An investigation into the Global Environment Facility-funded **Green Charcoal Project** in Uganda

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This investigation aims to contribute towards assessing the impacts of **"Addressing the barriers to the adoption of improved charcoal production technologies and sustainable land management practices through an integrated approach"**, [1] a project in Uganda funded by the Global Environment Facility (GEF) and implemented by the United Nations Development Program (UNDP) and the Government of Uganda. It is comprises a desk-top assessment of the project's Terminal Evaluation Report (TER), and a site visit to the districts involved to gather on-the-ground evidence of the project's impacts.

Traditional charcoal-making. **David Kureeba**

1. Introduction

Uganda's forests are disappearing at an alarming rate of 1.8% per year, equivalent to almost 90,000 hectares of forest loss. Over 80% of the population depends on biomass as their main source of energy with close to 100% of households using wood and charcoal for cooking. Biomass is used in all sectors of the economy with charcoal production in particular involving many rural producers that supply urban areas. Most of the charcoal produced comes from private forests which make up 70% of the total forest estate, and where there are high rates of deforestation. The National Forestry and Tree Planting Act of 2003 places the regulation of local forest reserves under the jurisdiction of the District Local Governments, and does not provide concrete guidelines on how forests on private land are to be managed, which worsens the situation.

Charcoal is often preferred to wood as a fuel source as it is affordable, produces less smoke and is easier to transport. Traditional charcoal-making involves wood being covered with soil and then left to burn for up to a week and is a very inefficient way of converting wood to charcoal. Consequently, 16 million tonnes of wood are transformed into just 1.8 million tonnes of charcoal each year. [2] Large areas of forest are therefore lost to produce charcoal largely for urban use.

[1] GEF: https://www.thegef.org/project/addressing-barriers-adoption-improved-charcoal-production-technologies-and-sustainable-land and UNDP: https://www.ug.undp.org/content/uganda/en/home/operations/projects/SustainableInclusiveEconomicDevelopmentProgramme/TheGreenCharcoalProject-AddressingBarrierstoAdoptionofImprovedCharcoalProductionTechnologiesandSustainableLandManagementPracticesthroughanIntegratedApproach.html

[2] https://www.ug.undp.org/content/uganda/en/home/library/environment_energy/TheBiomassEnergyStrategyUganda/

2. The Green Charcoal Project

It is against this background that the government of Uganda undertook a project on "Addressing the barriers to the adoption of improved charcoal production technologies and sustainable land management practices through an integrated approach". The main goal of it is to develop and promote improved charcoal production technologies and sustainable land management practices in four districts. Its implementation falls under three major components:

• Data collection, improved coordination and enforcement of regulations governing the biomass energy sector and in particular those related to sustainable charcoal production;

• Dissemination of appropriate technologies for sustainable charcoal production in the project's four selected charcoal-producing districts;

• Strengthening the capacity of key stakeholders in Sustainable Forest Management and Sustainable Land Management best practices and establishment of sustainable woodlots.

The project received USD $3.48 million over four years from the Global Environment Facility (GEF). It was co-financed to a tune of USD $14.6 million by the FAO, the UN Capital Development Fund, GIZ (a German development agency), Belgian Technical Cooperation and the Government of Uganda.

The project was approved by GEF in 2013 and ended after four years of implementation in November 2019. It was implemented by the Ministry of Energy and Mineral Development (MEMD) in collaboration with the Ministry of Water and Environment, National Forestry Authority, Nyabyeya Forestry College and the four districts of Kiboga, Kiryandongo, Mubende and Nakaseke. These districts were chosen because of their high deforestation rates due largely to traditional charcoal making, where communities are making and selling charcoal to nearby urban areas in order to earn a living. The project has been implemented by designated District Environment and Natural Resources Officers under the District Forestry Services.

The project aimed to reduce the amount of wood used in charcoal-making and to create a new supply of wood for it through "sustainably managed woodlots". The project was funded on the basis that hundreds of casamance and retort kilns [3] would be introduced to charcoal producers as more efficient alternatives to traditional charcoal-making, requiring less wood, producing better quality charcoal and also being safer than traditional methods. In addition, indigenous trees that are used to make charcoal locally would be distributed to local communities to establish woodlots that would later supply charcoal producers, and therefore reduce pressures on forests further.

