

Environmental impacts of oil palm plantations in Kalangala



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Summary

Land use changes in the Ssesse islands, Kalangala, have created a shift from six land use types (forests, small scale agriculture, grasslands, swamp forests, wetlands and wooded grasslands) to eight, including built up areas, and oil palm plantations. The sudden rise in built up areas now covering 10% of the land was almost entirely at the expense of grasslands. By 2006, large areas of forest, grassland, wetlands and wooded grasslands had also been cleared for oil palm plantations, resulting in loss in biodiversity. Kalangala district is known for its unique *Pitadeniastrum-Uapaca* forests that support a high diversity of birds and butterflies, but accurate data is deficient and biodiversity surveys are recommended. Threatened species

include two critically endangered mammals, the Ssesse island sitatunga or bushbuck (*Tragelaphus sylvestris*) and the endemic Lake Victoria rat (*Pelemys isseli*), and eight Red List butterfly species of which four are critically endangered (*Acraea simulate*, *Epitola miranda*, *Euptera elabontas*, *Neptis puella*), two endangered (*Teratoneura isabellae*, *Thermoniphas togara*) and two vulnerable (*Pentila incospicua*, *Thermoniphas plurilimbata*). There are also five endemic or endangered plant species: *Casearia runssorica*, *Lasianthus seseensis*, *Lagarosiphon ilicifolius*, *Uvariadendron magnificum*, and *Sabicea entebbensis*. Besides habitat destruction, soil degradation has been reported, and agrochemical pollution of lake waters.

Introduction

Kalangala forests are unique and support species that are suffering pressure from growing populations, clearance for agriculture, and extraction of wood for timber and fuel. Then in 2000, the government planned to convert 100 km² of the 296 km² of Bugala island to oil palm plantations, with 65 km² as nucleus estate owned by BIDCO and the remaining 35 km² earmarked for planting by outgrowers. However, a project of this magnitude in such a fragile ecosystem should have aroused environmental concerns at the outset. There are alternatives though, as the unique species assemblage offers an opportunity to explore the potential for ecotourism. But to do so, it is essential to maintain biodiversity, and as such, the environment in its entirety must be conserved. To date, reports by environmental groups contradict those of BIDCO and partners regarding the extent of environmental degradation. Environmental impacts of developmental projects tend to pose more threats to the environment than benefit, if negative impacts can be reduced through mitigation measures.

Oil palm expansion has led to forest degradation, resource conflict and food insecurity because it has left much less land for growing food crops. For oil palm and forest conservation to co-exist, enrichment planting with native species in degraded parts of forests and in other degraded vegetation types should be promoted. Already, Oil Palm Uganda Limited (OPUL) has done so in some of the 200 m lake buffer areas that had been degraded by lumbering and charcoal burning (Basaalidde, 2012) but much more needs to be done. This review collated information on conflicting reports of environmental impacts of oil palm production in Bugala island, including a consultative workshop including key stakeholders from Kalangala and Buvuma districts.

Historical changes

According to Langdale-Brown et al. (1964), the vegetation of Bugala island half a century ago consisted of a mosaic of *Themeda-Loudetia* grass savannas and *Pitadeniastrum-Uapaca* medium altitude moist evergreen forests. In Uganda, such savannas occur on skeletal hill soils, which are characteristically nutrient poor and dominated by *Themeda triandra*, *Loudetia kagerensis* and *Loudetia simplex*. Such grasslands are widespread in Uganda, but the Bugala forest type is unique to the Ssesse Islands, distinguished from mainland forests by the abundance of *Uapaca guineensis* and other dominant trees such as *Piptadeniastrum africanum*, *Maesopsis eminii* and *Canarium schweinfurthii* (Thomas, 1941). However, by the mid-1900s, forest patches had already been cleared for agriculture “leaving just a

fringe of trees round the edge” (Langdale-Brown et al., 1964). On Buvuma island, the main vegetation types include *Celtis-Chrysophyllum* medium altitude moist semideciduous forest, moist *Hyparrhenia* grass savanna, and undifferentiated semideciduous thickets.

Recent land use change in Bugala from natural vegetation to monoculture plantation has caused biodiversity loss as a result of habitat destruction, and that has extended into central forest reserves. But BIDCO and partners refute this, claiming that protected forests are better preserved than before because of new incomes from oil palm, and that farmers are turning away from activities that degrade forests (Basaalidde, 2012). But this logic is questioned because only 1,770 people out of 40,000 are actually involved in oil palm growing. And fishing used to be the main economic activity, but with the current ban, fishermen are turning to farming. Yet most cleared land is already cultivated, adding pressure on remaining forests as jobless people clear new areas for charcoal burning and growing crops.

