

Effective integration of drone technology for mapping and managing palm species in the Peruvian Amazon

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This manuscript has been previously reviewed at another journal. This document only contains information relating to versions considered at Nature Communications.

This file contains all reviewer reports in order by version, followed by all author rebuttals in order by version.

Version 1:

Reviewer comments:

Reviewer #1

(Remarks to the Author)

Many thanks for the revision. I find the updates to the ms. cover all of my points. One main suggestion L369 this recent paper maybe a useful citation to show lighting conditions has little affect on drone orth-image construction.

<https://www.tandfonline.com/doi/full/10.1080/01431161.2024.2377832>

(Remarks on code availability)

Reviewer #4

(Remarks to the Author)

In my opinion, the main work in the manuscript "Overcoming the research-implementation gap through drone-based mapping of economically important Amazonian palms" is about the UAV-based mapping and counting of different palm trees in the Amazonian forest. In addition, the authors gave detailed discussions about the costs comparison between UAV based method and traditional inventory based method, whereas the conclusion is quite clear and but few authors provide specific results. As for the topic "bridging the research-implementation gap", I think this is not a technical issue, and the authors has not provided innovative measures to achieve the goal.

Regarding the UAV based mapping and counting palm trees, the authors used a very traditional CNN based method (please check the following references) and didn't contribute a novel solution for this topic. In this regard, I don't think the manuscript is worth publishing in the Nature Communication journal and suggest the authors choosing a more suitable journals for publishing.

More references on the UAV based tree detection and counting:

- Explainable identification and mapping of trees using UAV RGB image and deep learning, Scientific Reports, 2021.
- Mauritia flexuosa palm trees airborne mapping with deep convolutional neural network, Scientific Reports, 2021.
- VrsNet - density map prediction network for individual tree detection and counting from UAV images, JAO, 2024.

(Remarks on code availability)

I think the results of the paper is reproducible.

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Response to the revisions for the manuscript NCOMMS-24-38609-T in green:

Reviewer #1:

Many thanks for the revision. I find the updates to the ms. cover all of my points.

Points	Remarks to the Author	Responses (<i>line numbers correspond to the document without markup</i>)
1	One main suggestion L369 this recent paper maybe a useful citation to show lighting conditions has little affect on drone ortho-image construction. https://www.tandfonline.com/doi/full/10.1080/01431161.2024.2377832	We thank the reviewer for this suggestion. We have included the suggested citation on line 300 to highlight the minimal impact of lighting conditions but the larger effect on windy conditions on drone ortho-image construction.

Reviewer #4:

In my opinion, the main work in the manuscript “Overcoming the research-implementation gap through drone-based mapping of economically important Amazonian palms” is about the UAV-based mapping and counting of different palm trees in the Amazonian forest. In addition, the authors gave detailed discussions about the costs comparison between UAV based method and traditional inventory based method, whereas the conclusion is quite clear and but few authors provide specific results.

Points	Remarks to the Author	Responses
1	As for the topic “bridging the research-implementation gap”, I think this is not a technical issue, and the authors has not provided innovative measures to achieve the goal.	The focus of our manuscript is to introduce a pipeline to map species abundances, and address the need of the National Authority of Protected Areas of Peru, to develop management plans for forest resources with local communities. This objective was successfully achieved, as demonstrated by the approval of management plans for the National Reserve Tambopata, which utilized our techniques, as referenced in the governmental resolution cited in the manuscript. We have revised the manuscript to emphasize this focus more clearly. Our goal is to demonstrate that this method has already been adopted by stakeholders, as we collaborated closely to address their specific needs. Unlike many models developed simply to be the "first ones" but never adopted, our approach has therefore been operationalized in real-world management. It is a scalable, cost-effective tool for monitoring species distribution across large and remote areas.

2	Regarding the UAV based mapping and counting palm trees, the authors used a very traditional CNN based method (please check the following references) and didn't contribute a novel solution for this topic. In this regard, I don't think the manuscript is worth publishing in the Nature Communication journal and suggest the authors choosing a more suitable journals for publishing. More references on the UAV based tree detection and counting: -Explainable identification and mapping of trees using UAV RGB image and deep learning, Scientific Reports, 2021. -Mauritia flexuosa palm trees airborne mapping with deep convolutional neural network, Scientific Reports, 2021. -VrsNet - density map prediction network for individual tree detection and counting from UAV images, JAO, 2024.	We thank the reviewer for this feedback. Regarding the perceived novelty of our work, we note that proposing a novel deep learning methodology is beyond the scope of this paper, since we instead focus on the novelty of developing a complete and deployable pipeline, focussing not only on the deep learning part, but the whole process through to successful deployment. There are several critical distinctions between the references provided and our research that highlight the novelty and impact of our research: (1) Our work encompasses a range of different forest types in more than one region of the Amazon, critically demonstrating the applicability of our approach in different sites, rather than their focus solely on a single forest; Onishi & Ise (2021) focused on a single habitat type with completely different floristic conditions (temperate forest while ours is tropical Amazon forest); Arce et al. (2021) worked in only one area with lower palm density, whereas our research spanned various forest types across multiple regions, showcasing the generalizability of our approach. (2) Our work specifically addresses the challenge of counting individual trees where crowns overlap while delineating the crowns, a feature that was explicitly required by our stakeholders since it is helpful to also calculate ecological parameters such as dominance. Arce et al. (2021) limited their research to one riparian zone where <i>M. flexuosa</i> is not at its highest density and actual ground data collection did not occur, which could mean that the model may have included similar species like <i>Mauritiella armata</i>, which is also present in the area, as training data, leading to potential misidentifications. (3) None of the references that are mentioned address the use of their approach in management practices in any capacity. Our approach explicitly incorporates a workflow that engages stakeholders throughout the process, from data collection to the implementation of our methods in management plans. We have revised the manuscript to highlight our unique contributions, and particularly the comprehensive process from data collection in the field to the successful implementation of our method in developing management plans.
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