

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	Surya Kumar Maharjan
Project title	Climatic effects on plant species distribution and diversity along the Himalayan altitudinal gradient, Nepal
RSG reference	20776-1
Reporting period	Final report
Amount of grant	£ 5000
Your email address	maharjansurya@gmail.com
Date of this report	26/01/2018

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
Compilation and processing of species occurrence and environmental data				Species occurrence records available at Department of Forest Research and Survey (DFRS) Nepal, National Herbarium and Plant Laboratories (NHPL) Nepal, and online floral databases (www.gbif.org/ , www.idigbio.org/) served as main sources of species occurrence data required for this research and additional species occurrence data were compiled from fieldwork. WorldClim climatic data, Shuttle Radar Topography Mission (SRTM) elevational data, CGIAR-CSI potential evapotranspiration and aridity data, ISRIC soil data, and water body's related data from http://hydrosheds.org/ and WWF were used as sources of required environmental data.
Calibration of environmental data				Meteorological data from Department of Hydrology and Meteorology (DHM) Nepal were used to calibrate environmental data.
Fieldwork for compilation of additional species occurrence data				Additional species occurrence data for the species with limited occurrence records were compiled from fieldwork, some of the doubtful occurrence records were field verified during this fieldwork.
Model current and future distributions of plant species				First round of modelling current distributions of plant species have been completed, the distribution maps are being remodelled with additional species occurrence data compiled from fieldwork and the process of computing future environmental data for modelling future distributions of plant species is in final stage.

Writing of articles and submitting final report to The Rufford Foundation			Documentation of the results of this research in the form of scientific articles is process, The Rufford Foundation will be reported once the articles are published.
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Formalising the process of data sharing between DFRS and Wageningen University and Research (WUR) took little longer than anticipated in absence of concrete data sharing protocol. However, at the end, in support of very enthusiastic colleagues from DFRS it was formalised.

Digitisation of herbarium records available at NHPL is in process and those that were already digitised were not yet fool proof. Therefore, the research team could not use the digitised herbarium records. Instead, the research team had to visit the herbarium and digitise the records themselves.

In the beginning of this research, WorldClim only had earlier version of climate data available in their website but later it made newer version available. As newer version was already there the research team decided to use them and generate future climate data using this newer version which cost more time than was anticipated.

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

The current and the future plant species' distribution/range maps and the understanding of their distribution patterns and rates of their upward and poleward shifts i.e. predictions of the impacts of climate change for plant species' future distributions are the main results of this research. These results provide interested relevant stakeholders [that includes scientists, conservation practitioners and non-government agencies in Nepal and across the globe] with scientific bases/evidences for designing effective evidence- and process-based strategies for *in situ* conservation and sustainable management of biodiversity under climate change. Additionally, these results can be used to educate local communities about the vulnerabilities of plant species to climate change, to make recommendations about the choice of species for plantation, to encourage local communities to plant valuable species in their future niches, and also to establish corridors and networks of protected areas along the altitudinal gradients to facilitate upward and poleward shifting of the species.

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

The research team worked closely together with the local Community Forestry Users Groups (CFUGs) during the fieldwork. CFUGs knowledge about their forests was impressive, it seems they know each individual plant in their forests. Every time when we asked for occurrence of certain species, they rightly guided us to those localities

where the target species were present. As far as time and local situations allowed we had interaction with CFUGs about their experiences with the changes they have experienced over past few decades. Thanks to ongoing projects and programmes from government and non-government sides that locals are aware about the climate change and adverse impacts that they are facing and likely to face if the right measures are not taken. Those interactions were mutually beneficial, the research team had an opportunity to learn about the local situations while the locals had opportunity to clear some of their doubts about climate change and its adverse impacts. The locals were very keen to know about possible changes in the species composition of their forests over coming years.

5. Are there any plans to continue this work?

Indeed, there is a plan to continue this work. Due to some unforeseen difficulties that arose during the research (elaborated in Section 2), the fieldwork got delayed. This delay in fieldwork has pushed behind modelling of current and future distributions of plant species and writing articles. However, remodelling of current distributions of plant species with additional species occurrence data and the process of computing future environmental data for modelling future distributions of plant species are in final stage, and the outline of first article has been readied. Therefore, it is anticipated that the articles will be ready by the end of May, 2018.

