Final Evaluation Report

Your Details	
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Project Title	Community-based Monitoring of Shrub Encroachment in the Ethiopian Highlands
Application ID	27885-1
Grant Amount	£5,000
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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
Design a community-based monitoring program to gather field experimental ecological data to monitor shrub encroachment into Guassa community conserved area				**Activities** Inception workshop for 34 community members to launch the project (September 3rd-4th 2019) with participation of the Guassa Committee (responsible body for governance of the conservation area); Local district administration and Conservation office. The project was approved during the workshop held from September 3rd-4th 2019. Training of nine selected members of the community was subsequently given on October 3rd and 4th 2019. The training was focused on hands-on skills of surveying experimental plots including data sheet management, quadrat survey methods and shrub removal. A baseline survey of the conservation area was conducted, and sites of the experimental plots were selected. **Install Field Experiments:** Based on the training given to the nine community members, we have installed the co-designed field experiments (fenced and unfenced experimental plots) for the total of 40 plots. For vegetation data collection, plots were systematically laid using block design along the altitudinal gradients and aspects. We have established eight blocks and each block has five (5 m x 5 m plots quadrats). The altitudinal range varies from 3200 to 3550 masl. In each eight blocks, we fenced two plots. Thus, each block has two fenced and three unfenced plots. Thus, we have installed a total of 16 fenced/experimental and 24

				unfenced/control plots. **Field Experiment 1:** Shrub removal. This field experiment is intended to inform our understanding of the competition between *Festuca* and *Helichrysum*, and to explore management options for the removal of the invasive *Helichrysum splendidum*. We used block design that allowed us to explore removal and regrowth of shrubs across a range of environmental variability. We organised our removal according to aspect and altitudinal gradients. From each block design, one fenced plot was randomly selected and all the *Helichrysum splendidum* found in these plots were removed. Thus, we have removed the shrub from eight fenced and eight unfenced plots. **Field Experiment 2:** Impacts of *Helichrysum* species on *Festuca* growth. This observational field experiment was to quantify how proximity to invasive shrubs affects the growth of the guassa grasses. We used a purposive sample of ~100 *Helichrysum* seedlings germinating on *Festuca* tussocks, and community monitors recorded the growth of both plants every two weeks over the course of the year. These observations occurred within the 40 established field plots of experiment monitors are being recording growth parameters such as plant height, number of leaves, leaf area, and canopy cover. Soil samples were collected for seedbank germination experiment. Survey of plant diversity, abundance of shrub and grasses were conducted, voucher specimens were identified and stored in the National Herbarium.

Conduct greenhouse experiment on Soil Seedbank				We set up the seed bank experiment in a greenhouse in Addis Ababa University to assess the diversity of the plants in the soil and compare it with the diversity of plants from our survey. This will help us test our hypothesis that *Festuca macrophylla* grass is less abundant in the soil seed bank due to harvesting of the grass before it sets seeds while *Helichrysum splendidum* (the invading shrub) is abundant in the soil, which gives the shrub a competitive advantage over the grass. The experiment is still running as we are currently identifying and counting the seedlings that emerge.
Monitoring: analyse these data to improve understanding of how these shrubs may continue to alter the landscape and livelihoods of the area for years to come				Monitoring of the experimental plot is conducted every 2 weeks by the community monitors while I was supposed to be travelling monthly to the study area to make observation but the past 3 months I was not able to travel due to restrictions

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

First, the meshed wire used for fencing was stolen two times. This illegal act has been resolved after consultation with the community; additional guards were hired. However, it increased our costs in terms of transport, purchase of the wires and labour for the installation of new fencing. Addis Ababa University, Department of Plant Biology and Biodiversity Management partially covered the cost. Second, the Guassa Community Conserved Area is located at about 320 km from Addis Ababa University, where I am based. There are two roads that connect the area to Addis Ababa, which are either under construction or highly degraded and require four-wheel drive vehicles. During our trips our tyres broke three times making the data collection trips logistically very difficult. Third, I have been travelling monthly to the study area in order to collect data and to monitor the growth of *Helichrysum splendidum* removed by November 2019 from the study plots. We have been able to collect good data for the consecutive three months from December 2019 to February 2020. However, the outbreak of the COVID-19 pandemic has made travel for data collection impossible since the beginning of March 2020.

Due to a State of Emergency issued by the Ethiopian Government on March 24th, 2020, there is a travel ban in the country making data collection trip illegal.

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

1. During the workshop and training sessions held with the community, we were fully able to understand community members' perceptions of the ecosystem services and conservation importance of the Guassa area. The communities have been participating in workshops and trainings, field site establishment, shrub removal and monitoring works with full energy and passion. Thus, the project increases their level of understanding and the importance of this project on why and how to conserve the precious guassa grasses.

