Final Evaluation Report

Your Details	
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Project Title	Conservation of Threatened Plant Species in Makueni, Kenya, through Community Mobilization
Application ID	30695-1
Grant Amount	£6000
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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
Collection of baseline information				Ngutwa-Nzaui (the study area) has attracted fewer floristic studies over the past and baseline information is scarce. Mapping the distribution of the target species established seven subpopulations of *Thunbergia napperae* (<100 mature individuals), 15 of *Euphorbia friesiorum* (c. 200 Individuals), 15 of *Millettia vatkei* (c. 300 mature individuals), and 19 of *Pavetta teitana* (c. 500 mature individuals). In total, 43.4% of forest and 20.96% of scrubland in this region has been lost in the last 33 years occasioned by, among other factors, an increase in crop farming (+271%) and built-up areas (+3594%). As an outcome of the local's perception of their ecosystem, the overall project threat rating was very high. Crop farming and overexploitation of natural resources were rated very high, perhaps explaining the declining populations of the target species within the area. On a fine scale, threat summaries for the target species indicated *M. vatkei* being very highly threatened,similar to *T. napperae* and *E. friesiorum*. *P. teitana* was rated highly threatened within the Ngutwa-Nzaui landscape. Notwithstanding this, there was an increase in forest cover within the last decade, highlighting the significance of devolution and the role played by the Makueni county government towards the set national target of 10 % forest cover and mitigation of climate change. An indication that restoration and conservation of this region's threatened species is possible when driven through the government agencies, stakeholders and the community.
Mass propagation and restoration of the target species				To ensure the project's adaptability, the study was built upon traditional propagation practices of the locals of

				Ngutwa-Nzaui area. Some of the indigenous technologies recorded included the use of perforated washing basins sealed with polythene sheeting as propagator, empty milk packets/tins (as sleeves), and mosquito nets (as shade nets). The study built upon these existing practices to come up with a non-mist propagation system using polytunnels. Water and electricity problems are a challenge, and therefore the established propagation system met the local community's needs since the system does not use electricity and minimises on water loss. The established polytunnels achieved 87% germination of the sown *M. vatkei* seeds. While 2528 *M. vatkei* seedlings were raised in the established polytunnels, 200 additional bare-root seedlings were acquired from natural regeneration, totalling to 2728 *M. vatkei* seedlings for enrichment, re-introduction and translocation within the identified microsites. Although four threatened plant species were targeted, the study focused on *M. vatkei* to pilot the project; however, propagation trials were carried out for the three remaining plant species. Some seedlings of the three remaining plant species were donated to the local school and locals to act as seed sources for the next phase.
Awareness Creation on the importance of biodiversity conservation and building the local capacity in plant propagation and conservation				Five training meetings (awareness creation) were organised to educate the locals on the importance of conserving biodiversity, especially threatened plant species. It is indeed the first step towards stable species populations. Throughout the project cycle from inception to the dissemination of project results, over 500 locals (mostly interacted with during the mapping and planting exercise) were made aware of the four target species and their importance. Among the 500 individuals, only 106 of them were trained to build their capacity towards plant conservation. 57 (53.8%) of them were males while 49 (46.2%) were females. To minimise community transmission of coronavirus, the study worked with representatives of local community-based

				groups (men, women, and youths). Regrettably, schoolchildren were not adequately engaged because of the limitations imposed by the COVID-19 pandemic. However, the study engaged some of them in collecting seeds and planting seedlings within their school compound. Generally, the level of awareness of the target species was found to be low. In this regard, a community-based organisation (Dryland Biodiversity Consultants Limited) was invited to offer upscale training to the locals. At the time of this report, the firm has been approached by a local group within the study area dealing with propagation and sale of seedlings to train them on how to develop polytunnels for themselves. Similarly, the firm is also engaging local farmers on suitable agroforestry practices.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled.

