	473	600	Tropical forest	0.7	yes	Nature	UK,US

Source: Author's survey, 2011

Protected areas, their time of formation and political effect at the time of their formation. Politics effected the formation of protected areas because it is the government that decided which area to be declared protected and how big in terms of size the area can be. It is evident that during colonial rule, the areas gazzeted are larger in size compared to protected areas gazzeted after independency. This is because the politics of colonialism favored wildlife to local communities. The present situation shows encroachment is high in such areas. The present situation also indicates that, part of land belonging to protected areas created during colonial rule area is being away being current government. This evident especially in Albert rift where part of Kidepo Valley and queen Elizabeth was given for oil exploration. Politics also influenced the formation areas in away that, betwen 1963 and 1980, there was no protected area formed and the country recorded the highest record of wildlife decline because there was no law enforcement body and stable government to put conservation into practice and protected areas were also used as hide places for rebels. This effect was also agreed by (Chemonics, 2001, Hogan et al., 2009, Mugisha, 2002)

Effect of climate change on distribution of animals in protected areas. Nature related causes such as long drought conditions, heavy rainfall and wildlifes are caused by climate change. Change in climate lead to migration of animals from one place to another. Also many animals dies in times of catastropher .The effect has also studied by (Luzira, 2007, Hogan et al., 2009)

Tourism, number of animals species and managment of protected areas. Tourism is mainly influenced by number of animal species in a given protected area, Areas with high animal density also recieves high number of vistors and generates high revenue. Tourism also depend on the type of species in a protected area and location. Mahinga National Park for example has one type of gorilla species but it is a mong the top revenue earners. Management of protected area also depend mainly only tourism. This because the higher the number of vistors, the high the revenue generated and the easier the conservation activities can be. Areas with high revenue generation are able to implement conservation practices while areas with low revenue generation are unable to carry out all their conservation practices. This effect was widely studied by (Arntzen, 2003, Adam,

2003, Namara, 2009, Plumtputre et al., 2007). However, it was contradicted by (Burgess et al 2002)

Donors contribution to conservation activities to Ugandas protected areas, their interests and their source of funds. International donors are the second contributors to conservation activities Uganda after tourists. The international donor main objectives to help communities manage their environment sustainable and also preserve the endangered animal species such as cranes bird. Some donors also have interests to preserve certain animal species.

EVALUATION AND DISCUSSION OF OBTAINED RESULTS

According to the study, protected areas in Uganda are classified into three different categories according to time of their established political effect at the time of their establishment. Political effect on wildlife has been widely studied by (Mugisha, 2002, Phares, 1992, Chemonic, 2001). Government decides which area to be gazzeted as protected area and how big in terms of size the protected area, politicians also decides which type of activities taking place in protected areas. In some cases they give away part of the land belongs to protected areas in return for votes (Luzira, 2007).

Category 1

Areas established by British colonial masters (1920-1962) include Park number (1) Bwindi Impenetrable National Park, (2) Kidepo Valley National Park, (3) Kibale National Park, (5) Murchison falls National Park, (10) Queen Elizabeth National Park, (15) Budongo forest and game reserve, (17) Uganda wildlife education centre. These protected areas are oldest in Uganda. They were established between 1920s and 1962 starting with Murchison falls in 1926 and Upiane Upe Game Reserves was the last area to be declared protected in 1962 short before independency Compared to protected areas established after independence, areas established during colonial rule on average larger in terms of size and animal density. Maganga (2002) says, because at the time of their establishment, population densities around protected areas were low and human activities were also low. Colonial masters were therefore, able to gazette large areas pieces of land as protected areas. It is also believed that locals were forced away from their land as colonial masters choose wildlife to human life.

Category 2

Protected formed (1962-2000) after colonial rule up to the end of 20 century include Park Number (4) Mahinga National Park, (6) Lake Mburo National Park, (7) Katonga Game reserve, (9) Semuliki National Park, (11) Rwenzori National Park, (13) Mountain Elgon National Park, (14) Bugungu wildlife reserve, (16) Karuma game reserve, (18) Uganda Reptile Village. The study indicates that the political turmoil and civil wars that followed after independence hindered conservation of wildlife resource

base of Uganda between 1964 and 1982. It is therefore evident that politics effects formation of wildlife resource.

Chemonics (2001) says, no protected area formed between 1964 and 1986 because at that time, there was no stable government in Uganda with conservation interests. Mugisha (2002) says that, protected areas during times of civil wars were used as battle ground for rebels groups that were looking for safe places to hide. However, the study shows that eight places were declared protected from 1986 up to 2000 by the current government head by Yoweri Museni. This may be attributed to relative peace and government policies to protected nature. The creation of more protected areas may also be as result of pressure from international organizations and donor community to Uganda to preserve her nature. However, despite efforts by the current government to preserve wildlife and its habitat, Wildlife is still exposed to poaching, encroachment and hunting activities by sorunded communities.

