Final Evaluation Report

Your Details	
Full Name	Nursyamin Hanis Zulkifli
Project Title	The Conservation Value of Biodiverse Durian Agroforestry Orchards for Birds and Anurans in Peninsular Malaysia
Application ID	42449-1
Date of this Report	4th May 2025

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
At least ten conservation priority species of birds in monoculture and polyculture farming management each will be identified.			✓	A total of 27 Near Threatened (NT) and five Vulnerable (VU) bird species were identified. Highest total number of conservation priority bird species in polyculture orchards is 15 species, while ten in monoculture orchards.
At least five conservation priority species of anuran in monoculture and polyculture farming management each will be determined.	✓			A total of 12 frog species identified in both polyculture and monoculture orchards are Least Concern (LC) species.
At least two forest associated and conservation priority species of bird and anuran that visit and/or utilize both monoculture and polyculture each will be found.		✓		**Forest associated bird species:** 1. Olive-winged Bulbul 2. Long-tailed Parakeet 3. Blue-crowned Hanging Parrot 4. Little Spiderhunter 5. Oriental Bay Owl **Conservation priority bird species:** 1. Rhinoceros Hornbill (VU) 2. Great Hornbill (VU) 3. Black-bellied Malkoha (NT) 4. White-crowned Hornbill (NT) **Forest associated frog species:** 1. Rough-sided Frog 2. Asian giant toad **Conservation priority frog species** None
Relationship between bird and anuran species				The study suggests that biodiversity is influenced not just

richness, abundance and assemblage with stand-level and landscape-level factors will be understood.			✓	by orchard management type (traditional agroforestry vs. monoculture plantations) but also by vegetation characteristics such as canopy cover, undergrowth height and presence of other crops. Higher canopy cover and the presence of diverse crops positively affected bird species while anuran thrive in areas that have close proximity to water bodies and with higher undergrowth height.
15 farmers and stakeholders in each site will be explained on the benefits of traditional management, intercropping and retaining grassland strips within/surrounding their durian orchards in terms of ecosystem services.			✓	A total of 21 orchard owners were briefly explained on wildlife-friendly farm management.
Usage of pesticides will be reduced to 50% and replaced with biological control agents (e.g., insectivorous birds and bats)		✓		All 20 out of 21 owners already practiced chemical-free orchard management. Chemicals were only applied at tree critical stage (e.g. canker infections)

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

a) Orchard management influences bird and frog biodiversity composition
   - Traditional agroforestry orchards recorded higher bird and anuran species richness and abundance as compared to monoculture plantations

b) Some habitat data as the key features in bird and frog diversity
   - Bird species richness and abundance increased with closer proximity to forest and higher canopy cover
   - Frog species richness and abundance increased with closer proximity to water and higher undergrowth cover
   - Presence of additional crops enhances species diversity

c) Importance of maintaining forest patches

- Presence of forest-dependent bird species provide insights on the importance of maintaining forest patches within or surrounding the orchards

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

a) Not all orchard owners allow access to their orchards
   - We identified one main owner who had contact with other owners, and from there, we used a snowball sampling approach to reach more orchard owners through referrals.

b) One owner in Perak initially agreed to assist with getting access from other owners however has bailed just few days before sampling day
   - We extended one day in Perak so we had ample time to identify another durian orchards and getting access from the owners.

c) Two recorders broke down while in the field- one in Pahang and one in Johor, to due heavy rain which has caused few hours of missing recordings
   - We extended data collection to record for the missing hours in order to reach minimum 120 hours per recording station
   - The recorders however were not sent for repair yet

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

All orchard owners were interviewed, and we exchanged information on durian orchard management practices. In Terengganu, Perlis, Selangor, and Negeri Sembilan, local community members actively supported our habitat data collection efforts. They helped record habitat measurements, and in return, we explained the significance of these data for understanding how habitat factors influence the diversity of birds and frogs. For those interested, we also shared details about the autonomous recording sampling design and the technicalities.

5. Are there any plans to continue this work?

There are no immediate plans for continuation under the current framework as the primary goals of the project have been successfully completed.

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

All research outcomes will be integrated into educational materials to promote biodiversity conservation and importance of wildlife-friendly farm management. These materials will be designed to be accessible and easily understood to durian orchard owners.

We will also produce summary reports documenting our interactions and collaborations with durian orchard owners. These reports will capture the perspectives, experiences, and contributions of participating local community members.

We will conduct outreach activities; however, this will be done on team lead's personal funds. One day will be dedicated to each site for the in-person delivery of summary reports to participating farmers. These sessions will include discussion on the

findings, answer questions, and understand the importance of the community's role in biodiversity monitoring.

