SOIL Discuss., author comment AC2
https://doi.org/10.5194/soil-2021-132-AC2, 2022

Reply on RC2

Ling Sun and Jinggui Wu

Author comment on "Combined application of animal manure and straw benefit soil fauna community in dryland farming" by Ling Sun and Jinggui Wu, SOIL Discuss., https://doi.org/10.5194/soil-2021-132-AC2, 2022

ANSWERS/ CORRECTIONS TO THE REVIEWER'S COMMENTS

Reviewer 2

- Line 10:Addition of organic wastes such as animal manures and straw is a feasible

Answer: these have been corrected. Addition of organic waste such as animal manure and straw is a feasible

- Line 12:"In this study, the community structure of soil fauna" "composition"? Anything else? Abundance? Have you characterized the soil? Invertebrates

Answer: In this study, the community composition and abundance of soil invertebrates

- Line 14-15:"A total of 12459 soil faunawere captured, belonging to 23 groups", "individuals"? "taxonomical groups"

Answer: A total of 12459 soil invertebrates individuals were captured, belonging to taxonomical groups.

- Line 15:"Treatments animalmanure combined with" with animal

Answer: this has been corrected. Treatments with animal manure combined with

- Line 16-17:"straw led to increased the number of soil fauna groups and individuals, diversity index, richness index and dominance index, while reduced the evenness index of soil fauna." Please simplify as some of these are redundant. It is interesting that you have an increase in richness but at same time decreased evenness.

Also, please use "invertebrates" instead of "fauna". Same applies across the document.

Answer: this has been corrected. Treatments with animal manure combined with straw led to increased richness and abundance of soil invertebrates.

- Line 21:"Oribatida, Astigmata, Desoria and Folsomia were the dominant species" I would suggest you stick to the same taxa hierarchy level here. "groups"

Answer: Among all the treatments, Oribatida, Astigmata, Entomobryomorpha were the dominant groups

- Line 22:"pig manure treatment had the largest diversity index soil fauna community." of soil invertebrates

Answer: Maize straw plus pig manure treatment had the highest diversity of soil invertebrates.

- Line 24:"maize straw plus pig manure treatments were higher compared to other treatments." if statistically significant, add "significantly".

Answer: maize straw plus pig manure treatments were significantly compared to other treatments.

- Line 25-26:"The highest dominance index of soil fauna was recorded in maize straw plus ox manure treatment." You could add the names of the dominant taxa.

Answer: The highest dominance index of soil invertebrates was recorded in maize straw plus ox manure treatment (Araneae, Oribatida and *Desoria*).

- Line 28:"enhancing soil fauna community." increasing the numbers of soil invertebrates. Is this reflected by both richness and abundance? If yes, please mention it.

Answer: especially the application of maize straw plus pig manure was the most effective treatment for enhancing richness and abundance of soil invertebrates.

- Line 38-39:"so it is particularly important to study the abundance and community composition of soil fauna" Why? Please, expand and use the opportunity to fit the topic under your background rationale for developing this study.

Answer: Different fauna groups have different sensitivity to soil environmental changes, and the composition of soil fauna can reflect the soil environment where they live after different organic materials are returned to the field. Therefore, it is particularly important to study the abundance and community composition of soil fauna (Lakshmi et al., 2017;

Barreto et al., 2021).

Barreto, C., Branfireun, B. A., McLaughlin, J. W., Lindo, Z.: Responses of oribatid mites to warming in boreal peatlands depend on fen type [J], Pedobiologia, 89, 150772, https://doi.org/10.1016/j.pedobi.2021.150772, 2021.

- Line 43:"Human activities such as agricultural cultivation, land use intensity and farmland". activity

Answer: Human activities such as agricultural activity, land use intensity and farmland restoration will change.

- Line 56:"Returning organic materials to the field can increase the input of organic C and nutrients" Reference missing? Give references as examples from literature.

Answer: this has been added. Returning organic materials to the field can increase the input of organic C and nutrients (Chabbi et al., 2017) Chabbi, A., Lehmann, J., Ciais, P., Loescher, H. W., Cotrufo, M. F., Don, A., SanClements, M., Schipper, L., Six, J., Smith, P., Rumpel, C.: Aligning agriculture and climate policy[J], Nat Clim Chang, 7, 307–309, https://doi.org/10.1038/nclimate3286, 2017.

- Line 58:"change the composition of microbial community through predation", Not only.

Answer: on the other hand, they can change the composition of microbial community through interspecific relationships like predation

- Line 61:"Different soil fauna communities play different roles in the decomposition" groups?

