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Interactive comment on "Effects of two contrasting biochars on gaseous nitrogen emissions and intensity in intensive vegetable soils across mainland China" *by* Changhua Fan et al.

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Thank you very much for your critical comments and great support! We have already answered all the comments you suggested , and we hope this revised manuscript can fit with the acceptable standard for Biogeosciences. Please see the attached point-by-point answers with the marked-up manuscript version for your further evaluation. The corrections for the previous two referees' comments are also included and combined in the attached file). Sincerely yours, Zhengqin (on behalf of all authors)

Reviewer #3 (Remarks to the Author):

This article is well structured, well written and it seems that the experiment was well performed. Results are well described and discussed. Some other articles on biochar and greenhouse gas emissions have put forward several hypotheses on the effect of biochar on greenhouse gas emissions. Some of them are discussed in the text, but all possible hypotheses could be discussed more systematically in the discussion. I also would have used soil types instead of site names for the treatments. I think this is more relevant. A: Thank you very much for your great support and critical comments. Those comments are all valuable and very helpful for improving our manuscript, as well as further important guidance for our researches. We have made corrections which we hope to meet with approval. Please see the following point-by-point answers. According to your recommendation, several hypotheses were put forward that: 1) biochar amendment could affect GNrEs, vegetable yield and GNrI in vegetable soils across mainland China, 2) those influences would vary among biochar and soil types. We have added those hypotheses on Page 5 line 18-20. Thank you! Also, we have renamed the treatments with soil type instead of site names throughout the manuscript. Thank you so much for your suggestion!

Some other small remarks 1. Line 26 agriculture accountS A: Thank you! We have changed the "accounted" to "accounts" on Page 4 line 2. 2. Lines 78-line 83 please make shorter sentences. It also seems that the words 'sites' and 'soils' are mixed up. A: We have split the long sentence into shorter sentences on Page 6 lines 3-8. Thank you! 3. Line 86: what do you mean with 'initial' soil bulk density? Was that the bulk density of the site where soil was collected and does it mean that all treatments had different soil bulk densities? A: In order to simulate the biochar effects on different types of soil as much as possible, initial soil bulk density (same to the field condition) was set for the individual soil type. Thank you! 4. Line 90 add 'were used' A: We are sorry for the inconvenience. We have added the "were used" on Page 6 line 15. 5. Line 192. It is mentioned that values were higher for Bm than for Bw amendments but this is only significant for HN; ie the soil with the lowest initial pH A: Yes, biochar can increase soil pH at different degree, and this elevation is more significant for acidic

soil than alkaline soil (Chintala et al., 2014). We have made some revision about the description on Page 10 line 10. Thank you! Chintala R, Schumacher T E, McDonald L M, et al. Phosphorus sorption and availability from biochars and soil/biochar mixtures[J]. Clean–Soil, Air, Water, 2014, 42(5): 626-634. 6. Line 193-194: Bm performed only significantly better in HN, so it did not perform better in all soils. A: Yes, you are right! Although the MBC was slightly higher in Bm amendment than that in Bw in all soils, this difference reached significant level only in Phaeozem. We have revised it on Page 10 line 11-12. Thank you! 7. Line 208-209: they greatly lowered some peaks of N2O emissions: how many occasions, what reduction %, was it significant? A: There were six and two times that biochar amendment significantly lowered peaks of N2O emissions in Anthrosol and Phaeozem by 8.7-74.4% and 23.6-73.6%, respectively. We have already added some description about the reduction on N2O peaks as affected by biochar on Page 10 line 27-28. Thank you! 8. Line 243: lowered A: We are sorry for the inconvenience. We have corrected it on Page 11 line 30. Thank you! 9. Line 277: how is inorganic nitrogen being immobilized in biochar with higher C/N ratio? What is the presumed mechanism? AïijŽAlthough biochar generally have high carbon contents, labile C fraction exist in biochar simultaneously. The assimilation of labile C by microorganism resulted in microbial demand for inorganic N in soil solution (DeLuca et al., 2006), which lead more N being immobilized. The Bw with higher C/N ratio possessed more labile C (such volatile matter, Bw vs Bm, 23.9% vs 16.3%, data not shown), which make Bw more suitable for N immobilization (Deenik et al., 2010). DeLuca T H, MacKenzie M D, Gundale M J, et al. Wildfire-produced charcoal directly influences nitrogen cycling in ponderosa pine forests[J]. Soil Science Society of America Journal, 2006, 70(2): 448-453. Deenik J L. Charcoal volatile matter content influences plant growth and soil nitrogen transformations.[J]. Soil Science Society of America Journal, 2010, 74(4):1259-1270. 10. Line 303: biochar is written wrong A: We are sorry for the inconvenience. We have corrected the spelling of biochar on Page 14 line 21. Thank you! 11. Line 306-307: how can soil microorganisms lead to unsustainable greenhouse vegetable production? A: That is a good question. As

long as we know, soil microorganisms are critical to the maintenance of ecosystem service because of their contribution to soil structure; decomposition of organic matter; toxin removal; biogeochemical cycling of carbon, nitrogen, phosphorous, and sulphur; and suppresiveness of plant pathogens (Chaparro et al., 2012; Ferris and Tuomisto, 2015; Larkin, 2015). Additionally, soil salinity has become an essential issue in vegetable ecosystem (Shi et al., 2009; Han et al., 2014), which reduces microbial activity, microbial biomass and changes microbial community structure, and result in the unsustainable for greenhouse vegetable production. Chaparro J M, Sheflin A M, Manter D K, et al. Manipulating the soil microbiome to increase soil health and plant fertility[J]. Biology and Fertility of Soils, 2012, 48(5):489-499. Ferris H, Tuomisto H. Unearthing the role of biological diversity in soil health[J]. Soil Biology & Biochemistry, 2015, 85:101-109. Larkin R P. Soil health paradigms and implications for disease management.[J]. Annual Review of Phytopathology, 2015, 53(1):199. Shi W M, Yao J, Yan F. Vegetable cultivation under greenhouse conditions leads to rapid accumulation of nutrients, acidification and salinity of soils and groundwater contamination in South-Eastern China[J]. Nutrient Cycling in Agroecosystems, 2009, 83(1):73-84. Han J, Luo Y, Yang L, et al. Acidification and salinization of soils with different initial pH under greenhouse vegetable cultivation[J]. Journal of Soils & Sediments, 2014, 14(10):1683-1692. 12. Table 2. NH3-emissoins. BC is not a significant factor but letters are different for the biochar treatments. How is this possible? A: Sorry for the inconvenience! We have rechecked and revised the data on Table 2 on Page 25 and modified the corresponding description on Page 11 lines 21-22. Thank you so much!

Thank you very much once again for your helpful comments! Best Regards! Zhengqin ∼∼∼
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Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2016-487/bg-2016-487-AC4-supplement.pdf

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