3. Methodology

3.1 Desk-top assessment of the Terminal Evaluation Report (TER)

Although GEF was unable to supply any monitoring and evaluation reports for this project, both the Mid-Term Review (MTR) and Terminal Evaluation Report (TER) were provided by UNDP staff. Follow-up questions relating to the content of this report are being discussed with UNDP. GIZ maintains that it has not had any involvement in the project despite the documentation clearly listing it as an "Executing Partner" and having provided 2,6 million USD in co-finance. This assessment looks exclusively at the kiln distribution and woodlot planting aspects of the project.

[3] Casamance kilns are modified earth kilns that use a steel chimney. They require a smaller area and involve the stacking of different sized wood in certain configurations. They are very similar to traditional methods as in effect they are still mounded wood covered by earth and can be placed wherever space allows. Retort kilns are permanent brick and steel charcoal makers that are more suited to plantation areas with consistent wood supply.

3.2 Site visit to project implementation areas

The aim of the site visit was to establish if tree plantations had been involved in the project, and if so, what their impacts on biodiversity and surrounding communities has been. Given the lack of publicly-available documentation and the difficulty in obtaining detailed information relating to how the project has been implemented, a visit to the project sites in order to gather first-hand evidence from the people involved is a valuable contribution to the project's overall evaluation.

An initial scoping visit to Nyabyeya Forest College, one of the project's implementing agencies, took place in June 2019 where officials confirmed the extensive use of eucalyptus. Following this, in September 2019 two Uganda-based researchers commissioned by the Global Forest Coalition visited Mubende, Kiboga, Nakaseke and Kiryandongo, the four districts where the project was being implemented.

In Kiboga, the District Natural Resources Officer responsible for implementing the project was interviewed, as well as ten members of the communities of Kapeke and Dwanilo in Kiboga who had been given kilns and eucalyptus trees. They were selected randomly from the beneficiaries register with the help of the District Natural Resources Officer. In Kyarandongo, the District Natural Resources Officer was also interviewed as well as seven beneficiaries in both Kiryandongo parish and Mutunda, who took part in a focus group discussion. All interviews were conducted in Luganda, the local language. The District Natural Resources Officers and Forestry Officers were also interviewed in Mubende and Nakaseke districts.

There were a number of challenges encountered in carrying out the site visit. These included the long distances between project sites and the fact that roads linking them are extremely poor, which made it difficult for the research team to effectively investigate given the available resources. In addition, government officials are reluctant to share information.

4. Main results

4.1 Reduced wood use by improved charcoal kilns

A goal of the project was to disseminate 400 casamance and 200 retort kilns to charcoal producers. According to the TER, 337 casamance kilns were distributed but, despite UNDP's claim at the start of the project that "a new charcoal conversion kiln that is up to 40 percent more efficient in converting wood to charcoal has been developed, successfully piloted, and is now available for use", [4] dissemination of the retort kilns was stopped after the first 15 failed to function fully. Casamance kilns have an efficiency range of 20-30%, [5] compared with 10% [6] for traditional methods and up to 40% for retort kilns. [7] The TER reports that 120,741 metric tons of wood have been saved because of this, translating to 6,674 hectares of avoided deforestation. However, the following points lead to serious questions over the validity of these claims and could actually mean that deforestation increased because of the project:

[4] https://www.ug.undp.org/content/uganda/en/home/presscenter/articles/2014/10/03/new-green-charcoal-project-rolls-out-more-efficient-low-carbon-kilns-to-curb-emissions-and-deforestation.html
[5] See for example Nahayo et al, 2013. Comparative Study on Charcoal Yield Produced by Traditional and Improved Kilns: A Case Study of Nyaruguru and Nyamagabe Districts in Southern Province of Rwanda. Energy and Environment Research; Vol. 3, No. 1. and Kammen and Lew, 2005. Review of Technologies for the Production and Use of Charcoal, Renewable and Appropriate Energy Laboratory Report and FAO, 2014. Charcoal, Bioenergy and Food Security Rapid Appraisal User Manual CHARCOAL
[6] Ibid.
[7] https://www.ug.undp.org/content/uganda/en/home/presscenter/articles/2014/10/03/new-green-charcoal-project-rolls-out-more-efficient-low-carbon-kilns-to-curb-emissions-and-deforestation.html

Were the improved kilns used by charcoal producers after they were distributed?