- The outbreak of COVID-19 presented unforeseen challenges in the implementation of the project. Cessation of movement by the Government of Kenya (GOK) affected the scheduled mapping exercise and collection of seeds leading to an adjustment in the timelines. However, this was tackled by partially incorporating citizen scientists in mapping the distribution of the target species. The locals played a crucial role in collecting seeds as well.

- Some of the locals were unwilling to disclose some information on the target species, particularly their medicinal uses. Similarly, others expressed their fears about increased plant poaching possibilities, as was sometimes witnessed with some *Aloes* and East African sandalwood (*Osyris lanceolata*) in the area. Others thought the study's targeted mapping was geared towards drug discovery and feared that such benefits might not trickle down to them. Aware of these unforeseen difficulties, the study adopted an approach based on cooperation with reciprocal benefits. Throughout the project cycle, we engaged the locals in all the project activities and shared with them the results of the project activities. We also trained them on basic procedures, such as establishing simple polytunnels and record keeping, among others.

- After Kenya outlawed single-use plastic bags, this plunged many farmers into an unforeseen shortage of potting tubes. Though limiting the number of seedlings to raise, some locals turned to re-using milk packets and tins instead of polythene sleeves. We tackled this by registering as a member of the Seedling Growers Association (Kenya) whereby we could get access to the sleeves for the large-scale propagation of *M. vatkei.* Similarly, some organised

groups within the study area working on tree nurseries also benefitted from this membership.

- Delayed rains and prolonged dry spells within the study area were due to climate change. This, coupled with the cessation of movement, which affected the mapping and collection of seedings, adversely affected the project schedule. The long rains (March to May 2021) within the study area were unexpectedly low, affecting the timing of transplanting the raised *M. vatkei* seedlings. Further, the second rainy season (usually October to December within the study area) was delayed, extending the dry season longer than expected. Therefore, the success of the projects' restoration effort was left on post-transplantation management that entailed monitoring and supplemental watering.

- The occurrence of *M. Vatkei* within the study area is restricted to seemingly uninhabitable nooks on sheer rock cliff faces, and this hindered population census and collection of seedlings. Also, these rock formations enclosed with thick *M. vatkei* populations hosts venomous snakes that feed on rock hyraxes. Throughout the exercise, the project team was guided by local knowledge that fresh hyrax droppings symbolised the absence of such snakes. Where there were no fresh hyrax droppings were used as an indicator of snakes' presence and thus avoided. Though this was not a guarantee for our maximum security, we observed caution. The local guides led the team members throughout the exercise since they were conversant with their locality.

- Interaction with schoolchildren within their institutions was discouraged by the government as a way of containing the spread of COVID-19. This affected awareness creation among the schoolchildren. Therefore, we delayed engagement with them until such a time when the situation was deemed under control. Some of the pupils were lucky to be engaged by their parents, who formed part of the investigation and seed collecting team. Also, as an indirect approach to interacting with the school pupils, some teachers were trained during the workshops.

3. Briefly describe the three most important outcomes of your project.

The study recorded various positive outcomes; however, the three most important ones include the following:

(a) Detailed baseline information for the study area as well as for the target species gathered.

The study established that 43.4% of forest and 20.96% of scrubland has been lost in the last 30 years. This vegetation loss was attributed to agriculture and infrastructural development. While built-up areas have increased by 3594% from 1987 to 2020, land under crop farming has increased by 271% within the same time. Other threats blamed for the loss include over-exploitation, soil erosion, herbivory, alien invasive plant species and prolonged droughts. Further, the perception and attitudes of the locals were found to play a crucial role in biodiversity loss. For instance, erosion of

cultural values led to increased wanton destruction of sacred groves, most of whom were found to host at least one of the four threatened plant species targeted by the study. These threats, either singly or combined, have adversely affected the existence of our conservation targets, with only seven subpopulations of *T. napperae*, 15 of *E. friesiorum,* 15 of *M. vatkei*, and 19 of *P. teitana* being mapped. The study also established low awareness among the locals on the targeted species, especially the young generation highlighting the need for intergenerational knowledge transfer.

