Dear Aleksandra Walczyńska,

thank you for editing our manuscript and for the opportunity to revise our manuscript. We are very grateful for the thoughtful and detailed feedback provided by the reviewers. Their comments were of excellent quality and offered valuable suggestions for improving our work.

We have carefully addressed all points raised by the reviewers, making significant revisions to the hypotheses, the description of methods, and the discussion of results, as requested. In almost all cases, we implemented the reviewers' suggestions directly, and for the few instances where alternative approaches were taken, we provided detailed justifications in our responses. You will find detailed answers to the reviewers comments below.

We believe that these revisions have considerably strengthened the manuscript, and we appreciate the constructive input that has helped to enhance the clarity and quality of our work.

Thank you again for coordinating this process, and we look forward to your assessment of the revised manuscript.

Kind regards,
Julius Reiff
[On behalf of all authors]

Reviewer 1: Paulina Kramarz

Dear Mrs. Kramarz,

thank you very much for your valuable suggestions. We included an extra paragraph in the discussion section to adress the proposed informations on natural succession, more nutritious food and social „yields“ of permaculture systems!

Best regards in behalf of all co-authors,

Julius Reiff

Reviewer 2: Julia Astegiano

Dear Mrs. Astegiano,

thank you very much for your valuable suggestions, which helped us a lot to improve the manuscript! See the comments below for detailed comments on your suggestions, which we have implemented as well as possible.

Best regards in behalf of all co-authors,

Julius Reiff

L14: We added ecosystems mimicry as basic permaculture principle and added that permculture sites were additionally working according to organic guidlines to clarify that this is not the prerequisite for permaculture.

L18: By 'total German agriculture,' we intended to refer to the productivity of the entire agricultural sector in Germany, encompassing both conventional and organic farming systems. We have now clarified this term as 'the overall German agricultural sector' in the previous sentence.

L21: To address your legitimate concerns, we have introduced a brief discussion in the abstract regarding how permaculture principles, such as diversity, the use of mutually supportive species and a focus on soil health, might explain the observed productivity of permaculture sites. These principles are central to the permaculture framework and could play a key role in stabilizing yields and optimizing resource efficiency.

L29-31: We added the suggested informations general trends in crop productivity in Europe and Germany.

L48-52: We added a connecting sentence justify why measuring land productivity is neccessary, also in relation to the principles of permaculture.

L56: Done

L56-68: We agree with this argument and have clarified in several places (including a new paragraph in the discussion) why crop productivity is also important in permaculture and what other yields a permaculture system can and should deliver. At the same time, this article is written for a broad readership, which is why we are not writing it exclusively from a permaculture world view.

L76-77: We clarified this point.

L88: There are only very few permaculture farms in germany so far and it would therefore be possible to identify the participating farms with a map. that is why we do not provide a map.

L93-94: As the permaculture farms in Luxembourg and Switzerland are located close to the German border, we assume that these comparative data are also representative for these farms. We added this information.

Reference data section: We agree that the use of large datasets for industrial agriculture introduces potential sources of variability, including the influence of diverse soils and land management practices. This is a valid concern, and we acknowledge that a more geographically and structurally comparable reference dataset would reduce these sources of noise and bias.Unfortunately, we were and are not able to acquire alternative reference data that meets these criteria. To the best of our knowledge, comprehensive datasets specifically for farms that are both geographically and structurally comparable to the investigated permaculture sites are not currently available. Additionally, due to resource constraints, we were unable to collect this data ourselves.

Table1: It is true that these farms are very young and you usually only see changes in yield later. You will notice that this is why woody crops were not included in the evaluation for these farms, as they were not yet in full yield. At the same time, we did not exclude these farms because we wanted to see whether they could still deliver comparable yields in the vegetable sector and also to enable

an evaluation of the yield dependency on the age of the farm. Unfortunately we do not have data on land use history on these permaculture sites.

L132-133: In this formula the sum is only for individual values of the individual permaculture sites. The reference value is always the average monocultural yield of a specific crop and year. We clarified that in the text. Unfortunately we only have yield data for one year for each permaculture site, so we are not able to investigate interannual variation although we agree that this might be very interesting!

L137: This has to do with the reference data availabe by the Federal Statistical Office in Germany. The Office only provides average yield values for overall German agriculture and for organic German agriculture but not for conventional agriculture only.

L145: We agree, thanks for this hint. We added a paragraph in the introduction section to explain why we have chosen these predictor variables.

L159-162: While we understand your point about moving the last two sentences to the discussion, we would prefer to retain them in the results section, helping to contextualize the results for readers immediately. But we have added a paragraph to the discussion to address a different perspective on productive agriculture.

L163: done

L244-245: We recognise your point and have included at least brief examples so as not to go beyond the scope of the conclusion.

Reviewer 3: Leda Lorenzo Montero

Dear Mrs. Lorenzo Montero,

thank you very much for your valuable suggestions, which helped us a lot to improve the manuscript! See the comments below for detailed comments on your suggestions, almost all of which we have implemented as well as possible.

Best regards in behalf of all co-authors,

Julius Reiff

L14: I think there is a misunderstanding, we only collected yield data of organic permaculture sites and compared with national average of overall agriculture and national average of organic agriculture. We clarified that in the text.

