



EGUsphere, referee comment RC1
<https://doi.org/10.5194/egusphere-2022-1120-RC1>, 2022
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Comment on egusphere-2022-1120

Anonymous Referee #1

Referee comment on "Deforestation for agriculture leads to soil warming and enhanced litter decomposition in subarctic soils" by Tino Peplau et al., EGU Sphere,
<https://doi.org/10.5194/egusphere-2022-1120-RC1>, 2022

General comment:

The manuscript "Deforestation for agriculture leads to soil warming and enhanced litter decomposition in subarctic soils" is well written and offers valuable soil temperature data concerning land use change. Further, it highlights the possible importance of other management-related effects on litter decomposition rates.

I have some comments regarding the data analyses and reporting: I am not sure that it is correct to treat "depth" as a random effect. This is indeed an effect that you should be interested in and including it as a fixed effect also allows you to explore interactions. Further, I suggest presenting exact p-values rather than <0.05 , <0.001 etc. Throughout the text the authors also present mean values \pm some value of their variation. However, it is not always clearly stated whether this is standard deviation or error. See for example section 3.1 and 3.2.

The material and methods section would likewise benefit from a bit more clarity. For instance, the experimental set-up is not easy to follow – here a figure might help. There are 21 pairs but only 15 farms. Does this mean that some farms had both cropland and grassland? If so, did they share the same forest? Did any farm have two croplands or grasslands? See specific comments relating to other parts of the method section below.

Otherwise the text is well structured and addresses the three objectives that it set out to answer. My opinion is that the manuscript can be published after considering the comments stated below.

Specific comments:

Line 55-60: No hypotheses were given in connection to the second objective. Did you already have some ideas about which soil properties might affect soil temperature beforehand, or was this part exploratory?

Line 65-69: it would be useful to have slightly more detailed site descriptions, e.g. concerning vegetation. What kind of native forests do we find in this area? Which types of croplands are you investigating? I am a bit unsure what the term "market garden" implies. It becomes especially important to provide this information when you then go on to emphasize the importance of vegetation for soil temperature (Line 216).

Line 69: what is meant by "nearby"? You could consider providing a number stating average within-pair distance (and between-pair distance, see comment on figure 1 below).

Figure 1: Even though sampling points are given in figure 1, it is difficult to evaluate the between-pair distance (also since some farms have more than one pair).

Line 70: It is not a simple task choosing comparable site pairs; you must have put a lot of effort into this. Maybe you could elaborate on what is meant by "comparable soil properties (...) checked in an auger-based pre-assessment", i.e. what were the soil criteria for the pairs. Soil type, soil texture etc.?

Line 79: Regarding the chosen depths of teabag deployment. You are using relatively fresh leaf litter material, which is normally deposited on top on the soil. Did you consider burying the "topsoil-tea" at a shallower depth? Since "*the soil was sampled from depth increments 0-10 cm and 40-60 cm*" and the "subsoil-teabags" were placed at 50 cm, it would intuitively have made more sense to bury the "topsoil teabags" at a depth of 5 cm (or shallower). Were you trying to avoid the teabags being dug up (e.g. by shallow tillage in the croplands)? Can you provide a rationale for choosing these depths.

Line 84-87: It is very nice that you have been so careful when weighing the tea i.e. washing off mineral soil particles and opening the bags to take out fine roots, but you must then also have obtained the (average?) weight of the teabag-bag (to be able to subtract this weight from the initial weights to gain estimates of start-weights including only tea). Maybe it could be nice to mention how you obtained this value (e.g. obtained from "fresh" bags; how many?).

Line 110: I am not sure it is justified using "depth" as a random effect here. You may choose an effect to be random if you are not interested in the effect itself, but only want to "control" for it. Another rule of thumb is that you need many levels of the effect to make it random (i.e. more than two). Neither of which is the case here.

Line 133: It would be useful to provide the actual p-value since alpha-levels are somewhat arbitrary. Then the reader would have a better idea about the strength of the evidence.

Line 138-140/Table 1: It is great that you provide effect-sizes and uncertainties, but you could also consider supplying p-values, to help the reader assess the strength of the evidence more easily.

Line 165/figure7: You state $p < 0.001$ in the text and $p < 0.05$ in the figure. Why not provide the actual p-value? Also, even though you are correct that the effect is "highly significant", I would be careful how I report this relationship with an $R^2(\text{adj})$ of 0.12. I suggest that you add a line acknowledging the low R^2 -value.

Line 248: I got a little unsure here. Can you be more specific about how/which type of agricultural management masks this temperature effect in the topsoil? In this connection, it would also be useful to describe whether any tillage or fertilizer is applied to the croplands (e.g. in the method section). Further, I am curious to know if the specific areas in the cropland where the temperature loggers and teabags were buried were treated differently than the rest of the cropland soils, e.g. if farmers avoided tillage or planting of crops directly inside the study plots?

Line 258: It is a weakness that the study did not obtain soil moisture data to support claims about irrigation effects on litter decomposition, but you could strengthen your argument if you had some sources to back up the assumption that "croplands are irrigated regularly", e.g. personal communication with farmers or similar.

Technical corrections:

Line 11: "litter bags", consider specifying: "tea bags"

Line 78: For how long were the bags buried? I would prefer exact start and end dates. Currently It says that they were buried in summer 2019 and retrieved in September 2021.

Line 78-80: A slightly picky comment. It is good that you refer to the methodology of Keuskamp et al. 2013 when using teabags, even if your methods deviate substantially from their methodology. However, it might (?) confuse some readers that you refer to "green tea" in the same sentence when it is in fact not identical to the tea used in the Teabag Index. I suggest that you are more clear about it being a modified method, i.e. deviating from the cited method by using different depths, different incubation time and

different tea; why you were not able to calculate decomposition rate constant (k) and stabilization factor (S).

Line 102: Do you have a reference for this method to distinguish organic and inorganic C?

Figure 3/5/7 + Table 1: Figure text is missing. But I assume this to be an artifact of layouting. Maybe also doublecheck the other figures.

Figure 5: I suggest using the same scale on the y-axes for easier comparisons.