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

In addition to this report submitted to The Rufford Foundation, the results of this research will be published as two articles in international scientific journals and will form two chapters of PhD thesis. Furthermore, the current and future plant species distribution maps that are being produced as a part of this research will be published online in WUR (<http://www.wur.nl/en.htm>) and Rupantaran Nepal (RN, <http://www.rupantaran.org.np/>) websites (if possible also through Rufford website) in the form of usable shapefiles so that they can be used by other conservation projects and (non)government organisations for future conservation planning.

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 Rufford Foundation grant was used over the period of 12 months i.e. January - December, 2017 except for the final sharing meeting that is being planned to be organised at the end of February, 2018. A part of the grant was used to purchase meteorological data from DHM (January 2017) and another part was used to cover the expense of digitisation of herbarium records available at NHPL (July, 2017). While the rest of the grant was used to cover the cost of 2.5 months fieldwork carried out in mid-October - December, 2017. Originally, the fieldwork was proposed to be undertaken in mid-February - April, 2017. However, due to some unforeseen difficulties that arose during the research (elaborated in Section 2), the fieldwork got delayed. This delay in fieldwork has pushed behind modelling of current and future distributions of plant species and writing articles. However, remodelling of current distributions of plant species with additional species occurrence data and the

process of computing future environmental data for modelling future distributions of plant species are in final stage, and the outline of first article has been readied. Therefore, it is anticipated that the articles will be ready by the end of May, 2018.

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
Travel cost	800	1130	-330	Traveling by public transport was not always an option so a car was hired for efficient movement between and within field stations. Deficit was covered by surplus from other budget items.
Living cost	400	400	0	Actual expenditure was 2500 of which 400 was covered by The Rufford Foundation grant and the rest was covered by The Stichting Het Kronendak grant as was proposed.
Material cost	0	0	0	Necessary materials were supported by WUR, RN and DFRS.
Cost of purchase of meteorological data	900	200	700	Part of the meteorological data were already available at DFRS. Surplus was used to cover deficits in other budget items.
Cost of stationery and printing	500	400	100	Unnecessary printing was discouraged. Surplus was used to cover deficits in other budget items.
Remuneration of a field assistant and local field guide	2000	2000	0	
Cost of organizing stakeholders meetings (2 meetings – initial presentation and final sharing)	200	110	90	Final sharing meeting is yet to be organized. The team is planning to organize this meeting at the end of February, 2018.
Communication	200	150	50	Surplus was used to cover deficits in other budget items.
Travel cost of supervisors from Wageningen	0	0	0	All expense covered by WUR Sandwich scholarship.

University and Research (WUR), The Netherlands to Nepal				
Cost of digitizing NHPL herbarium records	0	500	-500	Digitization of herbarium records available at NHPL is in process and those that were already digitized were not yet full proof. Therefore, the research team could not use the digitized herbarium records. Instead, the research team had to visit the herbarium and digitize the records themselves. This cost was not envisioned in the proposal. Therefore, surpluses from other budget items were used to cover this cost.
Total	5000	4890	110	Surplus will be used to cover the cost of final sharing meeting.

Note: £ 1 = Nepalese Rupee (NPR) 135

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

Next step will be to quantify the plant functional traits of selected sub-sample of plant species for understanding mechanism of plant species adaptation and roles of plant functional traits in defining the distribution ranges of the species, and effect of climate change on plant species performances.

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?

The Rufford Foundation logo was used in the presentation slides prepared for sharing research plan to the relevant stakeholders that includes (RN, DFRS, NHPL and CFUGs). Whenever, stakeholders asked about the funding sources of this research, it was clearly stated that this research is a part of four year WUR Sandwich PhD research being undertaken in joint funding of WUR, The Rufford Foundation and The Stichting Het Kronendak.

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

A core-team of five members was formed to accomplish this research. Additionally, a trained field assistant and two local field guides were hired for 2.5 months to assist in the fieldwork.

SN	Team members	Roles
1	Surya Kumar Maharjan	Principal researcher/Team leader
2	Prof. Dr. Ir. Lourens Poorter	Supervisor, supervised the research
3	Associate Prof. Dr. Ir. Frank Sterck	Co-supervisor, co-supervised the research,

		also joined the fieldwork in Nepal
4	Mr. Brahma Dhoj Gurung	Local supervisor, helped in planning fieldwork and coordinating with national and local stakeholders
5	Dr. Rajendra KC	Contact person at DFRS, facilitated the process of data sharing between DFRS and WUR
6	Bishnu Dhakal	Field assistant, assisted in the fieldwork
7	Nar Bahadur Rai	Field guide
8	Karma Wangju Tamang	Field guide

12. Any other comments?

None



Almost monospecific stand of *Shorea robusta* observed in Makwanpur district, Nepal