

***Interactive comment on “Conventional tillage vs. organic farming in relation to soil organic carbon stock in olive groves in Mediterranean rangelands (Southern Spain)” by L. Parras-Alcántara and B. Lozano-García***

**Anonymous Referee #1**

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The topic of the manuscript (MS) is of interest since it provides data about soil organic carbon (SOC) accumulation in agroecosystem in terms of management focusing on depth and not only on surface. Nonetheless, there are many orthographical, grammatical and syntax errors along the manuscript which make it difficult to understand and follow in many occasions. MS must be revised by a proficient in English. Manuscript is too long, with information too reiterative in many cases, with too many tables and graphs. Authors must make an effort to synthesize the manuscript. Results and Discussion must be shortened. The list of correlations can be shortened easily. I do not

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see the utility of the PCA performed. It must be explained and justified, or better delete it. There is a lot of information regarding chemical characterization of soil in terms of CEC, cations, etc, and this is not focus of the paper, if I understood correctly objectives and what it is shown with title. Eliminate this information and focus on SOC and properties/factors influencing its dynamics. I do not agree to the use of the stratification ratio of SOC as only indicator of soil quality. Authors use this parameter to conclude improvements in soil quality or soil degradation, but this is only a ratio which relates organic carbon content in surface with subsurface. It is clear that low values indicate mineralization or erosion in surface and thus loss of organic carbon, but it could also include increments in subsurface by leaching for example, since the soils shown here are not very deep and horizons not very thick. I would delete any reference to increments or descends in soil quality only due to the analysis of this ratio. Soil quality is a broad concept that must be supported by different indicators of different nature.

Abstract P36/L 3. Correct as “The management system is a key factor that influences these changes.”

P36/L 4-6. Correct as “To determine the long-term effects of management system on SOC stocks ... –southern Spain) for 20 ys”.

P36/L8. The fact that you show there were 4 principal components does not provide any useful information. Indicate some relationships or separations observed by PCA or delete this sentence.

P36/L11-12. The sentence “Equally was ... to SOC-S” is reiterative since in the previous sentence you write that there significant differences between management techniques. Delete so this sentence, and replace “management techniques” by “management practices” in the previous one.

P36/L15. You must define the meaning of stratification ration index of SOC.

P36/L16. I do not see that these results you show in the abstract indicate high qual-

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ity soils. You did not give any data about SOC contents, only that organic systems increased SOC compared to conventional in two soil types. Remake this sentence.

Objectives: they are not clear. What you mean with soil properties that affect land development? I do not understand this goal. Land development is a very broad concept. Do you mean soil profile evolution? Or the soil properties more affect by management practices? TO establish relationships between soil properties in terms of management? Please clarify. The third objective is also misleading. Variables involved in the SR of SOC in entire profiles? Pleas rewrite and clarify the objectives.

Study site

P38/L26. Include mean annual temperature as well

P39/L10. This citation is not included in the reference list. I guess it is the same than IUSS Working Group WRB (2006) written before. Use one format for the same reference.

P39/L10. Rephrase as “(1989-2009)”

P39/L13. Animal manure is applied only every 10 years? And how soil organic matter and mainly fertility is guaranteed with this low frequency if no mineral fertilization is added? And mainly under semiarid Mediterranean conditions where OC mineralization overpasses humification. Indicate the quantity of manure applied. Explain these issues.

Soil sampling Indicate the number of samples taken in each profile. Did you collect one sample per identified horizon in each soil profile? Indicate it.

P40/L3-6. Remove this paragraph since you show extra information not needed in this MS.

P40/L8. These four replications are lab replication of the same soil sample to reduce experimental error? Indicate it.

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## Statistical Analysis

-Indicate how you assured normal distribution of your data to develop parametric tests for all parameters, since only it is explain for SR.

-I understand that you developed a one-way ANOVA to determine differences among depths and between management practices shown in Tables 2 and 3. You must explain that you develop one-way Anova and also a three-way Anova, and the reasons for that. In fact, it seems that you made a one-way Anova for soil properties, and a three-way Anova for PCA factor scores. Is it right? Explain.

-How did you develop the PCA? I would make some rotation to increase the value of factor scores.

## Results

P41/L4-6. You indicated in M&M section that parent material was granite, climate is semiarid Mediterranean with the same temps and precipitation and soil sampling was carried out in flat areas in all cases. Thus, this sentence misleads here. What do you mean with different topography, physiographic location, parent material and climate?

P41/L15. Define “normal values”. You must indicate reference to range soil properties within these levels in this entire paragraph.

P42/L1-10. To support a strong correlation, not only “P” is used, but also and most important the value of the correlation coefficient “r”. Correlation with r values  $<0.8$  cannot be considered as “very strong correlation”. In fact those correlations you show as very strong are quite weak with  $r < 0.6$ .

P42/L13. Define “land development”. I do not understand what you mean with this term.

P42/17. Thirteen? Aren't they 4?

P42/L26-29. You must explain better what you developed here. What do you mean with

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first and second coefficient related to A horizon and management practise/soil types? Please, correctly explain. In addition, you must indicate why you developed this and show the essential results about the creation of these graphs.

P43/L1-12. I do not understand what you made here. Did you develop a three-way Anova with the factor scores of PCA? And which PC? I do not see in Table 6 the commented differences for PC1, PC2 and PC3. Nothing is clear and I cannot see anything supported in Table 6 neither in Figs 2-3. Rewrite and explain better.

P43/L23. Define total soil organic carbon, not explained in Material and Methods. You explain in table 1 the summation of SOC stock, but not the sum of SOC in all horizons. The same with nitrogen.

Discussion.

You have to be more concise, and avoid repeating results. You show again many data exposed in results which make this section too long.

P46/L14-15. Include in M&M that also granodiorites are present in the area, and indicate for the shown profiles the exact parent material.

P47/L3-4. In M&M section you wrote that all soil profiles were collected in flat areas. Here you say that LP is influenced by topography and physiographic location. It seems contradictory. Explain and if the topography is different in each soil profile, indicate the slope and location in the hill.

P50/L 11-14. How can it be since you explained that OF had no tillage?

P50/L17. What do you mean with vegetation losses? Explain.

Conclusions

Reduce the extension of conclusions.

P52/L9. In M&M you wrote 1989. Revise

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P53/L20-21- How can it be since you explained that OF had no tillage?

Tables. Use some symbol instead of superscript “a” to indicate differences between CT and OF within the same horizon, since it can be misled with the lowercase “a” indicating differences among horizons for each soil type. Replace in the table foot “between depth” by “among horizons”.

Table 2. Is the depth of horizons an average of all profiles? Please explain

Table 3. You must explain the difference between SOC/TSOC, N/TN. I do not understand the differences between both properties.

Figure 2. Include the explained variance after PC

Figure 3. You must explain what you developed here, it is not clear. What you mean with first and second coefficient? Indicate next to each axis to what PC corresponds. I do not understand the axes the way they are shown.

Table 6. What do you mean with r coefficient? Is this the factor score for each soil samples?

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