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	Raj Kumar Koirala
Project title	Nutritional Ecology of Wild and Domestic Asian Elephants in Nepal.
RSG reference	13058-2
Reporting period	March 2013 to March 2014
Amount of grant	£6000
Your email address	r.k.koirala@massey.ac.nz
Date of this report	27 March

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
First objective is to apply geometric analysis to understand the nutritional priorities of captive Asian elephant, at the Auckland Zoo		√		The information generated is anticipated to provide a baseline to help design and interpret the studies of domesticated and wild elephants in Nepal, and an independent test of the nutritional regulatory patterns of Asian elephants performed in a highly controlled setting. Feeding observations and quantification of fodder plants of elephant has been completed for a total of 11 study days. Chemical analysis has been done. The data is under process for analysis for final outcome to understand nutritional priorities of captive Asian elephant at the Auckland Zoo.
My second objective in this study is to apply geometric analysis to understand the nutritional priorities of domestic elephants, at the elephant breeding centre at Chitwan National Park, Nepal.		√		Field work for four seasons feeding observations of eight domestic elephants with different ages and sexes has been completed. Three seasons nutritional data of the food plants of these elephants has been acquired from the lab. We could identify and familiarised with the seasonal grasses and browse of these elephants. We have quantified the daily intake of food (both browse and grass). Will be analysing the data once the last season nutritional data is obtained from the nutritional lab.
My third objective is to measure the compositions of the foods of wild elephants in Chitwan National Park and Parsa Wildlife Reserve Nepal, and compare these to the composition of the crops targeted by elephants in this		√		These indirect measures will be made via the analysis of dung from wild herds, a process that will be calibrated using the zoo and the domesticated herd. These compositions will, in turn, be compared with the measures of the target nutrient intake of captive (Auckland zoo) and domesticated (Nepal) elephants, and indirect estimates of the target for wild elephants in Nepal. One season wild elephant feeding sign survey has been conducted.

region.				One more season data is needed to analyse for the final outcome. Micro-histological analysis is underway to compare the results from the feeding sign survey.
My fourth objective is to examine the relationship between nutrient composition of wild diets and frequency of crop raiding in agricultural fields.		√		We have succeeded in acquiring one season nutritional information (chemical analysis) of both natural food and crops raided by wild elephants.
My fifth objective is to assess the Human elephant conflict in central Nepal.		√		A semi structured questionnaire was prepared to assess the crop raid, property damage and human casualty by wild elephants in central Nepal. Data has been collected for 300 households and is in the process of analysis.

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

N/A

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

The result has enhanced understanding the general feeding ecology and movements of elephants in central Nepal. At this stage of this project we could find the following basic outcomes, however I am confident that the data that I have collected till now and the remaining data which will be collected this year, I believe would definitely give a first-hand information on nutritional ecology of elephants in Nepal .

- Till now we have Identified almost 50 grass and browse species which are the primary food plants of these elephants in both Chitwan National Park and Parsa Wildlife Reserve.
- We have obtained the two season's (Dry and winter) nutrient intake and utilisation information of both domestic and wild elephants.
- We have assessed the nature and extent of human elephant conflict in central Nepal through household questionnaire survey.

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

N/A

5. Are there any plans to continue this work?

I am doing my PhD research in Conservation Ecology on topic "Nutritional ecology of domestic and wild Asian elephant in Parsa Wildlife reserve and Chitwan National Park, Nepal. The primary aims are: i. to compare the nutritional content; ii. patterns of macronutrient regulation in the diets of free-ranging wild elephants with the fully and partially managed diets of captive and domesticated group derived from the wild population; and iii. to compare the nutritional composition of agricultural crops that are raided by elephants to construct a predictive model of the circumstances under which crop raiding by elephants in Nepal takes place. The research is being co-supervised by nutritional ecologist Prof David Raubenheimer of Sydney University, co-inventor of nutritional geometry, a technique used for modelling the patterns of nutrient regulation. Geometric analysis of the pattern of nutrient intake provides important information on the nutritional priorities of the study animal. The proposed research concerning the captive elephant in Auckland Zoo will provide an opportunity to perform detailed measurements of the patterns of nutrient intake (from feeding observations and nutritional measurements of the foods) and nutrient utilisation (from comparisons of diet and dung compositions). It will also provide an opportunity in a controlled, captive situation to validate some of the key methods being applied in my studies of the domesticated herd, which in turn is being used to validate measures used for the wild population. The proposed project will enable me to make a direct comparison between the nutrient content and patterns of nutrient regulation in the diets of the wild and domesticated elephants in Nepal on the one hand, and an Asian elephant housed in a New Zealand zoo. The comparison of nutrient content will help to inform elephant husbandry practices in zoos, and the pattern of nutrient regulation will give an indication of how general the results of the Nepal study are. The most important context for elephant-human conflict, and the associated risk to human life, is crop raiding by elephants. It is believed that cultivated crops are more palatable and nutritious than wild forage, but no study has substantiated this by comparing the composition of natural forages and agricultural crops with the nutritional priorities of elephants. Doing so will help to understand why elephants raid crops (is it due to the quality of crops, or just the quantity), to predict the circumstances in which crop raiding will occur, and to optimize the conservation of habitat to avert this damaging interaction with humans.

I am to continue the work for another 15 months as I am in my latter half of my PhD research and is submitting the final thesis around August 2015. The next 15 months are very crucial and expecting a good outcome to fully achieve my objectives. I will be able to submit my final detail report and publications to Rufford in 2015.

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

Through scientific publications, oral and poster presentations in conferences, concerned agencies and universities in Nepal and abroad**.**

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

The RSG was used between March 2013 and March 2014. The timescale was more or less accomplished as anticipated.

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
DSA, Principal Investigator for 60 days @ £ 15	900	700	200	The difference was covered from Institute of Forestry, small field research grant.
DSA, field research assistant for 90 days@£10	900	600	300	
DSA, two local assistants for 90days @£8	1440	1440	0	
Local travel, four persons	500	1000	-500	Our actual amount exceeded the planned expenditure due to: 1. Increasing fuel price, 2. Field vehicle needs more and also high mobility between (Chitwan, Parsa and Kathmandu)
Nutritional analysis	1000	1800	-800	More cost for nutritional analysis then the budgeted, as I had to analyse more samples than expected.
Lab chemical for diet analysis	300	0	300	These costs were not incurred as I did not need to buy chemicals, plant grinder and plant drier. These amounts were used to cover the difference in travel and lab cost.
Plant grinder	460	0	460	
Plant drier	500	0	500	
Miscellaneous	500	500	0	
total	6500	6040	460	*1 Pound sterling = 137 NPR

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

1. Remaining seasonal data collection for feeding signs and vegetation survey for wild elephants.
2. Two seasons nutritional analysis of remaining food plants for both wild and domestic elephants.
3. Body condition monitoring of domestic and wild elephants.
4. Scientific paper publication.
5. At least one oral presentation at the conference.

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?

I have not used during this study. I am hoping to use this year as my manuscripts are on review with my supervisors and hope to publish this year. However, I have acknowledged Rufford in my previous publication on carnivore.