Reviewer Report for: *Spatial Heterogeneity of Soil Properties in Planted Mixed Forests in the Rocky Desertification Areas of the Wuling Mountain*

1. Basic Reporting:

- **Clarity of language**: The manuscript is generally well-written, but there are instances where the English could be improved to ensure clarity. Certain sentences are unnecessarily complex and could be streamlined. Examples include:

  - Sentence in line 38: "The karst region desertification has appeared in the ecological environment has been infringed upon and led to the fragility of the ecosystem" – this is somewhat convoluted.

  - The phrase "appeared in the ecological environment" could be rephrased for clarity.

- **Introduction and Background**: The introduction provides a good overview of the issue of rocky desertification and its ecological impacts, particularly in the Wuling Mountain area. The references used are relevant, but the manuscript could benefit from a more detailed explanation of why the specific depths (0-15cm, 15-30cm, 30-50cm) were chosen for soil sampling. This would help contextualize the study better.

- **Figures and Tables**: The figures and tables are well-labeled and relevant to the study, but some require clearer descriptions. For example:

  - Figure 2 (Semivariance function model diagram) is difficult to interpret without better explanation.

  - The legends in the tables should include more detail about the metrics being presented, especially for readers unfamiliar with certain soil property terms.

- **Literature references**: The manuscript is well-referenced with relevant sources, though it would benefit from more recent studies (most references are from early 2000s or before). Including more recent work on soil heterogeneity or karst ecosystems would strengthen the literature review.

2. Experimental Design:

- **Research scope and relevance**: The study falls within the scope of *PeerJ* and addresses an important issue related to soil heterogeneity in rocky desertification areas. The research question is clearly defined and fills a knowledge gap, especially concerning soil spatial variability in mixed planted forests. The research could provide useful insights into ecosystem management.

- **Methods**: The methods are generally well-detailed and appropriate for the study, though some aspects could use additional clarification:

  - The process of sampling and data collection is explained, but the reasoning behind the specific spatial intervals (21.91 m to 87.59 m) used in the geostatistical analysis could be better justified.

  - The authors should expand on how they handled potential sampling biases (e.g., edge effects, site disturbances).

  - More information on why kriging interpolation was chosen over other spatial interpolation methods would enhance the methodological transparency.

3. Validity of the Findings:

- **Data availability and analysis**: The data presented is robust and generally supports the conclusions. The use of correlation, ANOVA, and principal component analysis is appropriate, though the interpretation of some statistical results could be improved. For instance:

  - The high variance contribution (95.557%) in the principal component analysis suggests that most of the variability in soil properties is explained by the components, but the implications of this high value could be discussed in greater detail.

  - The relationship between total nitrogen and soil organic matter (correlation coefficient of 0.947) is discussed, but the ecological implications of this relationship are not fully explored.

- **Conclusions**: The conclusions are consistent with the findings and address the original research question. However, the manuscript would benefit from a more explicit link

between the results and practical applications for land management in rocky desertification areas. The authors should also discuss the potential limitations of the study more thoroughly, such as the limited sampling time frame or potential seasonal variations.

4. General Comments:

- **Strengths**: The manuscript offers a comprehensive study of soil heterogeneity in a key ecological region, using a variety of statistical and geostatistical methods. The findings regarding the relationship between soil organic matter and nitrogen, as well as the spatial variability of other key soil properties, are particularly valuable for land management and conservation efforts in rocky desertification areas.

- **Weaknesses**: While the study is strong overall, it suffers from a lack of depth in discussing the broader ecological implications of the findings. Furthermore, the writing could be improved to make the manuscript more accessible to a broader audience, especially those who may not be familiar with specific soil science terms or geostatistical methods. Finally, the manuscript could benefit from more recent references to strengthen the literature review.

5. Confidential Notes to the Editor:

- The manuscript is a valuable contribution to the field but would benefit from revisions to improve clarity and expand upon the broader implications of the results. Specifically, more detailed discussions on the choice of sampling methods, the handling of biases, and the application of findings to soil management in desertification areas are recommended.

In summary, this study provides solid data on the spatial heterogeneity of soil properties in mixed planted forests, and with some revisions, it could offer significant insights into managing karst ecosystems affected by desertification.