Line-by-line answer for Reviewer’s Comment

Reviewer’s Comment

Reviewer 1

The title of this paper is： Establishing a Vegetation Spectrum Database through Hyperspectral LCTF Camera 2 Imaging: Development of a Novel Algorithm for LAI Estimation and Plant Species 3 Classification In this study, spectrometers were used in vegetation spectral measurement experiments and spectral data acquisition, but the measurement results of LAI were not verified, and the classification accuracy was not verified. Therefore, the research results were incomplete, and no practical conclusions were drawn. Validation of LAI estimation and classification accuracy should be supplemented. The structure of this manuscript is chaotic, and the methods are mixed in the results section.

Answer and comment.

**Comment:** [Establishing a Vegetation Spectrum Database through Hyperspectral LCTF Camera 2 Imaging: Development of a Novel Algorithm for LAI Estimation and Plant Species 3 Classification In this study, spectrometers were used in vegetation spectral measurement experiments and spectral data acquisition,…]

**Answer:** We fully agree with the reviewer’s comment. After correcting and reviewing the manuscript, we changed the title to “A Novel Algorithm for Classifying Vegetation and Non-Vegetation Using Red Edge Slope Coefficient with Hyperspectral LCTF Imaging”.

The new title indicates the focus of our research and methodology.

**Comment:** […but the measurement results of LAI and the classification accuracy were not verified. Therefore, the research results were incomplete, and no effective conclusions were drawn. Validation of LAI estimation and classification accuracy should be supplemented.]

**Answer:** We fully agreed with the reviewer’s comment and have included supplementary results “Validation of LAI estimation and classification accuracy” in a table.

You can see:

*Line 28-29: After correcting and reviewing the manuscript, we include the overall accuracy and Kappa coefficients of SVM, K-means algorithms, and a newly developed algorithm.*

*Line 171-183: The Method section now includes accuracy assessment and comparison methods.*

*Line 256-271: The Results section now includes accuracy assessment and comparison results, along with Table 2 titled 'Accuracy Assessment of Different Algorithms for Image Classification'..*

**Comment:** [The structure of this manuscript is chaotic, such as methods were mixed in the results section.]

**Answer:** We fully agree with the reviewer's comment, and we have reorganized the context of the Method and Results sections accordingly.

You can see: Lines 88- 301

Reviewer 2

Comments and Suggestions for Authors

**General comments:**

The authors should clearly state the purpose of the study. In one section it's "constructing a plant species spectral library", in another "development of machine learning models for plant species classification", in a third "determination of the leaf area index (LAI)".

From the section "2. Materials and Methods" it is not clear what materials and methods were used in the study. How many plant species were in the study? How many specimens of each species were there? How many times has hyperspectral imaging been conducted?

The authors state that many machine learning algorithms, including k-nearest neighbors (KNN), K-means, Support Vector Machine (SVM), and Artificial Neural Networks (ANN), have been tried to classify plant species. In doing so, they do not cite any results.

**Specific comments:**

Lines 17–34. The abstract does not provide insight into the study.

Lines 48, 57, 66. Literature reference is needed.

Line 85: “460 nm to 780 nm at 1 nm intervals.” Line 146: “460-780 nm range with a total of 65 channels at 5 nm”. Specify the hyperspectral camera model and its spectral resolution.

Line 88. What is “LCTF camera”?

Line 89. Was the study's purpose “plant species spectral library” or “machine learning models for plant species classification”? In any case, it is necessary to specify which plant species were involved in the study.

Lines 93–99. This paragraph should be moved to the introduction or deleted, and write how the instrument was calibrated in the study presented.

Line 101. This section should be moved to the introduction or deleted. It is unnecessary information.

Lines 127–131. This paragraph should be moved to the introduction or deleted. The general principle of operation of hyperspectral cameras is not needed.

Line 153–155. This paragraph should be moved to the introduction.

Line 163. An unsupported assertion.

Lines 164–179. These paragraphs should be moved to the Materials and Methods section.

Line 188. Figure 3c must be improved.

Line 193. “27 different plant species”. What species have been studied?

Line 196. Taxon names should be written in italics. The author of the taxon should be indicated.

Line 199. “The crux of this research was the determination of the leaf area index (LAI)”? The authors should clearly state the purpose of the study.

Lines 200–203. Where are the results?

Lines 215–216. It's been known for quite some time.

Line 254. Figure 5b must be improved.

...

Answer and comment.

**Comment:** [Authors should clearly state the purpose of the study. In one section it's "constructing a plant species spectral library", in another "development of machine learning models for plant species classification", in a third "determination of the leaf area index (LAI)".]

**Answer:** We fully agreed with the reviewer’s comment, and we have removed the statements regarding "constructing a plant species spectral library", in "development of machine learning models for plant species classification", in a third "determination of the leaf area index (LAI)," and clearly defined purpose of the study.

You can see: *Lines 80-83*

**Comment:** [From the section "2. Materials and Methods," it is unclear what materials and methods were used in the study. How many plant species were in the study? How many specimens of each species were there? How many times has hyperspectral imaging been conducted?]

