Final Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF 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 – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please DO NOT fill in and submit this form until the project has been completed.

Complete the form in English. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Ana Nicole Acosta Vasconez
Project Title	Mapping Galapagos invaders with drones and machine learning: An estimation of spread rates of invasive plants and identification of management keys for endemic
Application ID	42068-1
Date of this Report	19.09.2025

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
1) Update land cover map for rural areas and their surroundings in the Galapagos Islands.			x	During the processing of the satellite images, the fusion of the images was delayed due to a lack of thorough description of this step in the protocol. Once the correct method was found, the fusion was carried out. The results were submitted to a scientific journal and are expected to be published in the next months. With the drone flights we covered an area of approximately 13,8 km2. Due to high precipitation, a approximately 10% of the needed drone images could not be collected directly by me and had to be collected by a third party (please see budget report). Key findings will be published.
2) Estimation of the rate of spread of invasive plants between 2018 and 2023/2024			x	The results were submitted to a scientific journal and are expected to be published in the next months.
3) Mechanisms behind land cover changes will be discussed and plausible future pathways will be suggested.			x	Workshops were held with farmers and ways of controlling invasive plants in rural areas were discussed.

2. Describe the three most important outcomes of your project.

a) Land cover maps for the rural areas of Galapagos and its surroundings.

b) Estimation of the rate of spread of invasive plants between 2018 and 2023/2024.

c) Improved knowledge of farmers about the importance of invasive plant control for the conservation of native rural ecosystems, and their role in this task.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

I did not expect to have difficulties with the satellite images processing. The fusion of the images, which combines the geometry of the higher resolution bands with the spectral data of the lower resolution bands, took much longer than expected. Unfortunately, the protocol provided by Laso et al. (2020) did not describe this process in detail, and the first few attempts were unsuccessful. As a result, I spent three months experimenting with different tools in three different software programs to achieve the desired results. The problem was solved by implementing the fusion with ENVI image analysis software and verifying the results by estimating the Normalised Difference Vegetation Index (NDVI) for each of the islands.

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

As part of our project, we held workshops with farmers on both Santa Cruz and San Cristobal islands. Fourteen farmers participated in the workshop in San Cristobal, while twenty farmers participated in the workshop in Santa Cruz. During these workshops, farmers learned about the current state of ecosystems in rural areas, and in particular the threat that invasive plants pose to native ecosystems. We discussed their role in controlling invasive plants and ways to strengthen their capacity to do so. This exchange of ideas benefits farmers by recognising the importance of their work in controlling invasive plants. They also benefit from strengthening their network by finding common goals with other farmers in the region. Recommendations for future management of invasive plants in farms arose from discussions. For example, the controlled used use of *Psidium guajava* as shade in pastures, allowing enough distance between trees to let plenty light through the canopy arrive directly to pastures. This benefits pastures and reduces *P. guajava* abundance. Regarding *Cedrela odorata*, the recommendation for managing would be directed to the National Park Authorities. *C. odorata* is the main timber tree in Galapagos, but it is currently not allowed to harvest it in the protected areas, where it is expanding the most. This policy should be revised and mechanisms to avoid regrowth should be investigated. Farmers, on their side, use most of *C. odorata* they have in their farms and do not plant new trees, rather rely on natural regeneration.

5. Are there any plans to continue this work?

The outputs of this work will be an input to my future research projects on the topic. For example, I plan to work on a land use model to explore possible and optimal land use options that would reduce invasive plant areas while preserving the native vegetation in rural Galapagos.

6. How do you plan to share the results of your work with others?
Preliminary results of this research were presented at a conference in Krakow, Poland, in September 2024. A presentation of the final results was presented at the International Congress for Conservation Biology (ICCB) in June 2025. A peer-reviewed paper is expected to be published in the next months.

7. Looking ahead, what do you feel are the important next steps?
To continue my research on the topic I will finish developing the forementioned optimization model and will publish an article on the topic. Additionally, I plan to continue this research by working on the linkages between invasive plant dynamics, local livelihoods, and the food system in Galapagos. To do this I first need to write a new project proposal and apply for funds.

8. 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?
The Rufford Foundation Logo was used in the presentations and printed material during workshops and the visual material for the conferences in Poland and Australia.

9. Provide a full list of all the members of your team and their role in the project.
Supervisors from the University of Hamburg:
Prof. Uwe Schneider and Dr. Kerstin Jantke: supervised the project design and the data processing. Dr. Kerstin Jantke also supported me in the management of the project by supervising and advising on budget management and reporting.

Local collaborator (Charles Darwin Foundation):
Dr. Heinke Jäger: Oversaw the implementation of the project in the field and facilitated networking with local institutions such as the Ministry of Agriculture, and farmers. She supported the project management in the field, e.g. in obtaining research permits.

Field assistant: Supported the sampling by taking GPS control points and flying the drone, as this task requires an observer of the aircraft at all times. The field assistant was selected through an open call to Galapagos residents and Ecuadorians living on the mainland. Since no Galapagos residents applied for the volunteer position, a candidate from continental Ecuador was chosen.

Student assistant: Supported the satellite image processing.

10. Any other comments?
The confirmation of submission of my publication with the results of this project to the journal "Science of the Total Environment" is attached to this report.

ANNEX – Financial Report

[Intentionally removed]