Answer: Different soil fauna groups play different roles in the decomposition

- Line 63:"also play an important role in the formation of soil nutrients" "transformation"

Answer: also play an important role in the transformation of soil nutrients.

- Line 64:"Soil fauna can affect refractory organic C through a variety of direct and indirect ways". Give examples, but be succint.

Answer: Soil fauna can affect the growth, activity and relative composition of fungi and bacteria (Johnston et al., 2004). Some soil fauna can increase the surface area of organic matter by fragmentation and increase the decomposition rate of organic matter by intestinal enzymes. Biological disturbances affecting soil structure and organic matter distribution also have profound effects on soil organic carbon stability (Meysman et al., 2006).

Johnston, C. A., Groffman, P., Breshears, D. D., Cardon, Z. G., Currie, W., Emanuel, W., Gaudinski, J., Jackson, R. B., Lajtha, K., Nadelhoffer, K., Nelson, D., Post, W. M., Retallack, G., Wielopolski, L.: Carbon cycling in soil[J], Front Ecol Environ, 2, 522–528, https://doi.org/10.1890/1540-9295(2004)002[0522:CCIS]2.0.CO;2, 2004.

Meysman, F. J. R., Middelburg, J. J., Heip, C. H. R.: Bioturbation: A fresh look at Darwin's last idea[J]. Trends in Ecology□Evolution, 21, 688–695, https://doi.org/10.1016/j.tree.2006.08.002, 2006.

- Line 72:"and straw (AM-S) on soil fauna communities in a dark brown soil" according to what classification? Color is not the best approach fro soil classification. If you have Munsell colors, please add it. Ideally, I would prefer to see it classified according to the "World Reference Base".

Answer: The soil is classified as dark-brown soil, the term used is Cryumbreps in the American soil classification system, and Humic Cambisols in WRB with a pH of 6.3.

- Line 73:"The research results will help to identify the most suitable animal manure and straw for improving soil fauna." I am still puzzled abut what you mean about improving/enhace here. Please be specific. Increase taxa groups? Increase biomass/abundance?

Answer: The research results will help to identify the most suitable animal manure and straw for improving composition and abundance of soil invertebrates

- Line 76:"while different animal manure might have different effects on soil fauna function" If not measured, please remove it. As far as I can tell, you have only measured composition and density.

Answer: this has been removed.

- Line 82:"This region is very cold during winter and hot during" avoid colloquilism.

Answer: This region is cold during winter and hot during

- Line 85:"classified as dark-brown soil with a pH of 6.3." Please check my comment on line 72.

Answer: The soil is classified as dark-brown soil, the term used is Cryumbreps in the American soil classification system, and Humic Cambisols in WRB with a pH of 6.3.

- Line 89:"area is dryland" classified as a dryland. Also, because of the contrasting

seasonal abiotic conditions, you should state the season/time of the year of your experiment.

Answer: Artificial irrigation was not provided during the experiment although the area is classified as a dryland. An in situ soil burial test of a nylon net bag was conducted in May 2019.

- Line 91-92:The field was arranged in a randomized block design consisting of twelve plots (50 m^2 each) with four treatments in three replicates. Give the total N.

Answer: twelve plots in total. The field was arranged in a randomized block design consisting of with four treatments in three replicates (twelve plots, 50 m^2 each).

- Line 96:"The chicken manure, ox manure, and pig manure were collected from chicken farms, ox farms, and pig farms in Liaoyuan County and they were composted a few months before application" precise number?

Answer: The chicken manure, ox manure, and pig manure were collected from chicken farms, ox farms, and pig farms in Liaoyuan County and they were composted five months before application.

- Table1:If these characteristics were measured in this study, this needs to be moved to the results section and make sure the methodological approach is included in the methods section (measurments and stats). If this is not part of the study, mention the source of the data, a citation would do.

Answer: this has been corrected. The basic properties of the organic materials used in this study are described in the reference of Sun et al (2021).

Sun, L., Sun, Z. X., Opoku-Kwanowaa, Y., Hu, J., Wu, J.G.: Effects of returning organic waste on soil enzymes and microbial quantity in dryland farming[J], Int. Agrophys, 35(3), 279–287, https://doi.org/10.31545/intagr/142368, 2021.

- Line 104:"In this experiment, the same amount of maize straw was applied to each plot." Deposited/Incorporated? More details are needed.

Answer: different animal manures and maize straw was incorporated to each plot

- Line 112:"The incorporated organic materials were covered with the surrounding soil." Again, was it mixed some how? Please give details.

Answer: In each plot, about 20 cm trenches were made whereby the same amount of maize straw was applied in all the treatment plots. Then different animal manures were evenly spread on the maize straw for the respective treatment plots. Different animal manures and maize straw were covered with the surrounding soil.

