

Final Evaluation Report

Your Details	
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Project Title	Conserving gallery forests threatened by human pressure in Northern Benin
Application ID	30423-1
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1. Indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
<p>Ethnoecology of restoration: Semi structured interview with local population on their local ecological knowledge (LEK) of the impacts of anthropogenic activities on the destruction of gallery forests and restoration strategies.</p>				<p>We conducted semi-structured interviews with populations living around gallery forests to gather information on their perception on the destruction of the forests over time. All the respondents have great knowledge about the destruction of gallery forests in their region. Most of them recognise that the total area of these forests is shrinking. However, most of our respondents did not know that gallery forests harbour most of the endemic species in Benin. We were pleasantly surprised to hear some of the respondent's express concern about the climatic implication of exploiting galleries forests.</p>
<p>Collect satellite image and data processing for estimate the rate the rate of gallery forest degradation.</p>				<p>To estimate the rate of gallery forest destruction, we followed these steps: First, we downloaded cloud-free Landsat imagery on Google Earth Engine (GEE) for Benin for 2012 and 2020. In both years, we collected our data in January, which tends to be a cloud-free season. For 2012, we downloaded the median Landsat 7 surface reflectance Tier 1 data with a resolution of 30m. For 2020, we downloaded the median Landsat 8 surface reflectance Tier 1 data with a resolution of 30m. We then exported only the two bands, the red and the near infra-red, which provide vegetation data. Second, we used the buffer zone shapefile to crop and clip the Landsat data. We used the output raster to calculate the normalised difference vegetation index (NDVI). Further, we used gallery</p>

				forests occurrence data collected from a field expedition during 2018, 2019, 2020 to map gallery forest reference units. We extracted the NDVI value for each of these points and calculated the average NDVI for the entire gallery forest. We used that average NDVI value as the minimum threshold for all gallery forests in Benin. Finally, we estimated the number of pixels for each year and deduced if the number decreased or increased during the period of study.
Green school program and restoration program				The Green School was successful organised in localities around the gallery forests to teach to next generation the importance of gallery forests and the ecosystem services that these forests offer to people. We took advantage of 1 st June which is the national Arbor Day of Benin, to implement our restoration programme.
Installation of local management committee and follow up for restoration programs.				A local management committee was successfully installed as well. The local committee includes stakeholders such as village chiefs, representant of farmers and woodcutters or loggers.

2. Describe the three most important outcomes of your project.

a). Most of our respondents did not cite the role that gallery forests play in controlling the water cycle by regulating precipitation, evaporation, and flows. However, all the respondents recognised the importance of gallery forests as providers of resources. Rural communities in north Benin rely on plants found in the gallery forests for their primary healthcare and as source of food and income. For example, in the Atacora province, *Anogeissus leiocapra* is harvested for both timber and non-timber forest products. Tree trunks are utilised to build traditional houses known as Tata-Somba. These Tata-Sombas have an architecture that attract tourists from Europe. Local people recognise the rich soil associated with gallery forests.

b). Gallery forests were lost at 10.1% rate between 2000 and 2020. The main driver of this destruction is intensive agriculture. Because of their ability to flourish where the surrounding landscape does not support forests, galleries forests are also subject to overgrazing by Fulani people and most of species living in gallery forests that can produce timbers are harvested for furniture and charcoal. Species such as *Khaya senegalensis*, *Danielia oliveri*, *Pterocarpus erinacesus*, *Anogeisus leiocarpa* and *Isobertinia tomentosa* are the most heavily harvested for timber products. In addition, the regional rice culture is a major threat to gallery forests. One final threat

for this vulnerable ecosystem is the destruction of forest for home gardening particularly in the dry season.

c). Local people perceive species richness in gallery forests as being evenly distributed in north Benin. Most of the respondents consider the rare and endemic species in their midst as common species that they believe could be found anywhere. This misapprehension about the richness of the gallery forests might be an additional threat to this threatened habitat.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

The low rate of germination of native species was the main difficulty we faced. This impacted the planning of the restoration project. To overcome that difficulty, we tried the vegetative propagation technique, and it works for some species.

