Our Replies to the Reviewers' Comments

and the Revisions Made to the Manuscript

Comments by Reviewer #1:

1. L. 17: Please check: "in AN abandoned coal mine" or "in abandoned coal mines"

Reply: Thank you for the comment. We carefully revised the sentence structure and the type of word choice in our revised manuscript.

Revision:

Page 2, Line 17-19

Understanding the effects of ecological restoration in abandoned coal mines on soil and plant is important to improve the knowledge of ecosystems evolution and facilitate taking appropriate ecological restoration management practices

2. l. 20 What do you mean by "coupling relationship"? This is redundant.

Reply: Thank you for the suggestion. "Coupling relationship" means the interaction between two or more systems or components, the phrase appears together in many literature, so this is not redundant.

3. l. 23 What do you mean by "in the history of southern China"? Please be precise.

Reply: Thank you for the correction. We carefully revised the description of "in the history of southern China".

Revision:

Page 2, Line 21-23

The plant diversity and soil properties were investigated in four sites of different ecological restoration patterns in Fengcheng county, a typical coal-rich area in the history of coal mining in southern China

4. l. 24 It is common to first write out the complete term and then introduce the abbreviation in brackets afterwards .

Reply: Thank you for the comment. In the revised manuscript, the complete term is write first, and then introduce the abbreviation in brackets afterwards.

Revision:

Page 2, Line 23-30

The results indicated that: 1) the *Pinus massoniana* and *Schima superba gardn* restoration (PSR) site had higher Shannon-Wiener index and Simpson index values than *Pinus massoniana* restoration (PR) site, and in herb layer, the plant diversity was significantly higher than other layers; 2) in the PSR site, the soil properties were improved more notably than that of PR and nature restoration (NR) sites, and the plant diversity were also better than PR site; 3) Clay, soil organic matter (SOM), and microbial biomass carbon (MBC) made a great contribution to the plant diversity.

5. l. 24 Do you mean Schima superba gardn. & champ.? Please be precise.

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 2, Line 23-30

The results indicated that: 1) the *Pinus massoniana* and *Schima superba gardn. & champ* restoration (PSR) site had higher Shannon-Wiener index and Simpson index values than *Pinus massoniana* restoration (PR) site, and in herb layer, the plant diversity was significantly higher than other layers; 2) in the PSR site, the soil properties were improved more notably than that of PR and nature restoration (NR) sites, and the plant diversity were also better than PR site; 3) Clay, soil organic matter (SOM), and microbial biomass carbon (MBC) made a great contribution to the plant diversity.

6. l. 26/27 The plant diversity was higher than other layers or was it higher than in other layers?

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 2, Line 26-27

The plant diversity was higher than other layers.

7. l. 29 What do you mean by "plant diversity were (sic) better..."?

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 2, Line 29

Plant diversity were also better than PR site.

8. l. 39/40 What do you mean by "the exploited of coal accounts for one-third..."?

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 3, Line 39-40

Coal is one of the three primary energy resource in the world, and the exploited of coal accounts for one-third of the world's energy consumption.

9. l. 40 Goa et al., 2021 is not a valid reference here.

Reply: Thank you for the correction. We deleted the valid reference.

10. l. 41 "China is the largest country..."? - Do you mean "China is the largest producer of coal?

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 3, Line 41-43

China is the largest produce of coal, and coal is also the mainly energy resource in the nation's energy supply, such as power fuel and to generate electricity, and its dominance will continue for a long time

11. l. 43/44 These references investigate restoration after coal mining - they do not study resources and China's role.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

12. l. 45/46 Again, the references do not fit here. For instance, the paper of Babi Alenar et al (2019) "investigates and selects landscape ecology techniques that can be used by planners to assess the effects in terms of changes in habitat loss, fragmentation and ecological connectivity due to expected land use changes." - there is no investigation of the effects of coal mining.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

13. l. 51/52 Ahirwal and Maiti (2018) investigated the effects of revegetation.

Reply: Thank you for the correction. We were deleted the valid reference and cited other relevant literature.

14. l. 53 Xie et al. (2023) do not investigate economic development and/or dependencies of coal mining, but the effect of coal mining on soil microorganisms.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

15. l. 55 Wang et al. (2022) themselves give another source for this information and are not a valid reference here.

Reply: Thank you for the correction. We deleted the valid reference.

16. l. 57 Same here, please reference the original sources.

Reply: Thank you for the correction. We have referenced the original sources.

