

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	Catalina Gutierrez Chacón
Project title	The importance of the amount and configuration of forest areas for conserving bees and pollination services in a rural landscape in the Andes of Colombia
RSG reference	15856-1
Reporting period	5 th September 2014 – 5 th February 2016
Amount of grant	£5000
Your email address	catalinagch@gmail.com
Date of this report	26 th January 2016

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
Generate information about the relation between amount of forest area and bee diversity/pollination function		x		<p>All required information on bee diversity on sweet passion fruit (<i>Passiflora ligularis</i>) flowers and pollination success was collected, although not for the total number of plots originally proposed. Three out of 10 plots did not survive. However, information from the seven remaining plots will be sufficient for analysis and publication.</p> <p>Because flowering period was delayed, information on yield will be collected at the end of February 2016 when fruits development is complete.</p> <p>Final analysis and results will be obtained during the coming semester when I will be analysing data at the University of Freiburg, in collaboration with colleagues and advisers.</p>
Contribute to the knowledge of the bee fauna of the study area, which is a Regional Protected Area (Barbas - Bremen Soil Conservation District) and an Important Bird Area –IBA (BirdLife, 2008)			x	<p>The experiment with sweet passion fruit, which is the second component of my PhD thesis, allowed me to confirm and complement information on bee diversity in the study area in a satisfactory way.</p>
Inventory of pollinating bees of sweet passion fruit and its relation to surrounding forest area			x	<p>A complete inventory of bees and some other insects visiting sweet passion fruit flowers was produced for the study area.</p>
Disseminate information about local insect fauna (not only bees) diversity and relation to ecological processes (pollination).		x		<p>A brochure was designed, printed and delivered, according to the proposal. The brochure shows bee diversity in the protected area and its importance as pollinators (with examples of other non-bee pollinators).</p> <p>A total of six talks (showing results and the relation between the protected area and ecosystems services) have been given to the two main schools in Filandia town, landowners located in the vicinity of the Barbas forest, and the local community</p>

				(including producers and farmers) from Filandia town, reaching directly around 175 people. The number of talks originally proposed was not reached due to: 1) incorrect number of rural schools given by the local person helping me at the beginning of the project; 2) some of the schools were very small and isolated; and 3) lack of time, since crops were in high risk due to the El Niño, I had to spent a lot of time taking care of the plots. However, information was shared to a wide range of public (students, teachers, local producers, landowners, etc.).
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The field experiment with sweet passion fruits plots was delayed for two main reasons. Firstly, the germination process that I conducted with a local farmer failed for unknown reasons. Consequently, I had to purchase and bring seedlings from a nursery in another city, implying an initial delay of 2 months. Secondly, in 2015 we experienced the largest “El Niño” phenomenon since 1997-98, with extreme drought and high temperatures, affecting seriously all plots where plants delayed the flowering period. Hence, data collection on flowers visitors and pollination was delayed around 4 months. To tackle extreme drought, plants malnutrition and plague attacks (exacerbated by high temperatures), I had to water plants with the help of locals, and supply fertilisers and pesticides in more quantity and frequency than expected. Actually, another unforeseen difficulties was to find environmental friendly products to control plague effectively, although I attempted to use the less harmful products for the environment and for bees.

In addition to the delay, plants in three plots did not survived. One plot was lost from the beginning, probably due to fumigation executed in a nearby crop what it might have caused the intoxication of seedlings, judging for the leaves aspect. Two other plots failed due to the extreme drought, combined with poor soils quality, causing plants undernourishment. Although I tried everything in my hands for savings all plots, this was out of my control. However, the seven remaining plots will be sufficient for data analysis and publication.

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

1. According to preliminary results, diversity of bees visiting sweet passion fruits flowers increases as forest amount increases in the surroundings, and bee diversity seems to be positively related to pollination success. However, further analysis should be performed in order to confirm these trends. A total of 12 bee species were recording visiting and/or pollinating sweet passion fruit flowers (*Apis mellifera*, *Caenaugochlora* sp., *Eulaema cingulata*, *Eulaema meriana*, *Epicharis rustica*, *Paratrigona rinconi*, *Partamona peckolti*, *Pseudoaugochlora graminea*, *Thygater ca. aethiops*, *Thygater* sp.2, *Trigona amalthea* and *Xylocopa lachnea*). Some species were common to all plots (i.e *A. mellifera*, *P. peckolti* and *X. lachnea*) whereas some other were exclusive to one plot (i.e *Caenaugochlora* sp. and *E. meriana*).

2. Sweet passion fruit (*Passiflora ligularis*) is highly dependent plant on bees for pollen transfer and fruit production. Fruit set rate in flowers exposed to bee activity was much higher (31%) compared to that in bagged flowers (3%), where bees were excluded. The supplementary pollination treatment, where flowers are exposed to bees and pollen is also transferred manually (from a different plant), had a fruit set rate of 49%. Considerably higher, this value may serve as a reference for calculating pollinator deficit, although must be analysed in light of the plant species reproduction strategy.
3. A total of 67 bee species were recorded for the study area, which partially overlaps the Barbas-Bremen protected area, located in the UNESCO Coffee Cultural Landscape of Colombia. This is the first assessment on bee diversity in this area, and allowed me to record an important number of taxa for the first time for the department, extending the known distribution range in Colombia for several species.

