CBI CONGO BASIN INSTITUTE

THE EBONY PROJECT

A Program for Restoration, Use, and Community-based Livelihoods

Progress Report
December 2022

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Cover picture: Project participant with an ebony tree, Bifolone, Cameroon; photo: Vincent Deblauwe

Congo Basin Institute, Yaoundé, December 2022

PROJECT PARTNERS

The Ebony Project is coordinated by the Congo Basin Institute (CBI) in Yaoundé, Cameroon, and implemented by CBI and its collaborators:

International Institute of Tropical Agriculture
Cameroon

University of California, Los Angeles
United States of America

Institut Supérieur des Sciences Environnementales
Cameroon

Taylor Guitars
United States of America

Madinter
Spain

Crelicam
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The Ebony Project is developing activities in collaboration with institutions in Cameroon including:

Université de Yaoundé I, Yaoundé, Prof. B. Sonké

Ministry of Environment, Nature Protection, and Sustainable Development (MINEPDED), Ministry of Forestry and Wildlife (MINFOF), Cameroon, Conservation Services of the Dja Faunal Reserve
National Forestry School Mbalmayo, N. Kingsly

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CRITICAL POINTS IN 2022

In this year's Annual Progress Report, we give special attention to our work's social and economic aspects rather than focusing primarily on ecology and tree planting. The Ebony Project was conceived seven years ago with the modest goal of conducting research to better understand the ecology of African ebony (*Diospyros crassiflora* Hiern) and to enhance ebony stocks through community-driven planting. Thanks to the early input of Cameroonian scientist Dr. Zac Tchoundjeu and others, the project also included the co-cropping of locally valuable fruit trees. In addition to increasing the biological diversity of the resulting plots, this design element guaranteed the project would provide medium- and long-term value to participants. This improvement directly resulted from involving local stakeholders in the project design phase.

We are embarking on an effort to better understand the social and economic impact the use of fruit trees and other elements of the project have on participants. This complex topic requires balancing a desire for understanding and quantification with the logical and resource limits of what we can accomplish. It will be one of the most complicated aspects of the project to date.

One learning has been that while the production of locally valuable fruit trees continues to be one of the project's main challenges, the enhanced social and economic analysis of this year's report underscores how vital it is to ensure the project's success while meeting the needs of participating communities. As a starting point, we assess the Ebony Project using the 'Ten people-centered rules for socially sustainable ecosystem restoration.[1] Additionally, we try to understand how our project activities compare with international standards for Free, Prior, and Informed Consent (FPIC).

We have also continued the pioneering research that has been a hallmark of the Ebony Project since its inception. This year we confirmed and clarified the critical connection between ebony and the critically endangered African forest elephant. In addition, there have been significant and unforeseen synergies to conducting research while replanting. Needs from the re-planting work can inform the research agenda, and learnings from the research component can be immediately applied to the replanting. We hope this cross-fertilization becomes even more powerful as we expand our research on the socio-economic impacts of the project.

# # # #

After achieving its original goal of planting 15,000 ebony trees in 2021, the project team established new goals of planting an additional 30,000 ebony and 25,000 fruit trees by the end of 2026. In

[1] Elias, M., Kandel, M., Mansourian, S., Meinzen-Dick, R., Crossland, M., Joshi, D., Kariuki, J., Lee, L.C., McElwee, P., Sen, A., Sigman. E., Singh, R., Adamczyk, E.M., Addoah, T., Agaba, G., Alare, R.S., Anderson, W., Arulingam, I., Bellis, S.K.V., Birner, R., De Silva, S., Dubois, M., Duraisami, M., Featherstone, M., Gallant, B., Hakhu, A., Irvine, R., Kiura, E., Magaju, C., McDougall, C., McNeill, G.W., Nagendra, H., Nghi, T.H., Okamoto, D.K., Valencia, A.M.P., Pagella, T., Pontier, O., Post, M., Saunders, G.W., Schreckenberg, K., Shelar, K., Sinclair, F., Gautam, R.S., Spindel, N.B., Unnikrishnan, H., Wilson, G.N., Winowiecki, L. Ten people-centered rules for socially sustainable ecosystem restoration. 2021. Restoration Ecology: (30)4.

