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Interactive comment on “The combined effects of nitrification inhibitor and biochar incorporation on yield-scaled N₂O emissions from an intensively managed vegetable field in southeastern China” by B. Li et al.

Anonymous Referee #3

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The paper tries to assess the combined effects of nitrification and biochar application on vegetable yield and N₂O. This is a two-year field experiment, with useful information collected. It is well within the scope of Biogeoscience. However, the manuscript suffers from some major and minor problems.

1. This experiment set up six treatments to study the effects of NI and biochar on vegetable and N₂O emission, including CF-C0, CF-C1, CF-C2 and CP-C0, CP-C1, CP-C2. But two types of chemical N fertilizer species, compound fertilizer and urea, are also included. How the authors can assure N species exert no difference on N₂O

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emission and vegetable yield? Replacing the compound fertilizer with urea can make the results more persuasive. Two rates of biochar are included in the experiment, but few words are used to analyze the biochar application amount induced impacts on yield or N₂O.

2. Many previous studies focus on only single factor of biochar and NI. These author studied the combined effect of both. The rationale to study the combined effect has to be explored. Say, in some previous studies, biochar improves the soil pH, while NI can result in more NH₄⁺ in soil. These two soil amendments applied together may promote NH₃ volatilization significantly?

3. Many results confused me in the paper. Line 18-19 in the abstract “Vegetable yield was enhanced by 7.1–49.5% compared with the treatments without biochar amendment”. This result is not consistent with that in Table 3. Table 3 tells us in CP treatment, applying biochar at the rate of 40t/ha reduced yield, compared to CP-C₀. Page 15196, line 3“Both CP application and biochar amendment significantly decreased the yield-scaled N₂O emissions during the entire experimental period” according to data in Table 3, compared to CP-C₀, CP-C₁ and CP-C₂ could not decrease the yield-scaled N₂O emission significantly, how can such conclusion be got?

4. “1217.3 kg N ha⁻¹ yr⁻¹ across the experimental period” . The experiment lasted about two years. Is 1217.3 kg N applied every year or total two years’ period?

5. The paper wants to explore the coupled effects of biochar and NI on yield and N₂O emission, but most results and discussions concerned the single impacts of NI or biochar application. Only several lines in the fourth paragraph of section 4.3 discussed the coupled effects of biochar and NI. Authors should pay emphasis on exploring this combined impact rather than analyzing their single effect lengthily. There are some interesting results, say, as compared to CP-C₀, CP-C₁ increased total yield of vegetable, while further improving the biochar application rate to 40t/ha (CP-C₂), the yield was decreased. But in the three CF treatments, while increasing the biochar applica-

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tion amount from 0 to 40t/ha, the yield is enhanced from 311 to 446 t/ha. Authors said no words about the phenomenon.

6. Inconsistent with most early studies, biochar addition significantly decreased soil pH in this study. Authors thought weathering process of biochar resulted in this effect. You said biochar may be weathered more easily in vegetable soils. Powerful data or published papers should be provided to support this opinion. I think although weathering process of biochar can lower the soil pH, a significant level is hard to achieve. Can you provide the values of soil pH after each seasonal vegetable is harvested. The changes of pH during the seven seasons may provide hints to explain this phenomenon.

7. “biochar amendment significantly increased SOC and TN” . Please calculate how much SOC and TN was increased in the whole soil horizon, and please consider where did these increased carbon and nitrogen stem from.

The following are some minor problems:

1. Effects of The first and second sentences of Abstract overlap. The first sentence should state the purpose of the study.
2. The NI used in this study is chlorinated pyridine, or 6-chloro-2-trichlormethylpyridine, or “chlorinated pyridine, a mixture of urea and nitrapyrin” (Table 1)? Please be consistent. Likely nitraprin is used more common.
3. Page 15187, line 4, global N₂O emission.
4. Page 15187, line 24-28, redundant
5. Unit of Equation 2 is incorrect.
6. Page 15197, line 5-10, The effects of CP on yield is an important conclusion in this paper, more persuasive reasons should be explored. The available N in soil is not likely a limiting factor for yield.
7. Page 15201, line 13-15, you need reference or data to support your opinion.

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8. Language needs improvement greatly.

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