Final Evaluation Report

Your Details	
Full Name	Estefania Andrea Rosero Aymara
Project Title	Identification of areas for reforestation with vegetable species of importance for the Andean bear in the province of Imbabura, Ecuador
Application ID	35410-1
Date of this Report	17-12-23

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
Determine the distribution of potential habitat of selected plant species, which serve as a source of food for the Andean bear in the province of Imbabura.			■	During the project, it was decided to change the species to carry out distribution modelling. The species that we chose are *Hyeronima scabrida* (motilón), *Ocotea caesariata* (yalte), *Ocotea Pachypoda* (aguacatillo grueso) and we also added one more that was *Saurauia bullosa* (moquillo); and the only one that was kept from the initial proposal was *Ficus cuatrecasasiana* (higuerón). The potential distribution modelling of each of these species was carried out.
Prioritize areas for reforestation with the selected plant species, applying multi-criteria models and including ecological variables and human dimensions.			■	After applying multiple criteria, areas with reforestation potential were prioritised with each of the species in the province of Imbabura.
Proposal of propagation of plant species of interest as a tool for forest nurseries in the Prefecture of Imbabura and the community.			■	Because in the province there are two well-established nurseries (in Cotacachi and Angochagua) that are managed by the Prefecture of Imbabura. As a complement, review work was done for the propagation of species, which is the line where there are the most gaps in information. For this, bibliographic information was collected, and interviews were conducted with key actors and a synthesis was prepared with all the information about the study plants.

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

a). Regarding the potential distribution areas in province of Imbabura for the plant species of interest to the Andean bear, they were for *F. cuatrecasana* (higuerón), 19,711.75 ha, *O. caesariata* (yalte) 19,129.58 ha, *H. scabrida* (motilón), 34,895.07 ha, *S. bullosa* (moquillo), 31,234.08 ha and *O. pachypoda* (aguacatillo) 48,224.93 ha.

The modeling showed that in the eastern mountain range of the province, there are areas of ideal habitat for the higuerón, yalte, moquillo, and motilón. In the western mountain range, the modeling showed the aguacatillo as the species with the most areas of ideal habitat.

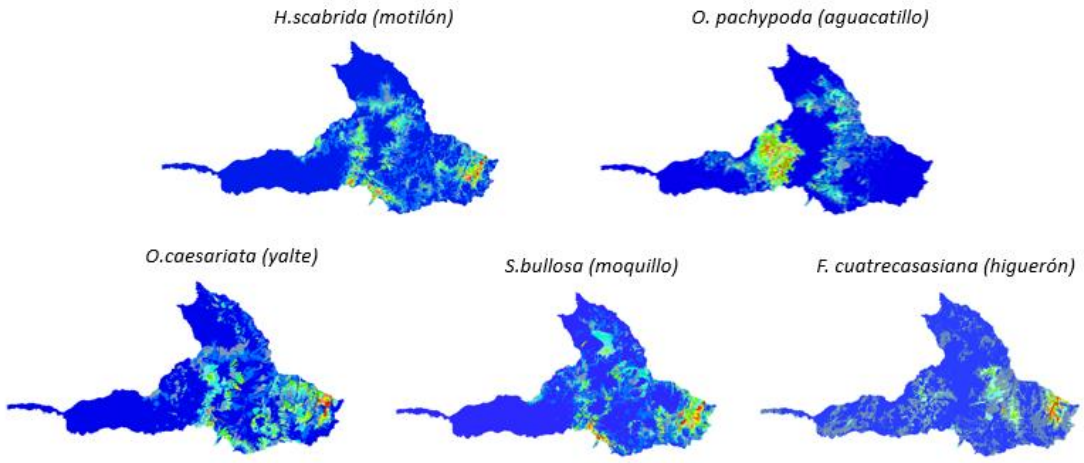

Figure 1. Maps of potencial distribution of each one species.