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

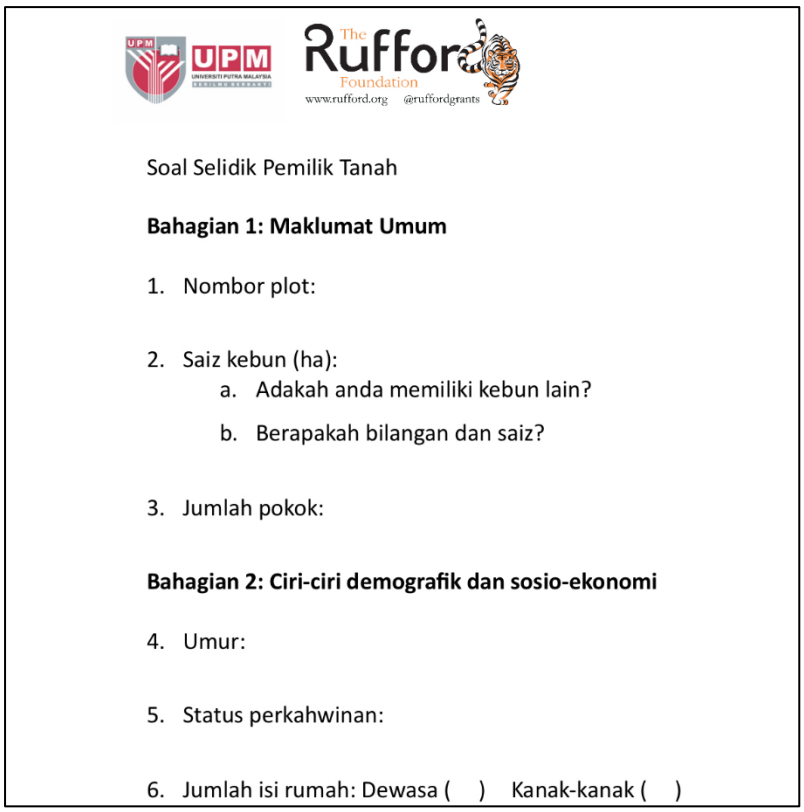
From the findings, traditional agroforestry orchards support higher bird and frog species richness and abundance as compared to monoculture plantations, hence it is important to further promote the wildlife-friendly farming practices through policy makers and programs whether by government or private sectors. Education programs can also be developed at school level to raise early awareness of multi-crop orchard systems in habitat heterogeneity.

Bird diversity and presence of forest dependant bird species were positively associated with proximity to forest while frog diversity increased with close proximity to water sources so future management strategies can integrate these habitat factors by preserving or protecting nearby forest patches and maintaining water bodies within or surrounding orchards. Forest patches can also potentially act as ecological corridors and sources to support species.

Moving on, to build on the initial findings from this study, long-term monitoring can be established to assess changes in biodiversity over time and the sustainability of mixed-crop orchard management. Further research is also needed to have a wider understanding of ecological benefits and services in durian orchards such as biological pest control and pollination.

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 Foundation logo was used in questionnaire with the locals (Figure 1). The Foundation received publicity when we introduced ourselves to orchard owners and this grant was also announced by my faculty in Facebook page (Figure 2).



Soal Selidik Pemilik Tanah

Bahagian 1: Maklumat Umum

1. Nombor plot:

2. Saiz kebun (ha):
   a. Adakah anda memiliki kebun lain?
   b. Berapakah bilangan dan saiz?

3. Jumlah pokok:

Bahagian 2: Ciri-ciri demografik dan sosio-ekonomi

4. Umur:

5. Status perkahwinan:

6. Jumlah isi rumah: Dewasa ( ) Kanak-kanak ( )

Figure 1. Questionnaire for the locals, in local language- Malay.

Figure 2. Faculty announcement.

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

Name: Muhamad Amir Hadi Muhamad Affandi
Role: Bird identification and photography

Name: Arief Aiman Lukhman
Role: Engagement with local farmers, measuring habitat data and photography.

Name: Amirul Mukminin Shamsul Miza
Role: Engagement with local farmers, bird identification and photography.

10. Any other comments?

This fund has allowed me to conduct uninterrupted bird and anuran surveys for four consecutive days without human disturbance. By deploying my recorders and leaving them at recording stations, I was able to continuously monitor species presence and behaviour without the need for frequent human presence, minimizing potential disruptions to the natural environment. This not only improved data accuracy but also provided valuable insights into undisturbed wildlife activity patterns (Figure 3).

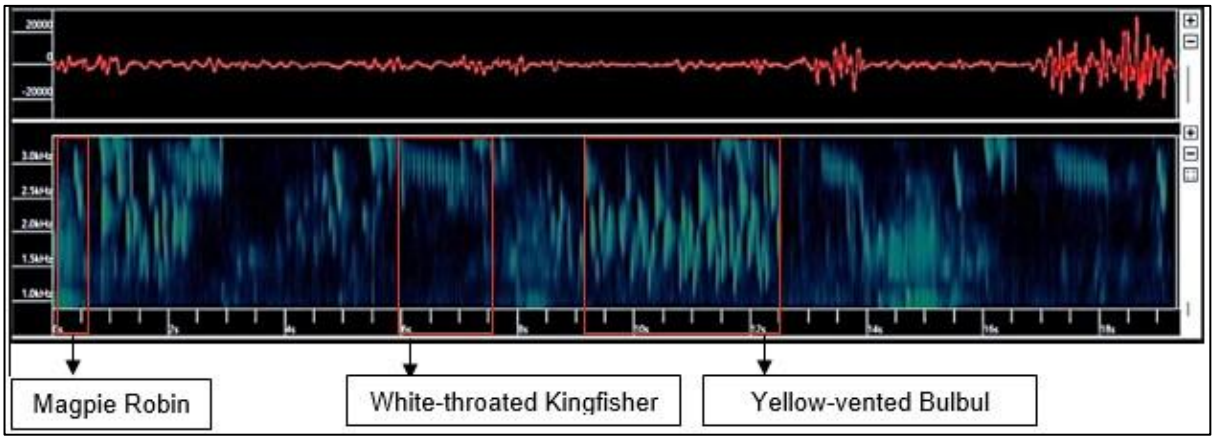


Figure 3. A 20-seconds recording in Pahang showing three bird species were able to be identified.

Through this fund also, we are able to demonstrates that mixed-cropped orchard management supports higher species richness for both frogs and birds compared to monocultures. These findings align with ecological theories in Southeast Asia, which highlight the importance of habitat heterogeneity in supporting biodiversity. This underscores the potential for biodiversity friendly farming practices to contribute to both conservation and sustainable land-use objectives. Implementing such practices is particularly pertinent in Southeast Asia, where agricultural expansion continues to threaten biodiversity.

ANNEX – Financial Report

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