

Final Evaluation Report

Your Details	
Full Name	BOUKARY Abdoul-Azize
Project Title	Contribution to the restoration and conservation of degraded habitats of wild edible mushrooms of Tchaourou, Toui-Kilibo in North East Benin
Application ID	39024-1
Date of this Report	29-03-2024

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
Ethnomycological study of the knowledge of edible mushrooms			X	The project conducted an ethnomycological survey in three villages surrounding the Tchaorou Forest Reserve, Toui-Kilibo (FC-TTK). Over a 6-week period between June and July 2023, our team surveyed 300 individuals a Kobocollect survey form. Local leaders facilitated the interviews, ensuring community participation and acceptance. The villages, representing diverse ethnic groups, provided insights into the edible mushroom diversity in the forest. Knowledge of edible mushrooms was categorised according to the respondents' occupation, age and gender. These data showed that edible mushrooms are better known: (1) by women than by men, (2) by the Nago ethnic group, (3) by farmers, who are the people who are in constant contact with the forest for their activities. The other data collected concerned the local people's perception of the availability of the resource (edible mushrooms), the temporal dynamics of the species and the threats to the various species. A catalogue of edible species in the study area was compiled. The analysis of the data from this survey has given interesting results. A scientific publication is currently being prepared to make the most of the perceptual data collected. It should be noted that:

			<ul style="list-style-type: none"> - More than 38 species were mentioned as edible for the whole region. - The three most mentioned species are <i>Candeleomyces tuberculatus</i> (15.2%), <i>Termitomyces schimperi</i> (12.6%), <i>Lentinus squarrosulus</i> (8.5%). - The most popular edible species is <i>Candeleomyces tuberculatus</i> (81% named), followed by <i>Lentinus squarrosulus</i> (9.4%) and <i>Termitomyces schimperi</i> (7.1%). - More than half of the species on the list of cited species have a declining dynamic with rare availability. - Several interesting edible species are known to be very rare at the present time or even to be locally extinct. Among these species, one of the three most highly valued due to the destruction of its habitat. This is <i>Termitomyces schimperi</i>. - None of the species are reported to be part of an evolutionary dynamic. The species are cited as being in either regressive or constant dynamics. - The study of local perceptions shows that 98% of the edible mushroom species in the FC-TTK are in a regressive dynamic. Only 1% of the received perceptions show a constant dynamic. - The species mentioned as having constant dynamics are all saprophytes. An example is <i>Lentinus squarrosulus</i>. - According to the local population, deforestation is the main reason for the disappearance of edible mushrooms (27.7%). This is followed by the destruction of termite mounds (22%) and excessive use of chemicals and
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			<p>pesticides (20.99%). Irregular rainfall is also a direct result of practices such as deforestation and poor agricultural practices.</p> <p>Finally, we have included some graphs from the analyses.</p> <ul style="list-style-type: none"> - Figure 1: A list of all the species mentioned by respondents, their frequency of mention as edible mushrooms. - Figure 2: The association between ethnic group and most preferred species was highlighted using Cramer's association test with the RVAidememoire package (Herve 2023). The figure shows the visual representation of this relationship using an alluvial flow chart with the ggalluvial package (Brunson and Read 2023). <p>NB: We have other graphs from the statistical analysis of these ethnomycological surveys which will be shared with the publication of the manuscript currently being written.</p>
Mushrooms cultivation training		X	<p>The training, previously scheduled for mid-February 2024, was held in May due to concerns about high temperatures in the area during February and March (Sudanese climate). The training went very well, with strong interest from the local community, especially the women. 30 people selected from the three villages involved in the project attended the training. Our team equipped with the necessary material for the theoretical training (posters, leaflets) and the practical training (substrate production equipment,</p>

				<p>seeds, substrate sterilisation equipment), went out into the field and managed to organise this activity perfectly (see pictures in the interim report). The theoretical training covered the steps involved in obtaining seeds, substrate preparation, sterilisation and sowing, incubation, fruiting and harvesting. A practical demonstration gave participants the opportunity to try their hand at growing.</p> <p>This training was done using posters, flyers and printing pictures that we shared with local population to facilitate understanding. The trainees were completely satisfied, as were the local authorities for choosing their respective villages.</p>
Raising awareness			X	<p>The final component of the project focused on raising awareness among the local population. This included:</p> <ul style="list-style-type: none"> - Presenting the findings of the perception study on the availability and dynamics of the natural production. - The various threats identified and their direct impact on mushrooms and habitats. - How to contribute to the conservation of mushrooms and their habitats. - The importance of commercial mushroom cultivation was demonstrated. <p>For this activity, bags and gadgets for regular use with messages to protect the TTK forest (natural mushroom habitat) were produced and distributed to the local population (photo attached). This activity was carried out in two sessions. The first</p>