The outbreak of COVID-19 was a challenge in the implementation of the project. This was particularly true for the semi-structured interview. However, we tackled this by collecting our field data first and then conducting the interviews when the transmission rate was low.

4. Describe the involvement of local communities and how they have benefited from the project.

Local communities were closely involved in the activities. Firstly, they were instrumental to selecting forests for our study and collecting seeds for germination tests. Secondly, they contributed in semi-structured interviews to provide information on the importance of gallery forests and the drivers of gallery forest destruction. Thirdly, we discussed the importance of gallery forests with children in the communities and how these forests are important in mitigating climate change. Finally, we collaborated with a local NGO, called the "Happy days NGO", which is involved in climate change mitigation in Atacora. The youth, who tend to be fast at adopting new technologies, were trained on the basics of citizen science. More specifically, we trained them how to use iNaturalist, a software available on android and iPhones, that allows species identification and observations of biodiversity sharing across the globe. Some of the strategies we proposed included encouraging local people to adopt alternative sources of livelihood such as ecotourism and agroforestry to limit land destruction for agriculture purposes. Since our project falls within the conservation objectives of the National Forestry Office of Benin, we received their support. The "Cantonment Forestier of Natitingou" allowed us to conduct our germination and propagation tests and provided us advice on the success of this project.

5. Are there any plans to continue this work?

Yes, there are plans to continue this work. Our field work revealed that most of the rivers in the region are drying up and are heavily exploited by local people. This will reduce access to drinking water and water for agriculture, as well as loss of river transportation corridors, and loss of aquatic habitats for fish and other organisms. The

main driver of gallery forest destruction is that they are able to exist where the surrounding landscape does not support other kinds of forests. For regions with low annual rainfall such as Atacora, where we conducted our project, galleries forests are the place to go to have decent crop yield particularly without any chemical fertiliser. Even though we installed local committees, we are aware of the existential dilemma that low-income populations face regarding environmental protection. There is an urgent need to initiate conservation strategies that will restore degraded soils and trained people on climate smart agriculture techniques. We believe soil richness and climate smart agriculture will reduce the pressure on gallery forests.

6. How do you plan to share the results of your work with others?

Two manuscripts are in preparation and will be published. Our results on the rate and drivers of gallery forest destruction will be published in *Conservation Biology* while our results on local people's perceptions will be published in *Economic Botany*. Oral presentations will be given at conferences. Once the papers are accepted for publication, we will tweet the main take home message and hashtag The Rufford Foundation for funding the project. We will also upload the papers on ResearchGate for more visibility.

7. Looking ahead, what do you feel are the important next steps?

An important next step will be to initiate a monitoring of transplanted individual plants to determine their survival and success. Mastering the germination techniques and the propagation techniques of some of the threatened species of these galleries forest is a crucial step in designing sustainable conservation actions. Finally, conducting an assisted natural regeneration in gallery forests with local people will accelerate gallery forest restoration. The sustainability of the local committees may be vulnerable to changes in local leadership norms. The village chiefs used to be permanent position. Nowadays, they are elected by government. Also, some of the current local officers in the forestry department are likely to be transferred. Getting more support from the national forestry office will help the durability of the project. Another important next step would be to conduct socio-economic research on some important indigenous species in the gallery forest with high potential for domestication.

8. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the Foundation receive any publicity during the course of your work?

Yes, we used the Rufford Foundation logo in talks we gave at a conference and workshops. We also acknowledged The Rufford Foundation in the two manuscripts in preparation for publication in peer review journals.

9. Provide a full list of all the members of your team and their role in the project.

Herman M'Po (BSc): He was born and raised in the study area and majored in Biological Science. He is familiar with local species and people and speaks five languages. He was our guide for the projects.

Yarou Aziz (MSc): Officer of the National Forestry Department. He was the project's resource contact in the National Forestry Office. He helped with meeting with stakeholders and local committee installation.

Deo-Gratias Gnonle (MSc): Management of Natural Resource. He has an excellent collaboration with traditional chiefs. In addition, he helped to establish contact with other primary school directors. He also facilitated questionnaire administration to local people.

10. Any other comments?

We would like to thank The Rufford Foundation for funding this project and allowing us to understand the value of gallery forest to local communities and the rate of destruction of these forests.