(b) Over 2500 *Millettia vatkei* seedlings propagated and restored

Engaging the locals of the Ngutwa-Nzaui area led to the establishment of an appropriate propagation system that not only met the objectives of the study but also served their needs. Building upon some existing indigenous technologies, the study developed a non-mist propagator using polytunnels that achieved 87% germination in the sown *M. vatkei* seeds. To increase the survival rate of the *M. vatkei* seedlings, the study used three approaches: re-introduction, augmentation, and translocation. Also, the study was able to carry out propagation trials for *T. napperae*, *P. teitana* and *E. friesiorum*. Because of the rarity and seasonality of *T. napperae*, some individuals were established in the local primary school and others on locals' farms to serve as a source of seeds for their propagation and recovery efforts.

(c) Local capacity strengthened and increased awareness on biodiversity conservation

Over 500 locals were made aware of the target species within the locality, with 106 of them being trained on the importance of the target threatened plant species and the general biodiversity. Most of the attendees were representatives of the 10 local groups of youth, women, men, and those with disabilities. Since the study established a low level of awareness among the youth, participants included both the youth and the elderly. The older generation, perceived as tacit knowledge holders, were engaged in discussions of the importance of sacred groves and the uses of the target species. The youth, most of whom served as citizen scientists of the study, were trained on recording observations and usage of GPS in mapping. They were also trained how to construct simplified non-mist propagation system (polytunnels) for their own use. The citizen scientists will help in monitoring the transplanted seedlings.

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

The study not only achieved its set objectives but also benefitted the local community. Throughout the project cycle, locals were engaged in all the activities, an approach this study loosely terms as '*cooperation with reciprocal benefits*.' At an individualised level, the study used some local community members either as guides or casuals earning themselves some income. Similarly, using locally available materials, they were trained on constructing a non-mist propagation system (tunnels) that they could use in propagation, such as lemon seedlings (a common practice within the area). The training module covered some aspects of commercialised forestry and agroforestry that most attendees seemed interested in.

The locals, especially the youth, benefitted from intergenerational information sharing, especially their culture. The youth, who are fast in adopting emerging technologies, were trained on the basics of citizen science procedures. Although not used for the present study, the use of *the iNaturalist* app in making observations was introduced and that holds potential in monitoring invasive species and continued mapping of the target species. Having seen the need for constant awareness creation and training among the locals, the study established Dryland Biodiversity Consultants Limited to offer environment-related services as sought by the locals. Some of the strategic plans for the firm is to encourage the adoption of alternative sources of livelihood such as the sale of tree seedlings, the establishment of ecotourism ventures, services agroforestry, climate-smart beekeeping, guides in birdwatching, among others. Also, Ngutwa primary school, a crucial part of the local community, benefitted from the project. Some *T. napperae*, *P. teitana* and *E. friesiorum* seedlings were donated and planted in the already existing *Aloe* school garden. The project formed an essential part of the newly rolled-out Competency-Based Curicullum (CBC) education system in Kenya, where environmental activities is one of the subjects. Therefore, it was hoped that the trained teachers would pass the acquired knowledge to their pupils. Since part of the study site falls within their gazetted forests, Kenya Forest Service (KFS) (Makueni County Branch) supported the project in granting entry for mapping/inventory. The project falls within their strategic objectives of conservation, sustainable management and utilisation of the forest and allied natural resources. Similarly, some of the propagated *M. vatkei* seedlings were restored within their forests benefitting from increased vegetation cover through tree planting.

