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Interactive comment on “Effect of land management on soil properties in flood irrigated citrus orchards in Eastern Spain” by A. Morugán-Coronado et al.

Anonymous Referee #1

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The study addresses an interesting issue related to the long-term effects of herbicides use or intensive ploughing on soil amended with inorganic fertilizers compared to organic farming on soil properties. The theoretical basis of this paper looks solid. However, due to the numerous changes required to improve the manuscript, I recommend to accept the paper with major revision. The main comments are:

Title: Since only one soil property (water holding capacity) studied here could be related to flood irrigation, I suggest change the title to “Effect of land management on soil properties in citrus orchards” or similar titles without include the type of irrigation used.

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Introduction: The general comment is that this section needs talk more about the land management types (organic farming, herbicides, inorganic fertilizers) and soil properties (specially microbial activity). Comments about mulches (Page 3, line 3), soil losses (Page 3, line 5), soil erosion (Page 3, lines 14 and 20), wastes (25) or gardens (Page 4, lines 12 and 26) are out of the scope of the paper. If you want to talk about soil quality (Page 4, line 9), probably need propose a soil quality index supported by the evaluation of soil properties developed in the study.

Materials and Methods: Page 6, lines 5 – 8: It not clear if organic farming treatment use flood irrigation or not. Please indicate if the irrigation flooding scheme (time, liters /ha) was the same for all treatments. Page 6, lines 16-17: It Is not clear the meaning of “aliquots”. Please explain better this term. Page 7, line 16: Please explain the method used to measure water holding capacity (WHC). The general comment for statistical analysis sub-section is that PCA needs to be improved. The main purposes of this analysis are: (a) the reduction of the number of variables, removing those with complex structure (e.g. with a correlation > 0.4 for more than one component) or those with low correlation and (b) the identification and classification of hidden partners in the data. In the results section, seems that you used a correlation higher than 0.6, but it was not explained in the text. Page 8, lines 5-10: Please explain what are the rules used to verify if PCA was statistically significant. I suggest: (a) sampling adequacy of individual and set variables by Kaiser-Meyer-Olkin measure (>0.5) and Bartlett’s test of sphericity(<0.05), (b) Variables with communality values <0.5 need to be removed, (c) The selection of main components regulated by the latent root criterion (eigenvalues > 1.0) and (d) Use of varimax rotation to do the classification of soil properties by component. All of these options are available in SPSS software. Develop an iterative process, removing variables adequately, in agree with the rules that you finally selected to verify if PCA was statistically significant. Page 8, lines 13: In the figure 1c, you analyse C/N relationship. Then, you have carbon values for each replicate and treatment. I suggest analyse C and use it to evaluate carbon mineralization coefficient (BSR/C), $Cmic/C$ ratio and metabolic quotient (BSR/ $Cmic$), which are indexes able to evaluate microbial

activity under different land management.

Results: Page 8, line 20: CaCO₃ was statistically higher for both, P and O treatments. Page 8, lines 21-24: Although the pH and EC were significantly different between treatments, if we observe the pH and EC classifications (e.g. Soil Survey Manual of USDA) pH was moderately alkaline (between 7.9 and 8.4) and EC was not saline (< 2 dS/m). Page 8, lines 24-25: CEC was statistically low for both, H and P treatments. Page 9, line 7: SOM was statistically low for both, H and P treatments. Page 9, line 13: The statistical analysis for available P and K were different. For available P both, H and P treatments showed the lowest values while for available K only P treatment showed the lowest value. Please modify the phrase. Page 9, line 19: The statistical analysis for Cmic and SBR were different. For Cmic both, only P treatment showed the lowest value while for SBR only H treatment showed the lowest value. Please modify the phrase. Page 10, lines 3-6: Productivity was not analysed statistically. Please comment it in the discussion section. Page 10, line 7: CaCO₃ was not included in the analysis (Table 2), why? The general comment of Bivariate correlation coefficients sub-section is that a high correlation between variables was observed. I suggest develop simple or multiple linear regression analysis, in order to have a more robust results section. It will improve consequently the discussion section. Page 11, line 1: As commented previously, seems that the criteria to classify soil properties for each component was to have a correlation higher than 0.6. However, for PC1 Cu (0.687) and Carb (0.625) and for PC2 silt (-0.606) soil properties were not included, why?

Discussion: Page 11, line 16: I suggest start the discussion section talking about the taxonomy classification of the soil studied. Briefly (Illustrated guide to soil taxonomy, version 1.0, 2014, USDA): (a) Ent: young soil with little or no profile development, (b) orthents: entisols lacking in pedogenetic development and (c) xerorthents: these soils have a xeric soil moisture regimen (cool and moist in winter and warm and dry in summer). With this information it is possible to discuss if the soil properties selected and studied were adequate to evaluate different land managements. Page 12, lines 18-

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20: However, the correlation of phosphatase with SOM was 0.699 while the correlation of phosphatase with available P was 0.712. Is it contradictory?

Other comments Table 1: Please use the same other of letters to differentiate treatments. Use always “a” to indicate the maximum value or use always “a” to indicate the minimum value. Please explain what is the meaning of bdl (below detection limit?). Table 2: Lack the analysis of CaCO₃ and C (if available). Table 3: Add the legend to explain the variance explained. Figure 1a: The order of letter could be: “a” for O treatment, “c” for H treatment and “b” for P treatment. Figure 2f: The order of letter could be: “a” for O treatment, “b” for H treatment and “ab” for P treatment.

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