- Line 113-114:"However, the focus of this study was to sample the litterbags for the experiment." What study? This is confusing. I suggest you create subsections in the methods for the distinct components. This experiment requires a different subsection. Considering the bags content, they are not representative of the surrounding soil environment and this changes the scope and claims of the study.

Answer: In this experiment, nylon net bag method was used to determine soil invertebrates. The environment in the bag is close to the surrounding soil.

- Line 115-116:"An in situ soil burying test of a nylon net bag was conducted in May 2019. In October 2018", A clear chronology of all the measurements done needs to be given, and how the different components relate to each other.

Answer: In this experiment, nylon net bag method was used to determine soil invertebrates. In October 2018, the maize straw from the test area was collected as the initial straw materials and brought back to the laboratory for air drying. An in situ soil burial test of a nylon net bag was conducted in May 2019.

- Line 123:"There were 60 sample bags (4 treatments × 3 replicates × 5 samples)" How are these related to the soil amendment experimental design?

Answer: In the experimental design of soil amendment (4 treatments), we used nylon mesh bag method to collect soil animals and sampled them every month (a total of five months).

- Line 126:"followed by adding the animal manure of each treatment, respectively, according to the equal C principle", ? Explain.

Answer: The mass of animal manure added has been stated in the text, so this has been removed

- Line 132:"handled with great care during the removal process," Avoid colloquial language.

Answer: the litterbags were handled with care during the removal process

- Line 142-144:"Shannon-Wiener diversity index (H), Simpson dominance index (C), Pielou evenness index (E) and Margalef richness index (D) were adopted, and the calculation formula was as follows (Zhang et al., 2018)" These are well known metrics. For sake of space, you don't really need to add all the formulas. However, you need to precisely explain if you have slightly modified the calculations.

Answer: this has been corrected.

- Line 149:"Where: S represents all groups of soil fauna, Pi=Ni/N represents the abundance ratio of the ith group" richness?

Answer: S represents richness of soil fauna. $P_i=N_i/N$ represents the abundance ratio of the *i*th group.

- Line 182-183:Quantitative data are expressed as mean ± SD and analysed by one-way analysis of variance (ANOVA). Give all the factors and variables measured. Was time considered a factor? Was all the data normal? Please make sure you show that you have checked the test assumptions. Give details about the factors and variables evaluated.

Answer: The means and standard errors for three replicates were calculated. A one-way analysis of variance (ANOVA) was used to evaluate the differences in the selected parameters (e.g. monthly dynamic changes in the diversity of soil fauna community, monthly dynamic changes of abundance and richness of soil fauna, the contents of soil organic carbon fractions, diversity index of soil fauna community).

- Line 185:Relevant data tables and graphs were obtained using 185 Microsoft Excel.

Answer: this has been removed.

- Line 193:"There were some differencesin soil fauna communities under different treatments" Ambiguous!

Answer: The number of soil invertebrates varied with different treatments

- Table 2: "Composition, individualsand dominance of soil fauna community after the application of animal manure combined with straw." abundance/density? This could be converted to a measure of volume or area according to the litter bag size.

"Name of soil animal" Sort these groups according to a taxa hierarchy, you could have both orders and matching genera (different columns, or rows).

"Group number", Dissect this in the different taxa hierarchy. How many orders, genera as possible, according to your identification efficiency.

Answer: these have been corrected.

- 1: Here you present sampling per month, however this needs to be better described in the methods. If sampling bags are destroyed at each time point you need define the starting bag number and the number of bags used at each time point (month).

Answer: There were 60 sample bags (4 treatments × 3 replicates × 5 samples). Sample

bags were destructively retrieved in May, June, July, August and September after the bags were buried. At each sampling date 12 (4 treatments × 3 replicates) nylon net bags were retrieved.

- 1: "Monthly dynamic changes of individualand group number of soil fauna", abundance, richness

Answer: Monthly dynamic changes of abundance and richness of soil fauna

- Line 229-230:"in Pielou evenness index of soil fauna in all treatments at different sampling time", However, you do say that evenness decreases in your abstract.

Answer: this has been removed in abstract.

- Line 248:"SP treatment reduced the Simpson dominance index." "showed a lower"

Answer: SP treatment showed a lower Simpson dominance index.

- " 3 Diversity index of soil fauna community", Please include the total observed species/groups. Also, what month is this and how different is this table from figure 2? If Figure 2 is showing the same and additional info (time), remove the table.

Answer: This table shows the average of the different diversity index, while Figure 2 shows the dynamic change from month to month.