Casamance kilns were only available via the project, parts for them could not be sourced locally and the project did not involve maintenance or replacement of the kilns. Further still, the lifetime of a casamance kiln is quoted as five years in the TER, which is only one year longer than the duration of the project and making it very likely that some would have failed before the end of the project. The TER makes no assessment of how many of the 337 casamance kilns were still being used at the end of the project, but the wood saved and avoided deforestation figures are based on the assumption that they would still be in operation, which is not true in at least two instances as discovered during the site visits.

An example of a casamance kiln, in Senegal. **energypedia.info**

The site visit to Kiboga found that the casamance kilns that had been distributed to two registered groups of charcoal burners in the sub counties of Ddwaniro and Kapeke were not functioning at the time of the visit. Communities reported that the kilns were inefficient and costly to run and maintain, given that they are made of materials that are not locally available. They explained that traditional charcoal-making uses no sophisticated equipment, makes use of easily-available materials, requires very low maintenance costs and avoids the use of metal and other materials.

Could the project have incentivised deforestation?

A risk identified in the TER was that disseminating improved kilns in charcoal-producing areas with large areas of standing forest could actually create a perverse incentive whereby increased efficiencies incentivise more charcoal production and therefore greater overall wood use, rather than replacing inefficient methods and reducing pressure on forests through lower wood use. In addition, there was very little assessment of whether the project engaged existing, inefficient charcoal producers or instead recruited new entrants into charcoal production without significantly introducing efficient technologies to a majority of the regular charcoal producers. There was no monitoring of the charcoal associations that received kilns to ensure that charcoal-producers were being reached by the project, and in fact a random assessment of the umbrella charcoal producer association of Mubende district at the end of the project revealed that over 60% (page 11 of the TER) of members had not been engaged in charcoal production before the project started. Therefore, rather than increasing the efficiency of charcoal production, the project could have simply increased the scale of the industry, and therefore overall wood use. It is unclear if any attempts to mitigate these two risks have been undertaken by the project.

4.2 Inconsistencies and errors in energy and carbon calculations

The TER states that 84.2% of the lifetime energy saved and carbon emissions avoided target for improved kilns has been met by the project (although the original target must relate specifically to casamance kilns alone). It also states that "MJ of energy saved from casamance kilns yet to be estimated", but still quotes a figure of Lifetime Energy Savings of 1,552,896,000 MJ and avoided emissions of 177,613 tCO_2eq by the end of the project. It can be assumed that this figure is derived from the fact that 84.25% of the target number of casamance kilns were distributed (337/400=0,8425) and that this percentage has simply been applied to the target of 1,843,200,000 MJ quoted at the start of the project in order to arrive at the new figures. These figures also assume therefore that all kilns were still being used at the end of the project, and theoretically, even if a kiln was never used, its contribution to this figure has still been taken into account. Given that there is no certainly that the kilns were still being used instead of traditional methods, this figure cannot be assumed to be correct. Even if it were, the overall target for emissions saved was 1,576,502 tCO_2eq, meaning that in fact only 11% of the target was met.

Likewise, in calculating how many metric tons of wood have been saved due to improved kilns, the target figure has seemingly again been multiplied by 337/400, and the claim made that 84% of the target has been reached. An equivalent target for retort kilns appears not to have been included in the original proposal, even though they were expected to save far more energy and therefore wood than the casamance kilns. Also, there is another error in the avoided deforestation figure, as the TER states that 6,674 hectares has been avoided, which is also equivalent to 84% of the original target. However, the original target was for 14,431 hectares of avoided deforestation, meaning that only 46% of it was actually met.

The TER also claims that 30,621 hectares of forest land (natural and planted) across the four districts have been brought under improved forest management, leading to enhanced sequestration of 1,310,872 metric tons of carbon. However, there is no indication of how this figure has been calculated and detailed calculations have not as yet been made available. The fact that native vegetation would inevitably have been cleared to make way for the planted woodlots (eucalyptus plantations), and considering that the intended purpose of the plantations was to be burned shortly after the end of the project period, suggests that instead of sequestering carbon the project could have been responsible for releasing it.

