

## The Rufford Foundation Final Report

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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](mailto:jane@rufford.org).

Thank you for your help.

**Josh Cole, Grants Director**

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Grant Recipient Details	
<b>Your name</b>	Hugo Reis Medeiros
<b>Project title</b>	The Importance of Forest Remnants for the Maintenance of Predatory Insect and Their Biological Control Services in Agricultural Landscapes of Southeast Brazil
<b>RSG reference</b>	18799-1
<b>Reporting period</b>	May 10, 2016 – August 23, 2017
<b>Amount of grant</b>	£4.829
<b>Your email address</b>	hugo.medeiros.r@gmail.com
<b>Date of this report</b>	August 23, 2017

**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
Estimate species diversity of beneficial insects				Species diversity was successfully estimated, insects were collected during 13 consecutive months and species identification is being done by taxonomists who I set partnership. Roughly 80% of specimens collected were identified to species level.
estimate biological control services provided by predatory insects				I estimated biological control services over 13 months and interesting results were found. The next step is to work on manuscripts to be submitted in high impact international journals
Investigate how beneficial insects respond to forest amount and habitat loss at multiple spatio-temporal scales				Here, I provide the first insights on the effects of forest cover on species diversity and their ecosystem services in Brazilian agricultural landscapes. Forest amount benefits natural enemies at multiple spatial scales.
sensitize farmers about the importance of conserving forests				Despite some farmers seem to be not sensitised, I considered that this difficult issue has been successfully achieved because most farmers partially changed their crop management activities in order to conserve biodiversity and ecosystem services in their lands
divulgate the results of this project in high impact journals of conservation biology, annals of congresses and through lectures at schools, universities and farmer's cooperatives				For while, this aim was partly achieved. But, I have partnership with scientists in landscape ecology and biological conservation from Brazil, Germany, Finland, Mexico and Canada. I am working with them in order to produce high quality papers. So far, I will present the results of this project in the 1° International Conference on Community Ecology that will be held in Hungary, September 2017. I also conducted lectures in universities and farmer's cooperatives of the study region. I

			hope that first papers accepted for publication in the second semester of 2018 because the review process usually that several months.
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**2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).**

I faced unforeseen difficulties that delayed data collection. In the original plan I expected to start data collection in January 2016, however atypical rains during the wet season (from December 2015 to March 2016) delayed the installation of experiment (opening of trails into hilly forest fragments and installation of insect traps) by 3 months. Moreover, I was submitted to a surgical procedure in April 2016 that resulted in an additional delay of 2 months. Another important factor was that due to bureaucratic problems with Brazilian bank system the financial support provided by The Rufford Foundation was available in my bank account only in May 2016. These difficulties were overcome and data were successfully collected.

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

**(i)** Providing insights on the effects of landscape structure and crop management on biodiversity and ecosystem services in Neotropical farmlands based on empirical evidence. Indeed, species richness and abundance of predatory insects as well as biological control services in coffee fields increased with increasing forest cover at local and landscape scales. These results suggest that tropical forest remnants act as refuge for biodiversity in farmland and that forest restoration should be considered in agri-environment schemes designed to preserve biodiversity. These results can aid conservationists defining priority strategies for conservation in agricultural landscapes; **(ii)** interact with farmers and sensitise them on the importance of forest cover for biodiversity conservation and food production and **(iii)** Sharing information on sustainable agriculture and biodiversity conservation with local stakeholders through lectures in universities and farmer's cooperatives.

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

Most farmers were very collaborative and interested in our project. During conversations with farmers, I introduced concepts and techniques used to promote biodiversity conservation and ecosystem services in farmland. Additionally, I showed all species collected in traps to introduce beneficial insects (natural enemies and pollinators) to farmers. After months of interaction with farmers, I was able to introduce important concepts and practical initiatives to promote biodiversity and ecosystem services in their own properties.

To evaluate if the activities of this project effectively sensitised farmers about the importance of conserving forests and biodiversity is a hard task and virtually impossible to be quantified, however I realised that some farmers adopted many actions that I have suggested. For instance, at least 10 farmers now pest populations

are periodically monitored and coffee plantations are submitted to pesticide application only when pest population reaches the threshold of economic damage. In Brazil most farmers follow a calendar of pesticide applications regardless the presence or absence of pest in crops. Such strategy implies in unnecessary pesticide usage with environmental and socio-economic losses. Pest monitoring reduced pesticide applications and seven farmers who used insecticides in 2016 did not use pesticides in 2017.