Further encroachment on remaining forests may lead to the extinction of some endemic and critically endangered species recorded from central forest reserves where biodiversity studies have been focused, confirming the critical need for their conservation. There is a need to generate species maps for endemic, rare and threatened species, locating their presence and to create awareness among communities who currently do not know their conservation value. In addition, efforts must be made to conserve rare and endemic species ex-situ, to maintain some germplasm for re-introduction into the wild in case wild populations do not survive, such as by collecting seeds for storage at the National Plant Genetic Resources Centre and cultivating live specimens in botanic gardens in Entebbe or Makerere University.

The black and white colobus monkey (*Colobus guereza*) is already believed to have been eliminated from Bugala island (Richard Ssemmanda, 2017, pers. com.) probably due to over-hunting and habitat destruction, attributed to oil palm which exposed the species to hunting. Although known to be resilient to habitat degradation, they can disappear entirely from forest patches that are subjected to high levels of disturbance (Fashing, 2002). The Ssesse islands are moderately diverse in bird species (89 species), the majority of which (45%) are forest dependent, hence clearing or fragmenting forests displace such species. Other important birds are restricted range species and migrants which have breeding grounds in the islands. Of the few small mammals, the Lake Victoria rat (*Pelemys isseli*) and the Ssesse Island sitatunga (*Tragelaphus sylvestris*) are listed as critically endangered (WCS, 2016). Sometimes call a bushbuck, this member of the antelope family is unlike other sitatunga in being a

forest and not wetland species (Kityo, R. mammologist, 2017, pers. com.), and as such, its existence is threatened if the clearing of natural forest continues. Worse still, on the premise that the population is healthy, the Uganda Wildlife Authority issued a hunting concession which coupled with poaching, further aggravates the threat. Local people report that this sitatunga is now only rarely seen. There is a relatively rich diversity of butterflies in Sseese, with 63% of them being totally forest-dependent species, 19% of restricted range, with four critically endangered species. Little documentation on the diversity of reptiles and amphibians is noted except for one regarding the sebal python, though the conservation status was not established due to lack of data (Both Ends, 2015).

Soil, water and air pollution

Besides habitat destruction, soil degradation has also been reported, and pollution of soil and lake water from nitrate fertilizers, agrochemicals and effluent from the palm oil mill factory is feared. Spraying of chemical sprays must be limited directly to plants but whereas reports claim that oil palm outgrowers do not follow regulations on fertilizer and pesticides application, OPUL itself state that they are following regulations (Wambi, 2009). It is also reported that oil palm is being grown within the 200 m buffer zone of the lake shore from where chemicals would much more easily transferred to the lake, and over use of fertilizers leads to nitrate leaching and can cause health disorders (Deepajan and Navindu, 2000; Kristensen et al., 1996). Plantation management must ensure that fertilizers are not over used and that farmers do not misuse them in their homes, with a need to conduct regular tests on underground water and soil to determine nitrate concentrations. Also, the palm oil mill in Bugala releases gases into the atmosphere, causing a stench near the factory. Use of chemical sprays must also be regulated and monitored as an avenue through which air could be further polluted. The effects of herbicides can vary from disruptions of soil microorganism biology function to nitrogen cycling (Rose et al., 2016). KADINGO (2009) lists agrochemicals used in oil palm plantations but their effects are not yet known, though some areas lack ground cover presumably from herbicide application which exposes soil to high evaporation rates, erosion and compaction.

Tests of water quality presented by OPUL to the district local government indicate that water quality is safe for both consumption and aquatic life. Independent tests should be regularly carried out to monitor compliance by OPUL to environment protection but unfortunately, the district local government is not able to do such supervision. Aquatic flora and fauna are threatened by reported instances of water pollution due to changes in pH, temperature, dissolved oxygen, nutrient levels and turbidity, leading to

impacts that influence the distribution and abundance of aquatic life. If the lake is polluted, water will not only be unsafe for human consumption but will also lead to the loss of biodiversity. For example, the endangered water plant, *Lagarosiphon ilicifolius* that is known from only two localities in Uganda could become extinct in the country because the other locality in Lake Mulehe is already silting up. Fish diversity in Lake Victoria is known to have decreased due to over fishing, predation and pollution (Balirwa et al. 2003, Hecky et al. 2010), and the situation will be further aggravated if oil palm activities pollute the lake further. Loss of species, particularly fish, from Lake Victoria, will affect the overall ecosystem functioning and also have socio-economic impacts.

Establishing oil palm plantations on forest land releases carbon and so contributes to the emission of greenhouse gases, and mature oil palm plantations contains much less carbon than fully grown tropical forest. Also, in the case of oil palm, the carbon sinking process is broken every 25 years and the stored carbon is released back into the atmosphere because few long-lasting products are made out of oil palm wood. Therefore, over time, oil palm plantations cause a net loss of carbon-sequestering forest land compared to sustainable annual harvests from a natural forest cover.