L17: We can not call this treatment conventional as this is the average of overall German agriculture and therefore also includes organic farms. However, we clarified this distinction in the text.

L17: We gave an example an LER unequal to 1, to clarify its interpretation.

L18: As mentioned above, we compare to overall (conventional and organic) and only organic agriculture. This is the case because this is the way the data from the Federal Statistical Office is available. We clarified that in the text.

L19: We prefer not to include statistical metrics in the abstract in order not to go beyond its scope. P-Values are given in the caption of the respective figure.

L42ff: We understand your point. Nevertheless, we are of the opinion that these are patterns that can also be found in nature and result in corresponding practices in permaculture. In natural ecosystems, for example, we find high biodiversity with a focus on woody plants (where possible), derived practices would be agroforestry and mixed cropping of field crops. But we had not expressed this clearly and adapted the wording of the sentence. Now there should be a clear difference between the two sentences referring to patterns and practices.

L57: Right!

L59: This paragraph in the introduction was requested by another reviewer, which is why we would like to leave it there.

L67: We have added the distinction between the two comparison groups that we were able to use in this study.

L74: We prefer to leave it like that, as permaculture principles are not the only tools used in permaculture design and management that were used by the farms.

L97: Done

L107: We added your suggested specification.

Table1: Yes, tree crops are fruit and nuts.

L132: We added this clarification throughout the text.

L133: We added an example based on your suggestion.

L134: Done.

L140: Total means conventional and organic (see above). We now called it “overall” to be more precise.

L145: We now discussed the chosen variables in the introduction section, as suggested. Presence of livestock at the farm level, yes. We added this information.

L158: We clarified the distinction between overall and organic only agriculture.

L159: We rephrased the paragraph to make it clear, that we are taking about trends. Unfortunately, all permaculture sites were managed as diverse polycultures making it impossible to compare yield values directly. That’s why we used the LER for comparison.

L168 (Figure1): We agree and call this a clear trend in the following.

L176: done

L178: done

L181: We rephrased the sentence, stating that there is a clear trend, as suggested.

L190: We added you suggested statement of a clear trend in the beginning of the discussion.

L194: We have also thought about this comparison. However, Paut et al only investigated classical intercropping systems with usually two different crop species. In our case, many (sometimes around

10) different crop species were grown in intercropping and these were often very similar between the different farms. therefore, this comparison does not seem meaningful in our case.

L199: That would have been possible. Unfortunately, we do not have this data and it would be very difficult to reconstruct it. We keep this idea for further studies!

L199: We added a discussion on the dependence on the farm age and our results.

L205: done

L207: This is just an assumption about which we do not want to make a definite statement.

L214: We have not made a statement about the crop diversity of individual permaculture sites and therefore cannot make this statement here.

L219: see above

L223: These references were somehow not recorded by the citation software. We have now checked all the references in the article again and they should now all be present.

L229: We see your point. At the same time, we deliberately put this part here at the end to put our results in a broader context of existing studies that have also measured some kind of yield or productivity of permaculture.

Reviewer 4: Anonymous Reviewer 1

Dear Reviewer,

thank you very much for your valuable suggestions, which helped us a lot to improve the manuscript! See the comments below for detailed comments on your suggestions, almost all of which we have implemented as well as possible.

Best regards in behalf of all co-authors,

Julius Reiff

L56: We have added the relevant variable.

L53-68: We added our argument that according to the permaculture principle 'obtain a yield', an agricultural system must always provide sufficient food to feed people (not only economic performance).

L66-68: We have added a discussion to explain why we examined the additional explanatory variables. We compared permaculture yields also to organic yields because permaculture farms work according to organic guidelines in most cases. In addition, organic agriculture is the most popular more environmental friendly alternative to predominant (in this case conventional)

agriculture. We discuss the comparison with organic agriculture more in detail in the discussion section.

L77: Wording improved.

L79: Done, thanks for the suggestion.

L136: done

L159-162: We have revised this paragraph at the request of another reviewer.

In scientific literature, the terms "by trend" or "statistical trend" are used to describe results that suggest a possible association or effect, but do not meet the standard threshold for statistical significance ($0.1<p<0.05$). A "trend" indicates that the data show some pattern or association that might become significant with more data, better study design, or less variability in measurements. As we were only able to use a small sample size of farms, the other reviewer wanted us to emphasize the existence of a statistical trend more strongly.

Fig1: This kind of plot, consisting of a mean bar and error bars, is called “crossbar”. This is a common way to display mean and a variation measure in dot plots.

L175-177: We added your argument.

L182: Here we disagree. The mean value of the LERs is 1.44 and thus clearly higher than 1. there is therefore an effect size of 0.44, even if no generalizable statement can be made based on this value due to the lack of statistical significance. Even with no statistical significance we find it important to discuss this effect size.

L208-209: Thanks!

L209-211: We improved the discussion on this point in the beginning of the discussion section.

L223: done

L232-233: We improved the sentence based on your justified suggestion.

L240-247: Thanks. As already mentioned, the discussion on the organic yield gap has now been improved in the beginning of the discussion section.