

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	Amy Chamberlain
Project title	Human elephant conflict bordering the Makgadikgadi and Nxai Pans national park: a cost benefit analysis of crop raiding management strategies.
RSG reference	17139-1
Reporting period	26/03/2015-26/03/2016
Amount of grant	£5000
Your email address	Amylaura19@yahoo.co.uk
Date of this report	16/03/2016

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
Generating estimates of species composition using the line transect method for the participating farmers' fields.			X	Due to lack of rainfall last year, fewer farmers ploughed their fields in the study period. However, a total of 39 fields were recorded, including species composition estimates, taken using the transect method described in my methodology.
Estimating elephant crop damage after every crop raid in the fields of participating farmers.			X	The farmers who agreed to take part in the study called me after every crop raid and I attended the incident within 24 hours. I estimated the number of damaged crop plants of each species using the line transect sampling method. A total of 96 crop raids were recorded in 25 different fields during the study.
Determining an economic value for each field and an economic cost for each crop raid.			X	Using local yield estimates, informed by the Botswana Ministry of Agriculture, I was able to convert the field species composition estimates and the damage estimates into yield values (kg) for each field and raid. Subsequently, using a commercial sale price, a local market sale price and a 'subsistence' price (obtained through questionnaires, see below), I was able to place three different economic values on each field in the study area and each crop raid event. Different values will be more relevant for different farmers, depending on whether they sell surplus crops at all and how they sell these crops.
Conducting questionnaires with farmers			X	Questionnaires were completed with all participating farmers at the end of the growing season. The questions focussed on economics, to establish how many farmers sell surplus crops and who they sell them to, the prices charged for crops between members of the community (local market price) and how much it would cost farmers to replace crops lost to elephants with replacement food items (subsistence price).
Calculating the economic cost of elephant deterrents (namely, chillipepper, beehive and			X	Throughout the data collection period I was in contact with a number of field researchers who were involved in the development of these deterrents. Consequently, I was able to obtain

electric fences)				complete lists of materials required for each deterrent per 10m of fence line. I then used local suppliers to establish the cost of these materials per 10 m of fence. Using the perimeter measurements for each field in the study area I was able to determine the costs of each strategy for each field.
Completing analysis of local characteristics of crop raiding in the study area, including seasonal trends in elephant damage, elephant crop selection and the scale of elephant damage.			X	These analyses form the first data chapter of my master's thesis and are important for facilitating targeting of the most appropriate mitigation strategies for each farmer in the study area, as well as contributing to the wider literature on patterns of elephant crop damage.
Construction of a cost benefit model for the elephant deterrents.		X		This analysis will form the second data chapter for my master's thesis and is still in progress. There have been delays in receiving the required advice from experts in the field of ecological economics. However, the baseline economic analyses have been completed in the meantime, including analysis of trends in field values, damage costs and deterrent costs. When the advice is received in the coming weeks, the cost analysis will be completed.

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

When I first arrived in Botswana, I realised that the logistics of my original methods, specifically recording the species composition of all fields before crop raiding began, was unrealistic due to time constraints and the patchy settlement pattern in the study area. This required adaptation of my methods to allow for both species composition and elephant damage to be recorded on the transects simultaneously, in case the field had not already been recorded prior to the first crop raid. This was quite simple to develop and implement in the field and was utilised throughout data collection.

Contacting other field researchers to determine the materials required for each elephant deterrent was also challenging, given the remote nature of many human elephant conflict research projects; many researchers are not able to access email regularly. However, by contacting members of Botswana government departments, who are involved in mitigating human-elephant conflict locally, as well as being persistent in my emails to researchers, I was still able to obtain the required information to generate cost estimates for the elephant deterrents.

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

- Placing an economic value of farmers' fields in the study area: this outcome is extremely informative for local farmers, since all are subsistence farmers and very few are aware of the

yield that they can expect from their field. While an awareness of their field's value is likely to encourage farmers to protect and enhance their yield further, simply knowing their likely yield will also enable farmers plan ahead in terms of food consumption and household finances, enhancing food security. The simple field method used to establish yield could be shared with future farmers to enable them to estimate their own yield to facilitate planning and sale of produce.

- Evaluating the costs of elephant damage: farmers in this area have, so far, been given no accurate estimate of the crop losses they suffer as a result of elephants – the government officials who record crop raiding incidents are over-stretched in terms of resources and time, and are unable to attend all incidents. Therefore, the farmers have no real estimate of how much they are losing and how much this is costing them. This is important information for subsistence farmers, who will need to replace damaged crops with food items purchased using money from other sources of income or from family members.
- Simple elephant mitigation measures: elephants are often perceived to create more crop damage than is truly the case, as a result of their large size and the danger they pose to people. In this study, significantly greater crop losses were felt when cattle were allowed to enter the field after elephants during a raid. This can easily be prevented if farmers visit the field early in the morning, before cattle are released from kraals, and thoroughly close any breaks in their acacia fence caused by the elephants. Furthermore, there was a significant peak in crop raiding during March, coinciding with both the dry season decline in wild elephant forage and crop maturation. This peak in crop damage could be avoided by ploughing crops earlier in the season. Both of these relatively simple mitigation measures could result in a significant reduction in elephant damage in the study area.