Some farmers adopted my suggestion that pesticide applications should be made in the end of the day to avoid high mortality of non-target species especially natural enemy insects that present high activity in crops up to 4 p.m. (unpublished data). Therefore, pesticide applications after 4 p.m. could avoid high mortality rates of these beneficial insects. Moreover, other farmers are now using selective pesticides that present low toxicity for non-target species such as birds, predatory insects and bees. Finally, some farmers told me that they are open for conservation initiatives in their lands such as reforestation and implantation of agro-ecological systems.

#### **5. Are there any plans to continue this work?**

Yes, I intend to continue this work in order to investigate how landscape structure, forest cover and crop management affect other functional groups such as birds and plants. The idea is to conduct a multi-taxa study in order to produce useful papers for conservationists. I also intend to keep working with farmers and extend lectures for local stakeholders from other regions of Brazil where agriculture is the main economic activity.

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

I already shared the results of this work with local stakeholders through lectures in farms, cooperatives and universities of the study region. At international level, I have a solid network with researchers from universities, research institutes and museums in Brazil, Germany, Finland and Mexico who will directly contribute in species identification, data analyses and writing of manuscripts. This network will significantly increase the quality of the manuscripts and the chances of acceptance in international conferences and in the best journals of ecology and conservation such as *Biological Conservation*, *Journal for Nature Conservation*, *Conservation Biology*, *Oryx*, and *Biodiversity & Conservation*. I will present a poster in the 1 International Conference on Community Ecology in September 2017 that will be held in Hungary and I expect to have first publications in the second semester of 2018 because the peer-review process usually takes several months.

#### **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 grant was crucial for the development of this project. Field work activities were performed monthly from January 2016 to August 2017. The grant allowed us to rent 4x4 vehicles to access remote areas and covered all costs with accommodation in the study region and some materials such as pots for insect storage. As expected the

grant was enough to cover 50% of the costs with field work. The other 50% was supported by two Brazilian Agencies “FAPESP” and “CNPq”.

**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
4x4 vehicle	£ 4.050,54	£ 4.200,00	- £ 149,46	This difference is related to additional days of field work that were necessary during rainy season
Accommodation	£ 653,28	£ 720,00	- £ 66,72	Additional days of field work were necessary during rainy season
Plastic pots	£ 126,00	£ 126,00	0	Pots were bought and used to conserve the captured insects in alcohol 70%
Total	£ 4.829,82	£ 5.046,00	- £ 216,18	This difference was covered by Brazilian agency “FAPESP” that also covered all costs with fuel for vehicles as well as highway fees and food

**Local exchange rate, 1 Real = £ 4.37**

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

The important next steps are: 1 – to extend the investigation to other functional groups such as birds, amphibious and plants by using a multi-taxa approach, 2 - divulgate the results of this project at international level through publications in high impact journals and international conferences and 3 - extend the divulgation of the results to local stakeholders from other regions where agriculture is the main economic activity.

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

Yes, RSGF received publicity in all lectures conducted in universities and cooperatives of study region. I highlighted the importance of RSGF for the development of this project. I will use the Rufford Foundation logo in posters that will be presented in conferences and RSGF will be mentioned in the Acknowledgement session of all published papers related to this project.

**11. Any other comments?**

Political situation is really bad in Brazil and the government is heavily cutting back investments in education and research. In this scenario, the Rufford Small Grant was crucial for the development of this project which involved the participation of farmers, undergraduate and graduate students as well as professors and researchers from national and international institutions. Therefore, I would like to thank you Rufford Foundation for the financial support that helped us to investigate the relationships between landscape structure, biodiversity and associated ecosystem services in Neotropical farmlands where little is known about these interactions. This project provides useful insights about how biodiversity and associated ecosystem services respond to agricultural intensification at multiple spatial scales. Such information can aid conservationists and decision makers defining priority actions for biodiversity conservation in farmland. For this reason, I will keep working on divulgation of the results of this project at local and international levels to reach readers around the world.

