Final Evaluation Report

Your Details	
Full Name	Tesfay Gidey Bezabeh
Project Title	Empowering community to introduce area enclosure for enhancing natural regeneration of the endangered *Boswellia papyrifera* and its degraded habitat in Ethiopia
Application ID	26273-2
Grant Amount	£5,000
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Date of this Report	March 9, 2020

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
Before introducing area enclosure into our study area, provide capacity building training for local stakeholders on its roles for conservation and restoration of *B. papyrifera* and its degraded habitat its establishment and managements				We provided capacity building training for 20 representatives of local stakeholders (local community, experts and NGOs) on roles of area enclosures for conservation and restoration of *B. papyrifera* tree and its degraded habitat, its establishment and management. During this training, the representatives were sharing their experiences and skills on area enclosure each other and with the project team members. This participatory capacity building training then improved the representatives' awareness and skills on the roles area enclosure intervention for conservation and restoration of *B. papyrifera* tree and its degraded habitats.
Introduce and establish area enclosure with full participation of all local stakeholders into the degraded habitat of the endangered B. papyrifera				Following our capacity building on roles of area enclosure for representatives of local stakeholders, jointly with them, we established area enclosure (20 X 20 m) using barbed wire inside of the degraded habitat of *B. papyrifera* in order to prevent human and animal interference. The representatives were trained on how to establish area enclosure, site selection for area enclosure and its managements and others. The established area enclosure was then protected and managed for 7 months to study its roles on natural regeneration and

				seedlings growth of *B. papyrifera* and its associated woody species and degraded habitat. With consultation of all project team members and the representatives, the size of the area enclosure was decreased to 20 X 20 m from its planned 70 X 70 m as it was enough for regeneration and seedlings study and easy management.
Introduce community-based soil and water conservation structures in the established area enclosure for assisting natural regeneration and seedlings growth of B. papyrifera, its associated woody species and degraded habitat				Jointly with the representatives of the local stakeholders, we introduced different soil and water conservation structures (terraces, stone bunds) into our established area enclosure to facilitate natural regeneration and seedlings growth of *B. papyrifera*, its associated woody species and degraded habitat. During these activities, the representatives of local stakeholders were trained on how to establish conservation structures. They also shared their skills and experiences on conservation structures for conservation each other and with the project team members
				Our established area enclosure with its soil and water conservation structures inside of *B. papyrifera* habitat was properly protected and managed for consecutive seven months to study its roles on natural regeneration and seedlings growth of our target tree and its associated woody species degraded habitat. After 7 months, data related to survival, regeneration and seedlings growth of B. papyrifera and its associated woody species were collected.

Analyse scientifically roles of the established area enclosure intervention for natural regeneration and seedlings growth of B. papyrifera, its associated woody species and degraded habitat				These data were also collected from non-enclosed area (free for human and animals' interferences), adjacent to our established area enclosure for statistical comparisons. These collected data were then statistically analysed using GenStat software for comparisons. During data collection, representatives of the local stakeholders were involved to learn procedures and skills on data collection. They were also participated during our data analysis activities to learn new skills on analysis of data using GenStat statistical software. Detail results of the analysed data can be seen in number 3 of this report below.
Provide on-field capacity building training for local stakeholders (community, experts and NGOs) on roles of the established area enclosure intervention for natural regeneration and seedlings growth of B. papyrifera, its associated woody species and degraded habitat				We provided practical capacity building training at a field level for representatives of the local stakeholders on roles of the established area enclosure for improving natural regeneration and seedlings growth (e.g. height, diameter, leaf and branch number, biomass), associated woody species and degraded habitat. For comparison purposes on roles of the area enclosure for regeneration and seedlings growth during the field training, adjacent non-enclosure areas were used. This capacity building training helped to improve awareness and skills of the representatives on roles of area enclosure intervention for sustainable conservation and restoration of the endangered *B. papyrifera* tree species, its associated woody species and Degraded habitat of our target tree, its associated woody

				species and degraded habitat. For comparison purposes on roles of the area enclosure for regeneration and seedlings growth during the field training, adjacent non-enclosure areas were used. This capacity building training helped to improve awareness and skills of the representatives on roles of area enclosure intervention for sustainable conservation and restoration of the endangered B. papyrifera tree species, its associated woody species and degraded habitat.
Share results of the project with different stakeholders through workshop, conferences, & e-sources for raising awareness on conservation & restoration of the endangered B. papyrifera locally, nationally and globally				We did additional work here beyond our planned objective: 1. We prepared a workshop to share our project results with different relevant stakeholders, including local community, experts, researchers, students, local and national governmental officials and policy makers. In this workshop, over 40 stakeholders participated and shared their skills and experiences on roles of area enclosure intervention for conservation of *B. papyrifera* and its degraded habitats. 2. To improve awareness on conservation of *B. papyrifera* at national and global levels, the project results were presented in three national conferences (Rufford in-country conference that was held in Addis Ababa, Ethiopia in April 2019; Aksum and Adigraat Universities). 3. For raising awareness on conservation of *B. papyrifera* its degraded habitats at local, national and global levels, our propjet results were disseminated using different e-sources such as Facebook, research- Gate, websites and

