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RESEARCH ARTICLE

ASSESSMENT OF THE THREATS TO CONSERVATION OF MT. MOROTO CENTRAL FOREST RESERVE AND THEIR EFFECTS ON THE LIVELIHOODS OF TEPETH PEOPLE IN MOROTO DISTRICT, UGANDA

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ABSTRACT

Mt. Moroto Central Forest Reserve is a unique, rich and vital ecosystem which acts as one of the key water catchment areas in Karamoja region. The forest reserve supports the livelihoods of marginalised, forest dwelling, indigenous people known as Tepeth who depend on it for shelter against other armed neighbouring ethnic groups, as a source of food, honey, herbal medicine, energy and spiritual values. For centuries, Tepeth have applied and practiced traditional norms to protect the forest cover, unique trees species of spiritual, medicinal and food values. However, in the recent years, the utilisation of forest resources has been commercialised, forest cover converted to crop fields and pro-conservation traditional norms undermined, with far reaching consequences on the integrity of the forest reserve and the livelihoods of indigenous people. A study was carried out to identify major threats to the conservation of the forest with the view of coming up with strategies for sustainable management of the ecosystem and enhancement of people's livelihood. Focused group discussions with forest resource users were carried out, consultative meetings with leaders held, a questionnaire was administered to randomly selected kraal members and field observations made. The results indicated that Mt. Moroto Central Forest Reserve was experiencing unprecedented human pressure in form of deforestation, mineral exploitation, fires, conversion to agricultural fields, charcoal burning and over grazing which had exacerbated forest degradation, food insecurity and loss of good traditional norms, which for a long time had enabled local people to protect the forest. It was established that conversion of the forest to crop fields was the greatest threat to the integrity of the central forest reserve. This was confirmed by 40.7% (n = 44) of the respondents. The findings also revealed gaps and weaknesses in the management of the forest. It was evident that there was urgent need for the forest management authority to formulate and implement an integrated management plan that sets priority interventions required to restore the integrity of the forest reserve, recognises the role of indigenous people and their traditional norms in conservation and promotes collaborative forest management.

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INTRODUCTION

Mt. Moroto Central Forest Reserve (3,008 m above sea level) is one of the few important water catchment areas in semi-arid and chronically food insecure Karamoja region of Uganda. The forest reserve is rich in biodiversity and mineral resources. It hosts about 200 species of trees and shrubs. The vegetation is classified as *Combretum butyrospermum* and dry savana acacia with *Juniperus podocarpus* dry montane forest (Nanyunja, 2003). Endemic bird species of *Tricholaema melanocephora, Nectarinia habessinica, Mirafra poecilsterna and Tchagra james* (Nature Uganda, 2010) as well as animals like leopard, Cheetah, rock hyrax and olive baboons are found in Mt. Moroto forest ecosystem. Like most parts of Karamoja, the reserve is endowed with precious mineral resources such as gold and marble stones (Ondoga, 2010; Hinton *et al*., 2011; Houdet *et al*., 2014). The region falls in the three major livelihood and land use systems; agricultural, agro -pastoral and pastoral systems (Gayfer *et al*., 2012; OPM, 2009; Gelsdorf *et al*., 2012). The productivity of these zones is hinged on unimodel rainfall pattern which commences in April to December (Dan Church Aid, 2010). For the last four decades, Karamoja region has been characterised by interethnic violent conflicts centred on armed cattle rustling and competition for natural resources such as pasture, water sources and forest products (Beinomugisha *et al*., 2007; Bevan, 2008; Stark, 2011; GOU, 2013). These conflicts forced the weak and minority group, the Tepeth to move and settle deep inside Mt. Moroto Central Forest Reserve at very high altitude, in search for safe haven, shelter and protection of their livestock. The forest turned out to be a vital source of their livelihoods and food security. They derive herbal medicine, wild food (fruits, roots, honey and bush meat) as well as fuel wood from the forest reserve. In order to safeguard these

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important forest resources, Tepeth developed and practiced traditional norms that promote forest conservation based on a strong social structure which is spearheaded by elders and forest resource use specialists (Nanyunja, 2006).

