

## Project Updates: June 2022

### Data Analysis

We finalised the analysis of our data, and we are working on a publication that will be soon submitted to a scientific journal. These results will also be presented in our final report to The Rufford Foundation.

### Dissemination of Results

We were invited to present our results at the Splendido Lecture Series on February 22, 2022, in Arizona, USA. The presentation was titled: "Working towards conserving nature in Paraguay."



In May 2022, we travelled to the field to have in-person meetings with the indigenous communities to present the results and give them printed reports. This was successful and they were happy to see the final product of the work conducted in their territories. They mentioned that they will use the data to keep their fight to recover their ancestral lands and highlight the importance of forests. The following photos show the presentation of the results to some of the indigenous leaders.



Our work was accepted for a poster presentation at the Ecological Society of America 2022 Conference in Canada that will be held in August 2022.



# Stakeholder's perspective on the importance of forest ecosystem services in Paraguay

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## Introduction

Ecosystem services (ES), the benefits humans receive from nature, are decreasing worldwide due to ecosystem degradation, overexploitation, and unsustainable management practices. Although concept/framing of ES gained much attention since 2005, there are still many challenges and barriers towards integrating ES into implementation plans.

One challenge centers on understanding the importance of ES for different stakeholder groups. Different stakeholders inevitably have different interests, and these can be particularly significant across cultural groups. Therefore, there is a need to expand our knowledge by decolonizing our methodologies to integrate local and traditional knowledge.

The objective of this study is to assess the importance of forest ES for multiple stakeholder groups in the Paraguayan Chaco region using multiple participatory research methodologies. This information can serve as a basis for negotiating land-use plans in multifunctional landscapes and providing insights that foster policy changes to promote participatory processes that conserve biodiversity and reduce land-use conflicts.



Figure 1. Paraguay ecosystem and location in South America



Photo 1. Paraguayan Parana

## Methods

### Researcher's Perspective

Indigenous Communities: Consent letters, UA Institutional Review Board (IRB), Form, prior and informed consent (PIIC)

Open-ended and Best-Worst Scaling method (BWS)

### Stakeholder Recruitment

Indigenous communities, ranchers, cattle farmers, and local and national decision makers.

Established rapport, Local institutions, community, ranchers, paragon, and snowball sampling

## Methods (cont.)

Table 1. List of forest ES and methods used for each stakeholder group

## Data Analysis

We used the count method to identify the most relevant ecosystem services for each stakeholder group (Peppard and Lusk, 2016). More specifically, we count the number of times each ecosystem service was listed as the first, second, third, fourth, and fifth mention for open-ended questions following the method used by Darvill and Lindo (2016).

For BWS questions, we counted the number of times that each respondent chose the same ecosystem service as the most important and subtracted the number of times that the same ecosystem service was listed as least important across all the questions (Peppard and Lusk, 2016).

Statistical Analysis: Chi-square tests of independence, Pearson's residual values, Contribution in percentage, Kruskal-Wallis tests, Dunn's test

## Results

The Failure of the Best-Worst Scaling (BWS) Method: Indigenous communities consider that all forest ES are of equal importance, the forest is perceived as a whole/integral system, therefore, it is difficult for them to rank services.

Most Important Forest ES: Food (24%) and wood (14%) were the most relevant forest ES considering all stakeholder groups. For almost all groups, provisioning is the most important service. Decision-makers listed regulating/supporting as the most important services (Table 2).



## Results (cont.)

Table 2. The most important forest ecosystem services within each stakeholder group as ranked on the size number of times mentioned (ranked 1st to 5th) in open-ended questions (n=10)

Table with 5 columns: Ecosystem service category, Stakeholder group, Rank 1, Rank 2, Rank 3, Rank 4, Rank 5, Total (n=10)

## Statistical Analysis Results

We conducted a chi-square test for independence, and we found that there is an association between the ecosystem services and stakeholder groups (χ² = 191.14, P=2.2e-16).



Figure 2. The number of mentions of each ecosystem service by the stakeholder groups

The Kruskal-Wallis test determined that there are significant differences in ecosystem services' importance across stakeholder groups (H=9.2337 (3), p = 0.02634). The Dunn's test indicated that there are significant differences between Indigenous community Breadwinners (p=0.0225), and cattle ranchers/residents (p=0.0296).

## Conclusions

- Ecosystem service's relevance changes depending on the interests of each stakeholder group.
Indigenous communities have a more holistic/integrated vision to value forests.
The higher ES number mentioned corresponds to residents who listed 14 provisioning, supporting, regulating, and cultural services.
Only the Indigenous communities listed honey, and only cattle ranchers listed climate protection and food for cattle, air quality maintenance, and fire protection.
Our results show the importance of considering all stakeholders in an ES approach to identify its benefits and synergies in land-use decisions.
This information can serve as a basis for negotiating land-use plans in multifunctional landscapes, as well as providing insights that foster policy changes to promote participatory processes that conserve biodiversity and reduce land-use conflicts.

## References

Wardell, J. (2017). The role of stakeholders in ecosystem services: A conceptual framework for understanding the role of stakeholders in ecosystem services.
Wardell, J., & Lusk, J. (2016). The role of stakeholders in ecosystem services: A conceptual framework for understanding the role of stakeholders in ecosystem services.
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## Acknowledgments

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Photo 1. Bahia Negra sign next to the Paraguay River



**Photo 2.** A main road in the Bahia Negra city



**Photo 3.** Paraguay River



**Photo 4.** Sunrise in the Pantanal Ecoregion



**Photo 5.** Smoke caused by human-induced fires that occurred in the region during our fieldwork



**Photo 6.** Learning how to do traditional handicrafts with palm leaves



**Photo 7.** A very talented Yshir artist in the project region. She reflects the Indigenous culture in her paintings.

**Photos of wildlife and plants:** Wildlife and plant species I could capture during fieldwork.





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