				publication (under review).
Prepare a manual on roles of area enclosure for assisting natural regeneration and seedlings growth of B. papyrifera, its associated woody species and degraded habitat; and handover it to different relevant stakeholders				The manual was prepared and distributed to our relevant stakeholders such as local governmental offices, local experts NGOs and research centres as to help them in their conservation works on *B. papyrifera* and other woody species.

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

There were two difficulties arose in achieving our project activities:

- We did not get all representatives of local stakeholders (especially those of local community as they were busy with their crop farming activities) during our area enclosure establishment inside of *B. papyrifera* habitat. For full participation of the local community representatives, the area enclosure was then established 2 months later than its expected initial time schedule when the representatives finished their crop farming activities. This was not affecting any activities of our project but a bit expanding its duration.

- As we expected in the projects proposal, we did not get enough time for disseminating project results through different e-sources and preparing a manuscript for publication (by combining our 1st RSG and 2nd RSG project results). An addition time was then needed for accomplishing these activities.

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

The three most important outcomes of our project were:

(i) Capacity of the local stakeholders were raised and improved on roles of area enclosure intervention for conservation and restoration of *B. papyrifera*, its associate woody species and degraded habitat. Details on this as follows:

- Before introducing and establishing area enclosure into our *B. papyrifera* habitat, we provided awareness raising training for 20 representatives of local stakeholders (community, experts and NGOs leaders) on roles of area enclosure intervention for conservation and restoration of endangered *B .papyrifera* tree species and its degraded habitats, its establishment and management. This training was a platform for the representatives to share their skills, experiences and indigenous knowledge on area enclosure for conservation of *B. papyrifera* tree each other and with the project team members. This participatory training also improved the representatives' awareness and skills on roles of area enclosure for conservation and restoration of *B. papyrifera* and its degraded habitat. Following this training, jointly with the representatives, we established area enclosure (20 x 20 m) using barbed wire inside of *B. papyrifera* habitat. Soil

and water conservation structures (terraces, stone bunds) were also introduced into the established area enclosure to facilitate natural regeneration and seedlings growth of *B. papyrifera* and its associated woody species through improving soil growing conditions and reducing disturbances. During these activities, the representatives were trained on site selection for area enclosure and its establishment, and establishment of different conservation structures inside the area enclosure intervention.

- Our established area enclosure was properly managed for 7 months to study its roles on natural regeneration and seedlings growth of *B. papyrifera* and its associated woody species. During the course of this experiment, representatives of the local stakeholders were invited to observe the roles of the established area enclosure intervention for conservation and restoration of our target tree and its associated woody species. They were also participated during our data collection activities to learn procedures and skills about data collection. Furthermore, they were participated during our statistical data analysis using GenStat software. These activities then improved skills and knowledge of the representatives on data collection pertained to conservation and restoration and their analysis using statistical software.

(ii) The established area enclosure intervention improved natural regeneration and seedlings growth of the endangered *B. papyrifera* tree species, its associated woody species and degraded habitat. Details as follows:

- Our established area enclosure inside of *B. papyrifera* habitat was properly managed for 7 months to study its roles on natural regeneration and seedlings growth of *B. papyrifera* and its associated woody species. After 7 months, data related to natural regeneration and seedlings growth of *B. papyrifera* and other woody species (Table 1) were collected. These data were also collected from adjacent non-enclosure area for statistical comparisons. GenStat software was then used to analyse the data. Our results then revealed that number of newly regenerates of *B. papyrifera* tree and other associated woody species (e.g. *Acacia etbaica* and *Acacia asak)* higher than the adjacent non-enclosure area. On average, we counted 15 natural regenerates of *B. papyrifera* inside the area enclosure but only five in the adjacent non-enclosure area (Table 1). The higher regeneration rates found in the area enclosure was due to its important roles on reduction of animal and human disturbances on regenerations and seedlings growth.

- Furthermore, the average *B. papyrifera* seedling height and its average collar diameter in the area enclosure were 8.5 and 5.3 cm, respectively, which was far better than the adjacent non-enclosure that had an average height of 5.4 cm and average collar diameter of 2.5 cm. The other seedlings parameters like leaf number and branch numbers were also statistically higher in area enclosure than the adjacent non-enclosure area (Table 1). Besides, the area enclosure provided a higher seedling biomass (on average 58 g/seedling) compared to non-enclosure area (on average 33 g/seedling). In conclusion, based on these results, the area enclosure intervention would contribute for sustainable conservation and restoration of *B. papyrifera*, its associated woody species and degraded

habitat in northern Ethiopia.

