The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Paul Furumo
Project title	Bioacoustic monitoring of Neotropical oil palm landscapes
RSG reference	18295-1
Reporting period	September 2017 – February 2018
Amount of grant	£4986
Your email address	pfurumo@gmail.com
Date of this report	September 29th, 2018

1. Please 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
Bioacoustic sampling of East and Central production zones			✓	At the time of receiving the Rufford grant, I had already sampled the north oil palm production zone of Colombia (n=120 sites). During the grant period I sampled an additional 200 field sites in the east and central zones.
Plantation-level interviews			✓	This objective began as a way to collect supplementary information about plantation management and practices that may influence biodiversity, particularly regarding RSPO certification. However, I was able to develop this topic much more thoroughly and it became a major additional component to my research programme. I established an experimental design to survey a group of RSPO-certified smallholders and group of non-certified conventional smallholders in the north production zone (43 matched pairs, or n=86 total producers). These field surveys contained questions based on the RSPO principles and criteria and sought to evaluate the effectiveness of RSPO certification in transforming farm-level practices. In addition to smallholder surveys, I also conducted qualitative interviews with more than 15 palm oil mills from the north and east zones to better understand the motivations for becoming certified, as well as the barriers and how certification becomes implemented along the supply chain.
Data Analysis		✓		Data analysis is underway: I have analysed the acoustic data from the north zone and all of the smallholder

				survey data (these results have been submitted as two peer-reviewed articles and are currently in review). As a great amount and variety of data was collected during this project, analysis will remain ongoing as I continue to analyse the acoustic data from the other production zones and interpret the qualitative interview results.
Communicate/Deliver Results				I have been prolific in disseminating the results of this research at four conferences (three academic, one sector-based). As I continue to analyse data, I will be developing reports for the participating companies that include species lists from the recordings collected on their plantations.

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

The most challenging part of the project was related to gaining access to plantations. Many companies were very cooperative and engaged in the project and even provided transportation and other logistical support to conduct field sampling. However, the goal was to sample as many landscapes as possible, and after working with the most open and interested companies, I invariably encountered other growers that were less receptive, and still others that were not willing to permit me access at all. Trying to convince these less receptive companies to take an interest in biodiversity monitoring took some creativity, as I had to refine my message so that it would be appealing from a corporate perspective (instead of just a scientific one).

Another challenge was gaining access to the other land uses surrounding the oil palm plantations (i.e. banana and rubber plantations). Cattle pastures were fairly easy to get access to, but anytime you wish to tread on company lands there is a fairly tedious bureaucratic process that requires approval at several different levels and can be very slow. In the end, overcoming these challenges just took persistence and patience; eventually I was able to access most of the different lands that I needed to for my study.

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

1. *Collection of baseline biodiversity data in Neotropical oil palm landscapes.* The most substantial achievement of this project was the collection of acoustic data at 326 sites in three different geographic production zones across seven different land covers, including two forest types, cattle pastures,

oil palm, banana, rice, and rubber plantations. Based on soundscape analysis, I determined that oil palm has an acoustic community more similar to forest than other production systems, leading to the conclusion that if oil palm continues to replace other production systems there will be neutral impacts on biodiversity. These results are presented in an article that is currently in review. This large dataset continues to be analysed and studies will be published in peer-review journals as they are developed. This dataset also provides a permanent record of biodiversity in oil palm production landscapes, which will be made available to future researchers and stakeholders working in these areas. This includes great potential as baseline data to establish a long-term biodiversity monitoring programme in the Colombian oil palm sector, which I will continue to pursue.

2. ***Collection of empirical field evidence to evaluate the effectiveness of certification programs (i.e. RSPO, Organic).*** Another major achievement of this project was the collection of socio-economic data captured in over 100 field surveys with certified and non-certified smallholder oil palm farmers. This provides the first empirical field evaluation of whether certification programmes are effective in transforming management practices on the ground. I found mixed evidence for the effectiveness of RSPO and organic standards on farm-level conservation outcomes. Certified producers used significantly fewer agrochemicals, and dedicated larger portions of their plantation to natural habitat, yet smallholder informality prevailed in aspects such as documentation, safety protocols, and water/waste management. These results are presented in a peer-reviewed article currently in review. Quantitative field surveys were also supplemented with qualitative interviews with oil palm mills to better understand the motivations, barriers, and benefits of becoming certified. These findings are currently being developed into a peer-reviewed manuscript.

3. ***Collaboration with Colombian oil palm private sector (i.e. Fedepalma, Cenipalma, companies).*** Perhaps the biggest achievement of this project was the contacts and connections made within the Colombian oil palm sector, particularly the national federation of oil palm growers, Fedepalma. This was a major goal of this project and indeed the success of this research depended upon making these connections and stimulating interest and cooperation in biodiversity monitoring from the Colombian private sector. These contacts were not only pivotal in collecting field data, but they will be very important to disseminating the results of this project and implementing future collaborations. Communicating this research is already under way. In September 2018, I attended the Fedepalma XIX International Palm Oil Conference in Cartagena, Colombia as an invited speaker. I not only presented the findings of my fieldwork, but also planted the idea of establishing a long-term biodiversity monitoring project in Collaboration with Cenipalma, the research branch of Fedepalma. The data I collected will provide a baseline to establish this program, and one of the goals will be to develop a toolkit that companies can use to monitor biodiversity on their

plantations, particularly throughout the certification process which requires periodic monitoring of biodiversity in high conservation value (HCV) areas.