17. l. 59 "...is a main measure to maintain the stability of the ecosystem"? How should it be possible to maintain something that was destroyed by coal mining?

Reply: Thank you for the correction. Phytoremediation can restore plant diversity and ecosystem services in mining areas.

l. 61 If this point has been highly valued by many researchers, name more than one study. Moreover, the study of Ismaeel and Ali (2020) deals with eco-rehabilitation plans for cultural heritage buildings and has no connection to mining areas.

Reply: Thank you for the correction. We deleted the valid reference and increased cite other relevant literature.

l. 70 Neither the work of Kaiser-Bunbury et al. (2017) nor of Lu et al. (2022) is related to coal mining areas.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

18. l. 72 Pathak et al. (2020) name specific sources for this claim and Sun et al. (2021) do not investigate aesthetic value or social economic benefits.

Reply: Thank you for the correction. We were deleted the valid reference and cited other relevant literature.

19. l. 73 Which property?

Reply: Thank you for the correction. We have precise revised.

Revision:

Page 4, Line 73

Re-vegetation can improve the soil structure and physicochemical properties.

20. l. 78-80 Same here: give basic publications in this context. The given examples are highly specific and not useful in this general statements.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

21. l. 83 Soil nitrogen and phosphorus limit the growth of vegetation?

Reply: Thank you for the correction. We deleted the unreasonable statement.

Revision:

Page 4, Line 83-84

Soil organic matter (SOM) is significantly correlated with available nitrogen (AN) and available phosphorus (AP).

22. l. 88 Why do you give a reference here that deals with imaging spectroscopy and not with the underlying science of the soil-plant-connection?

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

23. l. 89/90 The given references do not fit here.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

24. l. 95 You should give a basic reference for each index here.

Reply: Thank you for the correction. We gave a basic reference for each index.

25. l. 129 Pietrzykowski (2014) works with Pinus silvestris and none of the named species. The respective species are even not named in his publication.

Reply: Thank you for the correction. We were deleted the valid reference and cited other relevant literature.

26. l. 132 What do you mean by "same vegetation restoration year"? Please be precise.

Reply: Thank you for the correction. “Same vegetation restoration year”means all the vegetation was planted at the same time and was similar in size.

27. l. 139 "ground vegetation inv"?

Reply: Thank you for the correction. We corrected the word.

Revision:

Page 7, Line 138-139

We made ground vegetation investigation to collect data on plant diversity in June 2022.

28. l. 140-143 This description needs to be more precise.

Reply: Thank you for the correction.We corrected the sentence precisely.

Revision:

Page 7, Line 139-142

We made ground vegetation investigation to collect data on plant diversity in June 2022. The investigation sites were depended on the plant community size, five 10 m × 10 m quadrat were selected in each vegetation ecological restoration site as arbor layer, recorded the species name, quantities of trees, height, the branch diameter and coverage. Two 5 m × 5 m quadrat were mechanically arranged as shrub layer squares in each arbor quadrat, and one 1 m × 1 m herb layer quadrat was set in the center of each shrub quadrat. And heights, the number of shrubs. In the herb layer, species name, average coverage and average height of each specie were recorded in shrub layer and herb layer.

29. l. 153 What do you mean by "quartet method"? Please explain.

Reply: Thank you for the correction. “Quartet method” means mix the soil sample evenly into a square, divide the diagonal into four parts, remain the diagonal two parts, and remove the remaining two parts.

30. l. 155 What kind of sieve? Which physical and chemical properties? How? Table 1 You have ten years of restoration for any treatment, but more than 20 years in the so-called control. How do you deal with this?

Reply: Thank you for the correction. We have modified it, and Table 1 more than 20 years in the so-called control meant surrounding undisturbed natural forest soil.

Revision:

Page 7, Line 153-155

After air-drying, the collected soil samples were crushed, and passed through a 0.25 mm sieve. Finally, the physical (SBD, SWC, pH, Ks) and chemical (SOM, AP, AN, AK) properties of soil were determined.

31. l. 161 Zhang et al. (2011) is not the original source.

Reply: Thank you for the correction. We deleted the valid reference and cited the original source.

32. l. 192 Dong et al. (2018) is not a valid reference for this method - the authors did not even apply chloroform fumigation.

Reply: Thank you for the correction. We deleted the valid reference and cited other relevant literature.

33. l. 197 This should be "Pearson's..."

Reply: Thank you for the correction.We corrected the word.