Table 1. Natural regeneration and seedlings growth of *B. papyrifera* and its associated woody species under area enclosure and non-area enclosure conservation interventions in Abergele district, northern Ethiopia

Interventions	*B. papyrifera* regenerates	Other woody species regenerates	*B. papyrifera* Seedling height (cm)	*B. papyrifera* collar diameter (cm)	*B. papyrifea* leaves/seedling	*B. papyrifera* branches/ seedling	*B. papyrifea* biomass/ seedling (g)
Enclosure	15.1a	6.2a	8.5a	5.3a	9.4a	6.2a	58.17a
Non-enclosure	9.3b	2.2b	5.4b	2.5b	4.2b	3.4b	33.34b
LSD (5%)	0.33	0.31	0.57	0.50	0.39	0.23	0.43
CV (%)	2.3	3.9	4.4	6.8	3.1	2.6	0.5

(iii) Roles of the established area enclosure intervention for conservation and restoration of *B. papyrifera*, its associated woody species and degraded habitat were shared and disseminated through different media for raising awareness locally, nationally and globally. Details as follows:

a) Workshop

We prepared a workshop to share our project results (roles of our established area enclosure for conservation and restoration of *B. papyrifera*, its associated woody species and degraded habitat) for different relevant stakeholders, including local community, experts, researchers, students, local and national governmental officials and policy makers. In this workshop, over 40 stakeholders participated and shared their skills and experiences on roles of area enclosure for conservation and conservation of *B. papyrifera* and its degraded habitats. The workshop also improved awareness of the participants to consider area enclosure as an alternative intervention for conservation of different species under endangered conditions.

b) Conferences

To share results of the project with different national and international partners, we presented it at different conferences. For example, it was presented in the Rufford in-country conference, was held in Addis Ababa, Ethiopia in April 2019. In this conference, we shared our project results with more than 40 participants from Ethiopia, Kenya and Uganda. We also presented the results for researchers, experts and students of Universities of Aksum and Adigrat, Ethiopia. These conferences raised awareness of the participants on conservation and restoration of *B. papyrifera* and its degraded habitat through area enclosure intervention.

c) Different e-sources

In addition to workshop and conferences, the project results were successfully disseminated through different e-sources:

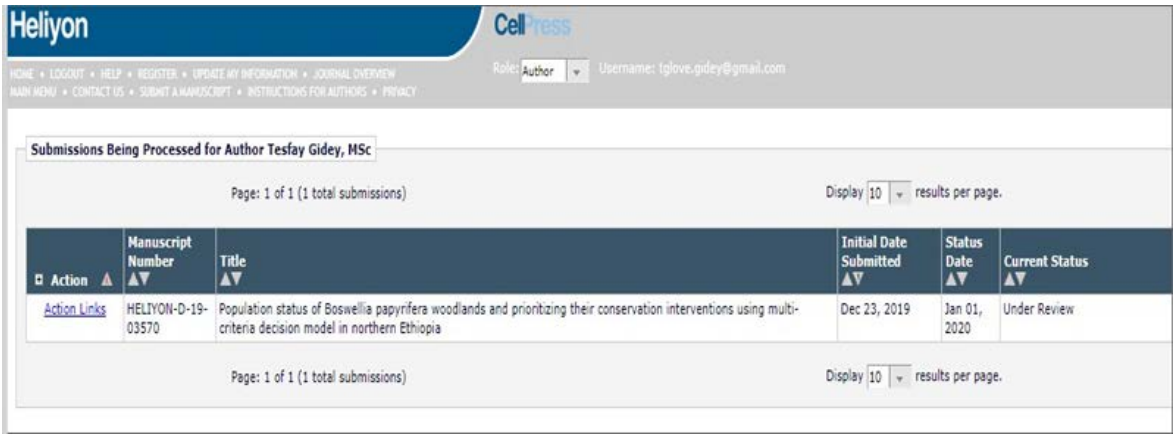
Facebook
https://www.facebook.com/tesfay.gideybezabeh
https://www.facebook.com/RCINKenya/?epa=SEARCH_BOX
https://www.facebook.com/groups/793719180726678/?epa=SEARCH_BOX
https://www.facebook.com/MEDfOR-244189478951956/