However, the recent commercialisation of forest resources, introduction of crop farming in the reserve, occupation of the same reserve by other ethnic groups as a result of disarmament and return of peace and tranquillity in the region as well as the rush for mineral exploitation by companies and individual businessmen have significantly affected the conservation of forest. The social structure has been disrupted, the traditional norms undermined, forest products overexploited and ecosystem heavily degraded. The destruction of the forest reserve has also been accentuated by a new paradigm shift in the government policy on Karamoja with emphasis on crop farming based livelihood at the expense of pastoralism (OPM, 2009; Mubiru, 2010) and internal competition for resources especially pasture and water (GOU, 2013). As local people lose control over the management of forest resource, land use changes, ecosystem degraded and natural resources exploitation intensifies, the livelihood and survival of a minority indigenous community become a great concern to many people of walks of life, more especially the policy makers, human rights activists, humanitarian agencies, conservationists and planners. Yet, no study has attempted to provide insight into challenges and threats experienced by Mt Moroto Central Forest Reserve and how they have affected the livelihoods of indigenous people. Two studies that were close to the subject matter were by Nanyunja (2003 & 2006) on the role of indigenous knowledge in determining the abundance of medicinal and food plants as well as assessment and monitoring of biodiversity in Mt Moroto Forest Reseve.

Furthermore, whereas, the National Development Plan places forestry resources at the centre of development agenda by considering the sector as a key driver of national development, ecological balance and source of energy (GOU, 2010), not much effort has been made to conserve Mt. Moroto Central Forest Reserve. Although one of the objectives of the national development plan (2010-2015) is to restore degraded natural forests, reduce human pressure on forest cover as a source of fuel wood and construction materials and promote forestry trade based industries and trade, Mt. Moroto Central Forest Reserve is still experiencing unprecedented human induced degradation and unregulated resource utilisation.

It is against this background, that a study based on three under listed questions was carried out:

- What are the major threats to the conservation of Mt. Moroto Central Forest Reserve and how do they influence the livelihoods of the forest dependent community?
- How have the Tipeth managed to sustainably utilise forest ecosystem goods and services?
- What strategies should be put in place to restore the integrity of Mt. Moroto Central Forest Reserve?
- The answer to the fore-mentioned questions would offer practical guidance to policy makers on approaches to forest management which guarantee a healthy forest ecosystem, recognise, appreciate, respect and integrate indigenous knowledge and values into the management of protected areas.

MATERIALS AND METHODS

Mt. Moroto is a dormant volcanic mass found in Moroto District and falls within geographic coordinates of 2º24' to 2º42' North and 34º39' to 34º56'East. The Central Forest Reserve covers an area of 483 square kilometres, rising from 960 to 3,008 metres above sea level. The study area was selected because the forest ecosystem was facing unprecedented human induced degradation and yet, it supports endemic wildlife species and the livelihoods of highly vulnerable indigenous people. A total of 108 kraals in the sample subcounty of Katikile were randomly selected and the kraal members who were forest resource users were administered with a semi-structure questionnaire. In total, 57 (52.8%) of the respondents were women and 51 (47.2%) were men. Most of the respondents (78%) involved in the survey were indigenous people who were above 30 years. Focused group discussions were held with four different resource use groups; herbalists (n = 14), beekeepers (n = 10), handcraft makers (n = 8) and cultural/spiritual leaders (n = 4). The discussions were kept focused by the use of semi- structured group discussion guide. The guide was first pretested in another sub-county in order to determine its effectiveness in generating desired information and also determine the length of time required to obtain adequate and meaningful data. Thereafter, it was fine-tuned by making a few alterations and making it clearer and well understood by the resource use groups. Field visits to areas of both great importance and concern to indigenous people whereby, the effects of threats to the conservation of Mt. Moroto Central Forest were highly evident were carried out. In such cases, critical observations made were recorded and photographed. The data was analysed using Statistical Package for Social Sciences (SPSS 17.0).

RESULTS

Threats to the conservation of Mt. Moroto Central Forest Reserve

When the respondents were asked as what was a major threat to the conservation of Mt. Moroto Central Forest Reserve, expansion of crop farming activities emerged as the biggest challenge with about 40.7% (n = 44) of them highlighted it as a serious threat. This was followed by the cutting of trees for building poles and other construction materials which was mentioned by 25% (n = 27) of the respondents, charcoal burning (10.2%) and other forms of forest degradation which include mineral exploitation, human settlement, overgrazing, and overharvesting of forest resources (9.3%) Table 1.

