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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.

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(1) comments from Referees Anonymous Referee #1 Received and published: 15 January 2015 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 prop-

erties in citrus orchards" or similar titles without include the type of irrigation used. DONE Changed to: Effect of land management on soil properties in citrus orchards in Eastern Spain 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). DONE Introduction was improved with more information about organic farming, herbicides and inorganic fertilizers. Microbial activity and microbial communities was enhanced in the whole introduction section.

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. DONE These paragraphs were rewritten removing comments about mulches, soil losses, soil erosion, wastes and gardens.

Materials and Methods: Page 6, lines 5 – 8: It not clear if organic farming treatment use flood irrigation or not. DONE Organic farming treatment plots are irrigated too. Paragraph rewritten with this comments. "the irrigation is every 20 days in summer and no irrigation takes place in winter."

Please indicate if the irrigation flooding scheme (time, liters /ha) was the same for all treatments. DONE Paragraph rewritten with this comments. "The orchards of this study are flooded every 20 days in summer and no irrigation takes place in winter (700 m3 ha-1 per irrigation) from April to October."

Page 6, lines 16-17: It Is not clear the meaning of "aliquots". Please explain better this term. Soil sample aliquots (a portion of a total amount of a field soil sample) were sieved between 0.25-4 mm to determine the percentage of stable aggregates.

Page 7, line 16: Please explain the method used to measure water holding capacity (WHC). The water-holding capacity of the soil was determined by placing duplicate 20 g field-moist soil samples in funnels fitted with folded Whatman 2V filter paper on

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the inside and mounted on preweighed 250 ml flasks as described by Forster (1995). Percentage water-holding capacity was calculated with the following formula: % Water-holding capacity=((100 Wp)+ Wi)/dwt x 100 where Wp is the weight of the percolated water in grams, Wi is the initial amount of water in grams contained in the sample, and dwt is the soil dry weight in grams (Forster 1995).

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. DONE We improved the statistical analysis sub-section, explaining the correlation criterion >0.4 in different components and the mean purpose of this analysis is establish relationships between variables and treatments. And Table 4 was enhanced following this changes.

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. DONE The statistical analysis was repeated with the suggestion of referee #1 and the paragraph was rewritten.

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

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management. DONE BSR/C, Cmic/C ratio, BSR/Cmic were added in results, statistical analysis and discussion sections.

Results: Page 8, line 20: CaCO3 was statistically higher for both, P and O treatments. DONE Sentence with statics comment was added in this paragraph

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). DONE Thank you, a sentence with this accurate comment was added in this paragraph.

Page 8, lines 24-25: CEC was statistically low for both, H and P treatments. DONE This sentence was rewritten with this comment.

Page 9, line 7: SOM was statistically low for both, H and P treatments. DONE This sentence was rewritten with this comment.

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. DONE This phrase was modified with this comment.

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. DONE This phrase was modified with this comment.

Page 10, lines 3-6: Productivity was not analysed statistically. Please comment it in the discussion section. DONE We have not recovered data about the productivity of harvest in the different agricultural managements because the objective of this study was evaluate effects on soil properties not in crop productivity. Nevertheless, we remove from the manuscript, the phrase: “However, we observed and estimated that there had

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not been important differences of yield between treatments in the last five years." Due to this was an estimation and we could not discuss these results.

Page 10, line 7: CaCO3 was not included in the analysis (Table 2), why? DONE CaCO3 was included in table 2. DONE We included in Table 2 (Correlation coefficients (R-values) for relationships between physical, chemical and biochemical properties for all the managements.) the CaCO3, carbon mineralization coefficient (BSR/C), Cmic/C ratio and metabolic quotient (BSR/Cmic).

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. DONE We repeated the bivariate correlation with the referee #1's suggestions.

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? DONE The whole PCA section was rewritten with the new PCA analysis with the suggestions of the referee #1, (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 (WHC was removed following this criterion), (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.

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 sum-

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mer). With this information it is possible to discuss if the soil properties selected and studied were adequate to evaluate different land managements. DONE This helpful paragraph suggested by the reviewer was added in discussion section.

Page 12, lines 18-20: However, the correlation of phosphatase with SOM was 0.699 while the correlation of phosphatise with available P was 0.712. Is it contradictory? DONE This results was revised and the paragraph was rewritten to clarify this conclusion.

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. DONE The different letters indicate significant different according to ANOVA analysis. We included this paragraph in table 1 to specify the meaning of letters. Different letters indicate significant differences ($P<0.05$) between soil management for each treatment according to one-way ANOVA.

Please explain what is the meaning of bdl (below detection limint?) DONE We explained in this table the bdl meaning. bdl: below detection limit of lowest concentration used in absorption chromatography analysis (Zn: 0.01 g kg-1; Cu: 0.01 g kg-1)

Table 2: Lack the analysis of CaCO3 and C (if available). DONE We added CaCO3 correlation values and the carbon mineralization coefficient (BSR/C), Cmic/C ratio and metabolic quotient (BSR/Cmic).