Research-Gate
https://www.researchgate.net/project/Prioritizing-the-Factors-Affecting-Conservation-of-the-Endangered-Boswellia-papyrifera-Tree-Species-And-Developing-Its-Community-Based-Solutions-in-Ethiopia
https://www.researchgate.net/project/Empowering-Community-to-Introduce-Area-Enclosure-for-Enhancing-Natural-Regeneration-of-the-Endangered-Boswellia-Papyrifera-and-its-Degraded-Habitat-in-Ethiopia

Websites
In my organization's (Adigrat University) website: -
http://www.adu.edu.et/
In MEDFOR Alumni website (consortium European Universities were I did my MSc):-
https://www.medfor.eu/news/environmental-project-funded-ruffor-uk-foundation

d) Publication

Combining our 1st and 2nd RSG results, we prepared (colleagues from Ethiopia and Europe) a manuscript for publication. The manuscript is now under review process in journal of Heliyon (Elsevier). When it will be officially released, we will share you.



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

Local stakeholders, including local community, experts and NGOs were involved in many activities of our project. For example, they were involved during capacity build training on roles of area enclosure for conservation and restoration of *B. papyrifera* and its degraded habitats. They were also trained on establishment of area enclosure, its management, soil and water conservation, data collection and data analysis. These participatory activities then improved awareness, knowledge and skills of the participants. In addition, we paid for some local community members who participated during our establishment of area enclosure, soil and

water conservation structures, area enclosure management and data collection. We also freely provided them t-shirts, hats and manuals.

5. Are there any plans to continue this work?

Yes, our established area enclosure improved natural regeneration and seedlings growth of the endangered *B. papyrifera*, its associated woody species and degraded habitat in northern Ethiopia. Then, based on our RSG project results, discussion with local stakeholders and observations, we have also learnt that in addition of area enclosure intervention, introduction of additional interventions for sustainable conservation and restoration of *B. papyrifera* and its degraded habitats are very important. Our next work will then focus on these, for example, providing continuous capacity building training for the local stakeholders on conservation of *B. papyrifera*. We will also focus on improving local community livelihoods through different farming activities like poultry, beekeeping and home gardening (a way of threat reduction on the target tree species and its habitats).

Furthermore, we will expand and introduce different habitat restoration techniques inside of *B. papyrifera* degraded habitats such as area enclosure, soil and water conservation structures and enrichment panting for facilitating its restoration process. We will also share and disseminate results of the project through workshops and media (printed and e-sources); and link the results with our local, national and international partners for their sustainable uses and management.

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

Results of the project were successfully shared for stakeholders through different capacity building training and education using different public awareness materials such as t-shirts, hats, banners, posters, manual and photos. Project results were also successfully shared with different local, national and international stakeholders through workshop and conferences (e.g. the Rufford in-country conference that was held in Ethiopia; Aksum and Adigrat Universities, Ethiopia). Besides, the results were disseminated through different e-sources such as websites, Facebook and ResearchGate (links are found in number 3 of this report above). A manuscript was also prepared and sent it to the journal of Heliyon (Elsevier) for publication.

Moreover, we will present the project results in a conference that will be held in Mekelle University in April 2020. We will have also plan to share results of the project locally, nationally and globally through workshops, conferences and e-sources.

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 approved on September 2018 and the budget was utilised starting from the October 2018 to November 2019. We expected to accomplish all activities of the project in 12 months but they were accomplished in 17 months due to: i) our area enclosure intervention was established 2 months later than its expected as representatives of the local community were busy with their crop farming activities; and ii) needed some more time than expected for disseminating results of the

project through different e-sources and preparing a manuscript for publication.

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
Meal costs for researchers	1260	1290	+30	Price of food items was increased
Accommodation costs for researchers	1260	1260		
Car rent cost	400	400		
Per diem for key informants from local community and stakeholders	1680	1680		
Equipment costs	190	140	-50	As size of our area enclosure was decreased, needed wire for it was also decreased
Costs for stationery materials	75	75		
Costs for public awareness materials	85	110	+25	Price of t-shirts and posters was increased
Costs for refreshment during training and workshops	50	50		
Total	**5000**	**5005**	**+5**	**The present exchange rate is, £1= 41 Ethiopian Birr**

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

Based on our RSG results, discussion with local stakeholders and observations, we will introduce different integrated conservation interventions (including area enclosure) jointly with local stakeholders for sustainable conservation and restoration of our endangered *B. papyrifera* tree species and its degraded habitats, such as:

Capacity building

We will provide continuous capacity building training for the local stakeholders on conservation and restoration of *B. papyrifera* and its degraded habitats. Through this intervention, we will increase numbers of local stakeholders (local community, local experts, NGOs and others) who get awareness on conservation and restoration of *B. papyrifera* and its degraded habitats.