2022, the Ebony Project planted 6,372 ebony trees, bringing our total to 27,810. We also planted 5,402 fruit trees.

For background information about the Ebony Project, please see this succinct description and the Ebony Project mini-site on Taylor Guitars' website. Prior annual reports are also available for 2017, 2018, 2019, 2020, and 2021.

COMMUNITIES

Growth and Geography

The Ebony Project is now active in eight communities: Ngola, Ekombité, Bifolone, Kompia, Adjan, Malen IV, Bemba II, and Zoebéfam I, with one community (Somalomo) having graduated.[2] This number is up from four communities in 2019, six in 2020, and seven in 2021.

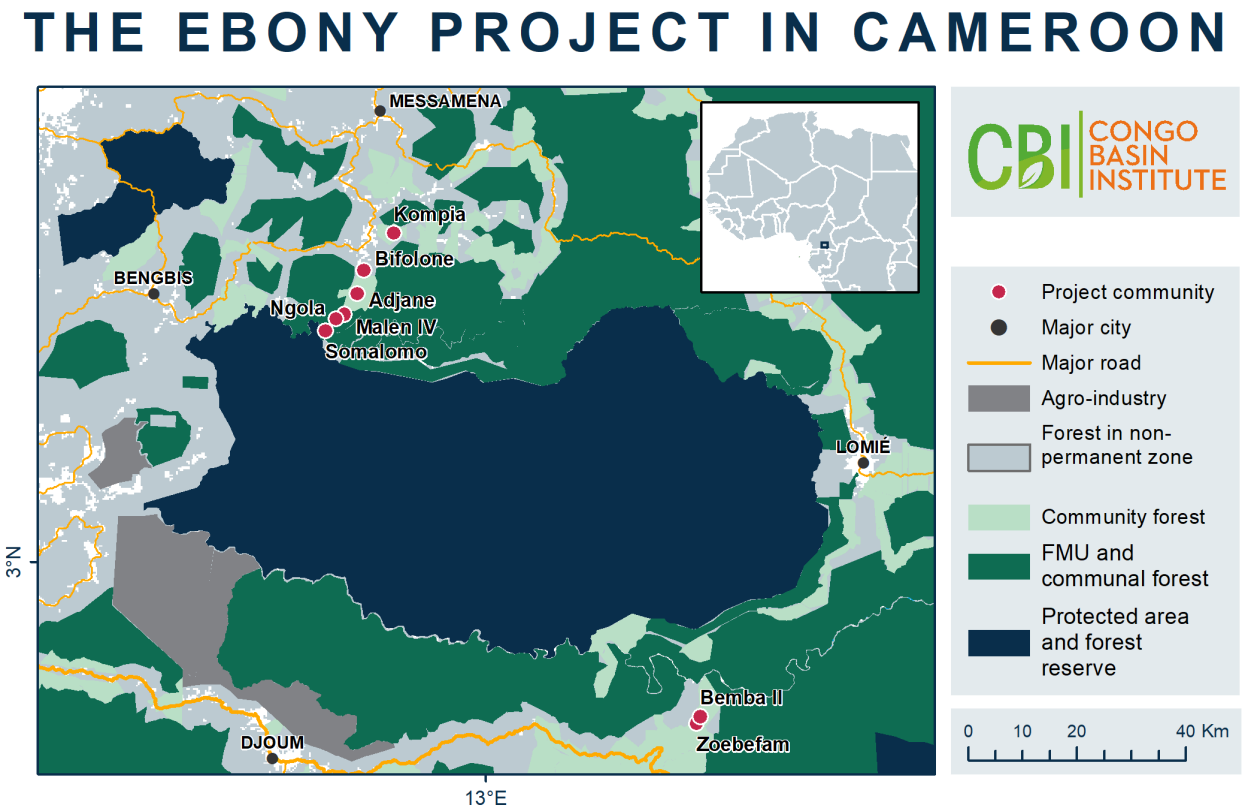


Figure 1: Map of participating communities and main land use classes

Last year's progress report (2021) detailed how the Ebony Project has grown mostly organically, with participating communities along the roadside near the Dja Reserve, a UNESCO World Heritage Site established in 1987, inspiring neighboring communities to seek involvement based on project results. Roadside human settlement in what is otherwise a largely intact forest landscape presents the main threat long-term biological integrity in the region because it impacts wildlife movement and the dispersal of plant seeds. While the Ebony Project was not designed to protect large swaths of forested land, it may help maintain and improve habitat connectivity in areas directly impacted by human settlement, particularly within 10km of roads.