b). Areas with high reforestation potential were prioritised with the study plant species in the province of Imbabura. For higuerón 4,404.90 ha, it is a species that would be useful in reforestation to recover vegetation next to streams and rivers. For motilón 10,084.89 ha, it is a useful species for reforesting high areas, mainly areas that connect forests and shrub vegetation, buffer zones between forest and agricultural land and connection areas of forest patches. For moquillo 5,410.68 ha, it is a useful species for reforesting high areas, mainly areas that connect moorland and forest, areas that connect forest patches and areas that have suffered some type of degradation. For yalte 4,296.98 ha, it is a useful species for reforesting high areas such as mountain ranges and connection areas of forest patches. and aguacatillo 9,241.25 ha, useful for reforesting middle parts, mainly buffer zones between forest and agricultural land with forestry suitability and connection zones of forest patches. All of these areas would be important to generate resources such as shelter, food, home and mobility for the Andean bear in the province of Imbabura.

c) As for *F.cuatrecasana*, propagation by cuttings is recommended in a substrate composed of coconut fibre and gravel, neutral to slightly acidic pH and a temperature of 18 to 25°C. For *O. caesariata*, propagation by seeds is documented; the substrate must be composed especially of organic matter and other substrates that allow adequate humidity and porosity conditions and an ambient temperature of 10°C to 15°C. For *H. scabrida*, propagation can be carried out with naturally regenerative seedlings and also by seeds, developing adequately in sandy and humid soils and temperatures of 12°C to 16°C. For *S. bullosa*, propagation with naturally regenerating plants is a good option, developing adequately in loamy soils and temperatures of 11-14°C. Finally, for *O. pachypoda*, propagation can be done by seed, in loamy-clay soil and temperatures of 16-20°C.

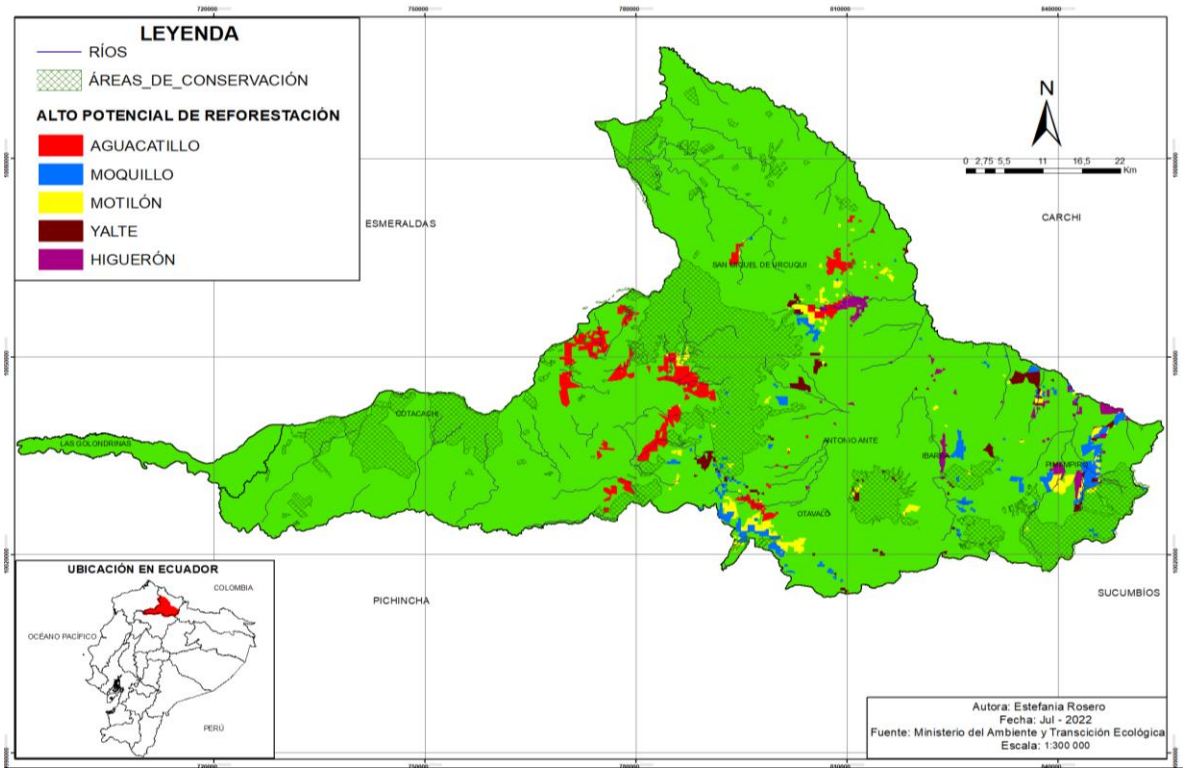

Figure 2. Map of areas with high reforestation potential in the province of Imbabura.