Livelihoods improvement

In our study area, livelihoods of many local community members (especially poor women) depend on resin product of the endangered *B. papyrifera* tree species. This exacerbates its degradation and deforestation. To minimise these threats, we will then improve livelihoods of the local community through different alternative livelihood sources such as poultry, beekeeping and home gardening (these alternatives are prioritized based on the local community preferences during our discussion with them).

Habitat restoration

Our 2nd RSG project confirmed that area enclosure along with the soil and water conservation improves natural regeneration and seedlings growth of *B. papyrifera*, its associated woody species and degraded habitat. Hence, jointly with local stakeholders, we will expand these habitat restoration techniques inside of *B. papyrifera* habitats for facilitating its restoration process. In addition, will planting seedlings of the endangered tree as to facilitate its restoration process.

Disseminate project results

Roles of the above-mentioned interventions for conservation and restoration of *B. papyrifera* and its degraded habitat will be carefully analysed and interpreted. The results will then be shared through workshops for relevant local and national stakeholders. The results will also be disseminated through different media (printed and e-sources); and linked them with our local, national and international partners for their sustainable uses.

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, the logo of Rufford Foundation was used during our training, workshop and conferences. It was also used on the published materials like t-shirts, banners, hats, posters, manuals and Power Point presentations. Furthermore, the logo was used during disseminating our project results through websites, Facebook and ResearchGate. We also shortly described missions of the Rufford Foundation to people during our training, workshop and conference activities. All these activities then helped to increase publicity of the Rufford Foundation at local, national and global levels.

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

Mr. Abraham Reda - He helped me during establishment of area enclosure; train local stakeholders; establish soil and water conservation structures; prepare manual; and others

Mr. Gebremedhin Baheree - He assisted me during establishment of area enclosure; establish soil and water conservation structures; train local stakeholders; data collection; data analysis; prepare workshop; and prepare manuscript

Key informants (representatives) from local stakeholders - They help us during establishment of area enclosure; establish soil and water conservation structures; mobilize local community for training; integrate results of the project with their activities; and disseminate projects results with their networks.

12. Any other comments?

We kindly acknowledged The Rufford Foundation for its financial support for our 2nd RSG project. We also heartily acknowledged the foundation for its full fund for accommodation and travel during presenting our RSG project results in the Rufford in-country conference that was held in Addis Ababa, Ethiopia. During these activities, we developed good skills on communication, maturity and networking to work with multi-stakeholders (in country and abroad) on conservation of *B. papyrifera* and its degraded habitats. In addition, we thanked IDEA-WILD foundation, based in USA for its equipment support for our RSG projects. We also thanked to all local stakeholders who directly and indirectly helped us in accomplishing our 2nd RSG project activities. We then kindly request The Rufford Foundation for Booster Grant Award to continue our efforts on conservation and restoration of the endangered *B. papyrifera* tree species and its degraded habitats in Ethiopia.

