Final Evaluation Report

Your Details	
Full Name	Agbatan Marc KOUTCHORO
Project Title	Improvement of the conservation status of *Afzelia africana* in Benin
Application ID	41122-1
Date of this Report	18/09/2024

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
Identification of habitats favorable to the conservation of *Afzelia Africana*			✓	We identified the most favorable natural habitats for the conservation of *A. africana* in Benin. We extracted species presence data from the national forest inventory database conducted in 2022 and supplemented by the GBIF (www.gbif.org). Twenty-one bioclimatic and edaphic variables were obtained online from the WorldClim website (https://www.worldclim.org/data/index.html). Techniques based on MaxEnt combined with GIS (Geographic Information System) were used to project suitable habitats for the conservation of *A africana*. Presence data were combined with bioclimatic and edaphic variables to simulate suitable areas using the MaxEnt algorithm. The simulation in MaxEnt was repeated five times using the cross-validation method, where 80% of the points were used for model calibration and 20% for model validation. The logistic threshold value of the 10 percentile training presence was used as the probability of occurrence (PO) threshold to define habitat suitability levels for the species (Liu *et al.*, 2013). PO < 10 = less favorable habitat; P10 > 10 = more favorable habitat.
Assessment of the impact of livestock on the demographic structure of *Afzelia africana* populations			✓	After modeling, the gazetted forests of Ouémé Supérieur (9°11'-9°47'N-1°58'- 2°28'E) and Alibori Supérieur (10°41-11°11N-2°15-2°48E) were chosen for data collection on *A. africana* populations. The criteria for choosing these two protected areas were (i) climate zone (Sudanian or Sudano-Guinean), (ii) size and (iii) sensitivity to current and future climate variability. Whatever the climate scenario (SSP2-4.5 or SSP5-8.5), these two forests remain the largest and most favorable protected areas for current and future conservation of *A. africana*. The Ouémé Supérieur gazetted forest is located in the Sudano-Guinean zone. The Alibori Supérieur gazetted forest is located in the Sudanian zone. Thus, in each of these forests, 30

				x 30 m plots were randomly installed in the *A. africana* populations, at intervals of at least 200 m from each other (Koutchoro *et al.*, 2022). A total of 256 plots were installed, 140 in the Ouémé Supérieur gazetted forest and 116 in the Alibori Supérieur gazetted forest. The installation of these plots was oriented by the presence of *A. africana* individuals. Within each plot, the following data were collected on individuals of the species: $dbh_{1.3m}$ (diameter at breast height, 1.30 m from the ground), total height of individuals with a $dbh_{1.3m} \geq 5$ cm (Gaoue and Ticktin, 2007) and pruning intensity. For small individuals with $dbh_{1.3m} < 5$ cm, a simple count was made To determine pruning intensity, we counted the number of branches pruned and the total number of branches for each tree stem. To estimate seedling density, we systematically counted all individuals with a $dbh_{1.3m} < 5$ cm in five 5 m × 5 m subplots, established at the four corners and centre of each plot. We had therefore defined seedlings as individuals with a $dbh_{1.3m} < 5$ cm (Nacoulma *et al.*, 2011). In addition to data on *A. africana* populations, we also collected data on the type of plant community, soil texture and relief for each plot.
Assessment of the perception of local communities on the temporal dynamics and local conservation practices of *Afzelia africana*				We carried out ethnobotanical surveys among riparian populations of favorable habitats in order to assess their perception of the vulnerability of *A. africana* and the endogenous practices adopted for its conservation. To this end, 270 people were interviewed using simple random sampling: 100 agro-breeders, 50 breeders, 90 farmers, 15 forestry officers, 10 nurserymen and 5 sawyers. Interviews were conducted exclusively in the local language, in order to gather as much information as possible about the species. The triangulation technique was used to control the quality of information provided by respondents. This technique consists in asking respondents the same question in several ways, in order to obtain real information. Thus, the following information was collected using the KoboCollect application: socio-cultural category of respondents (ethnicity, gender, age categories, marital status, level of education, profession and religion), perceptions of respondents on the availability of *A. africana*

			(rare, less abundant, abundant), population dynamics in recent years (stable, increasing, decreasing), reasons for the species' population decline (harvesting for fodder, logging, agriculture, drought and others), and traditional practices used for its conservation. The age categories of the respondents were defined as follows: young (18-30 years), adult (30-60 years) and old (≥ 60 years) (Assogbadjo *et al.*, 2008; Zon *et al.*, 2022).
Sensitization of local populations for the conservation of *Afzelia africana* in Benin.			We used posters and T-shirts with key messages and partner logos to raise awareness among local populations about the conservation of *A. africana* and its habitats. Following the awareness raising, practical training was organized for participants on techniques for the sustainable exploitation of the species. Educational games, drawings and competitions on *A. africana* were organized for schoolchildren. In collaboration with local communities, natural habitats favorable to the conservation of the species were identified and the seedlings produced were planted in degraded areas. For this first phase of the project, awareness, environmental education and reforestation activities were carried out strictly in the Sudanian zone of the country, due to the high pastoral pressure observed in this region during the survey and forest inventory phases. Thus, 10 villages bordering the gazetted forests of Trois Rivières (GFTR; 10°20'-10°45'N and 2°45'-3°40'E) and Alibori Supérieur (GFAS; 10°41-11°11N and 2°15-2°48E) were selected (five villages per forest): Nassikonsi, Bessassi, Zambara, Managbasso, Salonzi (for GFTR), and Ningoussourou, Guéssébani, Sèkèré, Yarra, Lougou (for GFAS). These villages were chosen because of their immediate proximity to forests.