5. Are there any plans to continue this work?

Yes, there are plans to continue this work. Although the study considered lumped conservation targets of four focal threatened plant species; *M. vatkei, E. friesiorum, P. teitana*, and *T. napperae*, it was scaled down to *M. vatkei* as the priority plant species that piloted the study for the other three target species. Even though much of the work for the present research entailed *M. vatkei*, baseline data (spatial distribution, population census, threat profile, propagation trials etc.) for the three species were collected. Additionally, any manipulation of the threatened plant populations (in this case *M. vatkei*) is viewed as an experimental approach or process whose success can only be determined through careful monitoring and evaluation. Therefore, as a follow-up to the transplanted *M. vatkei* seedlings, assessing survival success and applicability of the three strategies adopted (augmentation, re-introduction and transplantation) is hereby proposed. Against this background, we plan to continue this work by monitoring and evaluating the already completed *M. vatkei* recovery efforts and further undertake mass propagation and restoration of the three remaining plant species (*P. teitana, E. friesiorum* and *T. napperae*). One of the arguably the largest subpopulation for *M. vatkei* and *E. friesiorum* within the study area has been lost highlighting further population monitoring and awareness creation including mapping the species in sacred sites in the nearby locations. Mapping using *iNaturalist* is urgently needed using local community as a way of monitoring population changes overtime. There are also plans to make a quick guide of rare and threatened species in the area for enhanced awareness.

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

The norm of reciprocity adopted by the project required us to reward in kind actions of the local community and the stakeholders by sharing the results of our conservation efforts. Information about the target species was distributed in the form of leaflets. The outcomes of the project activities were disseminated to the locals through a workshop. With some of the key collaborators, e.g., National Museum of Kenya (Herbarium Department), we shared our results contributing to their efforts towards conserving Kenya's natural heritage. We shared the results through the Dryland Biodiversity Consultants Facebook page for wider consumption of our project results. Other avenues used to share the results included WhatsApp groups. We also plan to share the final project report to Kenya Forest Service (KFS), and National Museum of Kenya (NMK) and the Department of Environment County Government of Makueni (Kenya). Detailed project results will also be published in peer-reviewed journals once we finish writing the manuscript. Information gathered in this project will serve as baseline in future species assessments. Besides, we plan to develop YouTube documentaries about the target species and their conservation.

7. Timescale: Over what period was the grant used? How does this compare to the anticipated or actual length of the project?

The grant was used within the anticipated timescale (2020-2021) though extended by 2 months due to the unforeseen challenges presented by the COVID-19 outbreak that affected the scheduled project activities.

8. Budget: Provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Transport (Hiring 4WD vehicle, motor bikes to be used during the data collection).	950	1042	+92	COVID-19 constrains necessitated the use of private transport which resulted to higher amount than budgeted.
Subsistence costs (daily allowances for food and other incidentals by the project team during field investigation).	2060	2625	+565	Cessation of movement by the government forced the study to train some locals and use them in mapping and seed collection. Also, due to extended dry season, additional funds were used to pay locals to supply and water the planted seedlings.

Establishment of propagation system, propagation and restoration efforts.	1100	756	-344	Some items previously budgeted were acquired as in-kind contribution from the locals.
Purchase of fieldwork materials (Plant pressers, cameras, hire 2 GPS, d batteries, 1 specimen Drier etc.)	670	246	-424	Some of the budgeted fieldwork materials and equipment were acquired free of charge from well-wishers and thus additional funds directed to cater for subsistence costs.
Project promotional materials (Printing T-shirts, Banner, leaflets etc.)	570	570	00	Funds used as budgeted.
Awareness creation through training (Hiring tent, seats, food, and drinks etc.)	450	656	+206	Because of government restrictions not to hold large gatherings, the study undertook several workshops of smaller groups at different times. Therefore, more meetings were organized than it was previously planned.
Communication cost (2 Modems, data bundles for accessing internet, airtime for project administration)	200	105	-95	Working with group leaders/representatives minimized expenses of communication. Additional funds used in creating awareness.
TOTAL	**6000**	**6000**		
Exchange rate when funds were received £1=ksh130				

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

- There is an urgent need to initiate monitoring and management of the transplanted *M. vatkei* seedlings to determine their survival rate and success of the adopted strategies. Using the already completed *M. vatkei* study as a baseline, there is the need to undertake mass propagation and restoration of the remaining threatened plant species (*P. teitana, E. friesiorum* and *T. napperae*). Although these are essential and crucial steps in the short run, there is a need for long-term considerations.