Table 1. Threats to the conservation of Mt Moroto Central Forest Reserve

Threats	Frequency	Percent	Cumulative percent
Agricultural expansion	44	40.7	40.7
Tree cutting for construction poles	27	25.0	65.7
Fire (vegetation burning)	16	14.8	80.5
Charcoal burning	11	10.2	90.7
Others	10	9.3	100
Total	108	100	

It was observed that forest fires were caused mainly by crop farmers whenever they were opening new forested areas and

burning crop residues. However, traditionally, pastoralists in lowland areas of Karamoja were using fire as a tool for pasture management and control of pests such as ticks. Pastoralists were burning rangeland during dry seasons to kill ticks and create young and nutritious pasture during the rainy season. Sometimes, fire from lowland areas would escape to mountainous areas destroying the forest. Poachers were also mentioned by the respondents to be a source of forest fires. They were using fire to dry poached bush meat and but at the end failing to extinguish it, with strong winds, the fire would later spread to the forest (Fig. 1)

Figure1. Part of the forest that was found burnt in order to open the areas for crop cultivation

Fuel wood was the main source of energy for the forest dwelling community. However, on small scale paraffin, dry batteries and generators were being used especially by institutions. Charcoal burning was being practiced mainly for commercial purposes. The residents rarely used charcoal stoves. Most of the charcoal from Mt. Moroto Central Forest Reserve and the rest parts of Moroto District was being sold in Moroto Municipality and other neighbouring urban areas like Mbale, Soroti, Lira to mention a few. Although mineral exploitation especially of gold and marble stones was taking place at the foothill of Mt. Moroto, the mining sites were being left open without any effort and plans for restoration. The sites were highly degraded and prone to soil erosion (Fig. 2).Mt. Moroto Central Forest Reserve was hosting two sub counties of Katikekile and Tapac with over 5,969 households organised in about 351 kraals with a human population of approximately 130,000 all residing within the reserve and depending on the forest products for livelihoods (Fig. 3 & 4). Another challenge observed was continuous extension of Moroto municipality into the forest reserve. Many permanent building were being constructed and infrastructure like roads established inside the forest reserve boundaries. The degradation of the forest by overgrazing was evident in the foothills of Mt. Moroto and fragile part of the mountain ecosystem. Unregulated exploitation of forest products such as fuel wood and plants of medicinal and food values was a management challenge observed. There was no proper monitoring system to track the quantity and quality of forest resources extracted, not much effort had been made to establish sustainable resource off-take

Figure 2. One of the marble mining sites which are not restored and deprived of trees

Figure 3. Human settlement inside the forest reserve in Tapac Sub county

Figure 4. A sign post giving the direction to Tapac Sub-county built inside the forest

levels, distribution and abundance of forest resources of great importance to residents. When the threats mentioned by the respondents were cross tabulated with the age groups, all of them regardless of their age identified agricultural expansion (crop farming) as the most serious threat to conservation of Mt. Moroto Centaral Forest Resrve. However, unlike other age groups, respondents who were above 60 years did not consider the cutting of trees for building materials and charcoal burning a big threat Table 2.

Table 2. Cross tabulation of age group with threats to conservation of the forest

Age group (years)	Threat					Total
	Tree cutting	Fires	Charcoal burning	agricultural expansion	others	
18-30	8	5	2	6	0	21
31-40	6	4	5	19	2	36
41-50	12	5	2	10	5	34
51-60	1	1	2	5	1	10
above 61	0	1	0	4	2	7
Total	27	16	11	44	10	108

Tepeth approach to sustainable utilisation of forest products

When the respondents were asked as to how they had maintained the forest ecosystem amidst human activities, traditional norms which are well enshrined in the culture of Tepeth was the most prominent feedback given by over 44.4% (n = 48) respondents. Presence of plants of food and medicinal values which are respected and cherished by elders was also noted by 31.5% (n = 34). The role of the forest cover in enhancing the security of Tepeth against armed cattle raiders was raised by 20.4% (n = 22) (Table 3). Worth noting, is a small group of respondents (3.7%) who said that traditionally, Mt. Moroto Forest was a vital shelter of their deceased ancestors that must be protected by the current generation.