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

Data collection for this project took place in the fields of farmers in the local community. This required effort on the farmers' part, in terms of calling us whenever an elephant crop raid took place. Farmers were amply reimbursed with airtime for their mobile phone every time they contacted us, which made the project worthwhile for them, in the immediate term. Farmers will also be fully informed of all of the outcomes of this project (the most important of which, so far, are described in question 3), which could directly impact the farming practices they choose to employ, the elephant deterrents they choose to implement and the yield they generate as a result. Additionally, the results will also be passed on to Elephants for Africa, who will implement them more fully in their human elephant conflict community project in the study area. It is hoped that feedback from this project will help the farmers to protect their fields from elephants and enhance their yield for the long term.

5. Are there any plans to continue this work?

This project formed part of a wider human elephant conflict project in the Boteti region of Botswana, undertaken by the UK-based charity, Elephants for Africa (EFA). The results from this project will be fed back to EFA who will inform the local farmers of its conclusions. EFA then aim to use the results to further their human elephant conflict project, by beginning to actually implement the most appropriate and economically viable elephant deterrents in the local community. The economic analysis of the deterrents will be very helpful for them when planning their budget for the

project, as well as helpful for other farmers who wish to ‘follow the lead’ of community members involved in EfA’s project and invest in deterrents themselves.

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

The results will form the basis of a thesis for a master’s degree, which will be submitted to the University of Bristol in the coming weeks. The thesis will be read by members of the Mammal Research Group at the university, as well as future post-graduate students who may wish to conduct similar studies alongside EfA. I also aim to share the results with the wider scientific community by publishing two papers in scientific journals.

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 grant was used for field work taking place in Botswana between January and July 2015, which was also the anticipated length of the data collection period. The project is still ongoing in terms of the data analysis and writing-up, however, the period of data collection for which the grant was required ended in July, as 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.

All items below have been converted from Pula to pound sterling at a rate of 1 Botswana Pula = 0.062GBP

Item	Budgeted Amount	Actual Amount	Difference	Comments
Flight	1100	1100	0	The flight price was known at the time the original budget was calculated.
Fuel	875	657	218	This was difficult to predict since fuel prices fluctuate and the number of town trips and crop raid visits that would be necessary was unknown.
Ferry crossing	350	240	110	Fewer ferry crossings than expected were required, since some were covered by EfA’s camp fees.
Town accommodation	110	176	-66	Unexpected overnight trips to town occurred, primarily as a result of field vehicle break downs.
Car maintenance	200	275	-75	The field vehicles are old and in need of regular maintenance – there was an unexpected issue with the prop shaft which required extra parts, costing more than originally budgeted for.
Insurance	100	100	0	The cost of insurance was known at the time of the original budget.
My airtime	100	85	15	Due to limited phone signal in camp, airtime lasted slightly longer than

				expected, so I used slightly less.
Mankind's Wages/Expenses	125	343	-218	When calculating the original budget, Mankind's (the project's local field assistant) wages were lower and additional expenses such as fuel for his car were unknown.
Camp fees	3150	2046	1104	When calculating the original budget I overestimated the length of time I may stay in Botswana, in case of unforeseen fieldwork challenges. Additionally, I did not account for nights spent out of camp in town, for which camp fees were not paid.
Flight date change	0	50	-50	This small fee for changing the date of the homeward flight was not accounted for in the original budget.
Food/Drink/Camp supplies	0	145	-145	I did not consider that the food and drink included in the camp fees budget would be the basic requirements only, and that additional snacks, drinks and personal items would need to be purchased separately.
Visa	0	110	-110	I did not know the cost of the visa before arriving in Botswana, so this was not included in the original budget.
Mankind's Airtime	0	14	-14	I did not know that Mankind's airtime for the project mobile phone was separate from his wages/expenses at the time of the original budget.
Farmer's airtime	0	83	-83	I did not know, at the time of the original budget, the system we would use for reimbursing farmers for contacting us following a crop raid, so this was not accounted for.
Total	6110	5424	686	

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

The most important next step is to complete the economic analysis of the elephant deterrents. Since the data required for this is already complete and 'cleaned', this analysis will be finalised as soon as the remaining necessary advice from an economic expert has been received. Following completion of the economic analysis, I will be able to feed back the results to EfA, who will disseminate and implement them in the study area, as appropriate. The final important step will be to submit my master's thesis and adapt the two data chapters into papers for publication.

**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?**

I have not yet produced any official materials related to the project, so The Rufford Foundation have not yet received any publicity. However, the contribution of The Rufford Foundation to this project will of course be acknowledged in my thesis and any publications to follow, at which point the Rufford logo will also be used.