As illustrated in Figure 1, the Ebony Project operates within the thin segments land in between large blocks of land demarcated for different uses, ranging from conservation (dark blue) to large-

[2] A community is considered "graduated" from the Ebony Project when it is no longer actively planting.

scale agriculture (dark gray) to logging concessions (dark green). Most land in the area is heavily forested with thin ribbons where local people live and farm–and where the Ebony Project is focused (represented in light grey and light green)–in the interstitial space. The map conveys the limited geographic area currently available for project implementation, but also that the narrow area where the project operates is among the most threatened forest.

Tracking Community Progress within the Project Cycle

As discussed in the 2019 Progress Report, participating communities continue to advance through the project cycle. In total, nine communities have participated, signing the Memorandum of Understanding (MoU) and installing plant nurseries, although not all have reached the point in the project cycle of transplanting nursery plants into the forest.

Table 1: Community Participation in the Ebony Project Over Time

Community	Year joined[3]	Number of years of planting	Current status
Ekombité	2017	5	Active
Somalomo	2017	2	Graduated
Bifolone	2018	4	Active
Kompia	2018	4	Graduating
Adjan	2019	3	Active
Zoebéfam	2019	3	Active
Malen IV	2020	2	Active
Bemba II	2020	2	Active
Ngola	2021	1	Active

After six years, the project team is learning more about when communities are ready to graduate from the program and how to facilitate that process best. Community participation was always viewed as time-bound, as communities have finite land to plant trees on, and thus their participation would wane when available land was planted. We are now witnessing this process play out across two communities; Somalomo, which stopped planting in 2019, and Kompia, which appears to be winding down its participation. The time frame for graduating is highly site-specific and largely dependent on the number of participating community members and their level of engagement. In short, villages with fewer and less enthusiastic participants graduate earlier, as evidenced by the number of years communities have planted, detailed in Table 1.

As the project confronts how best to transition a community toward graduation, we more deeply understand how nuanced the process can be. For example, during project team visits, participants in two communities expressed a desire to continue but did not ultimately follow through with

[3] This is the year the community elected to join the Project and began project activities. Most communities spend the first year building a nursery, collecting and sowing seeds, and tending saplings in the nursery. The second year is usually when the first planting happens in the field.

project activities. There are a few possible explanations for this. Perhaps, the participants did not remember that payments for care continue for five years after planting, regardless of whether a community is actively planting new trees. Additionally, participation in the project brings a certain cache that some participants may be hesitant to lose.

Moving forward, when project staff perceives community participation waning, we will more proactively remind participants that the project will continue to make payments for surviving transplants for up to five years. It is also beneficial to give participants specific time-bound project-related tasks between planting cycles, for example, collecting seeds from locally valuable fruit trees to better gauge ongoing project commitment. If participants underperform in such opportunities, the project team may more seriously consider the timeline to transition them toward graduation. Finally, it is essential to remember that the project has limited funds, and successful graduation allows new communities to enter the project cycle and thus allows the project to expand its overall footprint. By gathering additional evidence about graduating communities, we may also be able to better select and onboard new communities.

Community Compensation

Establishing an appropriate level of compensation has always been critical for project success. Compensation is provided for nursery establishment and management, tree planting, and tree maintenance. Payments must be high enough to be fair and motivational, but not so high that they become the only motivation to participate. The project's objectives (i.e., ebony and fruit tree planting) must have some intrinsic value, or the participants may deforest the area again after the project ceases paying for their maintenance. The payments must also reflect real contributions, and the project dedicates significant staff time to ensure trees are planted, and fields and nurseries are maintained, before issuing payments.