Improving the situation

Forest monocultures generally support lower wildlife diversity than mature natural forests as the latter develop micro-habitats such as dead wood, tree fall gaps, ground litter and their associated flora and fauna that do not occur in oil palm plantations (e.g. Obidzinski et al., 2012). Invertebrates prefer particular host trees, and mammals and birds whose presence depends on such invertebrates for food and such trees for shelter are lost under forest monocultures. However, Cannel (1999) suggests that management options can enable plantations to support a richer biodiversity and these should be investigated. Large areas of land were opened up exposing soil to erosion, but rather than using leguminous cover crops, allowing natural ground cover to re-establish would have been preferred to maintain biodiversity and stabilize the soil, making it unnecessary to use herbicides that may cause further soil degradation.

Preserving the island's forest reserves would conserve wildlife and which would serve as the basis for development of a valuable and sustainable ecotourism industry. The rich biodiversity also provides ecosystem services including birds and insects for pollination, rodents contributing to soil aeration, reptiles checking rodent populations, and large mammals controlling the spread of plants by grazing and browsing. National biodiversity

surveys (Forest Department, 1996) found Ssesse Island species to have above average to average conservation value, although species diversity was rated average to low, though a new inventory is needed to update this 20-year old data, considering how much has changed in that time.

The vegetation of Buvuma island is similar to that of Bugala, though the woody vegetation in the former is semi-deciduous whereas that in Bugala is evergreen. Buvuma district once had a dense forest cover represented by 26 gazetted forests, seven of which are local forest reserves, but currently there is rapid deforestation taking place. It is therefore critical that before oil palm planting starts, to collect and document baseline data as hard evidence on biodiversity and map all critical habitats and species, as well as environmental data on water and air quality, soil parameters, and a valuation of the carbon content of the forests on the island. Subsequently, independent monitoring will be needed and not just that conducted by BIDCO/OPUL) to assess future impacts. This is lacking for Bugala island, and outgrowers also need to be sensitized on the environmental effects of agrochemical misuse and other poor agricultural practices. And all monitoring processes and results must be truly transparent, to build trust between stakeholders and to amicably handle issues of environment protection.

Lessons learnt

Arguments that oil palm is just another form of forest that offer the same environmental services as natural tropical forest are simply not true, for two main reasons. Firstly, tropical forests are very diverse in species of different taxa because of the variety of habitats they present, and secondly, tropical forest species are deeper rooted and so can draw up ground water from far below the surface, but as shallowed rooted trees, oil palm do not contribute so well to the water cycle. It is necessary to conduct a thorough inventory of wildlife diversity in plantations to allow direct comparisons with that of natural forest that were replaced. Where expansion of plantations is anticipated, a comprehensive review of biodiversity information is recommended for use in monitoring. Also, it is not clear whether endemic and threatened species still occur after expansion, so biodiversity information should also be updated in Bugala island where plantations are already established.

Knowledge gaps should also be filled for a better understanding of effects of plantations on the environment. First, the list of agrochemicals recommended by the National Environmental Management Authority (NEMA) should be made available to farmers and general public, and soil, water and air need to be analyzed to determine

the extent of pollution so that remediation procedures can be planned. Second, there is need for a revised documentation of biodiversity in oil palm areas and where plantations are planned to provide an informed basis for arguments on conservation and so clear species-specific strategies can be drawn. Baseline data will also allow comparisons to show effects of plantations on distribution and abundance of biodiversity. Diversity within plantations also needs to be documented, including the mapping of species and critical habitats to inform the development of the land use plans, required to guide conservation efforts.

Taking lessons from West Africa, oil palm plantations and forest conservation and environmental protection can co-exist if certain recommendations are followed. Smallholder production should be promoted, rather than expansion of monoculture plantations. This approach would ensure that there is enough land left for food production and other enterprises. In this way, encroachment on natural forests as a result of food insecurity as has occurred in Bugala island, will be prevented in Buvuma. Edwards et al. (2014) found no significant effect of the proximity of natural forest to oil palm yield, but there was a positive effect on proximity to forestry plantations. Therefore, the wood lots could cause an increase in oil palm yield whereas the natural forest would have no negative effect on yield.

Farmers should receive regular training courses on the safe use of agrochemicals and benefits of environmental protection could be shown through awareness-raising, and community participation in inventories, monitoring and remediation work. Production from plantations can be increased by improving yields per hectare, instead of converting more land. The 200 m buffer zone should not be violated, with enrichment planting, preferably using indigenous species. Planting of wood lots for domestic and commercial use would also relieve pressure on natural forests, and through collaborative forest management groups, sustainable use of forest products would be promoted. The districts need to develop land use plans to harmonize development and conservation with enrichment planting in forests and other degraded habitats to be promoted, while maintaining a natural ground cover rather than introducing alien cover crops. And lastly, both in-situ and ex-situ conservation programs should be initiated for endemic and threatened species, including the maintenance of tracts of natural forest and grasslands within plantation areas, collecting germplasm for preservation in gene banks and botanic gardens.

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