				took place in December 2023 with the village of Toui gare and the second at the end of February 2024 with the villages of Kilibo gare and Toui PK.
Reforestation			X	<p>Several plots of land have been reforested for this activity. Bare land within the forest. These plots were previously identified by forest officers in the project implementation zone, i.e. FC-TTK. The forest officers also facilitated this activity. Instead of 3,000 <i>Isoberlinia doka</i> and <i>Azelia africana</i> seedlings, we finally opted for 1,500 <i>Azelia africana</i> seedlings (the only species available in the Forest Department nurseries that met our reforestation target).</p> <p><i>Azelia africana</i> plays a crucial role in reforestation efforts as an ectomycorrhizal tree. Their selection and introduction into this fungal habitat restoration project activity will promote mycorrhizal symbioses, improve soil fertility, support biodiversity and contribute to ecosystem resilience. Through the restoration of this tree, we will be able to restore the complex ecological interactions that are essential to the health and sustainability of forests.</p> <p><i>Azelia africana</i> is also a species on the Red List of Threatened Species and is therefore encouraged for reforestation activities.</p> <p>The number of plants was reduced due to higher than expected costs.</p>

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

a). 30 persons were initiated for the edible mushrooms cultivation. They are now able to produce mushrooms especially Oyster mushrooms.

b). Edible mushroom species in the TTK Forest Reserve are in a regressive dynamic. Multiple correspondence analysis (MCA) using the packages FactoMineR (Husson et al. 2023) to show dominant perceptions of abundance levels indicates that 82% of cited mushroom species are now rare in this region (e.g. *Lactifluus luteopus*, *Lactifluus flammans*) and 5% of cited species are locally extinct (e.g. *Termitomyces shimperi* and *Clavulina albiramea*). The main causes are deforestation and excessive use of chemical pesticides.

c). The most popular edible species is *Candeleomyces tuberculatus*. However, its consumption is limited by seasonal availability and product quality.

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

We adjusted our implementation programme based on the availability of local resources and the season, optimising project outcomes. This involved postponing the mushroom growing season and splitting the awareness campaign into two sessions instead of one.

Regarding reforestation efforts We encountered challenges with the supply of ectomycorrhizal tree species, particularly *Isberberlina doka* and *Isberberinia tomentosa*. The local producers did not have these plants. The forestry department had also not produced these species in large quantities. In response, we purchased *Afzelia africana*, another ectomycorrhizal species, to bolster the natural habitats of the wild edible champignons.

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

The local population was available for all the activities carried out during this project. This availability was demonstrated by: (1) the support of the village leaders in selecting the beneficiaries of the mushroom cultivation training course, (2) the participation of the local people in awareness raising activities, (3) their contribution to ethnomycological surveys and (4) the commitment of the farmers who helped with reforestation. The perceptions of the local population made it possible to identify the dangers associated with edible mushrooms. This perception study is an important indicator of the state of the resource in the study area. In return, the local people were provided with a small amount of mushroom growing equipment and were educated about the causes and consequences of the destruction of the natural habitats of wild edible mushrooms. For those who had little knowledge of edible mushrooms, the open day (to raise awareness) provided an opportunity to inform and share knowledge about edible mushrooms and their habitats.

5. Are there any plans to continue this work?

Based on the results of the survey and observations during the project, the following actions are recommended

- Raise awareness of the ecological and economic importance of edible mushrooms, the risks of extinction and the associated consequences. We could take the opportunity to make a special communication on the habitat of species of the genus *Termitomyces*, which are becoming very rare, with species considered locally extinct.
- Implementation of sustainable forest management practices to preserve the habitats of fungal species.
- Forest surveys to verify the actual availability of species reported as locally extinct and very rare.
- Increased reforestation to enhance the natural habitat of edible fungi with local species (partners of edible fungi) and to conserve rare or declining fungal species. To achieve this effectively, an introduction to local plant production is essential.
- Strengthening the mushroom cultivation sector (especially the preferred local species) to meet food needs in times of scarcity. This is important given the enthusiasm shown by local people for this activity when introduced to mushroom growing. This activity will improve incomes and is an alternative way to reduce charcoal production and agriculture.
- Integration of traditional knowledge and observed perceptions into policies for the conservation and management of natural resources (mushrooms and their habitats).

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

One of our priorities is to produce a scientific publication on the perceptions studied during this project. A scientific article describing the results of the survey will therefore be completed and submitted to a scientific journal specialising in ethnomycology, ecology, conservation or forestry. This will allow our results to be disseminated within the scientific community and ensure peer validation. We plan to present the results of the survey at national and international scientific conferences. This will allow us to reach a wider audience and attract the interest of researchers, policy makers and NGOs working in the field of conservation.