The issue of compensation remains an ongoing topic of discussion within the project team and between field staff and the communities. The project team knows that conversations with project participants occur in the context of significant financial asymmetry. The project team arrives in vehicles with electronic equipment for data collection, various supplies, and often compensation payments. Apart from a desire to be just and fair, the project team understands that community participants have leverage, too—if the project has invested time and resources in onboarding a community, that community abruptly leaving would be a significant loss.

On-going dialogue with participants concerning compensation, while time-consuming, is an essential task for the project. These conversations are commonly at the center of community discourse and provide an avenue for feedback. This links to our project performance analysis against the 'Ten people-centered rules for socially sustainable ecosystem restoration in the Replanting Responsibly section below.

Growing and Planting Trees

After achieving its original goal of planting 15,000 ebony trees in 2021, the project team established new goals of planting an additional 30,000 ebony and 25,000 fruit trees by the end of 2026. To

date, the participating communities have planted over 39,000 trees of at least 16 species, most of them native (see Table 2).

Table 2: Total Trees Planted to Date by Species

Common name	Scientific name	Native?	Total planted[4]
Ebony	*Diosypros crassiflora*	Yes	27,810
Avocado	*Persea americana*	No	2,357
Safou	*Dacryodes edulis*	Yes	2,666
Bush mango	*Irvingia spp.*	Yes	1,917
Mango	*Mangifera indica*	No	1,339
Djansang	*Ricinodendron heudelotii*	Yes	346
Moabi	*Baillonella toxisperma*	Yes	296
Citrus	*Citrus spp.*	No	418
Soursop	*Annona muricata*	No	211
Strophanthus	*Strophanthus spp.*	Yes	354
Badamier	*Terminalia catappa*	No	114
Ayous	*Triplochiton scleroxylon*	Yes	130
African nutmeg	*Monodora myristica*	Yes	100
Ngoyo	*Trichoscypha spp.*	Yes	65
Guava	*Psidium guajava*	No	65
Other (various)	*NA*	No	4
		Total	**39,314**

Ebony Production and Planting

In 2022, the Ebony Project planted 6,372 ebony trees, bringing our total to 27,810. We have planted over 12,000 ebony trees as part of our goal to reach an additional 30,000 trees by 2026.

Fruit Tree Production and Planting

Work on fruit tree production was marked by significant advancements in 2022—particularly the production of fruit from some of the first trees planted by the project—but also challenges. For example, the realization that bush mango seedlings need to stay in the nursery for an additional year before being transplanted.

[4] As of 2021 planting season.

Figure 2: Safou growing on a tree planted as part of the Ebony Project

Following the development of a fruit action plan in 2021, the project team took a two-pronged approach to fruit tree production. First, we train communities on grafting and marcotting—two approaches that use asexual plant reproduction to produce more mature saplings that fruit sooner. However, these approaches are work-intensive and require access to mature stock trees to harvest branches from. Second, we work with communities to gather seeds and cuttings[5] to generate large numbers of less mature saplings. Table 3 compares the production approaches for fruit trees.

