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Interactive comment on “Nitrogen, phosphorus, potassium, calcium and magnesium release from two compressed fertilizers: column experiments” by M. J. Fernández-Sanjurjo et al.

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Nitrogen, phosphorus, potassium, calcium and magnesium release from two compressed fertilizers: column experiments M.J. Fernández-Sanjurjo, E. Alvarez-Rodríguez, A. Núñez-Delgado, M.L. Fernández-Marcos, and A. Romar-Gasalla

Reviewer 2:

This is an interesting manuscript (MS) dealing with the assessment of the release of nutrients by two different fertilizers one incorporated in soil. This information can be useful not only for scientists but mainly for land managers, being of broad interest. However, the manuscript must be improved before publication to better explain the

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procedure followed to carry out the incubation experiment. The statistical analyses must be remade, and more discussion about some aspects is needed. I expose my comments below: Objectives: -You have to be more explicit with the objectives. I do not really understand what you mean with “behaviour” of nutrients released and their effects on the chemistry of soil”. You have just checked how different nutrients increase in soil after the addition of two fertilizers, assessing the losses by leaching. Really indicate what you have planned. ANSWER: Thank you for your comment. We have done it.

Materials and Methods: -You have design and experiment under saturated conditions, indicating no aeration, and thus reduction conditions. However, these saturated conditions are not the ones found at field under agricultural management in this kind of soil. Explain in Discussion how results under these conditions can be extrapolated to aerated soils. ANSWER: Thank you for your comment. We have simulated laboratory conditions that facilitate more rapid solubilisation of the nutrients, knowing that they are not representative of what happens in the field when aerate conditions prevail. However, alternate red-ox environmental conditions would introduce much more variability, and we think it deserves further experiments and complementary future research.

-You have to better explain the procedure to carry out the incubations. Explain how distilled water was added and the criteria followed to select the quantity, intensity and frequency. Was it a continuous flow? Was it periodically added? When, how, why? You have to respond these questions in the text. You indicate in RD that the quantity added is equivalent to 13 years rainfall. But you must explain the reasons to select this amount and how was it added. Is it not too much water to simulate 13 years in 80 days? Are not you overforcing the system? Justify. ANSWER: Thank you for your comment. The basis and conformation of the experimental devices are described in our previous works, as referred in the manuscript (Núñez-Delgado et al., 1997; Núñez-Delgado et al., 2002; Pousada-Ferradás et al., 2012). We selected continuous flow conditions to reach a volume equivalent to a number of years (13) high enough to evaluate long

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term release of nutrients from the tablets. The flow takes place by gravity, from the top. We think that laboratory experiments cannot replace field trials, but can give rapid results that must be evaluated as an accelerated approach. Any case, at the end of the experiment the tablets remained partially undissolved. Also, in certain cases it is possible to find two pikes of solubility (is the case of Ca), with the second one maintained up to near the end of the trial, and it could not be characterized or even detected performing shorter experiments.

-You indicate that you collected 6 leachate samples for 15 days. Was the flow of leaching continuous? What is the criteria to collect 6 samples? What was the quantity collected at each sampling. These details must be explained. ANSWER: Thank you for your comment. Now we have included in the manuscript the indication that the flow was continuous, and that we selected 6 samples/day based in previous trials, in view of the variability of some parameters that were evaluated and in the final volume reached. Each of the 6 samples was equivalent to 0.117 L in volume.

-In this section you indicate that you measured Na and Al but they are not shown in the Results and Discussion. Delete them from here so. ANSWER: Thank you for your comment. We have done it.

-Statistical analyses: you must repeat the statistical treatment of the data. Your samples are dependent since you used the same soil sample collected in the field and applied treatments to this sample in the lab throughout an incubation experiment. Thus, you cannot carry out an ANOVA for independent variables. You must carry out Repeated Measures ANOVA with “incubation time” as within-subject factor and “fertilizer” as between-subject factor. Indicate as well how normality of data was ensured and the post-doc test used for means comparison. Indicate the selected level of significance. ANSWER: Thank you for your comment. We have translated data corresponding to the initial soil to an independent table (Table 1), and we have performed new statistical analyses considering control and fertilized columns (Table 3).

