

The Rufford Small Grants Foundation

Final Report

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

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. 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	Alejandro Danilo Venegas González
Project title	What can reveal the tree rings of <i>Nothofagus macrocarpa</i> about the conservation state of the Mediterranean deciduous forest of central Chile?
RSG reference	16502-1
Reporting period	November 2014 – November 2015
Amount of grant	£4990
Your email address	avenegasgon@gmail.com
Date of this report	December 1, 2015

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
Define priorities areas for conservation of <i>N. macrocarpa</i> populations through development of chronologies			x	Were selected five study areas (north to south) - National park "La Campana" (LC) - Nature sanctuary "Cerro El Roble" (ER) - Nature sanctuary "Altos Cantillana" (AC) - National reserve "Robleria de Loncha" (RL) - Nature sanctuary "Alto huemul" (AH) We collected wood samples of 22-35 trees per sites.
Estimate and compare the tree growth rate			x	Chronologies showed trees above 200 years, with annual growth rate of 1,06-2.66 mm.
Estimation of stem carbon fixation			x	Carbon uptake using intra-annual wood density measured by x-ray densitometry. Were estimated a carbon cumulative of 211-262 kg per trees.
Analyse the $\delta^{13}\text{C}$ isotopic composition		x		Wood samples were separated and prepared for this analysis, but still they are not sent to mass spectrometry.
Analysis of genetic variability		x		Leaves samples were stored in silica and send to Econote Laboratory of University of Comahue. Here, It will be analysed the genetic variability by chloroplast DNA markers

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

- 1) The first difficulty was to coordinate the fieldwork with the team. I received the funds in November 2014 but I went to collect in April 2015.
- 2) In general, the collects were successful because were sampled approximately 30 trees, except to RL site, where we sampled 22 trees due to difficult access to populations. In this site, we were lost in the forest for five hours until be found for a muleteer.
- 3) Wood samples were made with increment borer. However, *N. macrocarpa*'s wood is hard, and unfortunately we broke two bores.
- 4) To genetic analysis, initially we will work with Laboratory of Genomics and Molecular Biology Plants at University of São Paulo, but they did not want. However, we contacted the Dra Andrea Premoli of Econote Laboratory of University of Comahue, specialist in population genetics of the genus *Nothofagus*, and she accepted to collaborate in the development of molecular markers.

- 5) Leaves samples were sent on April 21 for Argentina by land; however the April 22 erupted the volcano Calbuco, so I had to request samples to Santiago.
- 6) This part of my doctorate, so I'm still working on the development and interpretation of results.

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

- 1) It is the first dendro-ecological study of *Nothofagus macrocarpa* covering the whole distribution (32.85°S - 34.85°S), considering four populations of the coastal mountains and the Andes. Here, we can observe that in highest sites (over 1700 m) have a tree growth rate and carbon sequestration lower compared with the lowest sites (less than 1700 m).
- 2) Vegetation dynamics and climate change in recent centuries has been studied in the central Chile based on populations of ancient conifer *Austrorcedrus chilensis* of Andes Mountains (e.g. Christie et al., 2011; Le Quesne et al., 2006, 2009). Therefore, we can complement these results based on our studies, with a hardwood species and populations of the coastal mountains.
- 3) Unfortunately, we can say that the populations of the coastal mountains have a tendency to extinction because they are isolated, with low growth rates in the last 50 years and without natural regeneration, so that conservation measures and restoration are needed urgent. These results give us more information on the importance of Mediterranean deciduous forest and hence, it allow some future studies about other species, since despite it be considered a priority area to preserve (Hotspot), there are still many unanswered questions about their condition and how to restore.

Referencias

Christie, D. A., Boninsegna, J. A., Cleaveland, M. K., Lara, A., Le Quesne, C., Morales, M. S., ... & Villalba, R. (2011). Aridity changes in the Temperate-Mediterranean transition of the Andes since AD 1346 reconstructed from tree-rings. *Climate Dynamics*, 36(7-8), 1505-1521.

Le Quesne, C., Stahle, D. W., Cleaveland, M. K., Therrell, M. D., Aravena, J. C., & Barichivich, J. (2006). Ancient *Austrorcedrus* tree-ring chronologies used to reconstruct Central Chile precipitation variability from AD 1200 to 2000. *Journal of Climate*, 19(22), 5731-5744.