Table 3: Comparison of fruit tree production approaches

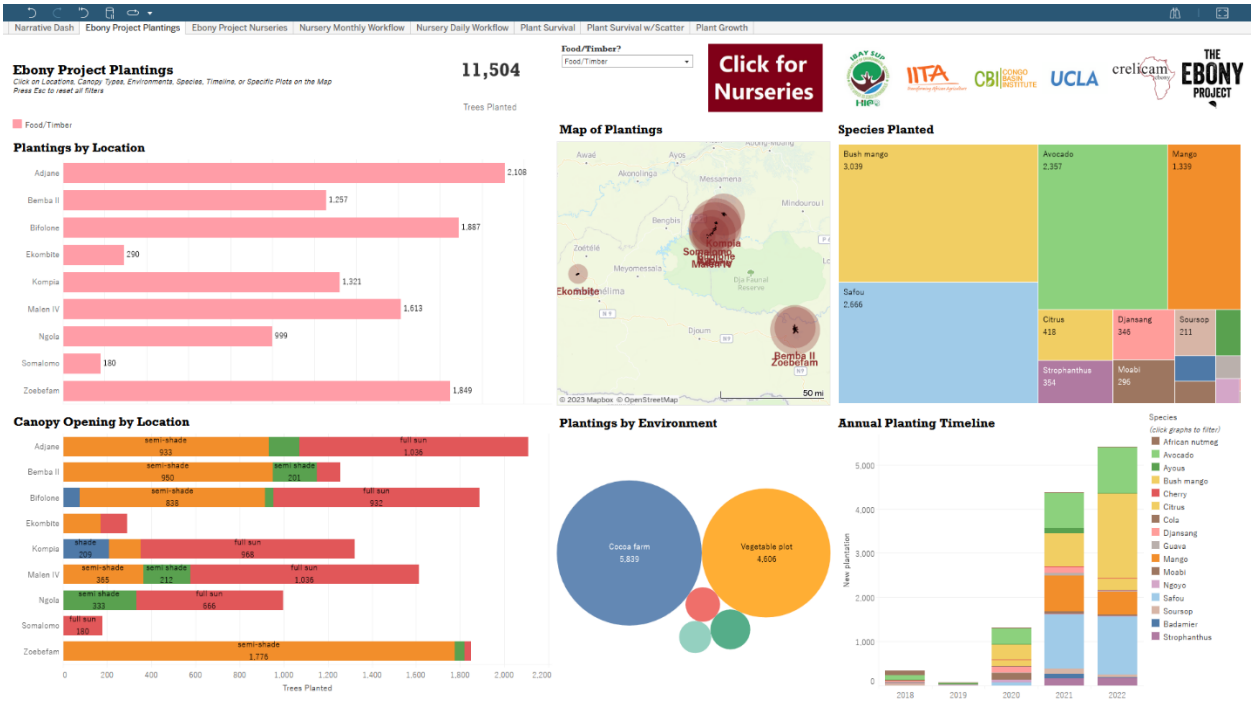
Production type	High volume production	Easy to do locally	Multiplies improved varietals	Short time to production	Cost-effective
Seeds	✓	✓	X	X	✓
Marcotting	X	X	✓	✓	X

[5] The Ebony Project has largely abandoned using cuttings to generate ebony because they result in plagiotropic growth (i.e. the trunks are not straight and have lots of branches (see 2021 annual report for additional information). Plagiotropic growth is not a concern for fruit trees, since their trunks are not for timber production.

Cuttings[6]	~	✔	✔	X	✔

Propagating tree species in demand by communities is also a key element of incentivizing production. Tree species are selected based on farmer demand, ecological value, and ease of production. See the 2021 Progress Report for a thorough discussion of tree species preferences.

Figure 3: Locally valuable fruit tree data from Tableau.



ECOLOGICAL WORK ON EBONY

Ebony Ecology

After years of observation, primarily of trees at the Mbalmayo arboretum, we discovered that ebony trees have a biannual cycle. Though fruits are produced each year from August to October, years of high fruit and low vegetative production alternate with a year of low fruit and high vegetative production. This confirms our experience with ebony seed collection, where some years there was a much higher production of seeds than others.

We also conducted a comprehensive forest inventory of ebony trees in Campo Ma'an National Park in the southeast corner of Cameroon along the border with Equatorial Guinea and the Gulf of

[6] Our success with propagation via cuttings has been highly species dependent. We have successfully propagated safou with cuttings, but avid readers of these annual reports will remember we were not as successful with ebony.

Guinea. We found 16 ebony in 400ha. We walked 30km of transects and found 9 ebony trees in 60ha. This low density (0.04 – 0.15) compared with the East and Center region warrants additional investigation to disentangle the effect of ebony ecology and the long history of ebony exploitation in that area. In addition, the density of ebony in Campo Ma'an is so low that pollination may be impacted, warranting further investigation.

The Ebony Project is also exploring a collaboration with Professor Bobo Kadiri Serge and his students from LAFAPSYTEB, Dschang University. Their team has started a forest inventory in area of high Diospyros diversity, and the collaboration offers exciting opportunities to better understand ebony species and morphological differences.