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-It is difficult to follow the explanation of every parameter and treatment without the proper explanation of the experimental procedure. Since I said before, you have to explain in MM how was the water added to each column, the selected flow (V/t), frequency of addition and why this selection. ANSWER: Thank you for your comment. We have done it.

-To better understand and visualize the actual effect of fertilizers on soil nutrients, I would subtract the control values from the values in soils incubated with the fertilizers for all properties measured and represent these in all the graphs. So, in the graphs you won't show the control values, but only the values of the samples fertilized. With this approach you really assess the actual contribution of the fertilizers, since you extract the release from soil constituents. ANSWER: Thank you for your comment. Your point of view is very interesting. Any case, we think that in this kind of experiments it is also very interesting to know the dynamics of the controls considered independently, due to the additional information provided by these control samples.

-Pag 1561, lines 1-11. The pH can affect these variable charges. How the pH in your soil may influence the actual variable charges of soil colloids? Discuss it. ANSWER: Thank you for your comment. Now we have discussed it.

-You must indicate in the text, when explaining the pattern of the properties, not only their trend with time, but also the correspondence with cumulative percolated water, since in the graphs this is the unit you use, and it is difficult to follow the writing in the graphs if different units are used. ANSWER: Thank you for your comment. Now we have indicated it.

-You should discuss why these slow release nutrients tablets release so many nutrients the first days after they stabilized. ANSWER: Thank you for your comment. The maximum release of nutrients corresponds to a relatively high addition of water, equivalent to 1.5 years rainfall. Now we have included some comments at this regard in the manuscript.

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-Pag 1564, lines 20-24 and Table 3. Refer the “leached” as accumulated leaching loss referred to the initial amount to facilitate comparisons. ANSWER: Thank you for your comment. We have done it.

-Pag 1564, lines 25/28. What do you mean with “ect” in the last line of the page? Give the possible possibilities where N can be retained according to literature findings. It is quite strange that 99 ANSWER: Thank you for your comment. We have changed it.

-Pag 1565, line 1. Leaching is very low to explain the lack of N accumulation in soil. Explain it better. ANSWER: Thank you for your comment. It can be explained taking into account denitrification and volatilization processes, favoured by the reduction conditions prevailing, as well as immobilization processes that can occur. We have included some comments on it in the new manuscript.

Tables and Figures -Include the standard deviation in all tables and figures. ANSWER: Thank you for your comment. We have done it.

-Include and a) in the upper graph and b) in the lower graph of the figures and refer to Figure Xa or Figure Xb along the text. ANSWER: Thank you for your comment. We have done it.

-It is difficult to me to understand these graphs with the accumulated percolated water in X axis instead of time since you explain in the text the evolution of the properties with time. Since I do not know the flow of the added water (amount added per time) I can't totally comprehend the information provided by the graphs. You should clearly indicate the water flow and duration of the experiment in the figure caption. To make it easier to understand, I suggest you two options: a) include time of incubation in the X axis; b) rewrite the way RD section is explained to correlate time with accumulated percolated water. If you keep the current version with accumulated percolated water, please define 5 or 10 L as range in the X axis instead of 20L. ANSWER: Thank you for your comment. We have changed the range in the X axis.

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-Include the F-value with the P-value in all tables. ANSWER: Thank you for your comment. We have included P values in Table 3, where significant differences are showed.

-Table 3. Apart from relative values, include in the table the actual absolute values. Make the difference between released and leached, and this quantity must be the amount retained in soil. Compare this theoretical difference in the nutrients level with the increments observed in Table 2, and assess if values match or there have been some loss not taken into account. Discuss these findings. ANSWER: Thank you for your comment. We have included new data and discussed it, as indicated.

-Figure 1. Include the same number of decimals in the axis. I miss a graph like this with electrical conductivity to know how these tablets affect soil and leachates salinity. Do you have these data? ANSWER: Thank you for your comment. Now Figure 2 corresponds to electrical conductivity. We have included new comments at this regard in the manuscript.

I include minor comments directly on the pdf attached. ANSWER: Thank you very much for all your indications.

Please also note the supplement to this comment:

<http://www.solid-earth-discuss.net/6/C1032/2014/sed-6-C1032-2014-supplement.pdf>

Interactive comment on Solid Earth Discuss., 6, 1555, 2014.

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