Our project report will then be shared with the local forest administration in the project area. The brochures and posters produced will be distributed to local people at the end of the project. The electronic versions will be put online on our social pages and on our Research Gate account for easy access by all.

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

In the future, prioritising intensified awareness campaigns on sustainable agricultural practices will be crucial for promoting forest conservation and ensuring the success of initiatives focused edible mushrooms and their natural habitats (FC-TTK). Conducting a comprehensive mycological survey will be essential for informed decision-making and designing a conservation plan particularly for species which disappearance or rarity poses significance to the local population. Furthermore, there's a promising opportunity in the development of mushroom cultivation and ectomycorrhizal plant production. This not only offers economic benefits for the local community but also plays a pivotal role in safeguarding natural habitats. By harnessing these opportunities, we can foster both ecological preservation and sustainable livelihoods for the region.

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?

For this project we used the Rufford Foundation logo on all posters, leaflets and flyers produced and published during the project. The logo was used on t-shirts, bags and gadgets made for the project. We also printed and pasted the logo on the mushroom production materials offered to the local community. Finally, the Rufford Foundation logo was used in publications on our social networking sites.

The Rufford Foundation did not receive any publicity, but we made sure that the foundation was well represented and highlighted in all the activities and documents produced.

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

Abdoul-Azize BOUKARY: Facilitate the coordination of all pertinent activities. Attended training sessions for mushroom cultivation, reforestation efforts, and awareness-raising initiatives.

Naomie Lucesse YABI: Her skills help us in mushroom cultivation training.

Ismaël ROUGA: He coordinates the reforestation activities of this project. He does it with some students of agricultural school and the local population for the execution of this activity.

Michel TCHEDE: He helped us to raise public awareness.

Gwladys Olyvia FADEYI: PhD student in ethno-mycology in Benin, she coordinates both ethno-mycology survey. She also helps for mushroom cultivation training. With her investigative skills on mushroom knowledge collection data and perfect knowledge of ethnosciences theories She was responsible for ethno-mycological studies.

Mathieu: local guide

Nestor AKAKPO: local guide

10. Any other comments?

We would like to thank The Rufford Foundation for providing this funding for the conservation of edible mushrooms and their habitats in the TTK region.

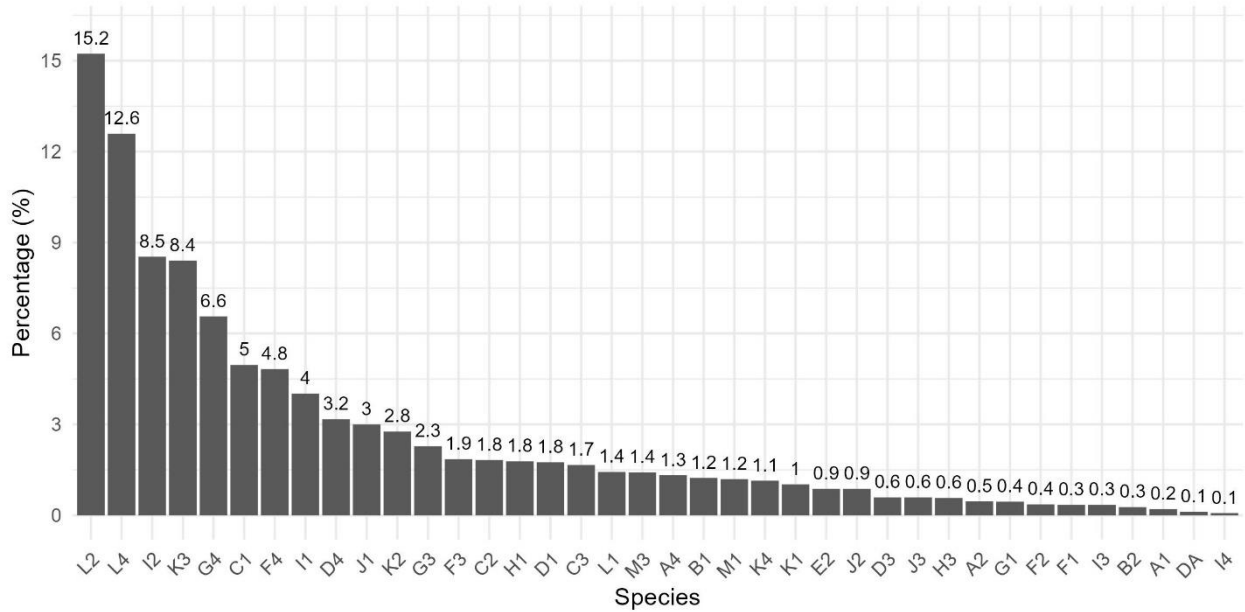


Figure 1: A list of all the species mentioned by respondents, their frequency of mention and the species mentioned as most preferred for consumption.

