Final Evaluation Report

Your Details	
Full Name	Isack Frank Rikohe
Project Title	Assessment of flowering plants diversity with honeybees' foraging preferences in Northern Tanzania
Application ID	36625-1
Date of this Report	25/06/2023

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
To determine flowering plants' diversity during both short and long rain seasons of 2021/2022			✓	The data for this objective were successfully collected and analysed accordingly. From this objective it was found that plant diversity was different significantly in both areas across the rain season, though during the same rainy season there was no different significantly in both study areas, thus the rainy season has significant contribution to variation in plant diversity and that the long rainy season found to be essential for honeybees as characterised with variety of plants blooming. The family Poaceae was the most dominant plant family with higher species abundance in both rainy seasons followed by other plant families such as Malvaceae, Commelinaceae, Acanthaceae, Amaranthaceae, Polygonaceae, and Lamiaceae. Most of the plant species from these plant family offers potential resources to honeybees and other pollinators.
To determine honeybees' foraging preferences to bloomed plants during both short and long rain seasons			✓	From this objective it was found that, honeybees show preference and flower choices in a particular landscape and season, also the foraging preference of the bees is beyond abundance of certain plant species in an area, as it was observed that most of the highly visited plant species were less abundant in both study areas and rainy season. During the short rainy *season Grewia bicolor, Ziziphus mucronata, Combretum schumanni, Terminalia brownii* and *Cordia monoica* were the highly visited plant species than others which bloomed during the same rainy season, while during the long rainy seasons, *Acacia mellifera, Hoslundia*

			opposita and *Ocimum basillicum* were the most visited plant species. Generally, from this objective, the issue of identification of plant species available in an area is very crucial as a step in their conservation, in turn saving the bees and other pollinators which play key role in the ecosystem and environment in general.

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

a). We claim that the long rainy season is potential in beekeeping calendar as it provides honeybees with variety of plant species that saves as source of food and other potential hive resources. From this we also managed to plan and recommend beekeeping calendar at the study areas (northern Tanzania) and the activities to be done per each period of the calendar.

b). We highlighted insect-plant interaction, which is very essential in conservation of the bees and other pollinators. Knowing which the forages are highly preferred by the bees is very essential in their conservation.

c). We highlighted the available plants and their diversity in the study areas and provide information database.

The knowledge and information gap on the bee plant diversity and honeybees' foraging preferences at the study areas (northern Tanzania) have been covered with some potential information thus created the foundation for other researcher to explore further. In addition, the findings from this study did not only end up in documents rather have been shared and communicated firstly to the local communities through prepared meeting sessions, the authorities concerned were also participated in the project from the initial stages, so we are confident that the information and recommendations delivered by the study will be highly considered.

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

The change in rainy season at the study areas caused delay in data collection as the plan was to collect the data for both the short and long rainy season but the rain especially for long rainy season was delayed. We waited for the rain and flower blooming then proceeded with collection of the required data.

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

The local communities (villagers together with government officials) were involved fully in the study from the preliminary stages (reconnaissance), data collection to the findings and recommendation drawn from the study. The people from the study areas were included as field assistant during data collection also we managed to

prepare a training (capacity-building) sessions at different periods to raise their awareness on bee-plant interaction and the plant diversity at their areas, also awareness on management and conservation of both plants and the bees which could be advantageous to both the ecosystem management and livelihood improvement. We further provided them t-shirts with Rufford logo, exercise books, pens, and brochures for acknowledging the great support from the project funder.

5. Are there any plans to continue this work?

Based on the findings from the current study, we plan to continue with this work in different ways, firstly, on extending the awareness to the local people so as they can be able to further understand plants available in their areas but also among those available plants which are highly preferred by the bees and the conservation approaches and techniques of such plant species.

Secondly, since the individuals will be aware in the issues related to bee-plant interaction and have the ability to conserve the plants for bee persistent and diversity then people should be equipped with intensive knowledge on modern beekeeping practices and the facilities for beekeeping activities so as they fully participate and benefits from the activity (financial) by selling bee products while helping the survival of potential pollinators of both crop and wild plants. In addition, since the study areas consist of national park and other potential protected areas, maximum facilitation, and engagement on beekeeping activities in areas will help to reduce the economic activities conducted by the local community that direct compromise conservation of the natural resources, also, will help to reduce the human-wildlife conflicts at the areas.

Thirdly, similar study with similar objectives and vision on conservation should be conducted in other beekeeping potential areas neighbouring protected areas or national parks.

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

The findings from this study have been shared through seminar presentations, village and district council meetings and conferences. We had an opportunity to present the findings of the study and give study feedback to local communities through prepared training also the opportunity to present the results and recommendations drawn from the study to officials from Same district council and Mkomazi National Park. The submitted manuscript titled "Plant diversity and honeybees' foraging preference: An implication for honeybees' conservation" has been published in the Journal of Ecology, Environment and Conservation. The master's dissertation with the findings from this project has been as well submitted in form of hardbound and soft copy at the Nelson Mandela African Institution of Science and Technology repository to be accessed online. We had an opportunity to attend seminars at the University of Milano Bicocca in Italy where we also shared, and discus issues of plant-insect interaction based on our findings. In addition, we have plan to search for more national and interaction opportunities to attend conferences and seminars so as we can further share the findings of this current study.

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

In this current study some of the issues which are also important in determining plant-insect interaction and foraging preference of honeybees were not studied, such as the factors (environment and plant composition) influencing foraging preference by honeybees to those identified plants, as it has been reported that composition of plant resources (nectar, pollen, and resins) required by bees from plants varies with different factors including season and geographical areas. The method employed for bee foraging visitation assessment (observation method), probably could be able to capture all the important plants that honeybees visited in a particular landscape, therefore other methods or more methods such as mellisopalynology and DNA metabarcoding should be employed as well.

Another next step is to conduct awareness campaign to enlighten people with the information drawn from the study also to equip them with the skills and knowledge on the conservation of potential plant for the bees, also to provide facilities and knowledge of modern beekeeping practice to increases people involvement and participation in keeping bees, thus benefiting from their products and services delivered to ecosystem and environment at large. The same study to be conducted in other beekeeping potential areas as explained above.

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, the Rufford logo was used, for instance, the prepared posters, presentations, brochures, and printed t-shirts had Rufford logo. We have acknowledged Rufford financial support in our submitted and accepted manuscript which will be published soon also the submitted dissertation to Nelson Mandela African Institution of Science and Technology which will also be available online at the university repository.

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

Prof. Anne Treydte: My academic advisor and mentor, provided guidance in different stages of the project.

Dr. Issakwisa Ngondya: My supervisor, attended for data collection and monitored me in all the stages of the project.

Ms. Prisca Peter Sima: District Beekeeping Officer, guided us during data collection and introduction to the district council management and villagers at the study sites.

Mr. Emmanuel Mboya: Botanist assisted in identification of plant species, during data collection.

Mr. Elisante: Assisted in field during data collection.

Mr. Isack Frank Rikohe: Project leader who involved in all the project activities, including data collection, analysis, preparation of the manuscript for publication,

write dissertation, conducted training session and research result feedback and writing all the reports based on the project.

10. Any other comments?

I would much like to extend my heartfelt gratitude to The Rufford Foundation for this golden chance, wonderful opportunity, and fundamental help I received from them, which helped me much to conduct and reach the goals of this current project. Local people from the study areas were highly benefited from the findings of the project and other people as well since the results have been shared in different platforms. It's my hope that The Rufford Foundation will keep on helping us young researcher and seniors and together we can make the world a good place for all the creatures.