Table 3: Add the legend to explain the variance explained. DONE Table 3 was changed to Table 4 and legend added in table 4

Figure 1a: The order of letter could be: "a" for O treatment, "c" for H treatment and "b" for P treatment. Different letters indicate the results for ANOVA analysis not the different treatments studied in the experiment. Different letters indicate significant differences ($P<0.05$) between soil management for each treatment according to one-way ANOVA.

Figure 2f: The order of letter could be: "a" for O treatment, "b" for H treatment and "ab"

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for P treatment. Different letters indicate the results for ANOVA analysis not the different treatments studied in the experiment. Different letters indicate significant differences (P<0.05) between soil management for each treatment according to one-way ANOVA.

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Please also note the supplement to this comment:
http://www.soil-discuss.net/2/C39/2015/soild-2-C39-2015-supplement.pdf

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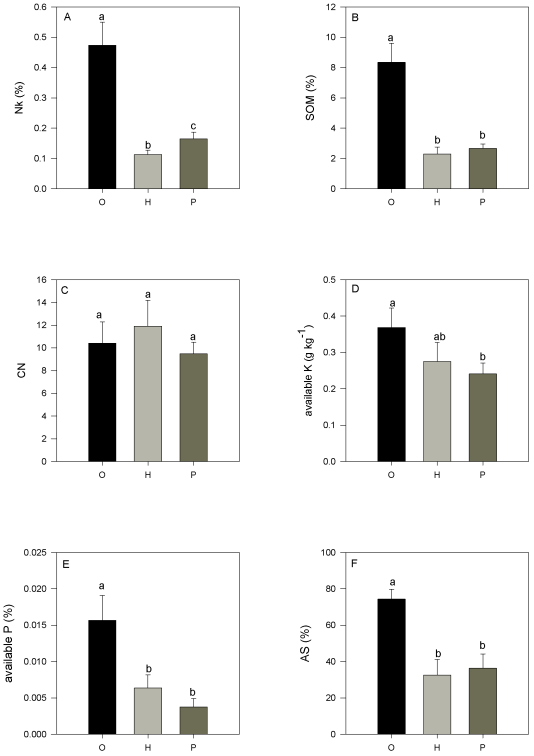

Fig. 1.

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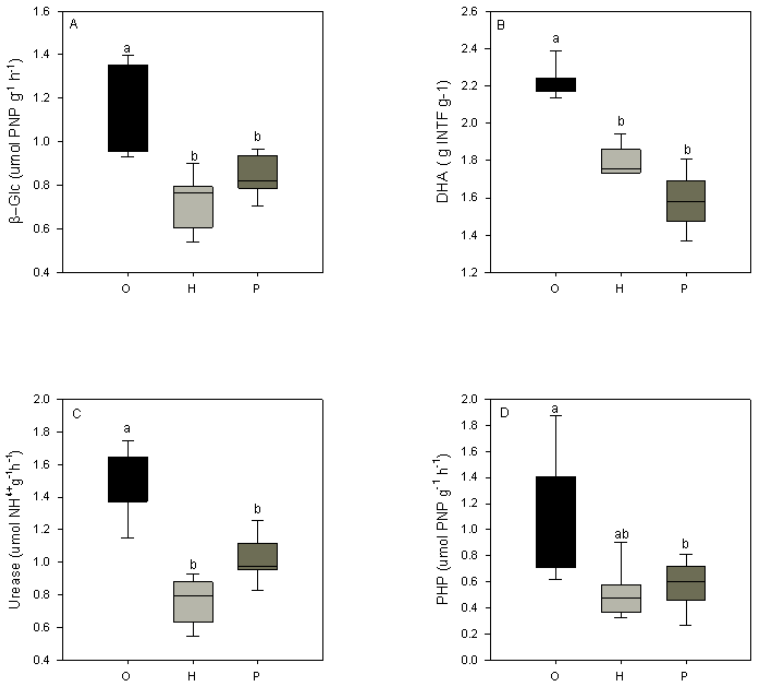

Fig. 2.

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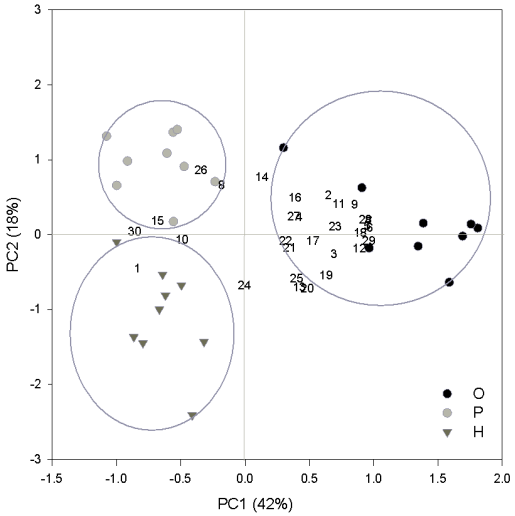

Fig. 3.

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