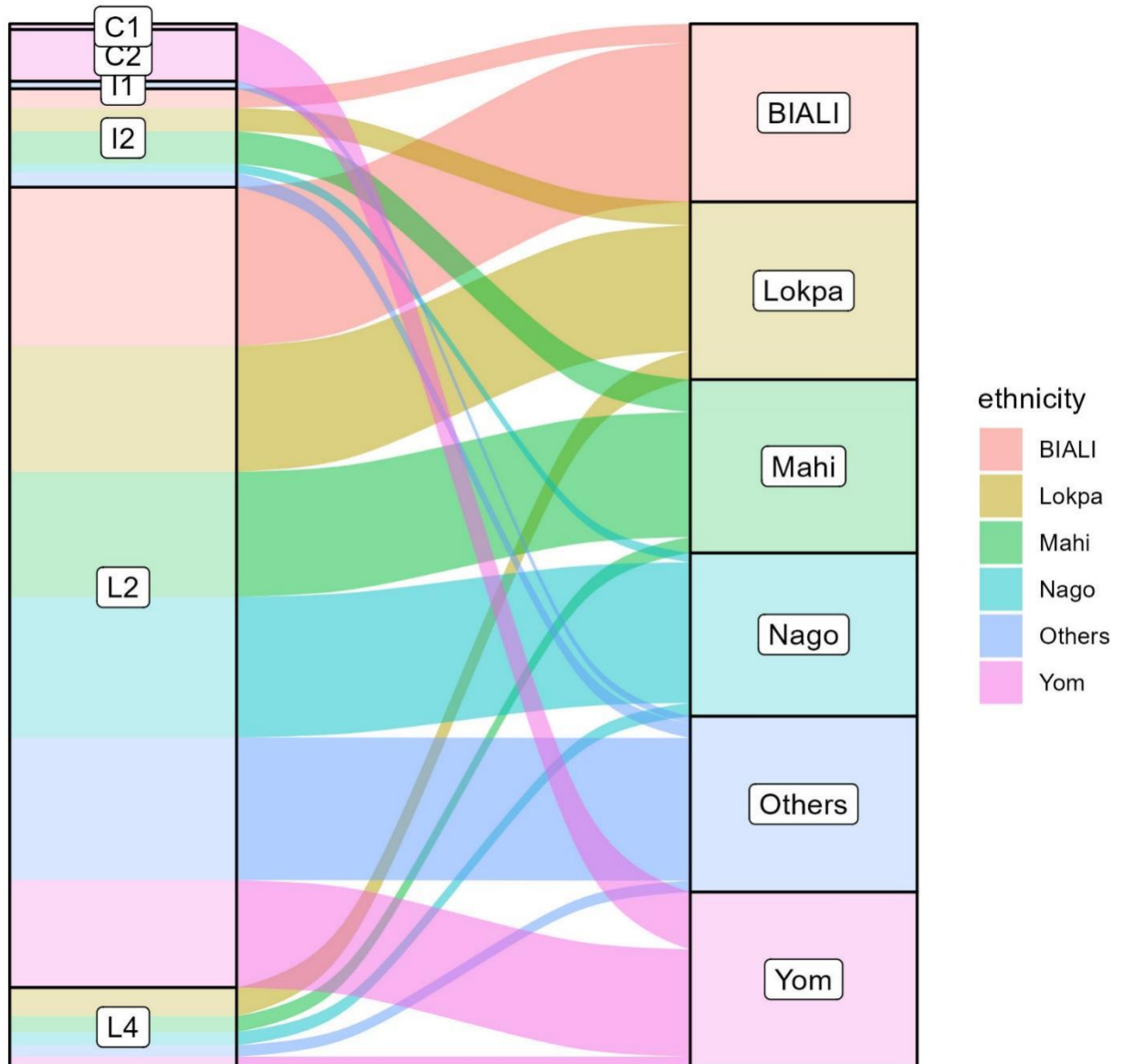


Figure 2: The association between ethnic group and most preferred species

Picture a, d, e, f, g, h, i: awareness (First group)

Picture b, c: awareness (Second group)

Picture f, g, j, k, l: gadgets with conservation messages



Picture a



Picture b:



Picture c



Picture d



Picture e



Picture f



Picture g



Picture h



Picture i



Picture j



Picture k



Picture l