Category 3

The protected area established between (2000-to date) in 21st century. Ziwa Rhino Sanctuary established in 2005 is the only one under this category. It is a privately owned wildlife sanctuary established in 2005 by Mr Kiwa. The Sanctuary has only one spece of White rhino. This is evident that private protected areas are not common in Uganda. Out of 18 suryed places, two places are the only privately owned, these are Ziwa Rhinos by Mr Kiwa and Uganda reptile village owned by Mr Kazibwe. Privatization of some national Park can help reduce rate of animal loss in Ugandas protected areas. Quoting Mr Ziwa during the interview “Private owners employs all possible measures to ensure safety of animals. Private owner can use repressive measures against poachers and encroachers”, Langholz (1996) recommends that, privatization of protected areas can unlock private sector investment and increase sustainability of the resource because it is communitities near the protected areas to benefit from intensified collaboration with private sector in general.

CLIMATE , BIODIVERSITY AND DISTRIBUTION OF ANIMALS

According to the study, most of Ugandas protected areas are located with in tropical savana and forests. Eleven out of eighteen surveyed parks are located with in tropical forests and savana. They are Parks located mainly in Albert lift valley and Rwenzori Mountains where rain is received through out the year. The protected areas with in Albert lift include, Bwindi Impenetrable National Park, Murchison falls NP, Kibale NP, Semuliki Wildlife reserve, Mahinga NP and Rwenzori Mountains. Queen Elizabeth NP, Karuma game reserve and Katonga wildlife reserve.

These are places with high biodiversity and they have the highest number of animal species compared to others in hotter climatic conditions the study indicates. For example, Kidepo Valley located in Semi-desert and savanah has a size of 1442 Km². It has only 163 animal species compared to Budongo forest and game reserve with 600 animal species and a size of 473 Km² as in Table 4 below. Pian Upe located in Sem-desert has 200 animal species compared to 275 animals species in Bugungu wildlife reserve located in Tropical bushes and Savanah. Important animal species such as Gorillas, Grew crowned cranes are found within with protected areas with in tropical type climate. Gorillas are found mainly in Mahinga National Parks and Bwindi Impenetrable National while Grew crowned cranes are found in Bwindi and Queen Elizabeth National Park.

Table 4 shows the effect of climate on distribution of animals in protected areas

Protected area	Size(km2)	Climate	Number of animal species(hundreds)
Bwindi NP	331	Tropical forest to Savanah	414
Budongo Forest and game reserve	473	Tropical rainforest	600
Bugungu wildlife Reserve	348	Tropical	275
Piane UPe	278	Sem-Arid	200
Queen Elizabeth NP	1978	Tropical and savanah	701
Kidepo Valley Np	1442	Sem-Arid	163

Source: Author's survey, 2011

The study shows that, climate conditions influence the distribution of animals in protected areas, the hotter the climate, the lower the density of animals in the area and vice versa. Luzira(2007) also writes that Wildlife distribution is dependant on temperature and moisture distribution. A change in climate leads to migration of animals.

STATE OF ANIMALS IN SURVEYED PARKS

All surveyed protected areas record animal loss according to the study. Meaning the number of animals in all Ugandas protected areas is decreasing not increasing. All correspondants said they record animal loss, seven out of eighteen correspondants mentioned poaching as the major cause of animal at their area of protection. Three correspondants mentioned both poaching and hunting. Eight correspondants mentioned nature related causes such as break, long drought seasons, heavy rainfalls and bush fires as a cause of animal death at their area of protection. In protected areas, community

education is one in which poaching, hunting and encroaching are fought. However, the persistent illegal activities in protected areas may be as result of poverty in community around these areas and need for more agriculture land. In general, population increases and poverty is the cause of increased illegal activities in protected areas. According to Arntzen (2011), in modern Africa, improving people’s livelihoods need to be the long-term goal of wildlife management since they play an important role in conserving the resource. Lesego (2010) also says that the provision of goods and services is one way in which locals in developing countries can sustain their livelihoods and that of wildlife. Agriculture can provide an alternative source of food and revenue to rural communities around protected areas and can help reduce illegal activities.

TOURISM, NUMBER OF ANIMALS AND MANAGEMENT OF PROTECTED AREAS

The study indicates that tourism depends on the number of animal species in given area. According to results presented in table (5) below, the higher the number of animal species in a given area, the higher the number of visitors visiting it and the higher the revenue generated from visitors.