2. From the baseline survey we conducted, a complete ecological plant check list of the area was documented. This will be an asset for the management and conservation of the area, especially for the restoration of *Festuca macrophylla* and other endemic plants seedlings found in the study area, as well as for conservation policy development in the district. From this survey, we also confirmed that the *Helichrysum* shrub, (both seedlings and mature individuals) is widely invading throughout the study area, it is not restricted to certain elevation and aspects, making *Festuca macrophylla* (economically and ecologically important plant) under threat.

3. Though the data collection is still on-going, so far germination in the greenhouse indicates that soil seed bank is full of *Helichrysum* spp. seeds that will make removal of this shrub very challenging for the future.

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

During our fieldwork, local people were involved with this project as field assistants, data collectors and data sources (by sharing their experiences). They helped during the establishment of the study plots by collecting baseline survey and were paid for their work. Experts from the Guassa conservation office were collaborating with this research and also got good research experience for future work in the area. We started the project by holding workshops on September 3rd 2019 for 34 participants from the nine kebeles involved in Guassa management, the Wereda administration office, and the Guassa conservation office, followed by training given just for nine representatives from nine kebeles. Thus, training these stakeholders on the methods and benefits of biodiversity conservation will have a lasting contribution for the sustainable conservation of Guassa. Community members thus gained knowledge and some small wages for their time. More importantly, the results of this project may reveal new insights on the ecological impacts of the invasive shrub *Helichrysum spelindidum* on the conservation of *Festuca macrophylla,* which ultimately benefit the local communities who rely on this grass for many purposes such as thatch, building material, and forage.

5. Are there any plans to continue this work?

Yes, we plan to continue with the remaining research objectives by actively involving the community. The study of ecological impacts of the invasive shrub *Helichrysum spelindidum* requires continued collaboration of researchers and

conservation managers throughout this area, and local community involvement as well. This is because a complete ecological study should be conducted to determine whether the removal of invasive shrub may have unexpected negative impacts on the highly valued *Festuca* grass and on ecosystem services as well, that both the communities and wildlife rely on. Some initial results from Cara Steger's dissertation work on this issue revealed that shrub removal in an agent-based simulation model of Guassa actually caused other shrubs (*Erica arborea* and *Euryops pinifolius*) to expand their range and further disrupt the growth of the *Festuca* grass. Further data collection is needed to better parameterize this model and compare these findings with our own field experiment observations.

This project is part of my PhD work and it is expected to come with publications and tangible outputs for the sustainable conservation and use of the *Festuca macrophylla* grass and its associated benefits. Therefore, we plan to continue with the remaining objectives from our first proposal and also the following points:

- Currently, we are conducting a detailed assessment of natural regeneration status of the plant species found in the study area to be better able to predict distribution of target species and to be able to develop a better management system for the conservation area. This work will continue for at least 3-4 years to come.

- We aim to collect additional data to conduct species distribution modelling of our target species (*Helichrysum* and *Festuca*) also to include other species such as *Erica* and *Euryops* in this analysis, it would be beneficial as other highlands in Ethiopia are being aggressively invaded by these plants (for example, Abun Yosef with *Euryops* in the north and the Bale Mountains with *Erica* in the south-east). So that we better understand how these species' ranges might change under drivers from global environmental change. We will use the software MaxEnt to analyze our data, which we plan to publish over the coming year.

- The invasive *Helichrysum* shrub is rapidly spreading into the conservation area. The local communities want to remove the shrub, they understand an ecological study is required to first assess the causes and consequences of shrub expansion in the area. The results of our study are eagerly awaited by the community. This line of research is deemed necessary to provide the evidence to inform the design of a shrub removal programme for the community.

- A series of consultative workshops are needed to share our results and publications with the district administration, the Guassa Committee and the conservation office. These will help us learn from each other and implement conservation actions and for creating sense of ownership among the community.

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

We plan to share the findings from this work by presenting at academic symposiums and workshops, sharing the papers produced, and presenting at informal events with local stakeholders. We also plan to translate the abstract and executive summary of each paper we produce and academic papers into Amharic so that local communities are able to read and grasp important findings of the work. We will give these reports to the local kebele offices, to the local woreda administration office, and the Guassa conservation office. We also plan to communicate our findings to the local communities through newspapers and radio broadcasts.

I plan to write two manuscripts for publication in peer-reviewed journals. One will describe our experience co-designing a community-based monitoring programme, and the challenges and opportunities it presents to advance ecological understanding simultaneously with societal impact. The data gathered through field and greenhouse experiments will then be presented in a second journal article that describes some of the mechanisms of competition between *Festuca* and *Helichrysum* species – which will be a novel contribution to the ecological understanding. The results will also be released on the Rufford Foundation website in the near future.

