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Interactive comment on "Obtaining more benefits from crop residues as soil amendments by application as chemically heterogeneous mixtures" *by* Marijke Struijk et al.

Anonymous Referee #1

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General comments

This manuscript reports the results of a full-factorial field experiment, carefully conducted to examine the short-term effects of different mixtures of crop residues on lettuce crop yield and soil respiration, aggregate stability, bulk density, and organic C, N, P, K and Mg contents. The authors found significant non-additive increases in soil available N and soil organic matter contents with the application of a straw-compost mixture (stronger effects than those of straw and compost applied separately) 44 days after the application of the amendments. The topic is important to improve management strategies for crop residues, and the results are well discussed in general. However,

some aspects detailed below would need to be clarified before publication (especially aspects related to the first hypothesis and the methodology).

Specific comments and technical suggestions

L. 13. "(i.e. mixture $\neq$ sum of the parts)" is not needed.

L. 47. "(mixture > sum of the parts)" is also redundant and not needed.

L. 64. What "other soil properties" are the authors referring to?

L. 113-115. The authors hypothesized that faster decomposition of the mixtures would result in higher soil respiration and greater levels of SOM. To fairly test this hypothesis, it would be necessary to differentiate between SOM and amendment organic matter, and this study fails to do so (SOM measurements included amendment organic matter). In other words, it is not possible to tell how much of the OM added with the amendment has been transformed into SOM.

L. 134. Is +-0.8 a standard error? Why only for straw?

L. 134. More information about the amendments would be very useful, especially about the preparation of the compost (stability and maturity).

L. 137-139. "roughly twice". Did the authors consider this error (and those of the application of the individual amendments) when evaluating additive effects?

L. 140. To what depth were the residues incorporated in the soil profile?

L. 140. Was the "fresh" compost (l. 134) mature enough for sowing just the day after its application?

L. 150. Table 2 can be moved to supplementary information.

L. 151. How long was the composting process? Did you perform any maturity or stability test? What was the average size of the straw and woodchip amendments?

L. 182. LOI at 430 °C instead of 500 °C as above for residue characterization. Why?

L. 233. The text “some of which were statistically significant (Table 5). Most notably. . .” is too vague. Only the effects on available N and SOM were significant. Please reword for clarity.

L. 252-254. I agree with the statement that “measurements from residue-mixture treatments cannot be directly compared to individual-residue treatments.” Hypothesis 1, however, is stated as “faster decomposition of residue mixtures will result in a higher soil respiration rate in the short term, as well as the release of greater levels of soil available nutrients (N, P, K, Mg) and SOM compared to individual residues.” Please reword to clarify.

L. 281 and S3. How were these percentages calculated and on which assumptions? Soil cores used for nutrient analysis were collected to 20-cm depth, whereas bulk density was measured on separate 10-cm-depth soil cores (and the authors still need to specify to what depth the residues were incorporated).

L. 312. Again hypothesis 1. Here decomposition is measured in terms of soil respiration, so how can it be that faster decomposition of an organic input compared to another results in higher soil respiration and greater levels of soil organic matter at the same time?

L. 322. Do you mean that the Solvita burst method is not accurate enough? Please clarify.

L. 322. You mentioned above that soils were sieved to 2 mm, and here that they were sieved to 4 mm. Please clarify.

L. 364-365. Organic amendments could stimulate native soil organic matter mineralization while increasing total soil organic matter content. Why not?

Table 5 could be moved to supplementary information.

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