Table 5 shows effect of number of animal species to revenue collection

Name of Park	Number of Animal species	Revenue /year million(\$)
Rwenzori Mts NP	620	1.2
Queen Elizabeth NP	701	1.25
Mahinga	750 Gorillas	1.3
Uganda Wildlife Centre	450	2.1
Karuma Game Reserve	160	0.3
Semuliki NP	250	0.4
Kidepo Valley NP	163	0.6

Source: Author’s survey, 2011

The table shows that Parks with highest number of animal species also generates more in terms of revenue compared to those with low animal density. National Parks such as Queen Elizabeth has the highest number of animal species (701) followed by, Rwenzori Mountains NP (620) and Uganda Wildlife Education Centre (450). The revenue from tourists is 1.25, 1.2 and 2.1 million US Dollars for Queen Elizabeth National, Rwenzori and Uganda Wildlife education Centre respectively. However, Parks with low animal species density Kidepo Valley (163), Karuma game reserve (160) and Semuliki National Park (250) has annual revenue of 0.6, 0.4, and 0.3 Million US Dollars respectively. The revenue from low density animal species is not enough to support management activities like community education and employment of enough Rangers to stop poachers and hunters. The donor fund to these protected is also low due to donors interests in high animal densities. This makes management activities and law enforcement in these places difficult due to lack funds therefore, such places are more exposed to poaching, hunting and encroachment compared to those with high animal density. Uganda World Life Centre generates the highest revenue among all protected areas in Uganda despite having lower number of animal species than Queen Elizabeth and Rwenzori because of its strategic location. It is located 30km from capital Kampala, 2km from Ugandas National Airport making it first destination for tourists and it is a small place with many animals. It was former Zoo and later was extended into Wildlife sanctuary. It accommodates most of important animal species like gorillas, buffulos, rhinos, crane, birds, lions, hynas, chimpanzes, elephants among others.

Mahinga National Park is also among top revenue earners because it has one single important species of Mountain Gorilla. It has more than half of Ugandas Gorillas. Mahinga has a total of 750 Gorillas according to the study. However, poor infrastructure and civil wars and climate in areas where protected areas are located also has an impact on revenue collection as tourists can not access some places. According to Chemonics (2001), tour operators are always hesitant to bring clients to such places because of impassible roads or where are wars, the safety of clients becomes an issue.

DONOR FUNDS TO SUSTAINABLE MANAGEMENT OF PROTECTED AREAS

The management of protected areas in Uganda is heavily funded by international donors. According to the study, the biggest donor to Ugandas protected area is USAID and European Union. USAID is a federal government agency of international development. The funds from USAID to protected areas are from Federal government of United States directed towards global climate change with aim of helping communities manage and benefit from their natural resources (USAID, 2012).

The fund from USAID goes to the following conservation places in Uganda, Bwindi National Park, Lake Mburo National Park, Queen Elizabeth National Park, Rwenzori Mountains NP, Kidepo Valley, Kibale National Park, Murchison Falls Np, Pian Upe game reserve, Katonga Game reserve, Mountain Elgon National Park, Budongo Forest and game reserve and Bugungu wildlife reserve.

Other donors include European Union (EU), European Unions funds goes to Kidepo valley Np, Kibale National Park, Murchison falls, Queen Elibeth National Park, Rwenzori Mountains NP, Mountain Elgon Np and Bugondo forest and wildlife reserve. The main objectives of European Union is to help communities manage and their natural resource.

World Wildlife Fund, established in 1961 by Julian Huxley, Peter Scot and Nicholson with aim to protected grobal environment. World Wildlife Fund became international fundraising organization that works in collaboration with existing groups to bring substantial financial support to conservation movement (WWF Report, 2012). According to study, funds from World Wildlife Fund goes to the following protected areas, Bwindi Impenetrable National Park, Kidepo Valley NP, Kibale NP, Mahinga, Murchison Falls Np, Queen Elizabeth NP, Rwenzori Mountains NP, Bugungo forest and game reserve.

International Union for Conservation of Nature is also among the biggest donors to Ugandas Wildlife protected areas. International Union for conservation of Nature is a United Nation Agency. It is the Worlds oldest and largest environmental conservation

programme (IUCN,1997).The funds from IUCN goes to almost all public protected areas to help in conservation activities.

Nature conservancy is a US charitable environmental organization that works to preserve the lands and waters on which all life depends. It works with more than 30 countries across the globe (Nature conservancy report, 2009). According to the study, funds from Nature Conservancy goes to Mainly to Murchison falls and Lake Mburo National Park.