Table 3. Reasons for Tipeth's participation in the conservation of Mt. Moroto Forest

Reason for protecting the forest	Frequency	Percent	Cumulative percent
Traditional norms	48	44.4	44.4
Food and herbal medicine	34	31.5	75.9
Security	22	20.4	96.3
Shelter	4	3.7	100
Total	108	100	

Dependence of Tepeth on Mt Moroto Central Forest Reserve

Tepeth were forest dependent community. Over 96.3% (104) of the respondents confirmed that they were directly using forest products for livelihoods. Only 3.7% (n = 4) of the respondents, all of them men indicated that they were not using forest products but on further scrutiny they realised that they use traditional stools which were made up of wood extracted from Mt. Moroto Forest. The main resources extracted from the forest reserve were handcraft material (31.5%), Honey (29.6%), medicinal plants (19.4%), fuel wood (16.7%), fruits and other products (2.8%). Over 34.5% (n = 34) of the respondents were using handcrafts made from forest products while the use of the forest for beekeeping was being done by 29.6% (n = 32) of the respondents (Fig. 5). Although the respondents never mentioned the construction materials, it was evident from field observations that there were significant

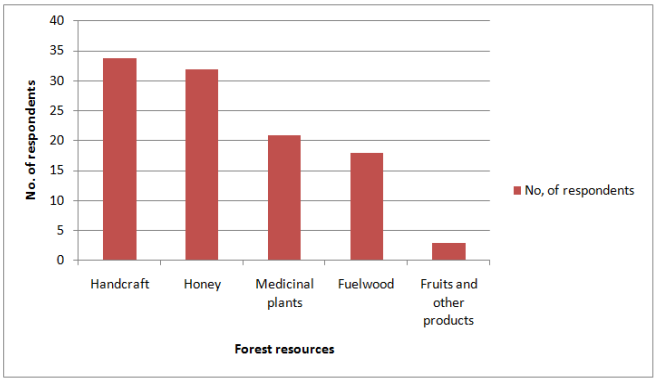

Figure 5. Forest resource utilisation in Mt. Moroto Central Forest Reserve

extraction of poles and other woody materials for construction. The cross tabulation of resources used and threats revealed that extension of crop farming mostly affected medicinal plants, handcraft materials and honey production (Table 4)

Table 4. Cross tabulation of resource use and threat to conservation of the forest

Resource use	Problem					Total
	Tree cutting	Fires	Charcoal burning	agricultural expansion	others	
Fuel wood	3	5	4	5	1	18
Honey	10	5	2	12	3	32
Handcraft	11	4	2	12	5	34
Medicinal plants	2	2	3	13	1	21
Fruits & food	1	0	0	2	0	3
Total	27	16	11	44	10	108

Management of Mt Moroto Forest Reserve

It was observed that although there was adequate legal, policy and institutional framework for managing central forest reserves in the country, this was not the case with Mt. Moroto central Forest Reserve. The management was characterised by lack of manpower, general management plan as well as inadequate funding and logistical support. One forest guard without adequate transport support was found to be on the ground. He was less than six month old at his station and he was yet to carry out field visits to sensitise residents on the value of the forest ecosystem. The study established that National Forestry Tree Act of 2003 gives the mandate of conserving, managing and developing central forest reserves to the National Forestry Authority (NFA). Although the Act prohibits the cutting, disturbing, damaging, burning or destroying any forest reserve unless it is done in accordance with regulations and guidelines or in course of the management of forest reserve by responsible body, Mt Moroto Central Forest was heavily damaged, burnt and degraded. The Act also had a provision of NFA issuing licence to allow some human activities in a central forest reserve. However, human activities in the forest were not yet licensed. The need to allow communities neighbouring central forest reserve to access and utilise non timber products was recognised in 2001 when the Uganda Forestry Policy was developed. The policy recognised the role played by the organised community groups in conserving and sustainably managing forest resources and the need to improve livelihoods. It provided for collaborative forest management based on resource access memorandum of understanding. Again, the NFA management had a formal

arrangement to engage communities in the forest in the conservation.