- Line 269:Astigmata ☐ Folsomia ☐ Actinedida and Entomobrya was positively

Answer: *Astigmata*, *Folsomia*, Actinedida and *Entomobrya* was positively

- "Table 5 The contents of soil organic carbon fractions after the application of animal manure combined with straw"Are these in the soil or in the bags?

Answer: soil in and around the bag.

- Line 278:"The different lowercase letters among the different treatments indicate significance at $P<0.05$." and the upper case?

Answer: The different lowercase and uppercase letters among the different treatments indicate significance at $P<0.05$ and $P<0.01$, respectively.

- " 3 A redundancy analysis (RDA) between soil organic carbon composition and dominant and common groups of soil fauna."Would be interesting to see the same analysis using the rest of the groups.

Answer: this has been added.

- Line316-317: "indicating that compared with the soil environment formed by straw returning to the field" You have not measured the surrounding soil env.

Answer: this has been removed.

- Line 330:"The average group number and individual number of soil fauna in all treatments were the highest in July" Make sure you experimental timescale is described in your methods section.

Answer: Sample bags were destructively retrieved in May, June, July, August and September after the bags were buried.

- Line 350:"In this study, Shannon-Wiener index, Pielou index, Margalef index and Simpson index of soil fauna community were changed by straw and animal manure combined application." You have several contradictions along the discusion. Make sure your story is consistent.

Answer: this has been removed.

- Line 354:"Usually, the Simpson index can reflect the changes 354 of the number of species in the community." What situations it cannot?

Answer: this has been removed.

- Line 362:"The Shannon-Wiener index of soil fauna community in SP treatment was the biggest," Avoid colloquialism. Highest?

Answer: The Shannon-Wiener index of soil fauna community in SP treatment was the highest

- Line 367:"Compared with S treatment, the combined application of AM-S reduced the Pielou index of soil fauna." This is only valid for SC. You need to stick to what is statistically significant.

Answer: Compared with S treatment, the application of SC reduced the Pielou index of soil fauna.

- Line 369:"which may be because the application of animal manure increased the group of soil fauna", I think you mean an increase in dominance. And if yes, dominance of which groups?

Answer: which may be because the application of animal manure increased the dominant groups (Astigmata, Oribatida and *Folsomia*) of soil fauna.

- References Line 413: "(Populus deltoids)", Italics

Answer: (*Populus deltoids*)

- Line 426, 433, "Eur J Soil Biol""Soil Biol. Biochem" Abbreviated with dots or no dots? Please check the journal guidelines.

Answer: these have been corrected.

- Line 449□[J], ?? Same applies to the other references.

Answer: these have been corrected.

- Introduction: The introduction needs to be made more concise overall as there are several redundant parts. For instance, Lines 37-48 section needs to be more concise, and a transition to the conservation approaches is required. Also, the paper needs to

accommodate the focus on nylon bags and clarify the objectives.

Answer: these have been corrected.

Human activities such as agricultural activity, land use intensity and farmland restoration will change the soil environment, which can directly affect the composition and nutrient structure of soil ecosystem, thereby affecting the composition and diversity of soil fauna communities (Morriën, 2016; Menta et al., 2020).

In the study, the soil invertebrates' communities are the ones inside the nylon bags, representative of the invertebrates' community by selected colonisation of the organisms that inhabit the surrounding soil (exchange/movement with the surrounding environment through the 2 mm mesh).

- Methods: The bag/ mesocosm approach needs clarification as it is unclear how the approach relates/overlaps with the soil amendment experiment. Also, a schematic

representation of the experimental field design, and position of the bags experiment,

shape of the plots, could be added as a supplementary figure. The quantity of soil included in each bag is not precise, or if even soil was included. If the soil was included, you need to state if any standardisation was applied (e.g., sieved to a certain size, defaunation, dry,

etc.) and the essential physic-chemical characterisation (Ph, OM content, CTC, etc.). Overall, the statistical approaches need more clarity (the author need to give factors used and all the variables measured).

Answer: The soil collected from the test site was sieved to 5 mesh and defaunation, and the weight of soil in each bag was 6.00 ± 0.03 g. The total organic C, total N, alkali-hydrolyzable N, available phosphorus (P), and available potassium (K) in 0-20 cm soil are 12.3 g kg^{-1}, 1.3 g kg^{-1}, 100.4 mg kg^{-1}, 20.3 mg kg^{-1}, and 125.1 mg kg^{-1}, pH 6.3, respectively.

Please also note the supplement to this comment:
https://soil.copernicus.org/preprints/soil-2021-132/soil-2021-132-AC2-supplement.pdf