There is a further problem with the claim that 84.2% of the target for forest land (natural and planted forest lands) being put under improved management was reached, as achieving 30,621 hectares of a 50,000 hectare target is clearly 61%. The subsequent claim that 84.2% of the carbon sequestration target has been met is also incorrect, as 1,310,872 metric tons of carbon equivalent out of an overall target of 2,100,000 tCO_2eq is also 61%. Due to these inconsistencies and unverified claims it cannot be assumed that the figures presented in the TER are correct or accurate.

A Green charcoal Project community training on how to use casamance kilns in Kiboga. **Edson**

4.3 Eucalyptus plantations as "sustainable charcoal woodlots"

Despite the fact that the project was approved and financed on the basis that landowners would be supported to plant woodlots of three indigenous tree species that had been identified as being suitable for charcoal production, [9] an “adaptive management action” during the project switched the focus to non-native, fast-growing and less suitable eucalyptus, which comprised 90% of the trees planted. According to the TER, 6,208 hectares of “well grown planted sustainable charcoal woodlots of mainly eucalyptus tree species have been established” after planting 6,898,000 seedlings (two different figures are given in the report) and with a seedling survival rate of 72%, and which were anticipated to provide 581,595 metric tons of biomass for charcoal production after the first cut at five years after planting (and one year after the end of the project).

The decision was made to switch to eucalyptus following demand from planters due to its multiple uses and following very low uptake of the indigenous species, although information gathered during the site visit contradicts this, and in fact a survey conducted as part of the original GEF project proposal found only 14% of landowners had a preference for eucalyptus. [10] Given the high demand for eucalyptus in construction, the TER raises doubts over whether the reported 581,595 metric tons of biomass grown by the woodlots by year five would be supplied to charcoal producers at all. In fact, the report states that there is no certainty that the trees planted would be used to produce charcoal given that 1) the planters were not contracted by charcoal producers during the project (an indicator in the original project proposal that wasn’t met); 2) the stationary retort kilns failed to function, which would have been more suited to charcoal production in larger plantations; and 3) trees that are more suitable for charcoal production are already being sourced by producers from near-by forests.

In addition, the short four-year implementation timescale of the project was not even long enough for the wood grown in the plantations to be harvested once, making it impossible to monitor or verify how the wood will be used. Another element of concern is the fact that there is no indication of what the original land use was for plantation areas before their conversion. Given that the project relied on individual and private land-owners to establish woodlots themselves with no apparent criteria or conditions, the eucalyptus plantations could have replaced any number of existing land uses including forests, grasslands or agricultural land, all of which would have resulted in significant carbon emissions and impacts on biodiversity.

The site visit has also added some important detail to the situation described in the TER. In Kiboga, tree planting has taken place district-wide as seedlings have been distributed freely across the whole district. According to the District Natural Resources Officer there, since 2014 the project has distributed around 1.5 million trees to 500 people, covering 1,350 hectares. 97% of the trees were eucalyptus, and the remaining 3% were indigenous species. The trees have been planted by the communities themselves with support from the district authorities. The percentage survival rate has been quoted as around 65%, with survival heavily dependent on seasonal rains as the only form of irrigation. Tree planting in the districts of implementation was spearheaded by project officers from the District Natural Resources or Environment offices.

In Nakaseke district, the planting started with demonstration woodlots and then individuals were given seedlings to plant on their own land. However, a prolonged drought throughout 2016 meant that only around 40% of the eucalyptus trees survived as irrigating them was rain-dependent. It should be noted that before planting the existing vegetation cover (grasslands with shrub and tree species including *Arundinaria alpina*, *Cordia millenii*, *Ficus natalensis*, *Markhamia lutea*, *Albizia spp* and acacias) was first cleared completely, meaning that when the planted eucalyptus trees failed the areas were mostly bare

[9] See GEF Project Document p74 https://www.thegef.org/sites/default/files/project_documents/PIMS_4493_Project_Document_Uganda_MFA__24.11.2013_2.pdf
[10] GEF Project Document p150 https://www.thegef.org/sites/default/files/project_documents/PIMS_4493_Project_Document_Uganda_MFA__24.11.2013_2.pdf

and susceptible to erosion when the rains did eventually come. According to community members this resulted in financial loss and most farmers didn't benefit from the first planting, although the survival rate of the second planting was around 65% due to there being more rain. The communities are still firewood deficient and, worse still, they report that eucalyptus trees aren't as suitable for charcoal-making as endemic species such as whistling thorn, which is an acacia. In fact, the trees that were cleared to facilitate planting were considerably more drought resistant and productive.