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

a). The temperature and precipitation were the most important environmental variables determining the current distribution of *A. africana* in Benin. The geographical ranges that are currently most favorable for the conservation of *A. africana* in Benin represent 56.97% of the national surface area. The model predicts a significant reduction in these areas currently favorable for the species' conservation by 2060, with an estimated loss of 16.22% under the optimistic scenario and 16.32% under the pessimistic scenario.

b). Pruning intensity was positively correlated with *A. africana* tree diameter. Pruning had a negative effect on the density of *A. africana* seedlings on sandy-silty and gravelly soils.

c). Interviews with riparian populations in favorable habitats enabled us to understand that *A. africana* is less abundant (40.23 %) and sometimes absent in certain localities (4.6 %). 27.59 % respectively stated that *A. africana* is rare and abundant in their locality. Similarly, 80.46 % of respondents noted that the species is in decline, mainly due to the pruning of branches for animals (80.46 %) and agriculture (37.93 %).

d). We organized 10 awareness and environmental education sessions in 10 villages (one session per village). The results of our research were used to sensitize participants to the conservation of endangered species and their habitats. After the awareness sessions, practical training was organized for participants on sustainable harvesting techniques for the species. In total, 2356 people were sensitized and trained in branch pruning techniques. We planted 2600 *A. africana* and *Khaya senegalensis* seedlings in degraded GFTR habitats.

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

The difficulties encountered during this project were related to the inaccessibility of the GFAS during the reforestation period due to the security situation in the region. To overcome this and achieve the project's objectives, we increased the surface area and the number of seedlings planted in the GFTR. Additionally, we were unable to find any *Pterocarpus erinaceus* seeds during the period when the nurseries were being set up. To address this, we increased the quantity of seeds for two other species (*A. africana* and *K. senegalensis*) and consequently the number of seedlings planted, in order to achieve the project's objectives.

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

This project was successful thanks to the support of local communities in implementing field activities. For the forest inventories, which assessed the impact of pastoral breeding on the population structure of *A. africana*, local hunters and sawyers served as guides for identifying and recognizing tracks in the forests. During the establishment of nurseries, tasks such as site maintenance, potting, sowing, watering, and nursery upkeep were carried out with the support of local communities. Additionally, local authorities, teachers, and school directors facilitated the organization of awareness and environmental education sessions. Thanks to this project, local populations received essential guidance on ensuring the availability of fodder for their animals during the dry season without affecting the survival of endangered woody species. Through environmental education activities, the project enabled schoolchildren to learn about the ecological and socio-economic roles of *A. africana*, its current population status, the threats it faces, and how they can contribute to the species' sustainability. Young people from local villages helped transport the seedlings to the reforestation sites and actively participated in planting and maintenance. Reforestation activities were also supervised and supported by local forestry officers

and rangers. In summary, this project was carried out exclusively through a participatory approach involving all stakeholders.

5. Are there any plans to continue this work?
We plan to seek additional funding for phase 2 of the project. This phase will consist of extending awareness and environmental education activities in other protected areas favorable to the conservation of *A. africana*. During this phase, we also plan to pursue reforestation activities in degraded habitats in these protected areas, in order to increase the density of the species' populations and thus ensure its sustainability.

6. How do you plan to share the results of your work with others?
We plan to make the data generated from this project available to the scientific community by publishing an article in a peer-reviewed, open-access international journal. This will help to widely share the data with a large scientific audience. The project results will also be presented at national and international workshops and conferences. A printed report will be deposited in the library of the University of Parakou for use by students in writing their dissertations and conducting biodiversity conservation projects.

7. Looking ahead, what do you feel are the important next steps?
This project has enabled us to identify habitats favorable to the conservation of *A. africana*, and the impact of pastoral breeding on its population structure. It will therefore be important to:
- Train local communities in advanced nursery and planting techniques for *A. africana* in favorable habitats,
- Develop techniques for producing fodder biomass in nurseries using *A. africana* to meet the demand for fodder to feed animals in the dry season, and limit the pruning of fodder trees,
- Pursue awareness and environmental education programs on the conservation of *A. africana* and its habitats,
- Pursue reforestation actions in favorable habitats to increase the density of *A. africana* and ensure its sustainability.

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?
The Rufford Foundation logo was used on all documents and publicity materials produced as part of this project. The poster and T-shirts produced for awareness and environmental education carried the Rufford Foundation logo. The three intermediary reports produced also bore the Foundation's logo. These three reports, containing images of our publicity materials, were sent to the Rufford Foundation.

9. Provide a full list of all the members of your team and their role in the project.
Agbatan Marc KOUTCHORO
Project Manager. He coordinated all project activities and ensured that the project objectives were achieved on time and within budget.
Mohamed ASSOUMA
It provided assistance with data collection and reforestation.
Mireille DEGNI

She provided assistance in organizing awareness and environmental education sessions.

Kenneth Gwenael DEGAN

A computer scientist and member of the SOS Savane NGO, he produced the publicity materials (poster and T-shirts).

Laurent HOUESSOU (Associate Professor)

He provided his expertise in developing and validating the inventory methodology, survey and awareness and in evaluating the success of the project.

10. Any other comments?

We would like to thank the Rufford Foundation for fully funding the activities of this project. We would also like to thank IDEA WILD for providing us with materials for field activities. Our thanks also go to our colleagues at LEB, forestry officers, local authorities and communities, and the SOS Savane NGO for their assistance and contributions to the success of this project's activities.