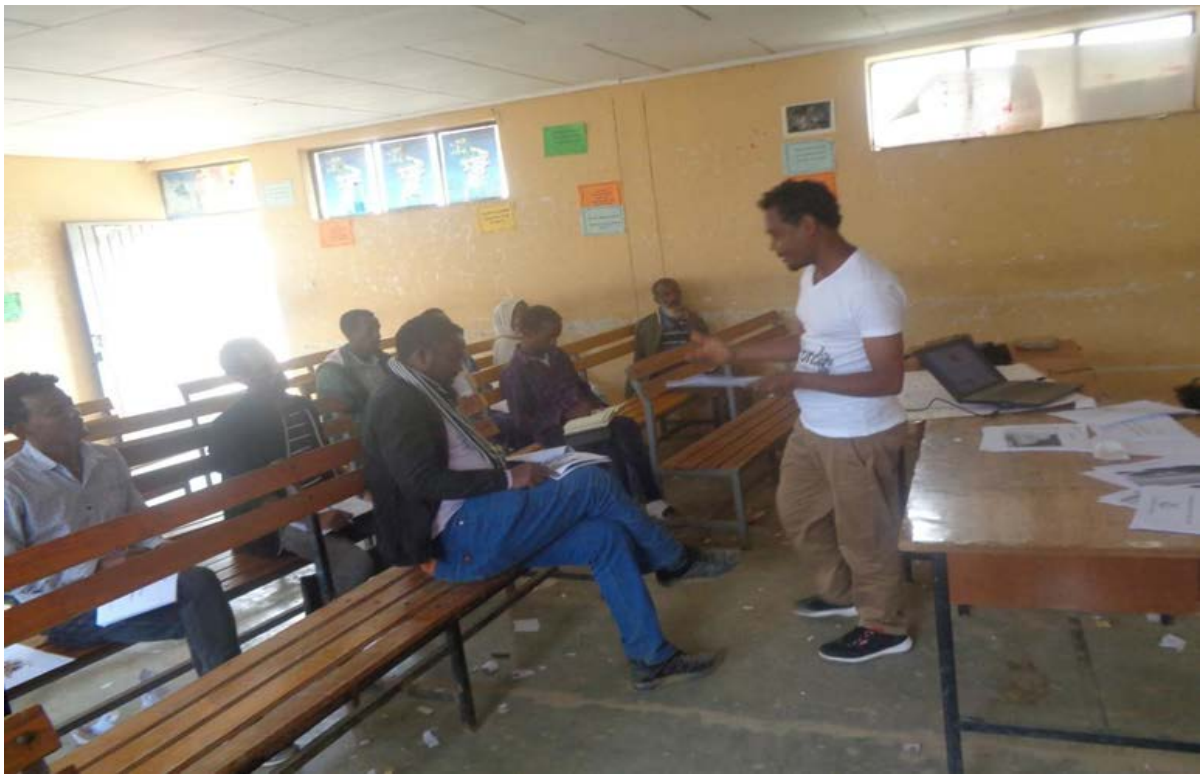
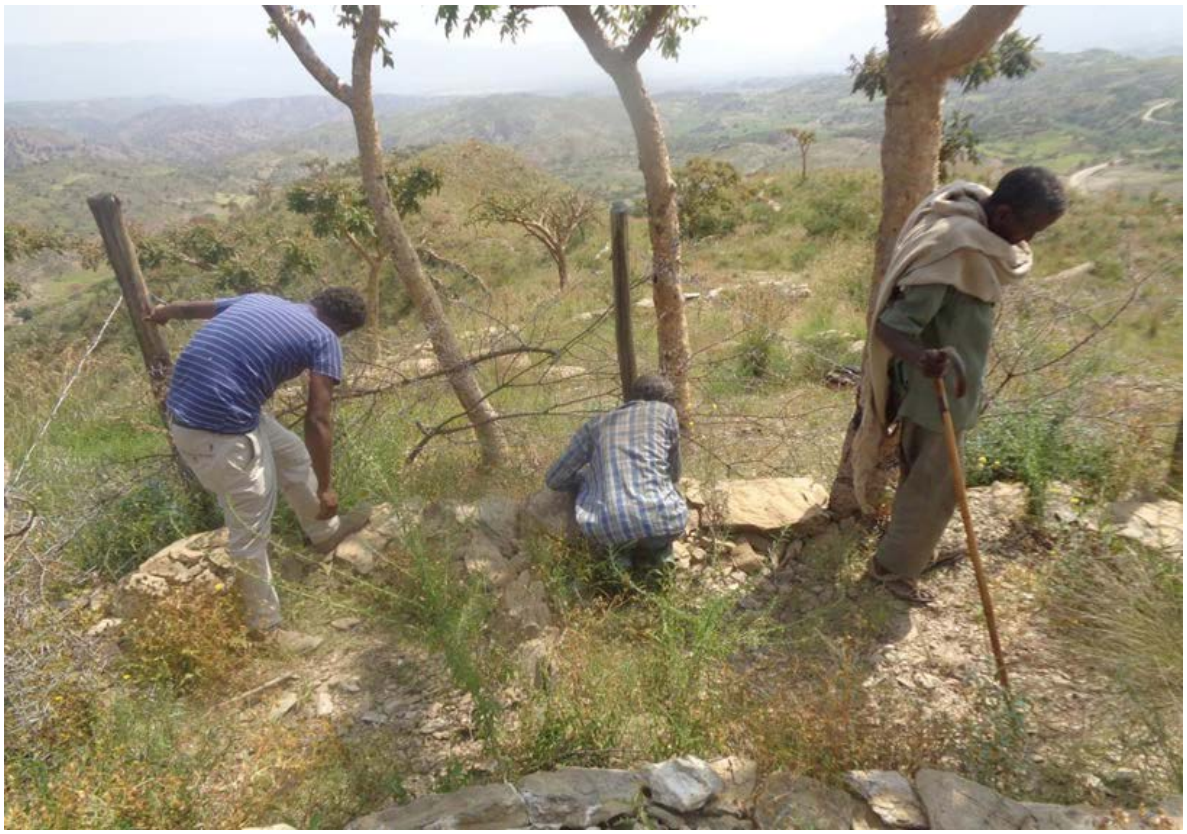


Figure 1. Before introducing area enclosure, capacity building training for local stakeholders on roles of area enclosure for conservation and restoration of the endangered *Boswellia papyrifera* and its degraded habitat

Figure 2. Jointly with local stakeholders, establishing area enclosure and conservation structures inside of *Boswellia papyrifera* degraded habitat in Abergele district, northern Ethiopia.