Ebony Seed Dispersal

Our research into the dispersal, germination, and survival of ebony seeds continued this year. We setup an experiment to answer the following questions:

1. Is the germination rate of ebony affected by the mode of dispersal (elephant droppings, rodent caching directly on the ground, or in fruit pulp if no dispersal)?
2. Does passage through the elephant's digestive tract affect germination rate?
3. Does the dispersal agent (elephant or rodent) affect the rate of predation/secondary dispersal (additional data to 2021 experiment)?

The ebony fruiting season recently concluded, and we will analyze the data over the next couple of months.

This year, we also collected additional data suggesting that a putative ebony seed disperser—the yellow-backed duiker—is not an important disperser. In the past, we observed yellow-backed duikers swallow seeds from ripe fruits in camera trap footage. Duikers regularly regurgitate organic matter that they do not digest in their nests. It was thus hypothesized that large duiker species could be ebony seed dispersers through spit dispersal—i.e., by regurgitating whole seeds. During the peak ebony fruit availability this year, we searched duiker resting sites in the forest. We found dozens of these nests but none with ebony seeds. This suggests the duiker instead swallows and crushes the ebony seeds, which are quite soft. The only whole seeds found at duiker nests were from species with very hard seeds.

Ebony Project Research

With over six years of research activities under our belt, we are also learning more about our productivity and how research can complement restoration work.

We have produced enormous amounts of diverse data, generated significant institutional knowledge, and built prodigious human capacity on ebony research. We have many gigabytes of camera trap images, thousands and thousands of tree measurements, and reams of observations. Much of this data can be paired with environmental data on temperature, rainfall, humidity, and other metrics collected at the Bouamir and Somalomo Research Stations. At this point, we are generating more data to analyze and publish. Over the next year or two, we will prioritize publishing the most important scientific findings.

We also have been "conducting research at the speed of restoration," where findings from our research work immediately inform the project's community engagement and tree planting aspects. For instance, research we conducted in 2017 suggested that the loss of seed dispersers and destruction of ebony habitat are a more significant threat to the species than selective logging. Such findings validate the approach of community-based planting as a conservation measure. At the beginning of the project, we also pursued three approaches to ebony sapling production—tissue culture, seeds, and cuttings—but after years of research eventually focused on seeds as the most viable approach. This synergy between the research and practice sides of the project has allowed the project to be more effective and could be a model for other efforts.

The Ebony Project in Context

Replanting Responsibly

In last year's Annual Progress Report, we assessed the Ebony Project against Di Sacco and Hardwick et al.'s *Ten golden rules for reforestation to optimize carbon sequestration, biodiversity recovery, and livelihood benefits*[7] as part of our ongoing effort to ensure the Ebony Project is following best practices. This year, we explore our performance compared to a set of standards focused on the socio-economic impact of restoration projects, Elias et al.'s *Ten people-centered rules for socially sustainable ecosystem restoration*. Table 4 summarizes the Ebony Project's performance across ten indicators of socio-economic project performance.

[7] https://onlinelibrary.wiley.com/doi/10.1111/gcb.15498

Table 4: Ebony Project performance on 10 people-centered rules for socially sustainable ecosystem restoration

Rule No.	Rule*	Rule Explanation*	Ebony Project Performance	Analysis
1	Recognize diversity among stakeholders	Stakeholders and rightsholders can have different viewpoints and relate to each other and the project differently.	Very good	Outreach meetings are conducted with whole communities rather than just community leaders. The project also engages both Bantu and Baka communities. Coordination with relevant government offices is improving.
2	Engage communities as change agents	Build from existing community capabilities and strengthen resources available in communities.	Good	The project comes to communities, and communities contribute based on their strengths and abilities.
3	Address socio-historical contexts	Be aware of natural resource-related tensions.	Very good	There are tensions between communities and the state over the creation of the Dja and between Bantu and Baka communities. Both are taken into account in the project
4	Consider tenure for marginalized groups	Identify the tenure rights of stakeholders and look for opportunities to strengthen the resource rights of marginalized groups.	Very good	The sylvicultural booklet strengthens traditional tenure claims for individual participants (Baka and Bantu). Strengthening female participation is a space for improvement.
5	Advance equity	Recognize and address equity issues across multiple dimensions and spatial and temporal scales.	Okay	The CBI team has worked hard to address local equity issues between Baka and Bantu communities, with some success. However, the project does not work on global equity issues (e.g., loss and damage payments).