In Mubende district, as well as eucalyptus the following tree species were also planted: *Bactedavia, Melia volkensii, Maesonsia eminu, Terminalia volkensii, Terminalia,* and *Grevillea robusta*. However, most of the communities in the districts where the projects have been implemented have not fully embraced planting, as they are afraid that the eucalyptus trees will make their land more barren and drier than before given that the native vegetation had to first be cleared before they were planted. This has had a knock-on effect, in that very few trees have been planted for conservation purposes either.

Eucalyptus trees planted as part of the Green Charcoal Project. **David Kureeba**

4.4 Impacts on communities' adaptive capacities

The community members interviewed during the site visit report that their land is now barer and less biodiverse than before the planting took place, and that they have continued to cut their remaining trees for firewood and charcoal production, which is harming biodiversity as well as their livelihoods. Communities also explained how the land is drier than before due to the fact that eucalyptus trees consume large amounts of groundwater. This additional stress placed on water resources also makes it harder for them to rear cattle, which is key to their food security. Communities report that microclimates have been compromised by the planting which has in turn reduced arable crop yields.

Another issue for communities in Nakaseke, Kiryandongo and Mubende districts was the fact that the Ugandan government had recently encouraged the large-scale planting of pine (for timber) and grevillea (for timber and charcoal) through a Global Climate Change Alliance (GCCA) project. It was hard for some communities to differentiate between the Green Charcoal Project and the GCCA project, even though they had not been implemented concurrently. Having been convinced that pine and grevillea should be planted on their land instead of other possible land uses (such as forest restoration or producing food) they were then told to plant eucalyptus to improve charcoal production. Given that trees take a number of years to mature this conflicting information does not help communities to achieve sustainable and resilient livelihoods.

5. Conclusions

The TER and site visits have identified a number of serious issues that call into question the claim that the project has been able to either avoid deforestation through the distribution of improved kilns, or create a sustainable biomass supply for charcoal producers. There can be no guarantee that the original project targets for avoiding and reducing carbon emissions from the charcoal supply-chain have been met at all, given the fact that 1) there appears to be no clear evidence that more efficient kilns replaced traditional charcoal production methods on a significant scale, 2) the creation of eucalyptus plantations has impacted communities surveyed negatively with no guarantee that the wood produced will reduce pressures on forests, and 3) the figures presented in the TER appear to have been arrived at simply by dividing estimated outcomes by estimated indicators with no verification or monitoring to back up the assumptions made in the process.

There is also reason to believe that, due to poor project design, implementation and monitoring, the widespread planting of eucalyptus in the districts where the project has been implemented has had significant impacts on biodiversity, water resources and soil health, with landowners not benefiting from their involvement in the project. On the contrary, communities report that agricultural productivity has reduced due to less land availability and drier conditions. Instead of helping to mitigate the impacts of climate change planting eucalyptus has undermined the ability of communities to adapt to the changing climate.

There has also been a shift in the communities away from conservation of native ecosystems and towards planting exotic species such as eucalyptus, at the expense of native trees. This shift is slowly turning the landscapes into monocultures as opposed to what existed before the introduction of plantation species. The Green Charcoal Project, amongst others, have contributed to this shift.

Given the above points, serious questions must be asked to GEF, UNDP, GIZ and other organisations involved in funding and implementing this project. There is a clear need for donors to refrain from financing projects involving bioenergy and tree plantations that might impact negatively on biodiversity and local livelihoods. Such investments should be redirected towards approaches that have been proven to work, which includes community conservation initiatives and genuinely sustainable renewable energy technologies.