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	Johanna Croce
Project title	Fires in mountain dry forests: importance of plant-plant interactions in the post-fire regeneration
RSG reference	21469-1
Reporting period	August 2017 – September 2018
Amount of grant	£4552.94
Your email address	johacroce@gmail.com
Date of this report	28/8/2018

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
The primary goal of the investigation is to study the plant-plant interactions in degraded burnt forest environments, proposing restoration solutions based in ecology fundaments.		x		Is important to state that this scholarship approval dates from August 2017. Our investigation started at the beginning of the rainy period (November 2017); for that reason we only analysed the seed sowing experiments and the trees re-introduction experiments are going to end at the end of the dry season (November). For that reason this project will be extended until the mentioned date. Nevertheless all resulting data will allow us to diagram reforestation strategies for our forests.
The second goal of the Project is to evaluate the effect of the weather conditions in the seedlings and herbs establishment that colonize the forest and to determinate if there is an influence on the emergency, survival or growth of the seedlings and herbs.			x	We were able to register the seedling growth under manipulated weather conditions (experiments in common garden) and also we were able to register weather conditions directly from the field.
The third goal is to assess if there is a raise in the growth under potential nurse plants with different forms of growth (woody, herbaceous and grasses) and different percentages of coverage.			x	We have successfully sowed trees and seeds under different types of nurse plants, manipulating the coverage in different scenarios. Also we could replicate our study in two types of forests.

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

During the development of the project, difficulties were experimented affecting the scheduled activities. At first, we did not have the necessary precautions with native herbivores, and we experimented a considerable loss of seedlings due to ant attacks; for that reason we had to perform a second seed sowing. Furthermore, we had to duplicate our activities (installation and monitoring experiments) in order to duplicate our experiment at a new study area in order to reach more generalisable conclusions.

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

We expand our knowledge about the interactions between the dominant trees of the forest and the vegetation that colonizes the area after a fire. This helps us to accelerate the forest regeneration process and restore their environmental services.

This information will be sheared with government authorities in order to manage the burned forests near to Salta city.

The facilitation between plants is a well-known strategy used worldwide to restore degraded environments; however, there has not been a technological breakthrough in these techniques in places with a dry season (the case for our forests). The results of this investigation have a direct impact in fill up this knowledge gap and it can be used by all researchers in similar studies.

With this project, we employed field assistants that worked in all the field campaigns. We gave working experience at advanced students from biology, environmental engineering and nature's resources. Finally, throughout this project, I could generate all the information and data to write my doctoral thesis; data that, without this project support, I could not generate.

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

During the sowing and transplanting activities, we had the participation of members of the Alta Montaña Janajman Club, students for careers of biological science and environmental engineering at the Salta National University, and the park rangers of Campo Alegre Private Natural Reserve.

We gave informal conferences with the goal of creating conscience about the proper ways to take care of the forest with all the participants. We had the opportunity of expose our results to the Biological Sciences Students Association (ASEBi) from the Salta National University.

Our project provided the first field experience of many students that had participated.

5. Are there any plans to continue this work?

The net plant-plant interaction frequently varies within each plant life cycle. For that reason it is important to monitor growth and survival of the trees and seeds planted for at least two more years.

Other relevant variable in this study is the weather. It is important to evaluate during a more extended period the weather conditions; because it will allow us to adjust our results to the future climate change.

The results obtained had helped us to formulated new questions about the recruitment dynamics of the forest that we would like to continue investigating.

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

Our first previous results were exposed to students of the Faculty of Natural Sciences of Salta National University. We have also shared this results with the Ministry of Environment of Salta, the directive committee of Amigos de la Montaña club, and with researchers working on similar projects in the reserve.

In addition, we are going to present two abstracts in the International Ecological Restoration Workshop in October at Salta.

Furthermore, as part of this event, we were also invited to give a guided tour of our study area in order to show our project to the other participants.

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

As I had mentioned in my scholarship application my project last 4 years but I asked for a grant to set up the experiments and the first year of sampling of the project. Taking in consideration that the project started in November of 2017, we still have funds to finance the last two campaigns scheduled for September and October 2018.

Besides the necessity of synchronise the project with the rainy period and the delay caused by having a second plantation due to the ant attack, we were able to adjust our activities to the scheduled activities in the project.

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.