**Answer:** We fully agreed with the reviewer’s comment and removed “Materials” from the section title. Hyperspectral imaging has been conducted in 6 sample sites, with each site measured 3 times [Line 92]. The study includes 14 plant species [*Line 211, 220, 337*]*.* All six sites include those 14 plant species.

**Comment:** [The authors state that many machine learning algorithms, including k-nearest neighbors (KNN), K-means, Support Vector Machine (SVM), and Artificial Neural Networks (ANN), have been tried to classify plant species. In doing so, they do not cite any results.]

**Answer:** We fully agree with the reviewer's comment, and the paper now includes a comparison of SVM and K-means classification results, along with their accuracy. We have included these results in both the tables and the accompanying contexts. And we remove ANN and KNN algorithms.

You can see: Lines 28-29, 171-182, 252-267

**Comment:** Lines 17–34. The abstract does not provide insight into the study.

**Answer:**  We have revised the abstract to include insights gained from the study.

**Comment:** Lines 48, 57, 66. Literature reference is needed.

**Answer:** We fully agree with the reviewer's comment and have added a literature reference. Additionally, we have removed the sentences from line 57.

You can see Line 47 and Line 62.

**Comment:** Line 85: “460 nm to 780 nm at 1 nm intervals.” Line 146: “460-780 nm range with a total of 65 channels at 5 nm”. Specify the hyperspectral camera model and its spectral resolution.

**Answer:** We agreed with the reviewer’s comment and added spectral resolution. Hokkaido University developed the LCTF camera used in this study; specific model versions and names have not yet been determined.

You can see: Line 83

**Comment:** Line 88. What is “LCTF camera”?

**Answer:** We have addressed the reviewer's comment by including the full name of the abbreviation for the LCTF camera.

You can see: Lines 27, 75 and 81

**Comment:** Line 89. Was the study's purpose “plant species spectral library” or “machine learning models for plant species classification”? In any case, it is necessary to specify which plant species were involved in the study.

**Answer:** We have addressed the reviewer's comment by removing the context regarding 'plant species spectral library' or 'machine learning models for plant species classification' and redefined the purpose of our study.

You can see: Lines 80-83

**Comment:** Lines 93–99. This paragraph should be moved to the introduction or deleted, and write how the instrument was calibrated in the study presented.

**Answer:** We agreed with the reviewer’s comment, which was deleted.

**Comment:** Line 101. This section should be moved to the introduction or deleted. It is unnecessary information.

**Answer:** We have agreed with the reviewer's comment, and these sections have been removed from the paper.

**Comment:** Lines 127–131. This paragraph should be moved to the introduction or deleted. The general principle of operation of hyperspectral cameras is not needed.

**Answer:** We have agreed with the reviewer’s comment, and this paragraph was deleted.

**Comment:** Line 153–155. This paragraph should be moved to the introduction.

**Answer:** We have agreed with the reviewer’s comment, and it moved to the introduction section.

You can see: Lines 66-68

**Comment:** Line 163. An unsupported assertion.

**Answer:** We have agreed with the reviewer's comment, and we have removed the assertion.

**Comment:** Lines 164–179. These paragraphs should be moved to the Materials and Methods section.

**Answer:** We agreed with the reviewer's comment and moved it to the Methods section, 2.2 Image Processing: New algorithms “slope coefficients on the red edge” for image classification.

You can see: Lines 140-153

**Comment:** Line 188. Figure 3c must be improved.

**Answer:** We agreed with the reviewer's comment and improved Figure 3c. In the revised manuscript version, we moved it to the Results section and numbered it 5c.

You can see Line 207; we adjusted the legend position where it overlapped with the curve.

**Comment:** Line 193. “27 different plant species”. What species have been studied?

**Answer:** We have addressed the reviewer's comment by correcting the number of plant species to 14 instead of 27 and conducting spectral analysis within the sample size for these species. Figure 5c displays the spectral reflectances of the 14 plant species.

**Comment:** Line 196. Taxon names should be in italics, and the author of the taxon should be indicated.

**Answer:** We agreed with the reviewer’s comment and corrected taxon names in italics.

You can see: Lines 212-217

**Comment:** Line 199. “The crux of this research was the determination of the leaf area index (LAI)”? The authors should clearly state the purpose of the study.

Answer: We have removed the mentioned sentence and rephrased the corresponding section to state the study's purpose clearly.

**Comment:** Lines 200–203. Where are the results?

**Answer:** We agreed with the reviewer’s comment, and different algorithm results were included.

You can see: Lines 260-274

**Comment:** Lines 215–216. It's been known for quite some time.

**Answer:** We agreed with the reviewer’s comment and rephrased sentences.

You can see: Lines 194-195

**Comment:** Line 254. Figure 5b must be improved.

**Answer:** We agreed with the reviewer's comment and revised the manuscript by removing images 5a and 5b, showing only the flowchart, and relocating it to the Method section.

You can see Line 127, Figure 3.