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

This project was implemented from July 2019 to July 2020 according the time stated on Rufford Grant application. So, the work was implemented as planned within a 1-year period (even with disruptions from COVID-19) and I confirm we used the time allowed effectively! However, as this work is part of my PhD dissertation it requires additional time for conducting additional data collection, analysis, and writing.

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
Travel to Ethiopia for Cara Steger	1000	1000		
Transportation within Ethiopia	1240	1395	+155	Since there was no public transportation to all the kebeles involved in our project, because some of the roads are inaccessible except by

				4x4. We were forced to hire a private vehicle using Addis Ababa University funding source.
Lodging for Research Team	500	500		
Food for Research Team	500	400	-100	To save some funds, we ate at cheap local eateries
Per diem for Workshop Participants	860	860		
Materials for Field Experiments	655	755	+100	Meshed wire was stolen by unknown people and we were able to buy using funds remained from food for research team and from Addis Ababa University support
Per diem for Training Community Monitors	245	245		
Totals:	**5000**	**5155**	**+155**	Used in local exchange rate of 30.7 Birr to Pound

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

Biodiversity conservation requires a continuous effort from all stakeholders. The Guassa Conservation area has enormous potential for eco-tourism and as a site of long-term scientific study. The local community shows high commitment to the sustainable utilisation of the area for their development. Our aim is to support the community to sustainably manage the conservation area through reduction of the invasive shrub. While we aim to strengthen the local management system of the conservation area, we also aim to unravel why this shrub is expanding into one of the coldest areas in the country. We believe our experimental study (if well supported) will shed some light onto the factors the driving this change, enabling us to conduct and publish novel research and thus provide sufficient evidence to advance ecological theory as well as support conservation efforts. The following points indicate some next steps in our research.

These experimental plots will be continuously managed for at least the next 3 years. We will model the distribution of key species of the area under current and future climatic conditions and conduct a series of workshops and training with the local community.

Conservation assessment of the endemic and indigenous plants must be conducted using the IUCN Red List assessment methodologies so that these plants are internationally recognised according to their threatened status.

Helichrysum splendidum, though invasive, is an aromatic plant which has been shown to produce a valuable essential oil. At later stage of our study we hope to partner with chemists and industry to extract the essential oil from the plant so that

the harvested or removed shrubs may be converted to a marketable commodity for the local community.

One of our hypotheses is that the decline of valuable *Festuca* grass is associated with its lack of seed production, as we suspect it is too often harvested by local communities before setting seed. If our hypothesis is correct, we believe it will be important to develop seed systems for provisioning of the grass seed to the community. Based on our assumption, preservation of certain area of the conservation area for seed production may complement the regeneration of the *Festuca* grass.

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, I used the Rufford Foundation logo on the power point presentation during my PhD proposal defence in Addis Ababa University both on the header and acknowledgement sections. Moreover, we have been introducing the logo to different stakeholders during field work and workshops by printing it as a header on documents we distribute.

We also acknowledge the Rufford Foundation funding in our research work and manuscripts. I plan to acknowledge RF in the upcoming manuscripts and will continue in promoting and using the logo in reports, papers, presentations and conference attended.

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

Shambel Alemu Chengere (Msc, PhD Candidate) Main Researcher for PhD Dissertation; I have been responsible for proposal development, proposal defense, field site establishment, data collection, monitor field data collection, develop data collection sheet format, data analysis and writing reports and findings to stakeholders.

Bikila Workineh (Assistant Professor) - Main supervisor: guides me in developing research proposal, field site establishment, data collection, develop data collection sheet and data analysis.

Sileshi Nemomissa (Professor) - Co-supervisor: assisted me in developing research proposal and field site establishment.

Cara Elizabeth Steger (Research Scientist) - Co-supervisor: assisted me in developing research proposal, field site establishment and writing reports.

Sisay Wube (Mr.) – MSc students, participates in field site establishment during data collection.

Admasu Tsegaye (Mr.) – Chair of conservation office: helped me by facilitating workshops given to representatives from the community members, selection of community monitors and coordinates training of nine community monitors.

Nine Community members: participate during training, field establishment and during data collection.

12. Any other comments?

We have gained extremely great experience from this work that will ensure the community benefited from the output of the project. I am very grateful to the Rufford Foundation for supporting this project, which otherwise may not have been conducted.

Moreover, I would like to appreciate The Rufford Foundation Grants Director and all Rufford administrators, especially Jane Raymond, for the commitment and unreserved communications starting from approval of the proposal to the project report update notifications.