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

Local people were involved in the project in two main aspects. First, locals were beneficiaries in economic terms, because some of them were hired to help with the experiment setting and maintenance, carrying out activities such as enclosure of plots (for protection from cows), arbors (structure to supports sweet passion fruits plants), soil preparation, and plants watering, fertilisation and fumigation. Furthermore, two landowners received income over 14 months for plots renting. Second, local people were beneficiaries in terms of acquired knowledge. Around six local people, two of them environmental leaders, learned about growing sweet passion fruit and they expect to keep the plots for an extra income and self-consumption. In addition, they became conscious about the important role of bees in pollination, by directly observing bees collecting nectar and pollen, while assisting the pollen transfer from flower to flower. Local people from Filandia town was pleasantly surprised by the high diversity of bees in their territory, as they did not recognized many species as bees and their essential role in pollination. Lastly, an environmental local organisations (Chinampa) and the local producer's organization (Agriquin), consider the information generated in this study very useful for their missions on nature conservation, environmental education and sustainable production.

5. Are there any plans to continue this work?

I do not have plans to continue with the experiment because it was a particular activity for my PhD thesis. However, as part of the WCS team, I do have plans to continue working in this area, because it is located in one of our priority landscapes. Besides it harbours several species of our interest (such as the Cauca Guan, *Penelope perspicax*) and it is a great scenario to do research on landscape connectivity (there is submitted proposal in collaboration with international colleagues) and strengthen some conservation actions such as biological corridors.

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

Results on bee diversity in the study area and their importance as pollinator have been shared with others through a printed and digital brochure, which was delivered to the local community, local, regional and national environmental authorities, regional universities, the Colombian national

research institute (Alexander von Humboldt Institute) and non-profit organisations. A total of 1500 brochures were printed and 1100 have been distributed. Digital version was shared in several institutions' webpages (i.e. WCS, Humboldt Institute and University of Freiburg) and social networks such as Facebook.

Six talks were given to the local community, showing not only the results in terms of bee diversity found but also on the relation between the Barbas-Bremen protected area and the ecosystem services relevant for their territory.

Results in terms of the relation between bee diversity, pollination success and production will be presented in conferences and congress. The first confirmed event is the European Conference of Tropical Ecology, which will take place in Gottingen, Germany, at the end of February 2016.

Finally, and as requirement for my PhD, I will show the results of this study through scientific papers that will be prepared during the 2016.

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 used between September 2014 and December 2015. The project was originally thought to last 12 months. However, due to the reasons explained above, project length will be 18 months (although report will be delivered in the 17th month). An extension was officially requested on 8th August 2015.

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
Material for experimental (10) plots: Guadua or Bamboo	190	232	42	
Material for experimental (10) plots: Wire and staples	190	307	117	Difference due to, for instance, most plots had to be fenced for protection against cows.
Soil and fertiliser (10) plots	700	396	304	I budgeted more expensive supplies.
Seedlings (20/plot x 10 plots)	70	56	14	
Salary for local people for experiment setting up (2 people/plot)	502	416	86	
Salary for local people for taking care of the plants (14 months)	702	687	15	
Private transport (fuel) for setting up the experiment	576	984	408	Due to project delayed, many more travels to the study area were carried out (4 hours from the city I live), in order to keep watering, fertilising and

				fumigating. Tolls and gasoline are considerable expensive in Colombia.
Private transport (fuel) for the education component: talks and material dissemination at local schools.	450	238	212	Not all the proposed talks were carried out in rural schools.
Private transport (fuel) for data collection during passion fruit flowering and yield estimation.	400	502	102	
Food during data collection phase and educational component	370	655	285	Difference due to the project time extension.
Salary for field assistants - Data collection during passion fruit flowering and yield estimation	300	465	165	Flowering period was more extended than expected, so we spent more time collecting data.
Salary for local people to disassemble experimental plots	250	0	250	Plots will not be dissembled because landowners will maintain the small crops.
Design and printing of posters and brochures	1200	1071	129	Posters were not made.
Other supplies (e.g. hygrometers, marking tapes, prints, experimental nylon bags, sprayers, others)	0	235	235	Essential supplies for experiment setting, maintenance and data collection were not budgeted.
Rent over 14 months for two plots	0	226	226	Since the properties were rather small, two owners asked me for a rent in order to offset the loss of space for livestock.
Total	5900	6468	568	Other funding (stated in the proposal) were obtained from WCS and ICESI University (Colombia). The extra expenses were covered by personal means.

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

Next steps include data analysis, interpretation, presentations in congress and conferences, scientific paper writing and submission to peer review journals. Most of this activities will be carried out at the University of Freiburg, Germany, where I will receive the help and guidance of my colleagues and advisers during the first semester of 2016.

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, I used the Rufford Foundation logo in the brochure, which was distributed physically and digitally in at least three Institutions webpages and social networks. Furthermore, I used it in the presentations of results to the local community.