UK AID is a programme by UK government with aim of helping the world to preserve nature(go green). UK AID provide funds to areas of conservation pririoties. The funds from UK AID goes to Queen Elizabeth National Park, Rwenzori Mountains NP, Mountain Elgon NP and Budongo forest and game reserve

International Crane fund, formed to help preserve world's endangered species of cranes around the world.The organization raise funds through indivual donors. According to the study, the funds from International crane fund goes to Bwindi Impenetrable National Park where the cranes Birds are found in Uganda. The study also showed that individual donors, mainly from Europe and America give donations to all Ugandas protected areas according to their interests or animals of interests.

RECOMMENDATIONS

Many scholars have discussed agriculture as one way to reduce poverty in areas surrounding protected areas to keep wildlife safe from illegal human activities, however agriculture for long has been practiced by locals as a source of food and income. To reduce poverty and illegal activities in protected areas, agriculture activities around protected areas has to be modernized in way that can generate more income to households. This can help reduce rate of wildlife loss in areas around protected areas as the output in agriculture will outweigh the input. Modernized agriculture will increase the household income of local communities and hence reduce poverty in such communities. This will help in sustainable management of resource.

Community education has an approach to sustainable wildlife management in Uganda have to involve not only qualified staffs and persons but also local chiefs and councils. Most importantly, community education in modern Uganda should focus on poverty eradication other than animal safety and importance of wildlife.

Data storage and research about existing species is scarce according to study, however data storage and more research can help to discover more knowledge about existing species because the more knowledge obtained about a given species, the more safety the species can be. This can also help in future generation research as the data about existing species will be available. Data storage about existing species can also help to know number of animals lost in times of natural catastrophe like outbreak fires or diseases.

Fencing and use of repressive methods can be another approach to sustainable wildlife management, though repressive methods can mean employment of more rangers. This approach can help in Karamajong regions of Northeastern Uganda where poaching and hunting wildlife protected areas such as Kidepo Valley National Park is rampant.

Improving of infrastructures, security and human rights can help unlock tourism potential of the country since this will attract more visitors in the country. This will help generate more revenue to financial conservation activities in protected areas.

CONCLUSION

The study shows that more than 90 decades ago, conservation and creation of wildlife protected areas in Uganda has been influenced by the politics of the last regimes. For example, colonial masters gazetted large areas of Land as protected areas because the population of that time was low. Human activities around protected areas were less significant, therefore large pieces of land and its habitants were able to be declared and protected from being accessed by the locals.

However, after independence in 1962, political instabilities caused by grid for power did impact negatively not only on human population but also that of wildlife. This because already gazzeted wildlife protected areas were used as hide places by the rebel groups who where fight for power from 1964 to 1986. Today wildlife continues to decline through poaching, encroachment of protected areas, hunting and nature related causes such as bush fires, out break of diseases, long drought seasons and heavy rainfalls despite governments policies to protect wildlife and its habitats.

Protected areas in Uganda are managed in old fashioned way of colonial era. The state agency called Uganda wildlife authority controls activities in protected areas and revenue generated is used to help in conservation activities. This colonial approach to wildlife management is not effective in modern Uganda because human poulation and need for land has increased. Community education as approach to sustainable wildlife management has also not achieved its objectives despite efforts by government and donor community to fund this programme help locals know the importance of wildlife. Wildlife resource is steadily decreasing.

There is also insufficient data about existing species according to study. Data storage in Ugandas protected areas has not been a common practiced yet, it is very important in sustainable respurce management because stored data help future researchers to know the history and number of animals that existed before.

New approaches to wildlife management need to be adopted, privatization of some national Parks can be one way in which Uganda can achive sustainable wildlife management as it can increase revenue from wildlife and reduce poverty in community

around protected area. Agriculture practices around protected areas has to be modernized not extended. Modernization of agriculture way result into higher output and help provide enough food and household income to local communities. This will help reduce illegal activities in protected areas and help in sustainable resource management.

In other words, to achieve sustainable management of wildlife resource in Uganda today, conservation approaches have to focus mainly on poverty eradication mainly in communities surrounding protected areas. However, other factors such as climate change, despotion of wastes, scientific research and data storage has to be considered.

Also most important to note is that Uganda depends heavily on forests for fuel and construction material. This damage the ecosystem of wildlife as the habitat is being cleared for charcoal burning or other use. This is a big threat to Uganda's wildlife base as the animals have to migrate to safer places when their habitat is cleared and others dies in the process. The government and donor community has for long ignored this fact and just focus only to protected areas yet it is vital for sustainable wildlife management.

Nevertheless, Uganda is still rich in wildlife, but persistent decline of wildlife resource may lead to existinct of some species and others becoming endangered. The management of approaches wildlife resource therefore, have to be revised and improved while introducing new methods such as privatization of some parks, modernization of agriculture, reducing dependency on trees for fuel and construction, scientific research and data storage as ways to achieve sustainable management of protected areas.

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