Final Project Evaluation Report

Your Details	
Full Name	Alejandro Venegas-González
Project Title	Effect of climate change on the growth dynamics of sclerophyllous species of the Chilean Mediterranean forest in a biogeographic gradient
Application ID	25822-2
Grant Amount	£5,000
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Date of this Report	July 7, 2019

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
Define study species of sclerophyllous forest (SF)			■	We sampled five species of SF in different sites. We perform laboratory test to select which were the most suitable species to our study. Finally, we selected *Cryptocarya alba* and *Beilschmiedia miersii.*
Define priorities study sites of SF			■	We selected four study sites of SF (31°-34°N, 70.5-71.5°W) to build tree-ring chronologies of species selected.
Temporal analysis of tree growth of selected trees species		■		We perform four tree-ring chronologies by species/site (eight chronologies in total). Preliminary results showed a negative trend of tree growth in the last decades, especially the southern population. It still needs to apply more robust analyses.
Relationship between trends growth and local and global climate variability			■	We observed that all populations are very sensitivity to climate variability, mainly to water deficit. Extreme event of drought in central Chile (e.g. 1968 and 1998) affected the tree growth, both during the event year and following year.
Spatial analysis of species distributions to habitat suitability under future climate change		■		Occurrence and tree growth data were sent to Center for Ecosystem Modelling and Monitoring (CEM), Universidad Mayor (Dr. Narkis Morales). Dr. Morales will analyse this objective.

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

The main difficulty is related to field work. First, we had difficulty accessing the study sites, because most of them were private areas. Therefore, we had to meet with each owner to explain the project and get the authorisation. Second, we did a prospection of sites and species for our study, sometimes finding it difficult to visualise the tree rings in species that we thought would be useful for our study (e.g. *Quillaja saponaria*). Third, we selected *Beilschmiedia miersii*, species categorised as

vulnerable, so it was difficult to find populations with large individuals (we had to walk a lot). Fourth, we had problems to model the distribution of species, so we had to associate with a colleague from my own university (Dr. Narkis Morales ate CEM UMayor), who is doing these analyses. Finally, we are still working on the development and interpretation of results.

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

1- After an initial prospection, we found that *Cryptocarya alba* and *Beilschmiedia miersii* have a great potential for dendrochronological, ecological and climatological studies. Both species have rings that are visible and sensitive to climatic variations. Under this context, these preliminary results allowed me to apply to a national grant, which was awarded (Fondecyt N°11180992).
2- Both species are crucial to understand the resilience of this forest ecosystem to climate change. In this sense, we observed a decline forest in last decades, especially in southern sites, which are also the most affected by extreme drought events.
3- We observed trees 200-300 years old. This finding is important to be included in the "Atlas of droughts for Chile of the last 1000 years" (Fondecyt N° 1181956, since before there were no chronologies in valleys and low sites in central Chile)

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

Overall, the involvement with local communities was at the time of sampling, where we shared information about this project objective. However, in December 2018, we participated in a dissemination activity in the rural college "Escuela Francisco Letelier Valdés de Rangue", Paine-Chile, in order to discuss the ecological role played by the sclerophyllous forests, and the importance of their conservation. We hope to make this activity in other communities.

5. Are there any plans to continue this work?

Currently, I lead a project on tree-growth resilience to global change of the Chilean Mediterranean forest, in which I am increasing the sampling sites and species. In addition, I hope to increase the explanatory variables of the objectives of this project, from the use of wood cellular anatomy to remote sensing.

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

Outreach: we will be conducted outreach activities in local communities to attend adult and children (schools, universities, community centres).

Scientific dissemination: results will be presented in national and international conferences (e.g. IUFRO World congress 2019 and National Congress of Ecological Society of Chile). I expect to publish at least two papers in journals. At the moment I

am writing a manuscript on resilience to the drought of the sclerophyllous and deciduous forest of central Chile.

Scientific network: This project involves researchers from two universities - Universidad Mayor (UMayor) and, Pontificia Universidad Católica de Valparaíso (PUCV). However, also the results have been sharing with researchers from others national university (Universidad of Chile and Universidad Austral de Chile). Currently, I am working with a network of scientific collaborators of national and international researcher to discuss and interpret results about the ecologic resilience to climate change of Chilean Mediterranean forest based on different projects (e.g. RSF 16502-1, RSF 25822-2, Fondecyt 111809902, Bosque Andino, etc.).

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

Most of the funds provided by the RF were used during the field work, stipend for field and laboratory assistants, and materials.

8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Material (fieldwork equipment)	350	350		The costs were within of the expected
Materials (increment borer)	600	1,320	+720	I bought 4 increment borer and 1 GPS
Fuel and toll	550	550		The costs were within of the expected
Rent car	1,300		-1,300	I used a car from my university
Meals and accommodation fieldwork	1,300	1,300		The costs were within of the expected
Field assistants	900	2,400	+1,500	Were paid (i) 2 field assistants, and (ii) 1 laboratory assistant for 6 months
Total	**5,000**	**5,920**	**+920**	

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

I believe that is necessary continue generate knowledge about forest ecology of this hotspot ecosystem in order to design and establish a long-term restoration and conservation programs. This is crucial, since all the current restoration plans have failed in the region, and the current conservation projects have not prevented the degradation of this ecosystem.

10. 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, in some presentations for students in my university, colleagues and the extension activity (all they had the publicity to the foundation). In addition, the paper that I am writing has an acknowledgement to the foundation (note that the papers published have already thanked the foundation for the other project 16502-1).

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

Alejandro Venegas-González, UMayor
- designed and conceived the experiments.
- wrote the project.
- participated in the acquisition of data (fieldwork).
- participated in the analysis and interpretation of data.
- performed a critical revision of the manuscript that is in preparation.

Cristina Aravena, UMayor
- participated in the acquisition of data (fieldwork)
- performed a critical revision of the manuscript that is in preparation.

Leonardo Durán, UMayor
- participated in the acquisition of data (fieldwork)
- performed a critical revision of the manuscript that is in preparation.

Narkis Morales, UMayor
- participated in the analysis and interpretation of data.
- performed a critical revision of the manuscript that is in preparation.

Ariel Muñoz, PUCV
- participated in the analysis and interpretation of data.
- performed a critical revision of the manuscript that is in preparation.

Tania Gipoulou, UMayor-PUCV
- participated in the acquisition of data (fieldwork)
- participated in the samples processing and data measurement (tree-ring width).
- participated in the analysis and interpretation of data.
- performed a critical revision of the manuscript that is in preparation.

Isabella Aguilera-Betti, PUCV
- participated in the analysis and interpretation of data.
- performed a critical revision of the manuscript that is in preparation.

Christian Bringas, PUCV)
- participated in the acquisition of data (fieldwork)
- participated in the samples processing and data measurement (tree-ring width).
- performed a critical revision of the manuscript that is in preparation.

Diego Parra, UMayor-UChile
- wrote the project.
- performed a critical revision of the manuscript that is in preparation.

12. Any other comments?

Thank you very much for the support given to scientists in training. Without the Rufford grants it would have been very difficult to finish my doctorate, and to have started my career as a researcher in my current university. I hope to apply for the next grants but in a few years (or months), when I already have solid results from this project.