

## **Response to Reviewer comments (Manuscript No. EGUSPHERE-2024-3602)**

This is a revised manuscript of No. **EGUSPHERE-2024-3602\_R2**. The manuscript has been revised, and the responses to the comments have been addressed as below.

Dear Editor and Reviewers,

We are grateful to the Editor and reviewers again for taking the time to review our manuscript. We deeply appreciate the reviewer's valuable comments, suggestions, and questions to improve our manuscript. Please find below our itemized responses to these suggestive questions. We have revised our manuscript according to the Editor and reviewers suggestions and hope our responses will be satisfactory and the manuscript has been improved significantly. We hope the revised manuscript will fully meet publication standards in your journal after this minor revision.

### **Comments from the Editor and Reviewers:**

Dear authors, while reviewer 3 states that you have addressed some of the concerns in your response letter, he also raised the issue that they have not been integrated sufficiently into the manuscript. This concerns the lack of detail in the reporting of statistical methods and the reporting of statistical test results (at a minimum in the supplement).

As recommended, I therefore selected minor revisions. Please have a detailed look at the recommendations of reviewer 3, and implement ALL required changes.

Note that addressing these two issues adequately and demonstrating that you did so, is a prerequisite for me to be able to accept the publication.

**Response:** We sincerely appreciate the time and effort once again taken by the Editor and the esteemed Reviewer to evaluate our manuscript. Their insightful comments and constructive suggestions have greatly helped us enhance the quality of our work. In response to Reviewer 3's comments, we have provided a detailed point-by-point reply addressing each concern and suggestion. Specifically:

- We have added statistical method details in the Materials and Methods section.
- We have included a summary of the ANOVA results for all parameters used in this study and provided it as a supplementary file in the revised manuscript.

We hope the revised manuscript now fully meets the publication standards of your esteemed journal.

### Response to the comments of Reviewer # 3

Although I appreciate the authors' detailed responses and many of the improvements made to the introduction, figures, and conclusion, the manuscript still requires further revisions before it would be suitable for publication.

Specifically:

- The statistical methods section still lacks sufficient detail. Although the response to reviewers clarified aspects of the random forest and path analyses, this information was not fully integrated into the revised manuscript. Clear descriptions of model construction, variable importance metrics, and model evaluation criteria should be added to the Methods section.

**Response:** Thank you for your valuable feedback. We agree with your observation that the Methodology section lacked sufficient detail regarding the analysis and its parameters. We have now revised this section to provide a clearer and more comprehensive explanation. Your comments have greatly improved our manuscript, and we appreciate your time and effort in reviewing our work. For your convenience, we have also included the key revisions below for your reference.

“Shapiro–Wilk ( $p > 0.05$ ) and Levene's tests ( $p > 0.05$ ) (Razali and Wah, 2011) were used to evaluate the normality and homogeneity of variances using SPSS 25 (IBM Corp., Chicago, USA). Origin 2021 software was used to evaluate each index. One-way analysis of variance (ANOVA) was conducted to determine statistical significance at  $p < 0.05$ , followed by Tukey's test to assess treatment significance. Pearson's correlations among root characteristics, SOM, soil aggregate parameters, and soil cohesive force were assessed using Origin software (OriginLab Corp.). The random forest (RF) model was constructed using the R software Random Forest package (v4.3.1) (Team, 2017), with hyperparameters, including ntree, mtry, importance, proximity, etc., to optimize through grid search and 5-fold cross-validation. The Gini index assessed variable importance, and model performance was evaluated using MSE and  $R^2$  on a 30% validation dataset. The partial least squares-path models (PLS-PM) were performed in R software (v4.3.1) using the "plsmpm" package to elucidate the bootstrapping (5,000 iterations) determined significance of path coefficients ( $*p* < 0.05$ , 95% CIs). The  $R^2$  and bootstrapped p-values validated model adequacy through which plant root characteristics, SOM, and soil cohesive forces influence soil aggregate stability. Figures were created using Origin 2021 (OriginLab Corp.).”

- The manuscript still does not report basic statistical test results (e.g., F-statistics, t.ratio) for the ANOVA and post-hoc comparisons. Reporting only p-values and letter groupings in figures is not sufficient for transparent results reporting. These test statistics should be either incorporated into the text or presented in a comprehensive summary table.

Overall, the changes made so far have improved the manuscript, particularly in the framing of the introduction, methods clarification, and practical implications. However, transparent and complete reporting of statistical methods and results remains a critical outstanding issue.

**Response:** Thank you very much for your suggestion. We have prepared a detailed summary table of the ANOVA results for all parameters used in this study, including essential statistical details such as degrees of freedom (df), F-statistic, and p-values etc.

We hope this revised response meets your expectations and fully complies with the journal's publication standards. For your convenience, we have included this information as supplementary data in the revised manuscript. Please have a look at the supplementary file.