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

We had difficulties due to the pandemic and the mobility restriction, since the country spent a long time in confinement, for which the field trips were delayed. But after this we continue working on the fulfilment of all the proposed activities.

We had a limitation in the identification of species in the field, for which a technical identification was carried out in the laboratory, and it was decided to change some species. The species that we chose for the study are *Hyeronima scabrida* (motilón), *Ocotea caesariata* (yalte), *Ocotea Pachypoda* (aguacatillo grueso) and we also added one more that was *Saurauia bullosa* (moquillo); and the only one that was kept from the initial proposal was *Ficus cuatrecasasiana* (higuerón). It should be noted that all these species also are part of the diet of the Andean bear. They are also native species, there is availability of germplasm and finally they are multipurpose species, that is, add to its restorative effect other purposes such as wood, coal, fodder, nectar, etc.

We also had problems recording some species because the study area was very extensive, for which it was decided to take only the presence of species and not absences and I use the Maxent logarithm to model each potential distribution, because it is an algorithm that works very well with the presence of species.

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

The area of influence of the bear-human conflict in the province of Imbabura covers 20 parishes where its inhabitants have different perspectives on reforestation with native species, 296 surveys were carried out on residents of the area of influence of the bear-human conflict, 64 % of The residents surveyed would like to participate in reforestation initiatives for the community and 57% of those surveyed would like to include some of the study species on their land. Therefore, reforestation of private lands would benefit the community since inhabitants could apply for ecotourism projects or environmental incentives, generating an economic benefit. In addition, people would benefit from the environmental services of reforestation and the most important thing is that this project will be beneficial in the long term because the bear will have access to natural resources and attacks on livestock and crops will be mitigated.

5. Are there any plans to continue this work?

Definitely, in the future I would like to seek public and private cooperation from institutions to carry out research and tests in the laboratory and in the field to deepen and/or improve the reproduction or propagation of all the species under study and continue expanding knowledge so that these species vegetables can be taken into account in reforestation and afforestation at the provincial level and why not at the national level.

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

I plan to share them as a thesis and as scientific articles since this topic is part of my master's degree.

In addition, a first outreach has already been made to nursery technicians in the Prefecture of Imbabura and also to members of the affected communities, about the systematisation of information on the propagation and reproduction of the study species, this to encourage nurseries that take them into account in their processes and inform the members of the communities of the uses and benefits of the plants. There was also a final socialisation of the complete project with representatives of the Prefecture of Imbabura.

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

The next important steps would be to publish scientific reports of the research and seek the necessary cooperation to continue researching the propagation of these species that are so important for the Andean bear and other wildlife species.

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?

Yes, I used the logo in socialisations with the Prefecture of Imbabura and the community members affected by the conflict. I also plan to use it in the presentation of the defence of my master's thesis.

9. Provide a full list of all the members of your team and their role in the project.

Estefania Rosero: I was in charge of taking the data in the field, carrying out part of the geographic distribution modelling, in addition to generating the necessary inputs for the final prioritization of areas for reforestation.

Andrés Laguna: Expert advisor on the Andean bear and large mammals. He was a guide in the field for data collection, and also provided important existing data about the bear-human conflict.

Mónica Retamosa: Research tutor. She advised on this project on geospatial data and modelling.

Luis Diego Alfaro: In this research he advised on forest species.

Juan Yépez: Botanist who identified the species in the herbarium.

Salyn Vallejos: In charge of the spatial analysis part.

10. Any other comments?

The research was carried out in its entirety and the financial support provided by Rufford was essential for all activities to be carried out to achieve the final results.

Moquillo, bear food.

Surveys of people in the area of influence of the bear-human conflict.