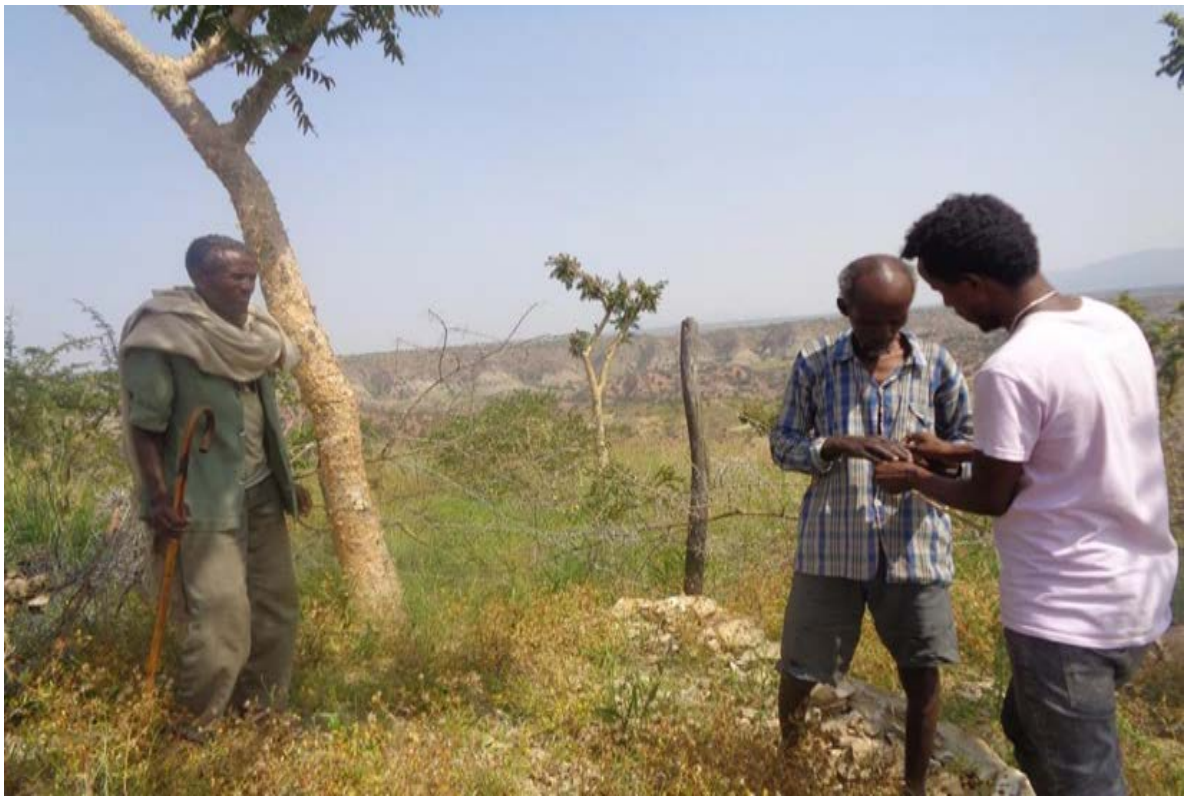
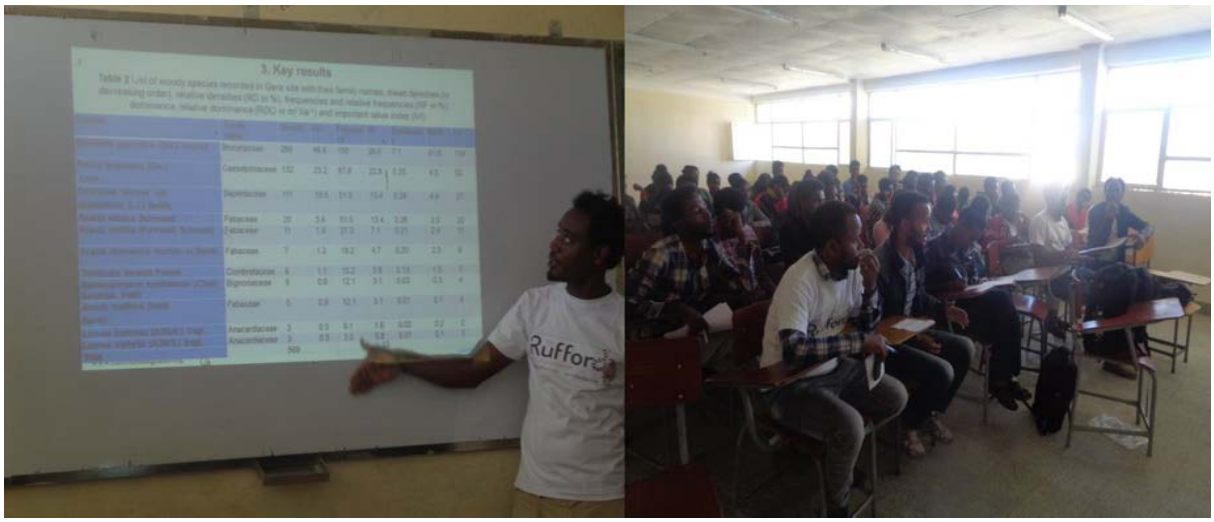