Le Quesne, C., Acuña, C., Boninsegna, J. A., Rivera, A., & Barichivich, J. (2009). Long-term glacier variations in the Central Andes of Argentina and Chile, inferred from historical records and tree-ring reconstructed precipitation. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 281(3), 334-344.

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

For now, the involvement with local communities was at the time of sampling, since then had to return to Brazil. The most important relationship with the community was through the guides "natives", who showed us the populations of these forests and they told their "story" (use of wood). I also had contact with Fernanda Romero, coordinator of Nature sanctuary "Altos Cantillana"; Christian Díaz, administrator of National park "La Campana"; Julio Vergara, administrator of National reserve "Robleria de Loncha"; and Nelson, director of the community "Capilla de Caleu" in charge of Nature sanctuary "Cerro El Roble"; with which I shared information about this project objective.

However, I intend to conduct workshops and meeting in rural schools and community centers in an upcoming visit, explaining the importance of conservation of *N. macrocarpa* and Mediterranean deciduous forest of central Chile

5. Are there any plans to continue this work?

Yes, hopefully this work will be continued, either by me or my partners in the project. My future plan is to keep studying carnivores and its conservation in this area, associated also with the PhD that I will be starting next year.

Yes, I hope to continue working with Mediterranean deciduous forest of central Chile through post-doctoral researcher. My future plans after finishing the PhD (I still have two years) are: (i) back to the same sites to make a detailed phytosociological study of vegetation communities with the aim of analysing their interspecific relationships and with the environment, through the spatial distribution of trees, development of regeneration, trees dasometric characteristics and floristic composition, among others. In this sense, the ideal would be the installation of permanent plots; and (ii) seek other species with dendrochronological potential, preferably lower altitudes, to complement the reconstruction of the natural history of Mediterranean deciduous forest of central Chile

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

- 1) Extension works: we will be conducted outreach activities in local communities to attend adult and children (schools, universities, community centres).
- 2) Science works: two approved posters will be presented at international conferences: (i) January 2016, I workshop on Tree rings, isotopes and climate change in the Amazon basin, Manaus-Brazil; and (ii) March 2016, III American Dendrochronology Conference, Mendoza-Argentina. Also, I expect to publish at least two papers in journals.
- 3) Scientific collaboration: I am working with a network of scientific collaborators from four countries: Argentina (Andrea Premoli, Fidel Roig, Paula Mathiasen), Brazil (Claudio Anholetto Junior, Mario Tomazello Filho, Matheus Peres Chagas), Chile (Duncan Christie, Karen Peña), Uruguay (Pablo Fresia).

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

As expected, most of the funds provided by the RSGF were used during the field work. Most of the lab work has been funded by the Universidad de São Paulo. The problem was some analyses are taking longer than expected.

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
Air Travel	1200	1000	+200	There was a price difference due to seek flight deal
Sampling material	290	500	-218	I bought a special material for the transport of samples (alveolar polycarbonate), which up costs.
Transport, fuel and toll	1700	2500	-800	I had to go twice to each site, (1) select area of study and accommodation; (2) sampling

Meals and accommodation fieldwork	600	800	-200	Get free accommodation in two sites (LC and RL), but we had to pay the other three (AC, ER and AH). In addition, initially we do not consider the lease horse (AC) and that I had to go twice to each site
$\delta^{13}\text{C}$ analysis	1000	50	+950	Samples are conditioned, but they have not yet been sent for analysis
Genetic analysis	200	200	0	Leaves samples were conditioned and sent to Argentina (University of Comahue), but we had problems with the volcano Calbuco. However, the costs were within of the expected
TOTAL	4990	5050	90	

1 British Pound= 713 Chilean pesos or 1.511 USD at moment field work

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

First, we must to present the condition and the ecological importance of this species and Mediterranean deciduous forest of central Chile, both to governmental and academic level, so there could be more resources and interest on this forest ecosystem. In this sense, it is vital to establish a long-term restoration plans in the region.

Secondly, I think it is necessary to increase the information on the vegetation dynamics in recent centuries in the region, considering the study of other species and natural regeneration (see item 5).

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

Not yet, but I'll use them on the posters that I will present in conferences of January and March 2016, and also the future meetings. It will also be acknowledged in the papers that we are currently writing. . Also we use the logo in each presentation about project.

11. Any other comments?

I am very grateful of RSGF for the funding of this project, since without this it I would not have been able to make the fieldwork.