In Argentina due to the current political and economic context in which we live, there is a distrust in the price level that consistently leads to rise. There is no consensus on a single rate of inflation and for that reason the prices can vary greatly.

The National Bank from Argentina gave us the amount of the fellowship in Argentinian Pesos with an exchange value of $ 22.7/ £1 in 2017.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Fuel	520	618	-98	The number of trips increased because we added a new study area
Materials: height scissors, bags, storehouses, sprinkler, seals, machete, shovels, hose	408	312	96	Some materials such as height scissors were borrowed, others such as vizcacheras shovels (that could not be used because of the amount of stones in the terrain) were replaced by heart shovels, more economical. Although we incur unplanned expenses such as ant control.
Soil for seedlings	150	163	-13	When we added a new study area we required more volume of soil in order to raise more seedlings
Installation: drawers, half shade, shutters, wire, woven wire	442	233	209	We were able to get some recycled materials such as posts and drawers for the assembly of the common garden, which were cheaper.
Greenhouse	2230		2230	We performed the experiments in the National University of Salta greenhouse.
Instrumentation for measurements: digital calibre, thermo-hygrometers, sensors for soil moisture, GPS	1250	3427	-2177	Following the corrections suggested by my thesis director, we changed the soil temperature sensors with data loggers "HOBBO". We got some materials borrowed, such as GPS.
Expenses due to an error in transfer data from the bank account		**345**	**-345**	**The employee of the Argentinean National Bank that filled the first form to perform the money transaction made a mistake and we had to pay for a new form.**

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

I think the next steps with this project are:

A second year of measurements to have a better temporal representation of the data collected.

Share the results at conferences and scientific meetings as well as giving conferences with students and environmental education to the people that uses our study area for recreation.

Generate a bank of tree saplings to develop transplanting and sowing activities on burned hillsides on a more important spatial scale.

Continue with future studies that contributes generation of knowledge for the development of this project and that can contribute to the conservation of native forests. For example studies of the seed bank, biological interactions or the influence of edaphic factors.

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, of course. RF logo was used in the presentation of all the conferences that I gave: informative talks in my study area, conference at the Secretary of Environment of Salta province, conference to the members of the Club Friends of The Mountain, and during the presentation to the biology students of the National Faculty of National University of Salta.

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

Dr Andrés Tálamo is my PhD director. He works as a researcher at CONICET (National Council for Scientific and Technical Research) and he is professor of experimental design and ecology of arid communities at the National University of Salta. **Dr Ernesto Badano** is my doctorate co-director. He works as a researcher in the Division of Environmental Sciences, Potosino Institute of Scientific and Technological Research, A.C., Mexico. His research focuses on the ecology of communities and it studies the mechanisms that form the structure in biotic communities and how the components of global environmental change affect the biodiversity of ecosystems and their associated species. My director and co-director collaborated in the experimental design of the work plan and in the data analyses and interpretation.

Dr Carolina Trigo has finished her research on sustainable livestock management at Copo National Park. **Maria Fernanda Martinez Gálvez** is developing her doctorate in restoration of overgrazed environments using sexual and asexual reproduction of trees to reintroduce native species. Both were assistant researchers during the installation of the plots in the field and in the common garden.

Eliana Vanesa Arévalo is an environmental engineering student. She is studying the effects of cattle exclusions on chemical and physical soil conditions in the Chaco forest. **Susana Pérez Viscarra** is an environmental engineering student. She is studying how the soil seed bank were degraded by cattle in Copo National Park. **Ayelen Díaz** is a student of biological sciences. **Rubén Chávez** is a student of environmental

engineering. **Rodolfo Maximiliano García** is a mining technician who works in an environmental studies laboratory (INDUSER) and he is a member of the Janajman Club also. All of them participated during the installation, planting of trees and seeds, fruit collection, growth measurements and sampling activities.

In addition to my work team, students from the National University of Salta, members of the high mountain club "Janajman" and park rangers of the Campo Alegre Private Nature Reserve collaborated during the planting of trees and seeds.

12. Any other comments?

Thanks to RSG grants by Rufford Foundation, we could carry out this project, because without all your huge help it could not been possible. This project could contribute to the development of valuable knowledge for our forest management. We could developed useful information and methodologies never practised before in this environment; this is precedent for future research in this province and in other dry forests of Latin America.