Figure 3. Practically train local stakeholders on roles of the established area enclosure for regeneration and seedlings growth of *Boswellia papyrifera*, and data collection jointly with local stakeholders.



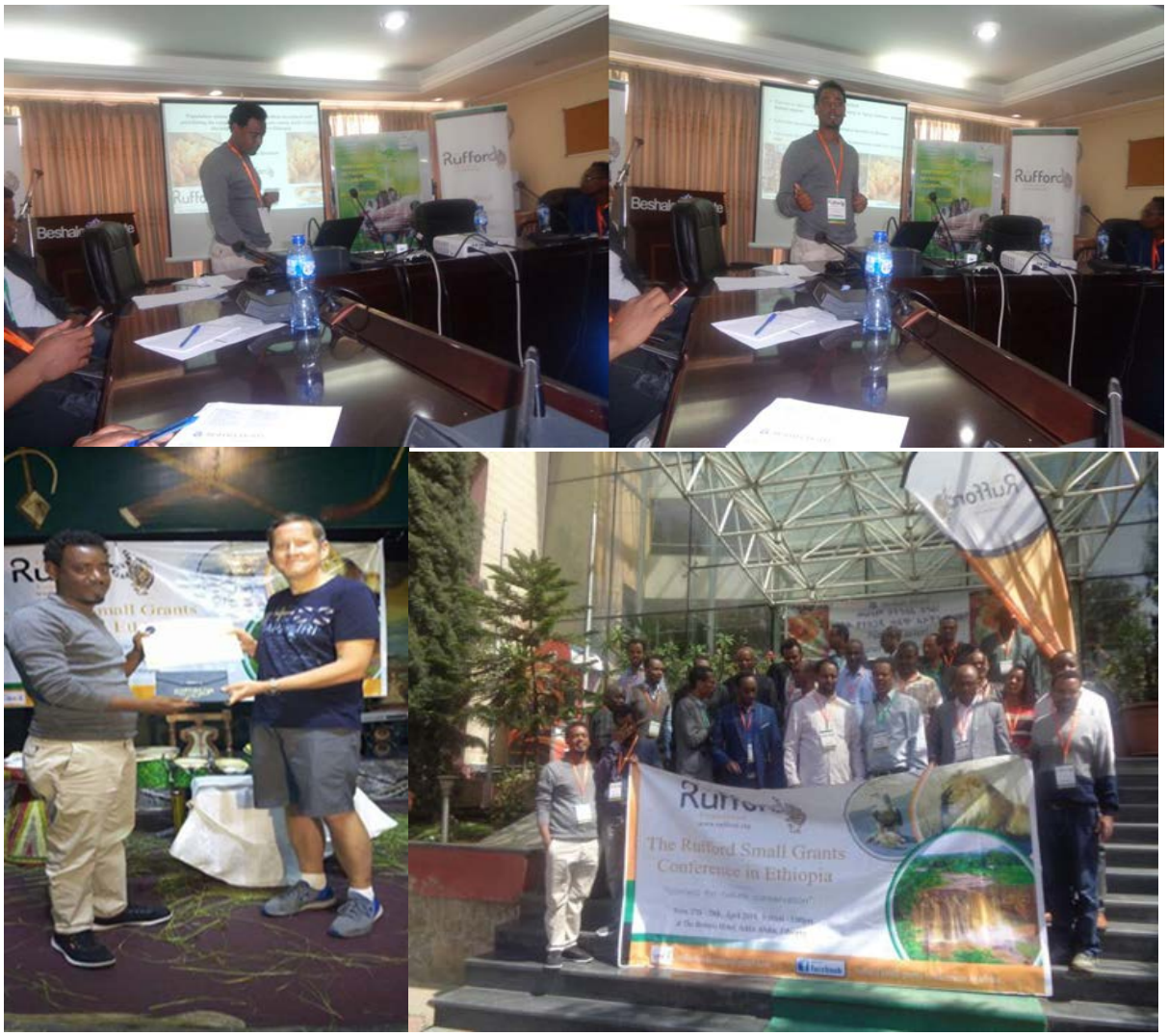


Figure 4. Our project results presentations during workshop and the Rufford in country conference