6	Generate multiple benefits	Generate social benefits and outcomes in addition to ecological ones.	Excellent	The project provides trees that produce locally consumed fruit and medicine, time-limited monetary payments, improved land tenure documentation, training/skills, and nursery infrastructure.
7	Promote the equitable distribution of costs, risks, and benefits	Ensure a range of benefits are equitably shared across stakeholders over time while ensuring that risks are mitigated, and costs are equally shared.	Good	Benefits and contributions are discussed and agreed to upfront in the MoU with communities. The project is exploring better access to project benefits for women.
8	Draw on different types of evidence and knowledge	Different types of evidence should inform design, planning, implementation, and monitoring. Co-production is insufficient, and projects should strive to integrate local and scientific knowledge.	Very good	A sister CBI project focused on indigenous knowledge and learning provides a good framework for integrating traditional knowledge into the Ebony Project. Community members participate in ecological research and provide inputs based on local knowledge.
9	Question dominant discourses	Dominant discourses can reflect outdated scientific understanding, which might reinforce the position of powerful actors while inhibiting alternative restoration visions and pathways.	Very good	By writing this annual report, the project demonstrates its commitment to the transparent sharing of information, admitting shortcomings, and questioning dominant systems.
10	Practice inclusive monitoring, evaluation, and learning (MEL)	Examine diverse human and ecological well-being outcomes, adopt mixed methods, and be guided by the priorities of stakeholders.	Good	The project is actively working to improve our understanding of socioeconomic outcomes.

* From Elias et al., 2021.

Geographic Expansion

As discussed in the 2021 Annual Progress Report, project expansion relies on a mix of **strategic growth** whereby the project team identifies a community where we have an existing relationship in a strategically placed high conservation value area and **organic growth** whereby neighboring communities seek involvement inspired by project activities. Somalomo (2017) and Zoebéfam (2019) are strategic growth sites where organic growth soon followed. These strategic sites introduce new logistical, financial, and personnel challenges but, once established, offer organic growth opportunities where the burden of expansion is significantly reduced.

In the coming year(s), the Project Team must consider whether it should solidify the project's ecological impact in existing regions by concentrating on organic growth or if it has the resources to expand to a new region to maximize the landscape level impact of the project. If it chooses strategic growth, the area around Lomié, east of the Dja Faunal Reserve, is a logical candidate. However, longer-term, and if ultimately successful, the Ebony Project must also consider opportunities surrounding neighboring protected areas, such as Boumba Bek and Nki National Parks to the east of the Dja. Expansion beyond the current project area would offer the opportunity to enhance migratory corridors between parks thus improving the chances of survival for several forests depended animals. For example, project research has documented the symbiotic relationship between the natural dispersal of ebony seeds via the diet and defecation of large mammals such as the African forest elephant. For such animals to easily transit from one protected area to another, strategically planting seasonal food sources may be beneficial. Currently, the Ebony Project only plants in and near villages that practice low intensity substance agriculture and gather food from community-controlled lands.

The Next Phase of the Ebony Project

In last year's Annual Progress Report, we noted that the Ebony Project was poised to transition into a "second phase" of its development marked by enhanced outside funding. To date, the project has been largely funded by Bob Taylor with significant in-kind support from Taylor Guitars. The project is also grateful to the Fondation Franklina, the World Bank and the University of California who have each provided funds. The most significant new funder potentially supporting project activities will be the Global Environmental Facility (GEF), the world's largest funder of biodiversity protection, nature restoration and climate change response in developing countries. Securing GEF funds has required a multi-year effort and the process has been challenging and time consuming. This is in stark contrast to the flexible and adaptive philosophy of our primary funder: Bob Taylor who brought a business-centric start-up mentality that has been critical to our early success. Simply put, when something was not working, it was discussed and revised. When something was overly complicated, it was simplified.

While Bob Taylor and Tom Smith have recently established an endowment that will support the project in the future, the project team knows that it will need to attract large institutional funders, such as the GEF, if it wishes to significantly expand its footprint and meet its true potential.