DISCUSSION

It was evident from the study that introduction of crop farming in Mt. Moroto Central Forest Reserve was the greatest mistake made by the government and biggest threat to the integrity of the forest reserve. In the first place, it was illegal for people to settle in a central forest reserve and undertake activities that damage, destroy and disturb the forest cover without a licence. It contravenes section 13(3), 14, 31(4) and 32 of the National Forestry and Tree Planting Act of 2003. Second, traditionally, crop farming in a forest ecosystem promote discriminate tree cutting and burning of woody materials in order to open up land for cultivation. This has a negative effect on the forest and wildlife resources (Ladrach, 2009) and in long run compromises the capacity of the forest to provide ecosystem services (Smail & Lewis, 2009) to the same people who were involved in its destruction. Although Tepeth in particular and Karamajongs in general were being encouraged to adopt crop farming based livelihood (OPM, 2009; Mubiru, 2010), they were still inclined to their traditional cattle keeping style which is basically nomadic and transhumant in nature. The crop cultivation in cattle dependent society was responsible for the accentuation of forest destruction mainly in three ways. First, crop farming was highly concentrated along river valleys which for long time were grazing areas for Tepeth during dry season (**Fig. 6**). The same area happens to be hosting trees of high food, medicinal and cultural values. These trees are systematically being lost as result of agricultural activities. Second, crop farming has forced cattle keepers to invade and overgraze high altitude areas including fragile areas like moorland leading to unprecedented land degradation. Third, crop farmers were planting crops on the river banks exposing rivers and streams to siltation.

Figure 6. A piece of land opened for crop cultivation on River Lia banks a kilometer above the main water source for Moroto Municipality

The use of fuel wood as a major source of energy was not only a local problem but a national challenge. In Uganda the national consumption of biomass energy in form of charcoal increased from 6 million cubic metre in 1994 to 32.8 million cubic metre in 2010 (GOU, 2010). Some of the fire wood was being transported to Moroto Municipality and beyond for sale. This raised a need for the introduction of fuel and energy saving technologies in the area. Similarly, burning of charcoal was common and widespread because of its high demand in urban centre where charcoal stoves were commonly used. Charcoal burning was targeting hardwood trees such as *Acacia species.* Therefore, this implies that forest management and the residents must develop and implement a forest restoration program as well as collaborating with the Ministry of Energy to identify and promote alternative and affordable sources of energy. In the meantime, efforts should be made to encourage residents and urban dwellers to adopt energy saving technologies if the rate of losing the forest cover as a result of charcoal burning and firewood collection is to be reduced. Nevertheless, very old residents (above 60 years) never considered the use of the forest as a source of construction materials and charcoal burning because the utilisation was highly selective in terms of tree species as they were still abundant (Table 5). However, as demand for forest resources continue to grow and desired tree species become scarce, resource user will be forced to switch to other species.

Table 5. Cross tabulation of age group with threats to conservation of the forest

Age group (years)	Threat					Total
	Tree cutting	Fires	Charcoal burning	agricultural expansion	others	
18-30	8	5	2	6	0	21
31-40	6	4	5	19	2	36
41-50	12	5	2	10	5	34
51-60	1	1	2	5	1	10
above 61	0	1	0	4	2	7
Total	27	16	11	44	10	108

Whereas, fire is known to be a tool of ecosystem management, its unregulated application in a fragile mountainous forest ecosystem to open land for crop cultivation has accelerated forest degradation, exposed bare land to soil erosion and loss of plants of food and medicinal values. Therefore, it is advisable that prescribed/control burns should be considered as a forest management tool that reduces the incidences and occurrence of very hot wildfires which has capacity to extensively destroy the natural forest (Ladrach, 2009). The rush for precious mineral exploration and extraction in the forest is attributed to the recent influx of investors into the region and high demand for marble stones by Tororo Cement Factory. This has been possible due to the recent government's effort to disarm cattle raiders and pacify the whole of Karamoja region. The extraction of precious minerals does not put into consideration environmental impact assessment as required by law and as such mitigation measures are rarely put in place. The mining sites require urgent attention. It would be prudent for the responsible companies to invest in the restoration of the sites.

