Response to reviewer's comments

The authors of the manuscript soil-2021-95 "Soil microbial community triggered by organic matter inputs associates with a high-yielding pear production" carefully revised the manuscript and supplementary materials according to the reviewers' suggestions, particularly in regards to the concerns that data does not allow to draw the conclusion that distinct microbial communities directly increase pear-yields. There are still some minor concerns I recommend to consider.

[1] Furthermore, after revisiting the structural equation model again, I recommend to undertake a major revision of the SEM or to delete it. In general, the M&M section to the SEM does not allow to reproduce and understand how the SEM was built and whether it clearly supports the research question or not. However, I am not convinced that the SEM was built in a way it allows to identify what drives the differences in pear yield between the treatments, which was what the study aimed for, as indicated in the introduction and L 341. This is due to the following reasons:

1) From the M&M it is not transparent whether the paired approach was accounted for (for example by including a random effect for site using the lavaan.survey package). If not, the model will try to explain overall yield, not the increase or difference between treatments.

2) Across site variances in SOM content and pear yield are larger than between treatment differences.

3) The SEM Figure 7 revealed that SOM has an effect on yield mediated through Beta. However, beta diversity by PCoA largely differed across sites and did not show differences between treatments (Figure 3A) as previously commented. Which support my assumption, that the model is fit to explain overall yield differences, not treatment related yield increases. (Also, I miss information in the M&M on whether beta diversity (PCoA) in the SEM refers to PCoA1 or PCoA2 or is a composite of both.)

4) Overall, the SEM explained > 70% of variance in yield. However, it might only explain differences across sites but does not allow to conclude on how differences in soil organic matter content affect yield of yield-debilitating and yield-invigorating orchards.

The SEM has to be revised or the results and discussion section adjusted to indicate that the SEM explains differences across sites. The model as it current state does not allow the conclusion in L 451 – 455: "Worth to mention, soil organic matter was not directly linked to the yield in the constructed model, indicating that soil organic matter maintain the high-yielding pear production probably via the indirect way. Therefore, we proposed that yield-invigorating soils harbour unique bacterial communities that may

improve soil biological fertility, which could be driven by soil organic matter and manipulated by keystone species (Chloroflexota) through altering the bacterial interactions."

Response: Thank you for your warm reminder. After fully discussion with all co-authors, we found that that SEM was not well described in the manuscript, and the SEM result does not help to much in explaining the potential mechanisms regarding to yield improvement. Therefore, we decide to delete this result and relevant material and discussion in the revised manuscript following your suggestion.

[2] L 71 Rousk et al. 2010 did not investigate microcosms (in the cited study).

Response: Thank you for your warm reminder. We have deleted the microcosms in the revised manuscript.

[3] L 98 - 105 Thanks for clarifying the definition of "yield-debilitating" and "yield-invigorating" treatments. Please revisit this newly written part for proof-reading and grammar checking. I recommend adding the mean ± standard deviation increase in pear yield to estimate the order of magnitude. While revisiting your manuscript, I wondered why you did not include average crop-yield orchards as a control. You might want to add a comment on that.

Response: Thank you for your warm reminder. We have revised the relevant sentences in the revised manuscript. We have added the standard deviation in the Table S1. In the present study, we aim to explore the key factors of soil chemical properties, and microorganism responding to high pear yield production. Indeed, the orchard with average yield production should be taken into consideration as another control. When designing this study, we thought by comparing the soils sampled from yield-debilitating and yield-invigorating orchards may be easier to achieve this goal at that time. Therefore, we only sampled these co-located yield-debilitating and yield-invigorating orchards with the same nutrients input. We sincerely appreciate your suggestion and we will take this point into consideration in our further works.

[4] L 163 introduce abbreviation as follows: Amplicon Sequence Variant (ASV)

Response: Thank you for your warm reminder. We have revised it following your suggestion.

[5] L 213 This is not the reference I was referring to and citing the indicated study here is not meaningful. Sorry, I should have specified: Grace JB (2006) Structural Equation Modeling and Natural Systems.

Cambridge University Press, Cambridge. Revise!

Response: Thank you for your warm reminder. We have revised it following your suggestion.

[6] L 232 Add criterion for goodness-of-fit index.

Response: Thank you for your warm reminder. We have revised it following your suggestion.

[7] L 243 - 246 Would be interesting to give more details on which chemical soil properties differed between YI and YD. I assume it is only organic matter content? Please, indicate statistical results which support that OM was higher in YI than in YD.

Response: Thank you for your warm reminder. We have revised it as following:

"Soil chemical properties differed among the locations and orchard yield types (Table S3). On average, yield-invigorating orchards showed obviously higher contents of OM, AP, Mg and Fe, and a lower content of Mn in comparison with those in yield-debilitating orchards. However, when taken all sites together, only a higher relative abundance of OM on average was observed in yield-invigorating orchards compared to that in yield-debilitating orchards based on the Wilcoxon test ($P < 0.05$)."

[8] L 401 - 406 Thanks for adding a paragraph on what you mean by "small-world". This is helpful.

Response: Thank you for your warm comment.

[9] L 421 Revise! "…, was recognized as a key phylum in improving pear yield" ◊ "…, was recognized as key phylum associated with higher pear yields".

Response: Thank you for your warm reminder. We have revised it as following:

[10] Figure 7 Also see my comment on the SEM. I apologize I had overseen the direct path from SOM to yield, which was already included in your model in your initial submission. Providing an R2 for the whole model seems not meaningful. Instead, the R2 should be indicated for each endogenous variable in your model (i.e. beta diversity, microbial biomass, key taxa, network module hubs, network connectors and yield) indicating the variance explained by your model for each parameter.

Response: Thank you for your warm reminder. We have deleted the SEM section in our manuscript as your suggestion. Please see the response to comment [1].

[11] Table S2 Thanks for providing a table on fertilisation regime. However, it is a bit confusing. Did YI and YD receive the same amounts of mineral fertilisers or do N,P,K values refer to a total (including N,P,K in organic fertilisers)? Please revise the Table so it becomes clear how much mineral fertiliser was added, and how much organic fertiliser. From the text I understood that YI orchards received less mineral fertiliser. Is that correct?

Response: Thank you for your warm reminder. For each site, the YI and YD orchards received the same amounts of nutrients. But they differed in organic and chemical fertilizer application. YI orchards usually received more organic fertilizer while YD orchards received more chemical fertilizer. We are so sorry about the unclear information, and we have added the detailed fertilizer amounts in the Table S2 in the supplemental material.

[12] Figure S6 This is not the meta-model I suggested, however it helps to understand the underlying concept or your model.

Response: Thank you for your warm reminder. We have deleted the SEM section in our manuscript as your suggestion. Please see the response to comment [1]. Therefore, this supplemental figure also was removed from the supplemental material.