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

This project directly engaged local oil palm communities in several different regions of Colombia. During bioacoustics sampling, plantation workers from the local communities were compensated for providing transportation and logistical support to field sites. Socio-economic field surveys were conducted with the local oil palm community and the results of this project will be useful in determining how certification programmes like the RSPO can be improved for smallholder participation and well-being. In visiting non-certified smallholder farms, I also took advantage of the opportunity to share information about the potential benefits of certification and how to pursue this process. Most smallholders were very interested in my research and very happy to participate in the study.

5. Are there any plans to continue this work?

Yes. I am already working with collaborators at Fedepalm and Cenipalma to organise a long-term biodiversity monitoring programme. The plan is to establish permanent acoustic monitoring sites at the four experimental field stations of Cenipalma distributed in different regions throughout Colombia. Each region features different ecosystems and therefore different acoustic communities. The first year will involve establishing permanent stations and conducting field sampling with portable recorders during different seasons (i.e. wet and dry seasons) to determine the minimum sampling effort required to effectively quantify and monitor the biodiversity in each landscape. The approved sampling design will then be implemented periodically each year to observe patterns in biodiversity, and there will be a focus on capacitating employees of Cenipalma to manage this project in the long-term. If successful, this pilot project can then be scaled up to other companies to implement their own biodiversity monitoring programmes using the methodology/toolkit defined. To become certified, companies must conduct an HCV assessment to identify critical habitats for species. They must also develop a management plan for these HCV areas, including a monitoring programme for biodiversity. This is a major hurdle for companies, and the overall goal of this pilot project with Cenipalma would be to develop a standardised solution-based on acoustic monitoring. This approach could also be combined with camera trapping in the future to account for the movement of large bodied mammals that are typically not detected using acoustic recorders.

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

Two manuscripts from this research have already been developed and are in revision at peer-reviewed journals. Several other articles are currently being developed, including several research collaboration articles with Cenipalma combining my acoustic dataset with some of their supplementary plantation, landscape, and regional-level data. I have disseminated the findings of this project

thus far with both the academic community and private sector via several conferences. These include:

1. International Congress for Conservation Biology (ICCB) – July 2017, Cartagena, Colombia
2. US International Association for Landscape Ecology (USIALE) – April 2018, Chicago, Illinois
3. Association for Tropical Biodiversity and Conservation (ATBC) – July 2018, Kuching, Malaysia
4. Fedepalma XIX International Palm Oil Conference – September 2018, Cartagena, Colombia

I will also share results with the individual oil palm companies that participated in the study. They will receive a list of species (birds, amphibians, mammals) found in the recordings on their plantations once they can be processed, in return for their participation in the study.

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

The original time period for this grant was 4 months (September 2017 – December 2018). However, I had the opportunity to collect more data and fieldwork was extended until March 2018.

8. Budget: Please 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Supplies	134	134		
Equipment	840	840		
Internal transportation	618	760	142	The original budget did not include transportation costs for the field assistant, which the researcher ended up covering. I also needed to arrange a trip to Bogota during the grant period for meetings and bureaucratic purposes.
Subsistence for field assistants	672	672		
Researcher lodging	1714	1714		
Researcher subsistence (food)	1008	1300	292	The budgeted £8.4 per diem for food was sufficient while staying in

			the field. However, for weekends and other visits to cities (Santa Marta, Bucaramanga, Bogota) this cost was underestimated for the higher cost of living in urban areas.
TOTAL	4986	5420	434	

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

The most important next steps are the following:

1. Continue data analysis in the central and east zones and turn in species lists to participating companies.
2. Incorporate landscape variables (i.e. composition, configuration, forest cover) into future analyses to understand how plantation biodiversity is influenced by the overall landscape, with the goal of identifying biodiversity friendly plantation designs.
3. Continue collaborating with Fedepalma and Cenipalma toward establishing a long-term bioacoustics monitoring program in the oil palm sector.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

Yes, the Rufford Foundation logo was acknowledged at the end of all presentations related to the communication of the project findings. The Rufford Foundation is also acknowledged as a funding source in the peer-reviewed articles.

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

Dr Mitch Aide, University of Puerto Rico-Rio Piedras, San Juan, Puerto Rico – Academic adviser at home institution; mentorship.

Dr Ximena Rueda, Universidad de Los Andes, Bogota, Colombia – Mentorship in Colombia.

J**uan Sebastian Rodriguez,** Universidad de Los Andes, Bogota, Colombia – Field assistant, data collection and interpretation.

Edgar Iganacio Barrera, Cenipalma, La Vizcaina, Colombia – Institutional collaborator with Cenipalma, provided logistical support for bioacoustic sampling in the Central zone and will be a collaborator for development of long-term monitoring pilot project.

12. Any other comments?

I would just like to thank everyone in Colombia for their help in conducting this research, both in and out of the oil palm sector. This work would not have been possible without the warm hospitality of the Colombian people that showed interest and enthusiasm in my work and opened their doors to me. Many of you who were once strangers, are now dear friends. Thank you again.