- The vision of the '*Conservation of Threatened Plant Species in Makueni, Kenya, through Community Mobilization*' project is to ensure the long-term conservation of the four target species. For sustainability of the already initiated conservation efforts, the locals should be made aware and trained on alternative sources of livelihoods as a way of reducing threats to biodiversity. The information established by this study has demonstrated that

the Ngutwa-Nzaui area has great potential (though inadequately exploited) for ecotourism ventures such as rock art, mystical caves, birdwatching, sacred sites, rock climbing, and climate-smart beekeeping (*Acacia–Combretum* honey).

- Additionally, there are various sacred groves within the area, most of whom host threatened plants, and therefore, the need to map these vital biodiversity repositories and educate the locals on their importance.

- Further, socio-economic research on some priority indigenous wild fruits (IWFs) in the area with high potential for economic and nutritional benefits is needed. Importantly, cultural crops and wild crop relatives and cultural practices would be a target to increase knowledge on climate change adaptation. In line with this, nutritional analysis (including resource mapping) is necessary to inform the locals, value addition and marketing strategies are other aspects for consideration. Such fruits include *Tamarindus indica*, *Adansonia digitata*, *Ximenia americana Balanites aegyptiaca, Carissa spinarum Vangueria madascariensis*, *Vitex payos*, *Strychnos spinosa* and *Mystroxylon aethiopicum*. Other common but threatned diversity with potential as pesticidals in the area include *Zanha africana*, *Securidaca longepedunculata* etc., and wild food relatives only occurring in that zone (endemic) such as *Pachystigma schumannianum* ssp. *mucronulatum*, and *Uvaria scheffleri*.

10. 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 in some project activities throughout the study. It was used in all the publicity materials used during the project cycle, such as t-shirts, banners, and leaflets. Similarly, the logo was used in propagation system establishment and propagation manual booklet, attendance and data collection forms. The Rufford Foundation was also acknowledged for its financial support during project inception/ dissemination of findings meetings, training and all other project meetings. Also, the foundation will be acknowledged in the final project report, manuscripts and/or articles resulting from the project.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Justus Mulinge Munywoki (Principal Investigator): lead roles in management and coordination of the project activities such as permit acquisition, seed collection, propagation, restoration and public awareness/training. Also, the lead author of the final project report.

Dr. Itambo Malombe: A chief research scientist at the National Museums of Kenya and crucial project team member with lead roles in guiding project implementation and conservation efforts. Also, with good knowledge on species ecology, taxonomy and conservation aspects.

Vivian Kathambi: A plant taxonomist and project facilitator based at the National Museums of Kenya and also took part in awareness creation and training.

Gilbert Ndutu: Project team member with lead roles in documentation and data analysis and compilation of project report

Mr. Dominic Muathe Masila- Local guide, village elder and representative of the local authority. Granted our entry and security within the villages.

Mr. Mutunga Mwakavi- Community field assistant, acting as conduit between the project team and the local community.

Robert Kasee: Project team member with key role in mobilizing local groups, and training.

12. Any other comments?

On behalf of the locals of Ngutwa-Nzaui, and all other parties who hold a stake in the project, express our gratitude for the financial support to undertake the conservation of *Millettia vatkei* within Ngutwa-Nzaui (Makueni, Kenya) by mobilising the locals. The project made the locals aware not only of the conservation of the target species but also the active participation of The Rufford Foundation in conservation for nature. The project laid a strong foundation for the conservation of threatened plants species within the neglected drylands of Kenya. Also, a guide to the rare plants of the region including wild crop relatives and their cultural uses and also continued mapping plant resources in the area is necessary. Therefore, it is hoped that the foundation supports our bid to carry out post-planting monitoring and evaluation for *M. vatkei* as well as support our proposal to mass propagate and restore the remaining three threatened plant species (*P. teitana, E. friesiorum* and *T. napperae*) in the quest for stable populations of the threatened flora in Makueni (Kenya).