Existence of human settlements in the forest is perhaps one of the greatest management challenges the National Forestry Authority is facing. The historical armed cattle raiding conflicts between the Tepeth and neighbouring makes the integration of forest dwelling communities and neighbouring lowland ethnic group somewhat tricky. The option of re-allocating the forest dwelling indigenous to other parts of

Karamoja is likely to attract a lot of criticism and resistance from politicians, human rights activists and Tepeth elders. The recent government and other development partners investment in infrastructure development in the area has made it possible to have two sub-counties, health units, school and churches, playgrounds established inside forest reserve. This implies that in long run as human population continues to grow; more pressure will be exerted on the forest resources as the need to meet the socio-economic aspects of the society intensifies. Forest resources which residents are currently using as source of food, fuel wood, to make handcrafts, extract herbal medicine and for beekeeping (Table 6) are likely to get extinct. This will not only have a devastating impact on a fragile mountainous forest ecosystem but also threaten people's livelihoods, economy and security. In other words, the degradation of the forest reserve would in long run compromise the ability of forest dependent communities to access essential forest resources, lose the forest cover which is necessary for their security thus exposing them to cattle raiders from neighbouring communities. A study on the distribution and abundance of essential forest resources and products needed by the forest dwelling communities should be carried out. Based on the results of the study, sustainable forest resources off-take levels should then be determined and enforced to avoid over exploitation and extinction of vital plant species. It is also prudent for the forest management support the Tepeth in value addition to the forest products especially herbal medicine and honey by building their capacity to effectively and efficiently harvest, process, package, store and market products. This will minimise the quantity of resources that go to waste due to poor packaging and storage.

Table 6. Forms of forest resource use

Resource use	Frequency	Percent	Cumulative percent
Handcraft	34	31.5	31.5
Honey	32	29.6	61.1
Medicinal plants	21	19.4	80.5
Fuel wood	18	16.7	97.2
Fruits and other plants of food value	3	2.8	100
	108	100	

The study revealed that Tepeth community had coexisted with Mt. Moroto forest due to strong pro-conservation traditional norms. Trees around the burial sites (usually caves), shrines and initiation centres are protected. Any community member who tries to cut or burn them is severely punished by elders. Plants of high food and medicinal values are jealously guarded against human damage. The same applies to the flowering plants preferred by bees or vegetation falling within area where their beehives are located. However, with commercialisation of resource use, formal education and impact of modern religion have contributed to the undermining the enforcement of norms. The rich and influential people tend to use money to get what they want, let it be the mineral resources, forest products or opening forested area for crop cultivation regardless of cultural beliefs and norms.

It was also evident that institution responsible for forest management, NFA was not effectively on the ground to conserve Mt. Moroto Forest Reserve, a key watershed and address challenges of encroachment, fire, mining and overexploitation. Nevertheless, the existence of a National Forest Plan was a strong instrument for guiding the management of the central reserve and resources therein. The programme three of the plan focuses on the need to rehabilitate degraded and deforested central reserve and fragile ecosystems such as water catchment areas (GOU, 2013). There is a strong need for NFA to expedite the process of developing a specific integrated general management plan to guide the restoration of the forest reserve, community access to non timber resources, collaborative forest management and application of indigenous knowledge and useful cultural values in forest conservation. A fire management plan is also crucial in guiding the fire management and control operations aimed at safeguarding the forest reserve against bush fires.

It is also vital for the capacity of NFA to be strengthened in order to effectively deal with the current challenges. This will require financial and technical support towards the recruitment, deployment and equipping staff to manage the forest reserve. The importance of involving the forest dwelling communities, resource users and other stakeholders such as leaders at sub-county and district level as well other agencies operating in the two sub-counties of Katekile and Tapac should not be underrated. Finally, as a long term solution, the government should promote land use planning process (Nanda *et al*., 2009) that will allow local people, local government authorities and other stakeholders to actively participate in the rationalisation of land use in Karamoja, with aim of conserving critical watershed areas and forest covers within and outside protected areas as well as improving the livelihoods of people

Conclusion

It is evident from assessment that Mt. Moroto Central Forest Reserve is experiencing unprecedented human induced degradation. The traditional norms that used to help the forest dwelling communities to conserve the forest cover, with time have been undermined as what used to be domestic forest resource utilisation became commercialised coupled with the effect of crop farming on forest ecosystem. Therefore, it is imperative that NFA should swiftly involve local communities and local government leaders in formulating a general management plan that will recognise the importance of indigenous knowledge, traditional norms and cultural values in enhancing the forest conservation. The plan is also crucial in guiding the forest managers to design and implement a restoration program that will improve the forest cover in degraded areas, regulate community access to forest resources as well as controlling human activities in the forest reserve. In addition, as a long term solution, government should review the policy of promoting crop farming in Karamoja region with the view of rationalising land use and balancing socio-economic needs of local people with conservation objectives.

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